

School of Physiotherapy and Exercise Science

An Exploration of Patient Satisfaction after Total Knee Replacement Surgery

By

Nardia-Rose Klem

B.Sc. (Physio)(Hons)

This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University

March 2021

Author's Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Human Ethics: The research presented and reported in this thesis was conducted in accordance with the ethical standards in the 1946 declaration of Helsinki. Ethical approval was granted by St Vincent's hospital (Melbourne) human research ethics committee (HREC/17/SVHM/251) and reciprocal approval by Curtin human research ethics committee (HRE2017-0827).

Nardia-Rose Klem
Doctoral Candidate
26th March 2021

Statement of Contributors

The candidate, Nardia-Rose Klem, was responsible for all aspects of the research presented in this thesis, including study design, data collection, data analysis, interpretation, and reporting of results.



Nardia-Rose Klem 26th March 2021

I, as Co-author, endorse that this level of contribution by the candidate indicated above is appropriate.



Professor Anne Smith (Co-author 1) 26th March 2021



Professor Peter O'Sullivan (Co-author 2) 26th March 2021



Associate Professor Peter Kent (Co-author 3) 26th March 2021



Associate professor Michelle Dowsey (Co-author 4) 26th March 2021



Dr Samantha Bunzli (Co-author 5) 26th March 2021



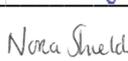
Dr Robert Schütze (Co-author 6) 26th March 2021



Professor Peter Choong (Co-author 7) 26th March 2021



Dr Robyn Fary (Co-author 8) 26th March 2021



Associate Professor Nora Shields (Co-author 9) 26th March 2021

Abstract

Osteoarthritis (OA) is one of the most commonly diagnosed conditions in Australian primary care. When symptomatic, OA can cause persistent pain, impair one's quality of life and is a public health burden. The Australian Institute of Health and Welfare has identified that individuals with symptomatic OA are 3.5 times more likely to report high levels of psychological distress and are 2.8 times more likely to report severe pain than those without OA.

As a treatment approach to knee OA in Australia, 65,266 total knee replacement (TKR) surgeries were performed in 2018. From 2005 – 2006 to 2016 – 2017, there was a 38% rise in the rate of TKR for OA, with rates predicted to continue to increase. While many people experience vast improvement in pain, function and quality of life following TKR, this is not the experience for all patients. It has been reported that 20% of those that undergo TKR will still experience ongoing pain and disability, and the dissatisfaction rate has been demonstrated to be as high as 35%. These rates of poor response to TKR are not only burdensome to the health care system, but also to the individual who experiences persistent symptoms and disability. For many of these patients, there is no clear biomedical explanation for their poor response to TKR. Thus, understanding the reasons driving these suboptimal outcomes has confounded researchers and clinicians.

However, there is a paucity of investigation into the patient's perspective of outcomes after TKR. In particular, there is a lack of understanding of what patient satisfaction means to the individual and how this intersects with outcomes of pain and function. To increase the proportion of people experiencing a meaningful benefit from TKR, a better understanding of patient satisfaction is needed at the level of the individual. Gaining the patient's perspective in this way may elicit reasons driving high and low satisfaction that are unrelated to biomedical factors, which can inform targeted solutions to patient problems.

Therefore, the aims of this thesis were to:

- 1) Evaluate the proportion of people reported to be satisfied after TKR for knee OA, and assess the content validity of the utilised satisfaction measures.
- 2) Understand what it means to patients to be satisfied 1 – 2 years after TKR, and the factors that influence their satisfaction, using qualitative methods.
- 3) Explore whether what it means to be satisfied, or the factors influencing satisfaction, undergo change 3 – 4 years after TKR, using qualitative methods.

The final piece of work in this PhD thesis arose from the experiences of conducting qualitative research in orthopaedics, a field dominated by a biomedical paradigm. While calls for research involving the patient voice have been made for over two decades, qualitative studies in orthopaedics are still rarely published. My experiences and the anecdotal experiences of other musculoskeletal qualitative researchers, especially as reflected in the comments received from manuscript reviewers and journal editors, suggests that the scarcity of qualitative publications in orthopaedics appears to be largely driven by the assumption that qualitative research is essentially ‘biased’ as it does not conform to quantitative concepts of rigour. In addition to this, as a novice qualitative researcher, I experienced a complicated array of often overlapping approaches, lack of consistency in terminology, and a lack of practical application of qualitative research to this clinical context. To address these issues, the doctoral candidate wrote a five-part series addressing the core concepts of qualitative research in terms of common applications to a musculoskeletal clinical setting. Although explicitly written for musculoskeletal and orthopaedic practitioners as consumers of qualitative research, it is hoped that the series will also be a resource for producers and evaluators of qualitative research in these fields.

Therefore, the overall aim of the final piece of work of this thesis was to:

- 1) Create a practical roadmap for consumers of qualitative research in order to promote greater inclusion of the patient voice in orthopaedic and musculoskeletal research and the 'clinical/academic conversation'.

Study 1: A systematic review of patient satisfaction after TKR

The following aims were addressed in Study 1:

- (i) Evaluate the proportion of people reported to be satisfied after total knee replacement for osteoarthritis.
- (ii) Assess the content validity of the utilised satisfaction measures.

Methods: We searched four literature databases with search phrases 'Total Knee Arthroplasty' OR 'Total Knee Replacement' AND 'patient satisfaction' for studies that measured satisfaction at least 6 months post-unilateral primary TKR for knee osteoarthritis. Identified studies were assessed for risk of bias, and studies at high risk of bias were excluded (PROSPERO: CRD42017058936). Meta-analysis was not appropriate due to the heterogeneity in satisfaction instruments, thus satisfaction scores were described. The content validity of satisfaction questionnaires was assessed using the COnsensus-based Standards for the selection of health status Measurement Instruments (COSMIN) criteria.

Results: The present review found heterogeneity in the satisfaction questions used, as well as the satisfaction estimates from the various studies. Only two satisfaction instruments were relevant for a TKR population and both failed assessment for content validity due to lack of patient involvement during development and testing, in accordance with the COnsensus-based Standards for the selection of health status Measurement Instruments criteria.

Conclusion: Future research should focus on qualitative methods to elicit patients' perspectives of satisfaction to build theoretical understanding.

Study 2: A qualitative investigation of patient satisfaction after TKR

The following aims were addressed in Study 2:

- (i) To explore what it means to be satisfied 1 – 2 years after total knee replacement.
- (ii) To investigate the factors that influence satisfaction levels 1 – 2 years after total knee replacement.

Methods: A constructivist grounded theory methodology was employed. People in a hospital registry who had completed 12-month follow-up questionnaires and were not more than 18 months post-TKR at the time of sampling were eligible ($n = 121$). To recruit a sample that provided insight into a range of TKR experiences, we divided eligible candidates on the registry into quadrants based on their responder status and satisfaction level. A responder was an individual who experienced a clinically meaningful change in pain and/or function on the WOMAC according to the Outcome Measures in Rheumatology-Osteoarthritis Research Society International (OMERACT-OARSI) responder criteria. Individuals were considered satisfied unless they indicated somewhat dissatisfied or very dissatisfied for one or more of the four items on the Self-Administered Patient Satisfaction Scale. From the resulting quadrants: responder satisfied, non-responder satisfied, non-responder dissatisfied, responder dissatisfied, we identified men and women with a range of ages and invited them to participate ($n = 85$). The final sample ($n = 40$), consisted of 10 responder satisfied, nine non-responder satisfied, eight non-responder dissatisfied, and 13 responder dissatisfied; 71% were women, with a mean age of 71 ± 7 years and a mean time since TKR surgery of 17 ± 2 months (range 13 to 25 months). Interview transcripts were analysed by looking for factors in the participants' narrative that appeared to underscore their level of satisfaction and attaching inductive (data-derived, rather than a priori derived) codes to relevant sections of text. Coded data from participants

who reported high and low levels of satisfaction were compared/contrasted and emerging patterns were mapped into a conceptual model. Recruitment continued until no new information was uncovered in data analysis of subsequent interviews, signalling to the researchers that further interviews would not change the key themes identified and data collection could cease.

Results: In those with high satisfaction levels, satisfaction was conceptualised as an improvement in pain and function. In those with low satisfaction levels, rather than an improvement, satisfaction was conceptualised as complete resolution of all symptoms and functional limitations. In addition, three pathways through which participants reached different levels of satisfaction were identified: (1) The full-glass pathway, characterised by no or minimal ongoing symptoms and functional deficits, which consistently led to high levels of satisfaction; (2) the glass-half-full pathway, characterised by ongoing symptoms and functional limitations, which also led to high levels of satisfaction; and (3) the glass-half-empty pathway, also characterised by ongoing symptoms and functional limitations, which led to low levels of satisfaction. The latter two pathways were mediated by three core mechanisms (recalibration, reframing, and reconceptualisation) influenced either positively or negatively by (1) a persons' thoughts and feelings such as optimism, self-efficacy, pain catastrophising, external locus of control; and (2) social and contextual factors such as fulfilment of social roles, therapeutic alliance with their surgeon, lack of family/social support.

Conclusion: This qualitative study suggests that satisfaction after TKR is partly a function of improvements in symptoms and functional impairments. In those patients that do experience continued symptoms or functional impairments after TKR, satisfaction appears to be multi-faceted and may better reflect their adaptability. For preoperative patients in whom unrealistically high hopes for complete symptom resolution and restoration of functional capacity persists, these high expectations should be addressed with a more realistic picture of likely outcomes. In some patients with unrealistically high expectations, it may be appropriate to direct them away from TKR due to the risk of low satisfaction. For postoperative patients troubled by ongoing symptoms or functional

limitations, clinicians may improve levels of satisfaction by targeting the three core mechanisms (recalibration, reframing valued activities, and reconceptualisation), as well as addressing modifiable negative thoughts and feelings, and negative social and contextual factors.

Study 3: A follow-up study of patient satisfaction after TKR

The following aims were addressed in Study 3

- (i) What is the stability in satisfaction 2 years following the initial inquiry?
- (ii) Does the existing conceptual model of patient satisfaction after TKR apply at this later follow-up?

Methods: From the 40 participants who took part in the original study, 11 were purposively sampled based on their level of satisfaction and factors driving satisfaction as reported in the first interview. Six women and five men were interviewed, the average time since TKR was 3 years and 5 months, and the average age at time of interview was 77 years. One-to-one interviews were conducted with open-ended questions. The interview schedule was designed to test the assumptions of the previous model. Interviews were transcribed verbatim and analysed according to a constructivist grounded theory methodology.

Results: Satisfaction levels were mostly stable with the exception of three participants; two transitioned in a positive direction and one in a negative direction. The meaning of satisfaction and the factors that influenced satisfaction were consistent with the original findings. However, beliefs relating to the influence of aging on persistent knee symptoms and functional limitations were more dominant in the present study.

Conclusion: The findings provide support for patient satisfaction being a multifactorial construct that is potentially modifiable. Clinicians may apply the conceptual model described to optimise satisfaction among patients 3 – 4 years post TKR. However, clinicians should be mindful as to

whether the age-related beliefs of their patients are appropriate, and highlight the importance of informing TKR patients to present for care in order to optimise their TKR outcomes, rather than accepting ongoing symptoms or functional limitations.

Qualitative resources: foundations of qualitative research for producers, evaluators and consumers, applied to the fields of orthopaedic and musculoskeletal therapy

The following aims were addressed in this qualitative resource series:

- (i) To describe in lay terms the fundamentals of qualitative research designs and how these designs can be clinically useful for the field of orthopaedics and musculoskeletal therapy.
- (ii) To provide guidance for the appraisal of high-quality qualitative research for consumers, producers, and evaluators.

Background: The intent of this series was to enhance the understanding qualitative research and how findings from qualitative research might apply to orthopaedic and musculoskeletal clinical practice. Qualitative research can provide detailed information about people’s experiences, beliefs and behaviours, which can be invaluable for delivering quality, tailored biopsychosocial care. However, the confusing and inconsistent terms used in the literature can make it difficult for orthopaedic and musculoskeletal practitioners to understand and evaluate qualitative studies. This series provided straightforward explanations of the key components of qualitative research. Rather than an exhaustive list of terms, the focus of this series was on how to appraise clinically targeted qualitative research and how to apply qualitative findings to clinical practice.

Design: A qualitative series was written over 5 instalments. Part 1 focused on what qualitative research is, and what types of questions qualitative research can help answer in the field of clinical practice of orthopaedics and musculoskeletal therapy. This was accompanied by a glossary of commonly used qualitative terms as a quick resource to assist consumers of qualitative research when faced with unfamiliar terminology. Part 2 focused on the core beliefs underpinning qualitative

research, which differ from quantitative research. Understanding these core beliefs will help readers interpret the findings of qualitative studies. This section aimed to explain the essential foundations for understanding how a qualitative study was done. Part 3 explained qualitative research designs and theory. In this instalment, real qualitative studies from the musculoskeletal field were used as examples to demonstrate how to identify the research design and theory employed, and what this means for the clinical application of the findings. Part 4 described the methods used by qualitative researchers. This section included a table with commonly used qualitative methods and description of what they are. Finally, part 5 explained how to appraise the rigour of a qualitative study. This section provided a table of the trustworthiness criteria and definitions, and discusses the use of rigour checklists.

Acknowledgments

My sincerest gratitude goes to the participants of this study. Thank you for sharing your experiences with me – both the incredible successes and the heart breaking disappointments. For those that continue to struggle after total knee replacement, I hope the findings of this work are a step in the right direction to help you on your journey.

For the financial support that made this research possible, thank you to the Research Training Program stipend and to the National Health and Medical Research Council Centre for Research Excellence, Optimising outcomes, equity, cost effectiveness and patient selection (OPUS).

Thank you also to the staff at OPUS and St. Vincent's Hospital who have been incredibly helpful in my participant management from the other side of the country.

To my friends, The Ghosts of Canterbury Terrace, thank you for keeping me laughing, especially in a year where h(y)umour was the only coping mechanism (thank you very muchly 2020).

To my co-authors in the papers that formed the body of this thesis, Dr Robyn Fary, Dr Rob Shütze, Associate Professor Nora Shields, and Professor Peter Choong, it was a privilege to work with and learn from you all.

To Dr Marilyn Palmer, thank you for your time in explaining qualitative research to me when I was deciding whether or not to undertake a qualitative PhD. I am very grateful for the knowledge you have imparted on to me.

To my five amazing supervisors, you have all played such an important role in my PhD journey over the past 4 years. Looking back, it was a big risk giving this responsibility to a 24 year-old, so I thank you for taking that chance on me! To Associate Professor Peter Kent, thank you for your ever calming and encouraging presence. Thank you especially for your expertise and guidance during the

systematic review, and for all your thoughtful feedback on the original research. To Associate Professor Michelle Dowsey, thank you for being so welcoming and supportive during my time in Melbourne. Thank you also for your practical and insightful feedback throughout this body of work. To Dr Samantha Bunzli, it has been a privilege to work so closely with you throughout the course of this PhD. I feel so grateful to have had such a fantastic qualitative expert, role model and trail-blazer to shape my qualitative skills on. I am in constant admiration of your kindness and generosity. To Professor Peter O’Sullivan, your enthusiasm and passion for helping people suffering with chronic musculoskeletal conditions is inspiring. Thank you for your continual support throughout this journey, and expertise in translating my findings to clinical practice. To my primary supervisor Professor Anne Smith, I am unbelievably grateful for the thoroughness and thoughtfulness you have invested into this body of work. Not only have you been an amazing primary supervisor during this PhD, but also an incredible mentor for me to model my research skills on. The integrity, pragmatism and thoughtfulness you approach research with are virtues I will continue to strive for on my journey as a researcher.

To my family, thank you for your continued support on this journey. Thank you to my sister Hannah, for always making me laugh with your (unbelievably regular) weird stories, always beginning with ‘you’ll never guess what Nards ...’, and it’s true – I can never guess. Your talent and dedication to music has always inspired me and I’m so excited to watch your career unfold. To my Mum and Dad, you have always been my biggest supporters of anything I decide to do – whether it be my hairdresser phase, my plans to start a cake baking business, or even swim to Rottneest – this PhD has been no exception. Thank you both for ensuring Hannah and I have as many opportunities as possible in our lives. I am so grateful that my values and morals have been shaped by two incredibly intelligent, empathetic, and passionate people, who are dedicated to helping others.

To my parents, I dedicate this thesis to you.

Table of Contents

Author's Declaration	Error! Bookmark not defined.
Statement of Contributors	iii
Abstract	iv
Acknowledgments	xii
Table of Contents	xiv
List of Tables	xvii
List of Figures	xvii
List of Boxes	xviii
List of Appendices	xviii
List of Publications Arising from this Thesis	xix
List of Abbreviations	xx
Chapter 1: Introduction	1
1.1 <i>Thesis structure</i>	3
Chapter 2: Literature Review	5
2.1 <i>Introduction</i>	5
2.2 <i>Background on osteoarthritis</i>	5
2.2.1 <i>Osteoarthritis as a disease and an illness</i>	5
2.3 <i>Total knee replacement as treatment for osteoarthritis</i>	6
2.4 <i>Measuring meaningful benefit after total knee replacement</i>	7
2.4.1 <i>Clinically meaningful improvement after total knee replacement</i>	7
2.4.2 <i>Satisfaction after total knee replacement</i>	9
2.4.2.1 <i>Historical context to patient satisfaction</i>	10
2.4.2.2 <i>Current conceptualisation of patient satisfaction</i>	13
2.4.3 <i>Prediction of satisfaction after total knee replacement by pre-operative factors</i>	15
2.4.4 <i>Intersection between clinically meaningful improvement and patient satisfaction</i>	17
2.4.5 <i>Longitudinal understanding of patient outcomes</i>	18
2.5 <i>Validity issues</i>	20
2.5.1 <i>Types of validity</i>	20
2.5.2 <i>Validity in satisfaction questionnaires</i>	21
2.5.3 <i>Response shift</i>	21
2.6 <i>Limitations in our current understanding of patient satisfaction</i>	23
2.6.1 <i>Qualitative approaches to understanding patient satisfaction in health care</i>	23
2.6.2 <i>Qualitative approaches in total knee replacement</i>	26
2.6.3 <i>Barriers to qualitative methodology in orthopaedics</i>	31
2.7 <i>Qualitative methodologies to assist understanding patient satisfaction after total knee replacement</i>	32
2.8 <i>Conclusion</i>	33
Chapter 3: Methodology	35
3.1 <i>Introduction</i>	35
3.2 <i>Qualitative approach and philosophical perspective</i>	35
3.2.1 <i>Relativist ontology</i>	36

3.2.2 Constructivist epistemology	37
3.2.3 Theoretical perspective	38
3.3 <i>Rationale for grounded theory</i>	40
3.3.1 Grounded theory approaches	41
3.3.2 Other methodologies considered	44
3.4 <i>Chapter conclusion</i>	45
Chapter 4: Methods	46
4.1 <i>Introduction</i>	46
4.2 <i>Recruitment and sampling</i>	46
4.2.1 Initial sampling	49
4.2.2 Theoretical sampling	50
4.3 <i>Data collection</i>	53
4.4 <i>Data analysis</i>	57
4.4.1 Transcription	58
4.4.2 Coding	60
4.4.2.1 Initial coding	60
4.4.2.2 Focused coding	62
4.4.3 Development of categories and theory	66
4.4.4 Memos	67
4.5 <i>Trustworthiness</i>	68
4.6 <i>Ethical considerations</i>	70
4.7 <i>Chapter conclusion</i>	71
Chapter 5: Study 1: Satisfaction after TKR is usually high but what are we measuring?	72
5.1 <i>Introduction</i>	72
5.2 <i>Published manuscript</i>	72
5.3 <i>Chapter conclusions</i>	100
Chapter 6: Study 2: What Influences Patient Satisfaction after TKA? A Qualitative Investigation	101
6.1 <i>Introduction</i>	101
6.2 <i>Published manuscript</i>	101
6.3 <i>Chapter conclusions</i>	132
Chapter 7: Study 3: What influences patient satisfaction after total knee replacement? A qualitative long term follow-up study	134
7.1 <i>Introduction</i>	134
7.2 <i>Study 3 manuscript</i>	134
7.3 <i>Chapter conclusions</i>	158
Chapter 8: Discussion	159
8.1 <i>Introduction</i>	159
8.2 <i>Summary of main findings</i>	160
8.3 <i>Situating the conceptual model</i>	161
8.4 <i>Response shift in satisfaction after total knee replacement</i>	169
8.5 <i>Implications for clinical practice</i>	172
8.5.1 Further considerations for the clinical use of the conceptual model	175

8.6 Implications for measurement	176
8.7 Strengths and limitations	178
8.8 Future directions.....	182
8.9 Methodological implications.....	184
8.10 Conclusions.....	187
Chapter 9: Qualitative Evidence in Practice	189
9.1 Introduction.....	189
9.2 Manuscript series	189
References.....	213
Appendices	231

List of Tables

Table 4.1. Inclusion and exclusion criteria	47
Table 4.2. Sampling quadrants.....	49
Table 4.3. Summary of participants	52
Table 4.4. Initial interview schedule	54
Table 4.5. Follow-up interview schedule	56
Table 4.6. Focused coding extract of the non-responder satisfied sampling quadrant (full focused coding tables examples can be found in the audit trail in Appendix 3)	62
Table 4.7. Evidence of trustworthiness in this doctoral thesis	69
Table 5.1. Inclusion criteria	76
Table 5.2. Method of extracting percentage satisfied.....	79
Table 5.3. Study characteristics	83
Table 5.4a. Content validity assessment of the SAPSS	95
Table 5.4b. Content validity assessment of the new KSKSS	96
Table 6.1. Criteria for sampling quadrants	107
Table 6.2. Participant characteristics.....	108
Table 6.3. Example interview schedule	111
Table 6.4. Coding framework and process of data reduction.....	112
Table 6.5. Case studies.....	122
Table 6.6. Helpful communication.....	129
Table 7.1. Semi-structured interview schedule	140
Table 7.2. Methods of analysis	142
Table 7.3. Participant characteristics	143
Table 8.1. Comparison of findings to Mahdi et al. (2020)	167
Table 9.1. Types of questions qualitative research can answer	191
Table 9.2. Common qualitative research designs and theoretical frameworks in musculoskeletal research	200
Table 9.3. Qualitative methods.....	205
Table 9.4. Trustworthiness criteria	211

List of Figures

Figure 4.1. Analytic process, adapted from (Charmaz, 2015).....	58
Figure 4.2. Line-by-line coding	61
Figure 5.1. 0–10 Smile face satisfaction scale.....	80
Figure 5.2. Study selection flow diagram.....	82
Figure 5.3. Proportion of patients satisfied after TKR. ES = effect size.....	93
Figure 6.1. Framework of patient satisfaction post-TKA	116
Figure 7.1. Conceptual model of patient satisfaction post-TKR	138
Figure 7.2. Roadmap to improve satisfaction levels post-TKR	153
Figure 9.1. House metaphor	197

List of Boxes

Box 4.1. Example post interview reflection	59
Box 4.2. Early interpretation of interview data	59
Box 4.3. Meeting notes discussing the conceptual progression of the analysis.....	65
Box 4.4. Example analytic memo	68

List of Appendices

Appendix 1: Excel spreadsheet: Purposive sampling (Study 1/Chapter 5).....	231
Appendix 2: Participant information sheet and letter.....	232
Appendix 3: Audit trail	235
Appendix 4: St Vincent’s Hospital ethics approval	269
Appendix 5: St Vincent’s Hospital ethics amendments and Curtin University reciprocal ethics approval.....	270
Appendix 6: Study 1: Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review	274
Appendix 7: Search strategy in MEDLINE	290
Appendix 8: Satisfaction with total knee replacement – risk of bias tool	292
Appendix 9: Content validity search strategy example	296
Appendix 10: COSMIN assessment of PROM development studies.....	297
Appendix 11: COSMIN assessment of PROM content validity studies.....	298
Appendix 12: Risk of bias results of all included studies	299
Appendix 13: Study 2: What influences patient satisfaction after TKA: A qualitative investigation..	301
Appendix 14: Reviewer feedback and author responses	318
Appendix 15: Glossary of qualitative terms.....	322

List of Publications Arising from this Thesis

Chapter 5

Klem, N-R., Kent, P., Smith, A., Dowsey, M. M., Fary, R., Schütze, R., O’Sullivan, P., Choong, P. F.,
Bunzli, S. Satisfaction after total knee replacement for osteoarthritis is usually high, but what
are we measuring? A systematic review. *Osteoarthritis and Cartilage Open* 2020. 2(1): 1-16

Chapter 6

Klem, N-R., Smith, A., O’Sullivan, P., Dowsey, M M., Schütze, R., Kent, P., Choong, P. F., Bunzli, S.
What Influences Patient Satisfaction after TKA? A Qualitative Investigation. *Clinical
Orthopaedics and Related Research* 2020. 478(8): 1850-1866

List of abbreviations

ADL	Activities of daily living
AIHW	Australian Institute of Health and Welfare
BMI	Body mass index
BOA	British Orthopaedic Association
COREQ	Consolidated criteria for reporting qualitative research
COSMIN	COnsensus-based Standards for the selection of health status Measurement Instruments
ES	Effect size
MCIC	Minimum clinically important change
MCID	Minimum clinically important different
NR-D	Non-responder dissatisfied
NR-S	Non-responder satisfied
NSW	New South Wales
OA	Osteoarthritis
OARSI	Osteoarthritis Research Society International
OMERACT-OARSI	Outcome Measures in Rheumatology-Osteoarthritis Research Society International
PASS	Patient acceptable symptom state
PROM	Patient reported outcome measure
QoL	Quality of life
R-D	Responder dissatisfied
R-S	Responder satisfied
SAPSS	Self-administered patients satisfaction scale
SD	Standard deviation
SMART registry	St Vincent's Melbourne arthroplasty registry

THAOEQ	Total Hip Arthroplasty Outcome Evaluation Questionnaire
TJR	Total joint replacement
TKA	Total knee arthroplasty
TKR	Total knee replacement
VAS	Visual analogue scale
WA	Western Australia
WHO	World Health Organization
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index

Chapter 1: Introduction

Total knee replacement (TKR) surgery is considered the 'gold standard' treatment for end stage knee osteoarthritis due to high rates of symptomatic and functional improvement (Ethgen et al., 2004). The success of these interventions is attributed to removal and replacement of diseased tissue with a prosthetic joint (Crawford et al., 2013). However, not all patients experience meaningful benefit from these surgeries; approximately 20% of all people who undergo TKR will continue to experience ongoing pain and functional difficulties (Beswick et al., 2012), 15% have been reported as non-responders to TKR (Dowsey, Spelman et al., 2016), and the dissatisfaction rate has been reported as high as 35% (Kahlenberg et al., 2018). These suboptimal outcomes are burdensome to both the health care system in terms of ongoing support for these patients, and the individual who will experience persistent pain and disability (Woolf & Pfleger, 2003).

To increase the number of people experiencing a meaningful benefit from TKR, it is important to understand clinically meaningful improvement, in terms of symptomatic and functional improvements, and how this intersect with patient satisfaction. Clinically meaningful improvement is commonly captured through the degree of change in pre to post-operative scores on patient-reported outcome measures. Consensus methods have been developed to characterise people who have undergone TKR as a 'responder' or a 'non-responder' (Pham et al., 2003) as a way of capturing clinically meaningful benefit. Measurement of patient satisfaction, on the other hand, suffers high heterogeneity in terms of both the aspect of satisfaction being measured and the method of quantification. For example, satisfaction questionnaires have included aspects such as; general satisfaction (Baker et al., 2007); fulfilment of expectations (Becker et al., 2011); satisfaction with limb alignment (Gandhi et al., 2007); satisfaction with pain relief (Brinkman et al., 2014); satisfaction with function (Clement et al., 2014); and 'global' satisfaction without definition of what components that might represent (Gildone et al., 2005). Methods of quantification have also ranged from Yes or No responses (Healy et al., 2002), Likert scales (Goh et al., 2016), VAS scales (Collados-Maestre et al., 2016), to amalgamated scales of different

components of satisfaction (Davis et al., 2012). Additionally, the majority of the commonly used questionnaires lack any form of validity with only a limited number demonstrating construct validity (Kahlenberg et al., 2018). Importantly, evidence of content validity in the existing post-TKR satisfaction questionnaires has not been reported, which is the most important measurement property of a patient-reported outcome measure (Terwee et al., 2017, 2018). Due to the heterogeneity in the aspects of satisfaction measured and quantification methods used to measure them, and the distinct absence of content validity, it is not possible to interpret satisfaction scores or understand what a patient means when they indicate 'satisfied' or 'dissatisfied' on currently used satisfaction questionnaires.

The inconsistencies seen in measuring this construct have likely arisen due to a lack of theoretical knowledge of the construct of patient satisfaction. Currently, there is a paucity of research that has investigated what underpins patient satisfaction specific to a TKR context. However, a previous systematic review found patient satisfaction within health care contexts was theorised to encompass factors such as fulfilment of expectations, therapeutic alliance, and equity (in the form of perceived return on investment) (Batbaatar et al., 2015). Unfortunately, the degree to which each of the factors underpin satisfaction has been shown to be inconsistent (Barlow et al., 2016; Kahlenberg et al., 2018). To add to the confusion surrounding this construct, the intersection between clinically meaningful improvements in pain and function from TKR and levels of satisfaction is unclear. While higher levels of satisfaction are often found to align with significant improvements in pain and function, this is not always the case; high levels of satisfaction have been reported in those without clinically meaningful changes in pain and function, and lower levels of satisfaction have been reported in those with clinically meaningful changes in pain and function (Baker et al., 2007). Despite the clear issues in the continued measurement of patient satisfaction to reflect meaningful benefit, measurement of this construct post-TKR has increased by a factor of ten from 2007 to 2017 (Kahlenberg et al., 2018).

Given the combined popularity of, and heterogeneity in, satisfaction questionnaires being used to reflect meaningful benefit from TKR, this lack of understanding into what satisfaction questionnaires are

actually capturing is problematic. Presently, scores on measures of patient satisfaction risk providing a misleading evaluation as to whether the TKR has been of meaningful benefit to a patient (Ring & Leopold, 2015). It is likely that satisfaction is a complex multifaceted construct, and the use of currently available questionnaires carries the risk that resultant scores are reflective of factors and processes not directly related to the TKR. Due to this, a greater understanding of what underpins levels of satisfaction after TKR is needed. Not only will this knowledge direct more consistency in how satisfaction questionnaire are designed and used in orthopaedics, but it has the potential to inform targeted solutions for patients reporting low levels of satisfaction post-TKR.

With respect to the current gaps in knowledge related to patient satisfaction after TKR, I sought to understand what 'satisfaction' means to patients, and what factors and processes influence levels of satisfaction post-TKR. The findings of this work are intended to inform of the use of satisfaction questionnaires in orthopaedics, and to understand how satisfaction levels may be improved in patients who report low satisfaction post-TKR. The following section will provide an overview of the structure of this thesis to address these knowledge gaps.

1.1 Thesis structure

Chapter 1: provides an introductory overview of the problems involved with the measurement of patient satisfaction post-TKR. In particular, the significant gaps in the theoretical understanding of patient satisfaction and how this has driven considerable heterogeneity in the measurement of this construct in orthopaedics.

Chapter 2: presents a literature review of patient satisfaction post-TKR, including a background to TKR surgery, how meaningful benefit is measured, the current and historical theorisation of patient satisfaction, limitations to understanding patient satisfaction, and proposed avenues to better understand this construct.

Chapter 3: describes the methodological considerations for this body of work, including theoretical assumptions and a justification for the choice of constructivist grounded theory.

Chapter 4: presents the methods employed for the grounded theory research, including sampling, interview schedules, analytic processes, and ethical considerations.

Chapter 5: provides the findings from a systematic review of patient satisfaction after TKR (Study 1). In this review the appropriateness of creating a pooled estimate of satisfaction scores after TKR is explored, and evidence for content validity in the existing post-TKR satisfaction questionnaires is assessed.

Chapter 6: reports the findings from a qualitative investigation into patient satisfaction after TKR (Study 2). In this original research, the meaning of satisfaction and the factors that influence levels of satisfaction are explored 1–2 years post-TKR. The findings informed the development of a conceptual model of patient satisfaction after TKR.

Chapter 7: reports the findings from a second qualitative investigation that tested the assumptions of the model developed in Chapter 6, 3–4 years post-TKR (Study 3). This study also explored the stability in levels of satisfaction over time through re-interviewing a portion of participants from the original sample in Chapter 6. A 'treatment pathways' model for post-TKR patients with low satisfaction is proposed based on the findings.

Chapter 8: presents a discussion of the main findings of this thesis and situates them within the extant satisfaction literature. Clinical implications, implications for measurement, and future directions are also discussed. A reflection of the methodological implications of this body of work is also presented.

Chapter 9: presents a response to the methodological implications of this body of work, in the form of a 5-part manuscript series providing foundational explanations of qualitative research contextualised to a musculoskeletal setting.

Chapter 2: Literature Review

2.1 Introduction

In this chapter, I review the scientific literature regarding the measurement of patient satisfaction after TKR. In doing so, I have included (i) a background to TKR surgery, (ii) an exploration of the methods of measuring meaningful benefit from TKR, (iii) a background to measuring patient satisfaction, (iv) the historical and current conceptualisation of the theoretical construct of satisfaction, (v) validity issues in measuring patient satisfaction, and (iv) a discussion of the limitations in our current understanding of patient satisfaction. This chapter concludes with possible directions to assist a better understanding of satisfaction after TKR.

2.2 Background on osteoarthritis

Osteoarthritis (OA) is one of the most commonly diagnosed conditions in Australian primary care (March & Bagga, 2004). When symptomatic, OA can cause persistent pain, impair one's quality of life and is a public health burden (Henderson et al., 2013), with OA costing \$3.5 billion to the Australian health system between 2015 and 2016 (Australian Institute of Health and Welfare [AIHW], 2019). The AIHW (2015) has identified that individuals with symptomatic OA are 3.5 times more likely to report high levels of psychological distress and 2.8 times more likely to report severe pain than those without OA (AIHW, 2015).

2.2.1 Osteoarthritis as a disease and an illness

Historically, OA has been viewed solely as a pathoanatomical condition, comprised of progressive disease of synovial joints (Lane et al., 2011). However, this does not reflect the heterogeneous and complex nature of this health condition. The contemporary understanding of the condition considers both the 'disease' of OA, as represented by radiographic evidence of structural change, as well as the 'illness' as characterised by patient-reported symptoms including pain, functional impairments, sleep quality, and depressed mood (Lane et al., 2011). While the disease and illness state can occur

concurrently, one may also occur in the absence of the other. In previous large scale studies of older adults with knee pain, only half displayed radiographic evidence of knee OA, while of all people with radiographic evidence of knee OA only half reported pain (Bedson & Croft, 2008; Neogi et al., 2009). From this, it is clear that neither a purely radiographic approach, pathoanatomical approach, nor a symptomatic approach, to diagnosing and treating knee OA is adequate to fully explain knee OA.

The contemporary understanding of knee OA also encompasses a multifactorial picture of its progression in addition to structural damage (Bedson & Croft, 2008). This considers the influence of a range of biopsychosocial factors including: inflammatory markers (Bedson & Croft, 2008); psychological factors (Heuts et al., 2004; Scopaz et al., 2009; Somers, Keefe, Godiwala et al., 2009); cognitive factors (Somers, Keefe, Pells et al., 2009; Urquhart et al., 2015); other comorbid conditions such as obesity (Kittelson et al., 2016); lower limb strength (Kittelson et al., 2016); activity levels (Kittelson et al., 2016); lifestyle factors (Lane et al., 2011); impaired body perception (Stanton et al., 2013); and central sensitisation (Lluch Girbes et al., 2013; Murphy et al., 2011). Therefore, to be successful, treatment approaches must consider the extent to which these factors influence a patient's experience of knee OA.

2.3 Total knee replacement as treatment for osteoarthritis

Current recommendations suggest that treatment for OA should begin with exercise and weight loss, and TKR should only be considered for end-stage OA when conservative measures have failed (RACGP, 2018). However, as a treatment approach to knee OA in Australia, 65,266 TKR surgeries were performed in 2018 (AIHW, 2020). Of the 2.2 million people diagnosed with OA in Australia (ABS, 2018), this represents about 3% of people going on to have a TKR. From 2005 – 2006 to 2016 – 2017, there was a 38% rise in the rate of TKRs for osteoarthritis (AIHW, 2019). It is probable that many patients are undergoing TKR without first attempting conservative measures, and for non-end-stage OA disease states. The decision to undergo a TKR is based on the premise that removal and replacement of diseased tissue with an artificial joint will result in improved function and reduced pain, and thus biases

targeting the 'disease' of OA (Crawford et al., 2013). While many people experience vast improvements in pain, function and quality of life (Ethgen et al., 2004), this is not the experience of all patients. It has been reported that 20% of those that undergo a TKR will still experience ongoing pain and disability (Beswick et al., 2012) and the dissatisfaction rate has been demonstrated to be as high as 35% (Kahlenberg et al., 2018). These suboptimal outcomes are not only burdensome to the health care system in terms of the financial cost of supporting those that require further interventions, but also to the individual who experiences persistent symptoms and disability (Woolf & Pfleger, 2003). To increase the amount of people experiencing a meaningful benefit from TKR, a better understanding of the intersection between clinically meaningful improvement and satisfaction after this procedure at the level of the individual is needed.

2.4 Measuring meaningful benefit after total knee replacement

To determine if an intervention has been beneficial to an individual, the concept of meaningful benefit may be used. In the field of TKR, traditional determinants of meaningful benefit were measured by joint-focused measures as assessed by the surgeon, and included improved range of motion, joint stability, and correction of deformity (Gopal et al., 2010; Lingard et al., 2001). More recently, meaningful benefit has moved towards patient-centred appraisal of improvement to understand the effect the knee replacement surgery has on the individual and their life. The main constructs used to examine this are 'clinically meaningful improvement' and 'patient satisfaction'.

2.4.1 Clinically meaningful improvement after total knee replacement

Clinically meaningful improvement is a measure of symptomatic and functional improvement and is used to determine if an individual has 'responded' to TKR. This is often based on the degree of change in pre to post-operative scores on patient-reported outcome measures (PROM), of which as many as 47 different instruments have been reported in the TKR literature (Ramkumar et al., 2015). Two of the most widely used PROMs in the field of TKR are the Western Ontario and McMaster Universities

Osteoarthritis Index (WOMAC) (Bellamy et al., 1988; Davis et al., 2009) and the Oxford Knee Scores (OKS) (Collins et al., 2011; Ramkumar et al., 2015).

As a positive change in score on an outcome measure may not reflect a meaningful change to an individual, it is important to determine cut points for values of change that are most likely to reflect meaningful improvement. These are expressed as the minimum clinically important change (MCIC), which defines the smallest change that is important to a patient, or the minimum clinically important different (MCID), which defines the smallest worthwhile effect and is used in the context of between group differences (Tubach et al., 2005). In the context of meaningful benefit, MCIC is most often drawn on, and is commonly determined by use of anchoring questions or distribution based methods (Terwee et al., 2010). However, there is a distinct lack of consistency between use of the MCIC and MCID, making the interpretations of these scores difficult (Kamper, 2019a). An alternative method of quantifying important change at the level of the individual are state-attainment criteria, such as the patient acceptable symptom state threshold (Tubach et al., 2005, 2009), which defines a value beyond which the patient considers themselves well. However, this method has experienced a lack of consistency in the wording of the external anchor (Tubach et al., 2007). Additionally, whether the patient acceptable symptom state should be standardised or be treatment specific still requires further investigation (Tubach et al., 2007). As an extension of these approaches, consensus methods have been used, such as the Outcome Measures in Rheumatoid Arthritis Clinical Trials and the Osteoarthritis Research Society International (OMERACT/OARSI) criteria. This approach defines a clinical responder to TKR by relative and absolute value change in items of pain and function from patient reported outcome measures (Pham et al., 2003). The scores are first normalised to a scale of 100 and a clinical outcome of a 'responder' is determined by a relative change of 50%, or an absolute change of equal to or more than 20 points in one of pain or function scores (Pham et al., 2003). If a patient does not meet this criteria but shows a relative improvement of 20% or an absolute improvement of equal to or more than 10 points in two of pain, function, or global score (which is a total score of all items in the patient reported outcome measure used), they are also deemed a 'responder' (Pham et al., 2003).

2.4.2 Satisfaction after total knee replacement

Within the orthopaedic literature, *satisfaction* is a frequently used metric to demonstrate the value of the orthopaedic intervention from the patients' perspective. Satisfaction may encompass an evaluation of the process of care, or, an evaluation of the outcomes of care. Most commonly after TKR, satisfaction with the outcomes of care is measured. A systematic review by Kahlenberg et al. (2018) retrieved 999 studies through the MEDLINE database between January 1, 2007 and January 1, 2017 that measured patient-reported satisfaction with the outcomes of TKR (Kahlenberg et al., 2018). The authors reported an increase in studies measuring patient satisfaction with the outcomes of TKR by a factor of ten from the first to the final year under study, demonstrating how measures of this construct are continuing to gain traction (Kahlenberg et al., 2018).

Despite the popularity in measuring satisfaction, there is great variability in satisfaction measures across the TKR field, both with regard to what is being measured, and how. Presently, there is no continuity in the aspect of satisfaction that is being measured; some examples include general satisfaction (Baker et al., 2007); fulfilment of expectations (Becker et al., 2011); satisfaction with limb alignment (Gandhi et al., 2007); satisfaction with pain relief (Brinkman et al., 2014); satisfaction with function (Clement et al., 2014); as well as an expression of global satisfaction without definition of what components that might represent (Gildone et al., 2005). Further, some studies have equated satisfaction to 'willingness to undergo surgery again' (Brinkman et al., 2014; Hamilton et al., 2013). However, this determinant has not been thoroughly studied and may in fact encompass some other aspects of meaningful benefit. Adding to the heterogeneity, previous studies have used a broad range of quantification methods, including Yes or No responses (Healy et al., 2002); Likert scales (Goh et al., 2016); VAS scales (Collados-Maestre et al., 2016); and amalgamated scales of different components of satisfaction (Davis et al., 2012). Consequently, consensus on how and what to measure with respect to satisfaction is absent.

The combined popularity of, and heterogeneity in, satisfaction measures after TKR is problematic; scores on measures of patient satisfaction may risk misleading clinicians, policy makers, and patients as

to the potential benefit of TKR (Ring & Leopold, 2015). Therefore, better theoretical understanding of patient satisfaction after TKR is necessary to direct homogeneity in how satisfaction is scored and used in the context of evaluating meaningful benefit and improving patient outcomes.

2.4.2.1 Historical context to patient satisfaction

The inconsistencies in measuring patient satisfaction after TKR become clearer when reflecting on the history of this construct in a health care context. In response to a National Health Services management inquiry in 1983 calling for the experiences and perceptions of patients to ascertain the how well services were being delivered (Maxwell, 1984), patient satisfaction was considered the best form of measurement (Roberts, 1989). Satisfaction surveys were an attractive solution to quality assessment due to ease of use, and quantification of data compared to the distrust of 'soft' qualitative approaches to quality appraisal (Williams, 1994). A proliferation of satisfaction surveys emerged in response to this call for measures of patient satisfaction, which ranged in scale and sophistication (Williams, 1994).

From the 1960s, several attempts were made to create a framework for patient satisfaction in health care (Batbaatar et al., 2015). These ranged from the patient's attitude towards the health professionals and the medical care received (Hulka et al., 1970); a positive attitude that has an evaluative and affective nature (Linder-Pelz, 1982); a comparison of standards to the actual care received (Pascoe, 1983); an emotional response to the experience but a cognitive process of comparing standards to actual results (Swan et al., 1985); an evaluation of the service compared to subjective standards, where being satisfied is a positive emotional response to the comparison (Eriksen, 1995); or health care meeting the patients' needs and expectations resulting in a sense of contentedness, achievement or fulfilment (Hills & Kitchen, 2007).

Although there were varying attempts to theorise patient satisfaction, it was largely considered to have a relationship with fulfilled expectations (Williams, 1994). Various expectation models existed, however, the most widely accepted model of value-expectancy positioned patient satisfaction as a positive

attitude, which related to the patients' beliefs that the care possessed certain attributes, and the patients' evaluation of those attributes (Linder-Pelz, 1982). Attributes were considered dimensions of health care, such as access, efficacy, cost, convenience and so on (Linder-Pelz, 1982). Under this model, the key hypothesis was that satisfaction scores were directly related to the sum of the expectations and values regarding the various aspects of care (Linder-Pelz, 1982). Alternative models of satisfaction related to expectations also included; discrepancy theory, that proposed satisfaction as a perceived discrepancy between what the patient expected and what was experienced as a proportion of those expectations (Pascoe, 1983); fulfilment theory, where the greater the gap between expectations and experiences the less satisfied the patient will be (Bowling et al., 2012; Linder-Pelz, 1982); and equity theory, where satisfaction is the perceived balance of inputs (time and money etc. from the patient) and the output of service (improvement of health as a result of the intervention) and often involves the patient comparing their value of service to others' value of service (social comparison) (Linder-Pelz, 1982; Swan et al., 1985). However, the role of expectations in satisfaction was shown to be uncertain, and criticised on theoretical grounds. When the value-expectancy model was tested, expectations only explained 8% variance in one dimension of satisfaction, thus, the model failed to be supported (Linder-Pelz, 1982; Pascoe, 1983). Models of patient expectations were further criticised on two accounts; firstly the assumption that the fulfilment of expectations is purely determined by objective outcomes, which negates the influence of psychological or emotional factors, and secondly the assumption that deviation from the desired outcome will result in dissatisfaction (Pascoe, 1983). Additionally, a relationship between expectations and satisfaction assumes patients hold expectations related to the health care process (Williams, 1994). However, patients who are treatment naïve may not hold expectations to appraise their health care encounter against (Williams, 1994). Additionally, if the patient does hold expectations, it is assumed that the nature of these does not undermine the meaning and utility of satisfaction scores (Williams, 1994); where a patient assumes a passive role in treatment their expectations may include a paternalistic role of the health professional, which may bring in to question the legitimacy of their health care quality evaluation where expectations play a central role.

Scholars, during this time, further questioned whether satisfaction is indeed a construct that can be measured (Carr-Hill, 1992; Williams, 1994). Central to the critiques were concerns regarding the complexity of this construct and the subsequent methodological issues in its measurement (Carr-Hill, 1992; Williams, 1994). In particular, satisfaction remained under-theorised, and knowledge of what satisfaction means to the individual was absent (Carr-Hill, 1992; Williams, 1994). The use of satisfaction must embody the users' views of service provisions; however, whether this is achieved by satisfaction scores had not been investigated (Williams, 1994). In a qualitative study of patients in a neurology outpatient clinic in 1983, the authors concluded a distinct lack of fit between the patients' accounts of their experiences and assumptions about patient satisfaction (Fitzpatrick & Hopkins, 1983). The authors further surmised that conceptual frameworks of patient satisfaction current at that time may provide partial and misleading insights to the perspectives of the patient (Fitzpatrick & Hopkins, 1983). Critics conceded a key issue is satisfaction has arisen from a consumer, private sector, space, which suffers transferability issues to the public system where the goals of treatment and service delivery to patients differ (Carr-Hill, 1992; Pascoe, 1983; Williams, 1994). Namely, consumers typically experience a transactional process where 'value for money' of a product is taken into consideration, which does not parallel with a health care process (Carr-Hill, 1992). Although satisfaction surveys were proclaimed to empower service users, the assumption that patients behave like consumers is not well founded (Williams, 1994). Whitfield and Baker (1992) summarise the key consequences of inadequate questionnaire design to assess health care quality from the patient's perspective:

Poor questionnaires act as a form of censorship imposed on patients. They give misleading results, limit the opportunity of patients to express their concerns about different aspects of care, and can encourage professionals to believe that patients are satisfied when they are in reality highly discontented. (Whitfield & Baker, 1992)

The intense proliferation of satisfaction surveys in health care without theoretical grounding has resulted in satisfaction measures that lack clarity in meaning and purpose. Despite numerous critiques

of satisfaction surveys on empirical and theoretical grounds, service providers continued to use satisfaction tools as the patients' perspective on the quality of health care. Given the continued use of satisfaction measures, there is a need to investigate further what satisfaction means from the patients' perspective, and its utility in quality evaluation in a health care context.

2.4.2.2 Current conceptualisation of patient satisfaction

A recent systematic review by Batbaatar et al. (2015) summarised the main theories of satisfaction with health interventions in the literature. Despite more than a 20 year progression, the authors arrived at similar conclusions to the earlier literature. Satisfaction theories were based on consumerist research assumptions, particularly related to the fulfilment of patient expectations (Batbaatar et al., 2015). Various empirical research has reported a strong association between satisfaction and fulfilled expectations (Dunbar et al., 2013; Haanstra et al., 2012; Hsieh & Kagle, 1991; Korsch et al., 1968; Mannion et al., 2001, 2009; Noble et al., 2006), (Noble et al., 2006). However, other recent studies present a weak or absent association between patient expectations and satisfaction (Batbaatar et al., 2015; Fitzpatrick & Hopkins, 1983; Linder-Pelz, 1982; Nilsson et al., 2009a, 2009b). Reviews of patient expectations have concluded the construct has an affective and cognitive component, which is continually subject to change, and requires further theoretical development (Bowling et al., 2012). The conflicting literature, in addition to the multidimensional nature of patient expectations and satisfaction, suggests the relationship between these two constructs is complex and is likely to be inadequately captured by questionnaires (Staniszewska & Ahmed, 1999). Thus, fulfilment of expectations may be included in the conceptualisation of satisfaction but not considered as the only factor underpinning this construct.

In addition to expectations, other theories have gained attention as potential dimensions of patient satisfaction. Therapeutic alliance, while not considered a prominent theory in earlier literature, has been identified as another factor that may influence patient satisfaction (Batbaatar et al., 2015; Sitzia & Wood, 1997; Ware et al., 1978). This theory is characterised by the level of rapport a patient

experiences with their health care provider, and is supported by a recent study by Halawi et al. (2019). The authors surveyed 551 primary total hip and knee patients, with a minimum of one year follow-up and found that although persistent pain and functional limitations were the most common reasons for dissatisfaction, a portion of patients viewed satisfaction as an evaluation of the process by which care was delivered (Halawi et al., 2019). These findings support the importance of considering the individual nature of satisfaction, whereby the weight of different aspects of the health care process will differ from patient to patient.

The embodiment theory is another more recent, potential determinant of patient satisfaction (Hudak, McKeever et al., 2004). The level of embodiment explains how a person relates to their injured body part; whether is it viewed as an object, separate from the body and mind, or whether is it completely embodied and unconscious to the person (Hudak et al., 2007; Hudak, Hogg-Johnson et al., 2004; Hudak, McKeever, et al., 2004). In a population of people who had experienced hand surgery, patients who had a more 'separate' relationship with their operated hand were more dissatisfied (Hudak, McKeever et al., 2004). Although this link has not shown to be causal, with limited research in this field, it does indicate a potential role for symptom coherency, which reflects the understanding a patient has of their symptoms, in patient satisfaction.

Lastly, cultural factors have also demonstrated influence on satisfaction outcomes. Garriga et al. (2018) developed a model predicting non-satisfaction one year after TKR based on a UK population, which was then tested in a Swiss population. While treatment for anxiety and injected corticosteroids were predictive of dissatisfaction in the UK population, these were not predictive in the Swiss population (Garriga et al., 2018). The authors concluded the model developed for a UK population had poor transferability to a Swiss cohort (Garriga et al., 2018). Thus, cultural and contextual factors may require consideration when attempting to understand factors underpinning satisfaction after TKR.

From a review of the literature it can be concluded that there has been minimal progression in theoretical development regarding patient satisfaction since literature dating back to the 1960s

(Batbaatar et al., 2015). Satisfaction appears to be a multidimensional construct, including the possible influence from factors such as expectations, therapeutic alliance, contextual factors, and symptoms coherency. However, satisfaction remains under-theorised, yet commonly, and inconsistently measured. There is a need for an in-depth conceptualisation of satisfaction at the level of the individual in a TKR population to understand the utility of this construct in this context.

2.4.3 Prediction of satisfaction after total knee replacement by pre-operative factors

The ability to identify patients that are unlikely to be satisfied after TKR is important to reduce health care seeking, or prevent painful and expensive surgeries that may not benefit the individual. However, this is only useful when the construct itself is well defined and well measured, which, currently, has not been achieved. Despite this, examination of factors predictive of current measures of satisfaction may provide guidance as to what factors may be salient to the construct of satisfaction. Presently, fulfilment of pre-operative expectations and psychological factors are considered the strongest predictive variables in the orthopaedic literature (Kahlenberg et al., 2018).

Following the early theoretical assumptions of patient satisfaction, numerous studies have identified fulfilment of pre-operative expectations as an important predictor of post-operative satisfaction after TKR (Adie et al., 2012; Bourne et al., 2010; Culliton et al., 2012; Scott et al., 2012). However, fulfilment of pre-operative expectations may only be one piece of the satisfaction puzzle; in a prospective study of 331 patients who underwent TKR, although only 64% and 76% of expectations were met in public and private hospitals respectively, 90% of patients were moderately or very satisfied in both cohorts (Adie et al., 2012). This indicates that while expectations are an important factor, they may not be the only predictive variable to consider. This is highlighted in another prospective study of 109 patients who underwent TKR where 93% of patients rated their expectations regarding pain relief as 'very important', yet at 5 year follow-up only 63% of patients reported they experienced much less pain, or less pain, than preoperatively (Nilsson et al., 2009b). Despite this expectations 'gap', 93% of the patients were satisfied in this study (Nilsson et al., 2009b). Thus, while fulfilment of expectations may hold some

predictive capacity for satisfaction outcomes after TKR, this does not appear true for all patients. A systematic review by Barlow et al. (2016) encourages further scepticism on the relationship between fulfilment of expectations and satisfaction after TKR. The authors sought to investigate the relationship between satisfaction and the discrepancy between expected and actual or perceived outcome (Barlow et al., 2016). Four studies met the inclusion criteria and passed risk of bias assessment, all of which used different measures of expectations and satisfaction due to the lack of consensus on how to measure these constructs (Barlow et al., 2016). The authors concluded that on the basis of the current evidence, expectations appears to have a small, if any, association with satisfaction after TKR (Barlow et al., 2016). In line with the previously outlined theoretical criticisms of expectations, while pre-operative expectations may be influential in some patients, it is clear other factors need be considered to predict those unlikely to be satisfied after TKR.

In addition to expectations, psychological factors have been considered a strong predictor of low satisfaction after TKR; a previous systematic review reported that the most common pre-operative predictor of patient dissatisfaction after TKR was the presence of anxiety and depression (Kahlenberg et al., 2018). This notion was supported in another systematic review, which specifically investigated whether pre-operative psychological factors predicted poor outcomes after TKR (Khatib et al., 2015). Nineteen studies passed the inclusion criteria and risk of bias assessment, which contained data on 9026 TKRs in 8704 patients with follow-up ranging from 6 to 60 months (Khatib et al., 2015). Sixteen of the studies determined that psychological health was a significant predictor of dissatisfaction, pain, or impaired function at a minimum of 6 months after TKR. However, due to the heterogeneity in measurement of mental health by the included studies, data pooling could not be conducted (Khatib et al., 2015). Further, pre-operative mental health was determined by patient-reported questionnaires rather than by formal assessment, and most studies only assessed one psychological state rendering the authors unable to conduct a thorough comparison of factors (Khatib et al., 2015). Lastly, potential confounding variables such gender, age, and BMI were not accounted for in all the included studies (Khatib et al., 2015). Despite this, there appears to be some interaction between pre-operative

psychological states and satisfaction outcomes, however, which factors and to what extent remains under-theorised.

Lastly, although not widely investigated in orthopaedic populations, health literacy has been shown as a key predictor of health outcomes (Wilkinson & Marmot, 2006). A recent study examined the relationship between health literacy and satisfaction after TKR with the question “would you undergo surgery again?”, with responses of “Yes” or “No” (Narayanan et al., 2021). The authors reported a statistically significant relationship between health literacy and the desire to undergo surgery again ($p = 0.19$; OR = 2.163) (Narayanan et al., 2021). Despite not directly investigating satisfaction, and the study being conducted retrospectively, this study demonstrates some interaction between health literacy and outcomes after TKR. Further research is required to better understand this relationship with direct satisfaction questions in a prospective design.

The ability to predict those that will not be satisfied after TKR may enable redirection of patients who are unlikely to benefit from TKR towards alternative care. However, currently, there is a lack of consistency with regard to identification of variables predictive of satisfaction, and potentially predictive factors are under-theorised. This is a likely consequence of the lack of theoretical grounding of patient satisfaction, resulting in a lack of direction for predictive modelling. Thus, a better conceptual understanding of patient satisfaction after TKR is needed to better identify and interpret predictors of satisfaction after TKR. Despite these limitations in predictive modelling of patient satisfaction, current data provides clues to the potential influence of psychological variables and fulfilled pre-operative expectations in the conceptualisation of satisfaction after TKR.

2.4.4 Intersection between clinically meaningful improvement and patient satisfaction

The relationship between clinically meaningful improvement, as measured by changes in patient-reported pain and disability, and patient satisfaction, as determined by response to satisfaction questionnaires, is poorly understood. For example, patients may have improved clinical outcomes but

may still report dissatisfaction post intervention (Ali et al., 2014; Baker et al., 2013). This unclear and somewhat counter intuitive relationship between clinically meaningful improvement and patient satisfaction, paints a complicated picture of meaningful benefit from TKR.

A study comparing pain and function outcomes between satisfied and dissatisfied groups after TKR, reported no significant differences between groups in terms of functional outcomes in 114 people (Ali et al., 2014). However, the dissatisfied group reported higher pain levels than the satisfied group (Ali et al., 2014). Further, in a large prospective study of 15,882 TKR patients, 1,592 patients reported their satisfaction levels as only fair or poor, despite reporting symptomatic improvements (Baker et al., 2013). While persistent pain and dysfunction appears to be a driver of dissatisfaction, they do not appear to preclude some patients from reporting high satisfaction. Further, it appears improvements in levels of pain and function do not necessarily result in reports of high levels of satisfaction.

It is not only important to predict those who will not experience any clinically meaningful improvement, but also those 'responders', who achieve clinically meaningful improvement, but remain dissatisfied. Although there is no definitive evidence, it is probable that dissatisfied patients are more likely to continue to seek care after TKR than those who are satisfied. Further, those that report being satisfied but remain disabled may bring into question the utility of satisfaction measures as a reflection of meaningful benefit from TKR. Understanding the intersection between clinical outcomes and satisfaction is important as it will facilitate a deeper understanding of meaningful benefit and progress knowledge of the various factors that may influence satisfaction scores outside of changes to pain and function outcomes.

2.4.5 Longitudinal understanding of patient outcomes

Most measures of patient outcomes after TKR focus on the first two years post-operatively due to this being the peak period of improvement post intervention (Shan et al., 2015; Williams, Blakey et al.,

2013). However, an understanding of the longer term trajectory of patient outcomes is important to understand the drivers of benefit or lack of benefit for patients after TKR beyond two years.

A prospective study by Brander et al. (2007) investigated pain and function outcomes five years post TKR in 83 patients (Brander et al., 2007). At one year post-operatively, nearly one in eight patients reported substantial pain despite a lack of clinical explanation (Brander et al., 2007). This subgroup of patients were evaluated separately at five year follow-up, where the authors measured pain, function and satisfaction scores. The authors reported nearly all of the patients in the heightened pain subgroup experienced an improvement in pain and were satisfied at five year follow-up (Brander et al., 2007). However, three of the 12 patients died prior to the final follow-up and were therefore not evaluated, and two patients reported being unhappy with pain outcomes and their satisfaction scores were not reported. Further, of the patients that did report being satisfied, two patients experienced an increase in VAS pain scores from 56 and 49 to 80 and 65, after five years, respectively. Despite a small sample size, these findings demonstrate that a lack of improvement in pain does not preclude high satisfaction scores, therefore other facilitators of satisfaction may need investigation at longer term follow-up. However, given there was no baseline satisfaction levels for the main study population or the high pain subgroup, it is not known from this data how stable satisfaction outcomes are over time, particularly following the peak in symptom improvement after year two. Similar results were reported by Núñez et al. (2009), who investigated pain, function and satisfaction outcomes at seven years post TKR in 112 participants. The authors found that despite improvements in pain and function, 14% of participants reported dissatisfaction with their TKR, which the authors speculated were for reasons other than the knee replacement or unmet expectations (Núñez et al., 2009). Like the findings from Brander et al. (2007), as this study did not measure satisfaction in the first two years post TKR, it is unknown if participants had changed in their level of satisfaction from two to seven years post-TKR.

Presently, there is limited evidence from the current TKR literature as to how satisfaction outcomes change over time after TKR. Understanding satisfaction over time can provide insight to what factors

may be shaping satisfaction outcomes, and whether they are dynamic or stable constructs. If satisfaction is a dynamic construct at long-term follow-up, this may provide opportunities for health professional intervention to facilitate improvements in satisfaction levels.

2.5 Validity issues

Despite the importance of measuring patient satisfaction as a reflection of the patients' perception of outcome, it is clear that the way in which it is measured is highly variable. A systematic review by Kahlenberg et al. (2018), identified that only 13% of the included studies that measured satisfaction after TKR used an instrument that demonstrated some form of validity (Kahlenberg et al., 2018). Further, 21.2% lacked definition of how they measured satisfaction, and the remaining 65.8% used a variety of non-validated questions and quantification methods to measure this construct (Kahlenberg et al., 2018). This variability in measurement likely explains why satisfaction scores can range from as high as 100% to a low as 65% (Kahlenberg et al., 2018). The variability in scores in combination with the complexity of satisfaction theory may account for the difficulty in understanding what is measured by instruments purporting to measure satisfaction.

2.5.1 Types of validity

There are three key forms of validity, which refers to whether a questionnaire is measuring what it purports to measure; construct validity; criterion validity; and content validity (Mokkink et al., 2018). Construct validity relates to how well the test measures the theoretical construct it is intending to measure, and encompasses structural validity, hypothesis testing, and cross-cultural validity. Criterion-related validity is used to determine whether the scores on a test are an adequate reflection of the 'gold standard'. Content validity is of particular importance as it indicates whether the content of a patient-reported outcome measure is an adequate reflection of the construct to be measured. The three key aspects of content validity are considered to be content relevance, comprehensiveness, and comprehensibility. Although face validity, another aspect of content validity, is commonly used to

determine if the content of a patient-reported outcome measure *appears to be* an adequate reflection of the construct to be measured, this form of validity commonly only involves evaluation by health professionals and not the target population. Rather, content validity requires target population involvement in theory and item development, as well as item testing to assess comprehension of the content and response categories (Terwee et al., 2017). The COsensus-based Standards for the selection of health Measurement Instruments (COSMIN) considers content validity as the most important measurement property of a patient-reported outcome measure (Terwee et al., 2018).

2.5.2 Validity in satisfaction questionnaires

To date, of surveys used to assess satisfaction after TKR, only a limited number have been assessed for validity, and of these, only construct validity has been examined (Kahlenberg et al., 2018). However, satisfaction, like quality of life, is an abstract concept that cannot be directly observable (Blome & Augustin, 2015). Thus, there is no gold standard to compare satisfaction scores against, resulting in difficulties in conducting criterion validity testing. While testing of construct validity is possible through relating satisfaction to related constructs such as pain and disability, content validity is a necessary prerequisite of this process. Content validity facilitates an understanding of what underpins abstract concepts (Terwee et al., 2017). Presently, there has been no investigation into the content validity of patient satisfaction questionnaires in the field of TKR. Consequently, it is not known how well these questionnaires represent the patient's understanding of satisfaction. Future research should be concerned with assessing the content validity of existing satisfaction questionnaires. This requires an assessment of whether the target population, people who have undergone TKR, were involved in the theoretical development, item development and item testing of the questionnaire.

2.5.3 Response shift

In addition to the validity issues surrounding satisfaction questionnaires, minimal attention has been given to the possibility for the influence of response shift bias on the measurement of satisfaction levels.

In the quality-of-life literature, response shift bias is an important consideration, as it involves a person's appraisal of their current state. Response shift is a phenomena whereby the level of quality of life indicated on an assessment tool can change, despite no change in objective circumstances (Blome & Augustin, 2015). This indicates that caution should be taken when interpreting quality-of-life scores following an intervention. In the context of repeated measure on the same individual, an improvement in a quality-of-life score may be unrelated to any objective improvements in health status. Likewise, when comparing quality-of-life scores between people, the factors driving these reports may not be comparable. A person may report a high quality of life due to excellent objective health circumstances, whereas another person, who also reports a high quality of life, may have poorer objective health circumstances but have experienced a response shift.

Response shift encompasses three key aspects; recalibration, reprioritisation, and reconceptualisation (Blome & Augustin, 2015). Recalibration means a person understands the response scale differently than previously. For example, a person may initially believe they are experiencing intense pain and record this as a 9 out of 10. However, after experiencing a more severe pain, or observing people suffering more than them, they then change their understanding of intense pain. Resultantly, on a later assessment, the same person rates their pain as 5 out of 10 despite no change in their underlying pain intensity. Reprioritisation means that what a person initially found important changes as a result of a change in circumstances. For example, a person who has experienced an unsuccessful shoulder operation preventing them from participating in their favourite sport of tennis now finds enjoyment from running as their main form of exercise. Initially, this person may have reported a very low quality of life once they realised they could no longer play tennis. However, since finding a new hobby to enjoy, the person reports a higher quality of life despite no change in their objective physical health. Lastly, reconceptualisation means that a person changes their definition of quality of life. For example, a person who has recently become wheelchair bound after a car accident may be no longer able to participate in a way that is congruent with their current understanding of a high quality of life.

Subsequently, they may redefine what quality of life means to them, thus, their rating of quality of life increases despite no change to their current circumstances.

Despite a lack of investigation, response shift may be an important consideration for the measurement of satisfaction after TKR. It may be that some patients report high levels of satisfaction despite continued pain and disability as a result of the response shift phenomenon. Investigation to the influence of the phenomena is important, as assumptions about high satisfaction corresponding to a meaningful improvements in pain and function from TKR may not represent the full picture (Baker et al., 2007).

2.6 Limitations in our current understanding of patient satisfaction

Presently, the dominant research paradigm employed to understand patient satisfaction in orthopaedics is quantitative (Beaton & Clark, 2009). As discussed in Section 1.3.2, the prolific use of quantitative satisfaction questionnaires is problematic given the heterogeneity in the type of questions and quantification methods used. Additionally, the almost sole use of quantitative research to understand this complex phenomenon may be insufficient to capture the individual factors that drive satisfaction and dissatisfaction after TKR. As qualitative approaches are seldom used in orthopaedics (Beaton & Clark, 2009), investigations into patient satisfaction from other disciplines can provide guidance as to how qualitative approaches might assist an understanding of patient satisfaction after TKR. The following summary of research is not an exhaustive review of qualitative approaches to understanding satisfaction in health care. Rather, the following are exemplars to provide guidance as to the possible concepts underpinning satisfaction and what methodologies may be most appropriately employed in the field of orthopaedics to better understand satisfaction with surgical procedures.

2.6.1 Qualitative approaches to understanding patient satisfaction in health care

Qualitative investigation has highlighted the role satisfaction plays in health behaviour, process evaluation, and evaluation of health care interventions. Freidin and Timmermans (2008) conducted a

grounded theory study to understand why some mothers opt for alternative medicine for the treatment of children's asthma, whereas others do not. From interviewing 50 mothers, the authors found that the decision to rely on alternative medicines depended on their satisfaction with biomedical treatments (Freidin & Timmermans, 2008). Satisfaction was driven by either the success of the medication in controlling symptoms, 'testing' the drug by withholding a dose from the child and observing the effects, or previous life-threatening experiences of asthma of friends or relatives (Freidin & Timmermans, 2008). Some mothers had also been reassured that the side effects of the medication were minor and unavoidable, were satisfied with the drugs being free through government programs, or had other stressors that detracted from questioning the medication (Freidin & Timmermans, 2008). Alternatively, mothers who were dissatisfied by medical management and did not have their medication concerns adequately addressed by health care professionals, tended to seek complementary and alternative medicine (Freidin & Timmermans, 2008). The findings from Freidin and Timmermans (2008) applied to a TKR context may indicate how satisfaction can be driven by multiple factors including an individual's previous knowledge, experience or contextual factors, and that dissatisfaction with care can drive alternative treatment seeking behaviours. Further, the findings also indicate the importance of the health care encounter in validating and providing education to patients to prevent dissatisfaction, which may be salient to a TKR population.

Satisfaction with the outcome of breast surgery was investigated by Klassen et al. (2009) who explored satisfaction and quality of life in women who undergo this procedure (Klassen et al., 2009). Forty-eight women were invited to tell their story of how their breast condition and subsequent surgery had impacted on their life (Klassen et al., 2009). Although there was no definitive indication of the theoretical framework governing this study, six key themes related to the patients' satisfaction and quality of life after breast surgery were identified; satisfaction with the breasts (size, shape, natural appearance), satisfaction with the overall outcome (general statements about happiness or would recommend to a friend), psychosocial well-being, sexual well-being, physical well-being, and satisfaction with the process of care (Klassen et al., 2009). The findings from this study illustrate the diverse

concepts that are integrated into a patients' appraisal of satisfaction, ranging from aesthetic outcomes to the effect on physical and emotional wellbeing, and factors related to the process of care. Thus, an individual's conceptualisation of satisfaction with the outcome of a surgical intervention may be multi-faceted and require more qualitative research to make sense of these aspects in respect to satisfaction after TKR.

Qualitative research in other disciplines has also investigated satisfaction related with the process of care. Although satisfaction with the outcome of care is different to satisfaction with process of care, they may share overlapping factors, which may assist in the overarching understanding of the construct of satisfaction. A study by Luo et al. (2018) conducted a thematic content analysis with focus groups to understand how patients evaluate satisfaction with dental care (Luo et al., 2018). The authors found six key themes related to the process of care, which included the attitude of the dentists and support staff, convenience, cost, pain management, quality of the equipment and facilities, and the patients' perceived need for oral disease prevention education being met (Luo et al., 2018). Given previous quantitative research has indicated the importance of process factors in a patients' appraisal of satisfaction after TKR (Halawi et al., 2019), the themes identified by Luo et al. (2018) may be transferable to a TKR population where satisfaction with outcome is measured.

A study from the discipline of nursing sought to understand which knowledge paradigm may be most appropriate to understand patient satisfaction with the process of care through a mixed methods study (Merkouris et al., 2004). The quantitative component employed a four-point Likert type questionnaire, completed by randomly selected in-patients at a Greek hospital. The questionnaire included six dimensions of satisfaction with the care delivered and 29 items; 18 related to the nursing staff, and 11 to the hospital environment. The six dimensions included; technical aspects of care, delivery or information and patient education, interpersonal relationships and availability of nurses, maintenance of a restful atmosphere, cleanliness, and hospital meals. For the qualitative component, the authors based their interview schedule on the aforementioned questionnaire with open-ended questions. A

content analysis with systematic techniques to capture discrete 'positive', 'negative', or 'neutral' responses, in addition to phenomenological narrative analysis to capture the overt and hidden meanings of the data was employed (Merkouris et al., 2004). The authors reported the addition of qualitative data provided an expansion of the quantitative analysis findings, which brought forward key issues of the patients' experiences with their care and expectations of nurses. In particular, this synthesis of qualitative and quantitative data importantly illuminated that patients are not dissatisfied with nursing care *per se*, but rather the circumstances under which care was provided (Merkouris et al., 2004). This included staffing shortages, housekeeping issues, and allocation of nursing staff to tasks other than patient care, which resulted in insufficient care for the patients' needs (Merkouris et al., 2004). The authors concluded that patient satisfaction with nursing care is multi-factorial, and the combination of quantitative and qualitative data contributed the completeness in understanding of this phenomenon (Merkouris et al., 2004). The integration of qualitative and quantitative data may therefore be an important consideration for conceptualising patient satisfaction after TKR.

The broader qualitative health care literature has brought forward key features of the multidimensional nature of satisfaction related to both the process and outcome of care, including previous knowledge and experience, social influences, environmental and contextual factors, the therapeutic encounter, and service related issues. Although overlap may exist between the two dimensions of satisfaction, process and outcomes, particularly related to the therapeutic encounter, further research is needed to explicate this intersection. It is possible that patients may not be able to effectively separate these two dimensions when asked to rate their level of satisfaction with the outcomes of TKR. The findings further suggests that complimentary qualitative investigation to quantitative data may be important to comprehensively understand patient satisfaction after TKR.

2.6.2 Qualitative approaches in total knee replacement

There is a paucity of qualitative literature seeking to understand the construct of satisfaction with the outcomes of TKR, with most current qualitative literature focused on the process of care and hospital

experience of TKR (Jansson et al., 2019; Lane et al., 2016; Waters et al., 2016). Waters et al. (2016) explored the factors influencing the satisfaction of patients receiving TKR with the orthopaedic outpatient clinic consultation (Waters et al., 2016). The authors conducted a combination of one-to-one interviews and focus groups, with data analysed with thematic analysis as per the recommendations of Braun and Clarke (2006). The key themes identified that affected patient satisfaction with the orthopaedic clinical encounter were clinic waiting time, clinical contact time, trust, empathy, communication, expectations, and relatedness.

Lane et al. (2016) conducted a mixed methods study exploring factors that shape satisfaction with the hospital experience for patients receiving TKR. However, the quantitative and qualitative components captured two different dimensions of TKR satisfaction (outcome and process, respectfully), and how the qualitative and quantitative data were mixed was not described. In the quantitative component of the study, satisfaction with their TKR was measured on a four-point Likert scale (very satisfied, satisfied, uncertain, and dissatisfied), where 70% of patients were satisfied with the results of their TKR. The qualitative component comprised of written responses at the end of a satisfaction survey asking participants to elaborate on the best and worst aspects of their care 12 months post-TKR. The authors analysed the qualitative data through an interpretive phenomenological approach, where responses were synthesised into conceptual themes (Lane et al., 2016). Three main themes were found to be important to satisfaction with the hospital experience; communication from hospital staff; pain in the post-operative period; and experience of the process of TKR including quality of care and the hospital environment (Lane et al., 2016). The authors suggest the findings provide evidence for the influence of the hospital experience upon satisfaction with the outcomes of the TKR. However, given the 'mixing' process of data was not described, it is not clear as to how the authors ascertained the influence of the hospital experience on levels of satisfaction with the outcomes of TKR. Further, the qualitative component focused only on the process of care, which may not provide context for satisfaction with the outcomes of the TKR.

Jansson et al. (2019) conducted a similar study, investigating satisfaction during fast track primary total hip and knee replacement. Eleven patients who had undergone TKRs and nine who underwent total hip replacement were interviewed about their process of care, and an inductive content analysis was conducted (Jansson et al., 2019). Eight main categories were identified from the qualitative analysis that related to patient's experience of fast track joint replacement; patient selection; meeting the Health Care Guarantee; patient flow; post discharge care; patient counselling; transparency of the journey; communication; and feedback (Jansson et al., 2019). The authors also quantitatively measured satisfaction with the process of care on numerical rating scale from 0 (lowest) to 10 (highest), with mean patient satisfaction reported to be 9. Although the process of mixing qualitative and quantitative findings was not described, the authors concluded that patient satisfaction with the process of fast track primary total hip and knee replacements was high. However, closer analysis of the qualitative accounts of patient experiences revealed challenges, and suggestions as to how these could be solved. In particular, the findings from the qualitative analysis indicated that the processes could be improved through better communication, including digital reminders for appointments, and patient-centred rehabilitation, such as individualised goal setting (Jansson et al., 2019).

Despite similar themes identified from all three aforementioned studies related to satisfaction with the process of care with TKR, particularly related to effective communication from the health professionals and other factors related to the hospital experience, these studies did not directly explore satisfaction with the outcome of TKR. Further, these studies primarily focused on factors of influence, rather than unpacking the construct of satisfaction. A lack of focus on the construct of satisfaction may also be a result of the study methodologies of thematic and content analyses. As these analyses end at description, they do not facilitate an in-depth understanding of the complex intersection of themes, which may be needed to understand similarities and differences in how people conceptualise satisfaction. Where a study did conduct an interpretive phenomenological analysis, data was collected only through short written responses at the end of a questionnaire, whereas rich experiences related to satisfaction with TKR may have been better gathered through in-depth, one-to-one interviews. Although

limitations exist in the utility of these qualitative investigations to understand satisfaction with the outcomes of TKR, as previously established earlier in this chapter, it is probable that overlap exists between the process and outcome of satisfaction after TKR. Presently, it is not known whether patients are able to separate these two dimensions of satisfaction when presented with questionnaires measuring satisfaction with the outcomes of TKR. Additionally, in alignment with work from the broader health care field, this literature supports the use of qualitative exploration in addition to the collection of quantitative data to better understand satisfaction after TKR.

A qualitative study published at the same time as Chapter 6 of this thesis investigated patient experiences of discontentment after TKR (Mahdi et al., 2020). The authors surveyed 348 people, and reported that most of the 16% who reported dissatisfaction with their TKR mentioned that ‘dissatisfaction’ did not describe their experiences. The authors therefore concluded discontentment was a more appropriate word to describe the patients’ experiences, as by definition discontentment means ‘triggered by cognitive stimuli or external forces, is a state of dissatisfaction with one’s circumstances’ (Mahdi et al., 2020). The authors conducted semi-structured interviews with 44 ‘discontented’ patients, and employed an inductive content analysis to analyse the data (Mahdi et al., 2020). The analysis was governed by seeking to understand patients’ experiences of discontentment 1 year after TKR. (Mahdi et al., 2020). The authors concluded the main category driving discontentment was unfulfilled expectations and needs, with three generic categories all informing the main category; unresolved and new harms (including pain, cosmetics, and stiffness); limited independence (including recreations and activities of daily living); and lack of relational supports (related to the process of care) (Mahdi et al., 2020). Mahdi et al. (2020) provides key insight to the construct of dissatisfaction after TKR, particularly the influence of unmet expectations in various domains, and the lack of resonance patients experienced with the term dissatisfaction to describe their experiences. However, the results of this study present some divergent findings to the other literature and theory on satisfaction that purports satisfaction as a multifactorial construct, which is unlikely to be explained by expectations alone (Batbaatar et al., 2015; Carr-Hill, 1992; Freidin & Timmermans, 2008; Klassen et al., 2009;

Williams, 1994). Although it was apparent unmet expectations was an important consideration in the conceptualisation of discontentment in the study by Mahdi et al. (2020), the choice of a content analysis by the authors may have been too restrictive to fully explicate the complexities of this construct; the authors themselves acknowledge difficulties in capturing the complexities associated with patient discontentment in a single category (Mahdi et al., 2020). It may be that the interplay of the generic and sub categories identified in this analysis may have more salience to the experience of discontentment, rather than informing unmet expectations. Understanding the construct of dissatisfaction may require a methodology that allows deeper exploration of processes and meaning, which ends in theoretical development. Further, the authors only sampled dissatisfied patients; seeking those that were satisfied with their TKRs may have provided a more comprehensive understanding of the constructs of satisfaction and dissatisfaction. Additionally, whether the choice to explore discontentment instead of dissatisfaction yielded a different conceptualisation of the construct is unknown, particularly given the decision to use the word 'discontentment' appeared to be a decision made by the authors rather than the participants. Exploring language that better fits with the experiences of participants may have important implications for capturing the patients' perception of outcome following TKR, such as informing the design of PROMs in this population.

Across the qualitative TKR literature, satisfaction has been predominantly investigated in relation to the process of care. As previously discussed, although probable overlap exists between satisfaction with the process of care and satisfaction with the outcome of a TKR, the lack of qualitative investigation into the construct of satisfaction with TKR outcomes is problematic given this is the main context in which satisfaction is quantitatively assessed. The qualitative studies exploring satisfaction with both the process of care and outcomes of the TKR also appear to have methodological limitations in terms of the analytic choice. The use of thematic and content analyses, or an interpretive phenomenological approach applied to short written responses at the end of a questionnaire, were appropriate for facilitating a descriptive analysis. However, a methodology that facilitates theory generation, through in-depth interviews, is likely to be more appropriate to understanding the construct of satisfaction. Theory

generation into satisfaction after TKR may facilitate a broader understanding of what being satisfied means to patients, and the factors that lead to high and low levels of satisfaction after TKR. As was demonstrated in the broader health care qualitative satisfaction literature, the appraisal of satisfaction with TKR may extend into factors such as previous knowledge and experiences, quality of life, and physical and emotional well-being (Freidin & Timmermans, 2008; Klassen et al., 2009). Therefore, future research related to understanding satisfaction with the outcomes of TKR may require methodological approaches that facilitate abstraction and theory development to understand how the various factors interact to inform a person's appraisal of their level of satisfaction after TKR.

2.6.3 Barriers to qualitative methodology in orthopaedics

From the existing literature, it is clear there is a paucity of qualitative enquiry into satisfaction after TKR, and where enquiry exists it has predominantly investigated the process rather than outcome of care, and the methodology has limitations. The insufficient production of qualitative literature in orthopaedics may relate to a lack of alignment with a biomedical approach to knowledge (Beaton & Clark, 2009). Within a biomedical context, knowledge is thought to be measurable and objective (Crotty, 1998). However, in a qualitative research paradigm, knowledge is considered socially constructed and subjective (Crotty, 1998). This qualitative approach to knowledge is incongruent with biomedical approaches to treatment, and likely results in orthopaedic research users, such as clinicians, and producers, such as researchers and editors, assuming qualitative studies are inherently biased, low quality designs (Beaton & Clark, 2009). An additional reason for the low uptake of qualitative designs may relate to the complexities of qualitative methodologies; for novice qualitative researchers, the inconsistencies in terminology render qualitative research difficult to understand and conduct (Sperka, 2019). An expansion of this historically quantitative research space to qualitative enquiry could enhance patient care and outcomes. The development of orthopaedic specific qualitative resources may be indicated to assist orthopaedic research users and producers to understand how qualitative studies are designed, how rigour is established, and how findings can inform clinical practice.

2.7 Qualitative methodologies to assist understanding patient satisfaction after total knee replacement

The research designs employed to understanding patient satisfaction with the process or outcome of TKR to date have used descriptive analyses, such as thematic analysis and content analysis. These forms of analyses have strength in the flexibility of their approach; they can be adapted to most research questions and theoretical orientations. However, thematic analysis is more aligned with a *method* of analysis rather than a *methodology* (Braun & Clarke, 2020), which encompasses theoretical orientation and guidance of the research design, and content analysis tends to favour attaining a condensed and broad description of phenomenon (Elo & Kyngas, 2007), rather than depicting a complex intersection of themes. Thus, it is unlikely these approaches are well suited to contend with the complexities of the construct of patient satisfaction. The qualitative approach needed to understand the construct of satisfaction with the outcome of TKR must facilitate grappling with contradicting meaning, and a myriad of influencing factors that may differ across TKR patients. Further, given the paucity of theoretical knowledge in this space, a methodology that facilitates the development of a theoretical or conceptual model would lay grounding for further understanding of this construct.

In the aforementioned study by Freidin and Timmermans (2008), the authors conceptualised what it meant to be satisfied or dissatisfied with the biomedical care received by the mothers for their child's asthma, which informed the choice of biomedical treatment, complimentary alternative medicine, or a combination of the two. These findings were then presented in a conceptual model, providing a theory for lack of parent adherence to biomedical care in children with asthma. The authors employed a grounded theory methodology, which uses in-depth interviewing techniques, and facilitates a recurrent back and forth between the raw data, developing findings and theory development (Charmaz, 2006). Grounded theory methodologies also use 'theoretical sampling', which is the deliberate selection of participants to test emerging concepts and developing theory (Charmaz, 2006). Given the depth of analysis and development of theory generated from a grounded theory methodology as demonstrated

in the study by Freidin and Timmermans (2008), grounded theory may be a more appropriate methodology to create theoretical understanding of patient satisfaction after TKR. The development of a theoretical model of patient satisfaction after TKR may then inform what it means when a patient indicates they are satisfied or dissatisfied after TKR, and what factors influence their level of satisfaction. This knowledge may direct clinicians towards assessing for factors that may be modified to improve satisfaction levels.

2.8 Conclusion

This chapter has highlighted a clear lack of theoretical understanding of patient satisfaction after TKR. This has driven heterogeneity in the measurement of this construct and a lack of understanding regarding what it means is when patients report being 'satisfied' or 'dissatisfied' after TKR. Given the prolific use of satisfaction questionnaires to reflect meaningful benefit after TKR, it is logical that future research is required to better understand this construct. As quantitative approaches have not adequately progressed our understanding of patient satisfaction, qualitative research may be best positioned to progress knowledge in this space. Through turning our attention to the individual narratives, we may gain novel insights to what underpins reports of satisfaction and dissatisfaction. Therefore, to provide an understanding of patient satisfaction after TKR to facilitate an improvement in patient outcomes, the aims and research questions of the studies conducted for this doctoral thesis are as follows:

Study 1: systematic review

- ii) Evaluate the proportion of patients reported to be satisfied after total knee replacement for osteoarthritis.
- iii) Assess the content validity of the utilised satisfaction measures.

Study 2: qualitative study

- iii) To explore what it means for patient's to be satisfied 1 – 2 years after total knee replacement.

- iv) To investigate the factors that influence patient satisfaction levels 1 – 2 years after total knee replacement.

Study 3: follow-up qualitative study

- iv) What is the stability patient in satisfaction 2 years following the initial inquiry?
- ivi) Does the existing conceptual model of patient satisfaction after TKR apply at this later follow-up?

The next chapter will discuss the methodological considerations for addressing the research aims of Study 2 and 3. This will include a rationale for a qualitative approach, epistemological and ontological assumptions, the theoretical perspectives employed, and appropriateness of a grounded theory methodology.

Chapter 3: Methodology

There is no such thing as philosophy-free science; there is only science whose philosophical baggage is taken on board without examination.

-Daniel Dennett

3.1 Introduction

By undertaking the body of work in this thesis, I sought to understand the subjective meaning of satisfaction after TKR to patients, as well as to explore the processes that influence levels of satisfaction at 1–2 year and 3–4 year follow-up. In answering these research questions, the overarching goal of this enquiry was to create substantive theory about patient satisfaction after TKR. I employed qualitative approach, situated within a relativist ontology, constructivist epistemology, and an interpretivist theoretical perspective in this research, which is described in this chapter. This chapter also provides a rationale for the choice of constructivist grounded theory as the most appropriate methodology to address the research questions.

3.2 Qualitative approach and philosophical perspective

As illustrated from the literature review in Chapter 2, theoretical knowledge of patient satisfaction after TKR is lacking. Although there has been a large quantity of literature seeking to measure and predict satisfaction, the reasons why a patient reports high or low satisfaction remain unclear. Previous quantitative methods have indicated relationships between satisfaction and variables such as preoperative narcotic use (Franklin et al., 2010), improvements in pain and function, and fulfilment of expectations (Dunbar et al., 2013). However, the amount of variables shown to correlate with scores on measures of satisfaction are vast, and a reliable prediction model has failed to be developed for satisfaction or dissatisfaction after TKR (Zabawa et al., 2019). Moreover, at the clinical level, surgeons may be left perplexed as to why two patients with similar objective outcomes or radiographic evidence of surgical success can have discrepant levels of satisfaction (Ring & Leopold, 2015).

The predominant quantitative research paradigm used to understand patient satisfaction after TKR may be limiting in terms of exploring the nuances and complexities of this construct. In a quantitative research paradigm, reality, known as ontology, is considered an observable and stable experience for individuals, while knowledge, known as epistemology, is considered value-free, unaffected by human factors, and measurable (Creswell, 1998). These assumptions can be highly beneficial for answering research questions related to prevalence and causality but may not be aligned with gaining knowledge related to an abstract, social construct such as patient satisfaction. Satisfaction is likely to be an individual, context dependent, and experiential construct that is difficult to capture through methods of measurement aligned with quantitative approach to knowledge and reality. Attempts to understand patient satisfaction may benefit from assumptions about reality and knowledge that acknowledge a value-laden inquiry, where the focus is on individual, subjective meaning. These assumptions are aligned with qualitative research approaches, which are useful for understanding the complexities of human experience in personal and social contexts, and gaining an understanding of the factors that influence these experiences (Gelling, 2015).

Thus, in light of the current gaps in knowledge regarding patient satisfaction after TKR, and the limitations of understanding this construct through quantitative research designs, a qualitative approach was needed to address the research questions. In employing a qualitative approach, the present study involved a series of assumptions, which guided the acquisition of knowledge in response to the research questions (Creswell, 2013). By making my assumptions transparent, the reader is clear on how the research questions were developed and how the data were approach (Creswell, 2013). These assumptions are described below.

3.2.1 Relativist ontology

The qualitative research required the acquisition of subjective knowledge in respect to a participants' understanding and experience of satisfaction after TKR. The meaning of satisfaction and the factors that influence satisfaction were likely to vary between participants. Additionally, satisfaction may be context

dependent and the influencing factors were likely to be complex and multi-faceted. The notion of truth is not 'out there' to be discovered, rather, reality is created and exists in multiple mental constructions and through experience (Lincoln et al., 2011). Thus a relativist, or subjective, ontology is the most appropriate lens from which to view reality for this research, where reality is considered a human experience (Levers, 2013).

A relativist ontology positions the researcher to understand multiple constructions of satisfaction. The researcher acknowledges that two participants are not experiencing the world differently, rather, their worlds are different (Stajduhar et al., 2001). Further, the researcher understands the presence of multiple truths in the context of multiple realities (Levers, 2013). Therefore, the researcher will position themselves to see satisfaction after TKR as an individual experience and process, with multiple meanings in the varying contexts of the participants.

3.2.2 Constructivist epistemology

In acquiring knowledge about satisfaction after TKR, the assumptions about knowledge must compliment the subjective position on reality and the purposes of the inquiry. A constructivist epistemology assumes that both the participants and the researcher construct the world around them (Guba & Lincoln, 2005). A constructivist epistemology compliments a subjective ontology as it assumes ever changing, multiple layered realities (Guba & Lincoln, 2005). Constructivism further embraces the subjectivity of knowledge and places this within social contexts (Guba & Lincoln, 2005). This subjective knowledge is also reflexively examined, which requires the researcher to reflect on how their own values and experiences are influencing the acquisition of knowledge. Constructivism also compliments the research questions as this thesis is seeking to understand how participants construct their view on satisfaction after TKR; *what does being satisfied with TKR mean to them?* Additionally, the research questions further seek to understand how a participant's construction of reality influences their level of satisfaction after TKR: *what is happening in this person's life to result in their level of satisfaction with their TKR?*

Meaning in constructivism is co-constructed between the researcher and the participant, acknowledging the researcher as part of the research process (Charmaz & Bryant, 2010). It is unlikely that the researcher is able to completely separate their previous knowledge and experience from the phenomenon being studied, nor is it desirable under a constructivism paradigm (Charmaz & Bryant, 2010). Thus, the clinical lens of myself and my supervisory team, which includes clinical and research physiotherapists, a research orthopaedic nurse, a qualitative expert, a clinical and research pain psychologist, and a clinical and research orthopaedic surgeon, was not diminished or negated. However, to ensure the interpretations of the data remained grounded in the participant stories, rather than my own the clinical lens, I maintained reflexive accounts to monitor my personal views and experiences, and to critically engage these in respect to prioritising the participants' voices. The reflexive process is described further in Chapter 4.

Social constructionism was also an epistemological influence in this thesis. While aligned with constructivism, social constructionism further acknowledges the influence of the social world on knowledge, and how knowledge is created through interaction (Andrews, 2012; Guba & Lincoln, 2005). Previous literature has identified the important influence of social determinants (Wilkinson & Marmot, 2006), and social and cultural beliefs on health appraisal (Abraham, 2013; Bhui & Dinos, 2008). As satisfaction is an appraisal of a health outcome, the possible influence of socially informed processes and beliefs should be considered. Adopting a social constructionism lens allowed me to view the contextual and social processes within the participant's narratives which influenced their conceptualisation and level of satisfaction after TKR. This included the support, beliefs and attitudes of family and friends, interactions with the health care system, and their relationship with their surgeon.

3.2.3 Theoretical perspective

This section will discuss the philosophical stance underpinning the methodology, which provides context for the processes involved and basis for the logic and criteria (Crotty, 1998). In approaching the research questions, the subjective meaning of satisfaction, and the individual experiences leading to reports of

high and low satisfaction were the primary lens applied to the data. As such, interpretivism was considered the most appropriate theoretical perspective. Interpretivism is related to understanding, as compared to an explicative approach that focuses on causality found in the natural sciences (Crotty, 1998). Interpretivism emphasises the importance of how meaning is constructed by individuals in response to phenomena (Goldkuhl, 2012; Orlikowski & Broudi, 1991). At the core of interpretivism is subjective meaning within the social world, which informs theory construction (Goldkuhl, 2012; Orlikowski & Broudi, 1991; Madill et al., 2000). As such, the natural world is meaningless until social scientists impose meaning-constructs upon it (Silverman, 1970). Relativism and constructivism are inherent to an interpretivist theoretical perspective, as they assume subjective realities and subjective construction of meaning. Thus, the ontological and epistemological assumptions feed into the theoretical perspective placed on the data.

Symbolic interactionism is considered a distinct approach to the study of human life and conduct situated under the broad umbrella of interpretivism, and was considered a more focused lens through which to approach the qualitative data (Blumer, 1969; Crotty, 1998). Symbolic interactionism stems from philosopher and social scientist George Herbert Mead, whose work had roots in pragmatic philosophy (Crotty, 1998). Symbolic interactionism assists in understanding how people give meaning to events in their life (Beck, 2013; Blumer, 1969). Further, the meaning people place on events, and the response they provide, is context dependent and influenced by emotion (Beck, 2013; Blumer, 1969). Therefore, I viewed the data through the lens of understanding how the participants gave meaning to their satisfaction, and what contextual and emotional factors influenced this construction. Symbolic interactionism further compliments the constructivist and relativist positions as it encompasses a fluid reality, with multiple perspectives, and the belief that facts are value-laden (Charmaz & Bryant, 2010). The influence of pragmatism was also drawn on in this research as a lens of viewing '*what is useful?*' in the context of a practical application of ideas (Beck, 2013). This suited the present study as I aimed to create an understanding of patient satisfaction that may be useful in our current health context.

3.3 Rationale for grounded theory

The primary purpose of this study was to generate substantive theory about patient satisfaction after TKR. From the initial literature search it was apparent that little was known about this construct beyond investigating the relationship between poorly validated satisfaction questionnaires and measurable outcomes such as pain, disability, narcotic use, and expectations. The patients' voice in the understanding of patient satisfaction post-TKR was absent. This lack of theoretical understanding of patient satisfaction after TKR has driven the high heterogeneity in satisfaction measures, resulting in an inability to obtain estimates of high and low satisfaction after TKR. Thus, exploring methodologies which facilitated theory generation may generate important knowledge about this construct to improve patient outcomes after TKR. In this thesis a theory "... states relationships between abstract concepts and may aim for either explanation or understanding" (Thornberg & Charmaz, 2012, p. 41).

Grounded theory research aims to generate a theory based upon a structured and systematic approach to simultaneously gathering, analysing and coding data about processes related to the phenomenon being studied (Glaser & Strauss, 1967). Grounded theory is appropriate when there is little known about a topic, as it is an exploratory and inductive style of enquiry. This approach facilitates progression from simple description of processes to a more in-depth understanding of the meaning and actions involved in the phenomenon of interest (Glaser & Strauss, 1967). Thus, the purpose of grounded theory approaches aligns with the goals of this inquiry in creating a substantive theory on a topic where little is known.

Additional rationale for the selection of grounded theory was the potential flexibility of the approach and the concurrent data collection and analysis (Morse, 2009). This was important for this inquiry due to the novel nature of the data that was being collected; at the time of inquiry, no previous research had addressed this gap in the literature with a qualitative approach. Thus, I required an approach that could change as patterns emerged in the data, and build on knowledge during subsequent data collection. Further, grounded theory approaches are well used in the health science space; since the development

of grounded theory in the 1967, nursing scholars have employed grounded theory to understand health care processes (Schreiber & Stern, 2001). Thus, the application of grounded theory in the appraisal of satisfaction after TKR is considered appropriate.

Previous literature has used the term 'grounded theory' to refer to either the methodology, the method, the research design or the output (Bryant & Charmaz, 2007; Martin et al., 2018). For the present study, the terminology will be aligned with Crotty's (1998) 'four elements': the epistemology and ontology refer to constructivism and relativism; the theoretical perspective refers to symbolic interactionism and pragmatism; the methodology refers to constructivist grounded theory; and the methods will refer to the series of processes aligned with constructivist grounded theory approach that guided the data collection and analysis.

3.3.1 Grounded theory approaches

Grounded theory was founded by Glaser and Strauss (1965), who examined the experience of death and dying in Californian hospitals. The development of this methodology was revolutionary during a time where quantitative paradigms dominated the research sphere, and qualitative approaches were not considered a rigorous approach to inquiry (Charmaz, 2006; Stern, 2009; Glaser & Strauss, 1967). Thus, Glaser and Strauss sought to develop a qualitative approach that may be accepted by quantitative researchers due to its structured and transparent approach to analysis (Charmaz, 2006; Stern, 2009). Despite the importance of this first grounded theory study, the philosophical differences between Glaser's background in descriptive statistics and Strauss' foundations in symbolic interactionism, resulted in divergent directions for this method (Charmaz, 2006).

Glaserian grounded theory remained true to the original method, aligned with an explicit systematic approach, with aims to codify steps to allow for the 'natural emergence of theory' (Glaser, 1978).

Glaserian grounded theory treats theory as emergent from the data (Glaser, 1978), aligned with the assumption that a knowable world is waiting to be discovered by unbiased observers (Charmaz, 2006,

2015). The approach further aims to limit the prior knowledge of the researcher as much as possible by discouraging prior literature searches and asking the researcher to put aside their experiences and knowledge (Glaser, 1992; Charmaz, 2015). In doing this, theory is meant to be fully constructed from the raw data, without injection of previous conceptual frameworks or relevant literature. Although Glaser asserts his original version of grounded theory is not aligned with any philosophical positions (Glaser, 1998; Holton, 2008), these approaches reflect a positivist theoretical perspective, directly aligned with Glaser's statistical heritage (Bryant, 2007). Glaserian grounded theory has been criticised for the requirements of the researcher to remain neutral in approaching the data; other qualitative researchers have suggested a neutral researcher is impossible and incongruent with the purpose of qualitative inquiry (Bryant, 2007; Flick, 2014). For the present study, I felt my prior expertise and experience, as well as the co-construction of knowledge, were unavoidable in conceptualising patient satisfaction after TKR. Urquart (2002) proposes that if grounded theory holds inherent philosophical positions, then a researcher with an opposing paradigm may be unable to use it. Thus, the positioning of the research in Glaserian grounded theory appeared incongruent with the philosophical stance of this inquiry.

Straussian grounded theory has roots in symbolic interactionism combined with pragmatism, with action/ interaction the core of this approach (Strauss, 1987; Corbin, 1991). Straussian philosophy was centred on people not being passive recipients of events, rather, that people give meaning and respond through action/interaction (Beck, 2013). Strauss believed meaning is derived through a process of interaction between the self and others, which is context laden by factors such as emotions, past experiences, family, friendships, relationships, culture, and political structures (Beck, 2013; Mead, 1963; Strauss, 1987). However, in the development of this methodology Strauss and Corbin prescribed multiple analytical stages, which reduced the flexibility of the methodology (Charmaz, 2015), or 'forces' the data as Glaser has purported (Glaser, 1992). The rigidity in the systematic analytic methods required to conduct Straussian grounded theory may leave researchers with preconceived ways of data management that may skew findings, and reduced the importance of developing emergent theoretical

categories (Charmaz, 2015). Although philosophically, Straussian grounded theory may align with the purposes of this inquiry, the level of prescription in the analysis was considered too limiting.

Constructivist grounded theory developed by Kathy Charmaz, a former student of Glaser and Strauss, evolved from the foundations of early grounded theory to move away from positivist constraints (Charmaz, 2015). Constructivist grounded theory treats grounded theory as a series of tools for researchers to use and adapt to fit their research question, and acknowledges researchers' backgrounds as influential in the data analysis (Charmaz, 2015; Morse, 2009). Charmaz's constructivist grounded theory is philosophically closely aligned with Strauss' approach with influences from pragmatism and symbolic interactionism, however, Charmaz emphasises the influence of constructivism, particularly the co-construction of meaning between the researcher and the participant (Morse, 2009). Charmaz further emphasises that despite these philosophical influences, the lens applied to the data is flexible depending on the needs of the enquiry (Charmaz, 1990; Morse, 2009). Similarly, although the researcher is given tools to guide the analysis, the process that the researcher chooses to employ is malleable and dependant on the needs of the research question. Due to the alignment of the philosophical underpinnings, and flexibility of the methodology in the creation of theory, constructivist grounded theory was considered to most appropriate approach to answer our research questions.

However, the development of constructivist grounded theory has not occurred without critique. Glaser firmly believes the constructivist approach is not true to grounded theory, as the purpose of grounded theory is conceptualisation, rather than description of experiences (Glaser, 2002). Instead, Glaser asserts that Charmaz's approach to grounded theory was simply a constructivist approach to qualitative data analysis (Glaser, 2002). Further, Glaser also rejects the mutual construction of knowledge between the interviewer and the participant, as he believes this inappropriately elevated the researcher to a co-creator rendering this a violation of grounded theory research (Glaser, 2002). However, constructivists believe that their approach to grounded theory is not the only valid one, rather, it is an alternative paradigm from which to generate theory, which does include conceptualisation (Bryant, 2007). From

reviewing the various approaches to grounded theory, I believe the constructivist approach remains aligned with the core purpose of grounded theory methods in creating substantive theory where little is known on a phenomenon (Glaser, 1998). Charmaz has also defended the co-construction of knowledge as she believes it is impossible for the researcher not to forge a relationship with the data given the researcher is part of the studied world and part of the data collected (Charmaz, 2006). For the present study, I viewed my existing knowledge and experience as both important and advantageous to the data analysis, while simultaneously managing pre-existing knowledge and experiences reflexively. Additionally, in alignment with Charmaz's position, I did not conceive it possible to neutrally approach this data. From a review of the grounded theory approaches, I believe the dispute between Glaser and Charmaz is based on epistemological differences; Glaser champions a neutral researcher and objective acquisition of data, while Charmaz asserts the inescapable impact the researcher has on the data and subjectivity of data. Thus, both approaches to grounded theory are appropriate to generate theory, however, constructivist grounded theory remained better aligned with the philosophical approach taken to this inquiry.

3.3.2 Other methodologies considered

Although constructivist grounded theory was considered the most appropriate methodology to answer the research question in this doctoral thesis, other qualitative methodologies were considered. In this section, a rationale for why other qualitative methodologies were not deemed appropriate to answer the research questions of this body of work will be described. The appropriateness of constructivist grounded theory will be further explored in the context of the 'gaps' of alternative methodologies.

Interpretive description was considered due to the clinical orientation of the findings, and its alignment with a constructivist and naturalistic orientation to inquiry (Hunt, 2009). However, this approach was not considered appropriate to the present inquiry as it favours the researcher's interpretation for clinical practice rather than prioritising the social processes and co-construction of knowledge (Hunt, 2009). Interpretive description is also more aligned with a descriptive analysis whereas this doctoral

thesis aimed to create substantive theory on patient satisfaction, which was more aligned with a constructivist grounded theory methodology.

Thematic analysis was considered due to the flexibility of the approach and philosophical positions, however, was ultimately not selected as it does not provide a robust enough methodology to produce theory (Clarke & Braun, 2017). Instead, constructivist grounded theory offered flexibility in the analytic approach and simultaneous rigour to arrive at theory development.

Lastly, although content analysis has the ability to create theory, content analysis has a focus on collapsing language into concepts and categories (Hsieh & Shannon, 2005). The present inquiry required the ability to identify patterns and processes, to facilitate understanding of theory of satisfaction after TKR (Hsieh & Shannon, 2005). Constructivist grounded theory allows for the exploration of patterns and processes rather than reducing data into hierarchical categories.

3.4 Chapter conclusion

This chapter explored the analytical and theoretical lens applied to the acquisition of qualitative data; relativist ontology, constructivist epistemology, and interpretivist theoretical perspective. This chapter further described and defended the methodological approach in constructivist grounded theory as both an approach and a production of findings. The next chapter will provide a detailed explanation of techniques used to conduct the constructivist grounded theory research.

Chapter 4: Methods

The almost sole recognition given to quantitative methods has trained students inadequately, established flawed standards of practice and research, and delayed the development of essential medical knowledge ... when qualitative methods are clearly established in our research repertoire, the advance of medical knowledge will be greatly accelerated.

– Holman (1993)

4.1 Introduction

This chapter will explore the design of the constructivist grounded theory research, including recruitment and sampling, data collection, data analysis, and theory generation. This chapter will also describe how trustworthiness was achieved and conclude with how the research ascribed to ethical conduct.

4.2 Recruitment and sampling

Participants for this study were recruited from St Vincent's hospital in Melbourne, Australia. The hospital collects a broad range of data on all patients who undergo TKR surgery through the St Vincent's Melbourne arthroplasty (SMART) registry, including demographics, levels of pain and function and mental wellbeing before TKR surgery, and levels of pain, function and satisfaction at 12 months post-surgery and annually thereafter. Participants were purposively selected from the smart registry and the specific inclusion and exclusion criteria for this study are detailed below in Table 4.1.

To facilitate a broad range of outcomes and experiences after TKR, I categorised the sample into 'quadrants' based on their improvement in pain and disability levels and level of satisfaction at 12 months after TKR surgery.

Table 4.1. Inclusion and exclusion criteria

	Details	Rationale
Inclusion criteria	TKR for the treatment of knee osteoarthritis.	TKR for the treatment of other conditions such as trauma or inflammatory arthritis may yield different experiences and outcomes, thus sampling for these conditions was beyond the scope of this study. TKR for knee OA was selected as it is the primary reason for TKR surgery in Australia (AOANJRR, 2016).
	Patients with complete pre-operative and 12 month registry data.	Complete registry data facilitated purposive and theoretical sampling. Without this information it was considered too difficult to conduct theory testing and seeking divergent cases.
	A minimum of 12 months post-TKR and a maximum of 25 months post-TKR for the primary qualitative study. A minimum of 3 years follow-up was included for the follow-up qualitative study.	This study was concerned with the factors and processes that shape satisfaction. By choosing a timeframe of 12 to 25 months these influencing factors may be targeted by clinicians to improve satisfaction at later time points. By conducting the follow-up study on patients three years post TKR, this allowed ample time to see if the same factors and processes were still influential, or if other factors were important at a later time point. This time-frame also gave insight to the stability of patient satisfaction appraisal over time.
	Patients who spoke a language other than English were interviewed with a professional interpreter.	In seeking a diverse range informants, it was desirable to accommodate Non-English speakers if possible. In including these participants, interviews were only conducted if the participant consented to a professional interpreter. The authorship team felt this would result in a more reliable translation as compared to a family member or spouse, who may relay their own beliefs rather than the participant's.
Exclusion criteria	Cognitive impairment preventing meaningful answers.	As the interview schedule required thoughtful reflection from the participant on their TKR journey, cognitive impairment was deemed limiting in relaying these experiences and beliefs. The SMART Registry records cognitive impairments from each patients' medical admission assessment. Cognitive impairment was also screened when I approached a participant to be interviewed, I ensured that the participant understood the purposes of the study and when in any doubt would verify the cognitive status with a family member/carer.
	Significant post-operative complication resulting in subsequent surgery, such as amputation or prosthesis removal.	Additional surgery for TKR due to serious complications was not considered to be informative for the context and study population central to the inquiry and was therefore excluded from this sample.

Changes in pain and/or function from pre-TKR to 12 months after TKR, were based on the outcome measures in rheumatoid arthritis clinical trials and the osteoarthritis research society international (OMERACT/OARSI) responder criteria (Pham et al., 2003) this defines a clinical responder to TKR by relative or absolute value change in pain and function domains from a patient-reported outcome measure (Pham et al., 2003) (see Table 4.2). One of the most commonly used PROMs for before and after TKR surgery is the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) (Bellamy et al., 1988), which was collected by the smart registry pre and 12 months post-TKR. The WOMAC includes three domains: pain (5 questions), function (17 questions), and stiffness (2 questions), with each question measured on VAS scale from 0 (no suffering) to 10 (high level of suffering) (Bellamy et al., 1988). The results are then aggregated per construct for a mean score (Bellamy et al., 1988), and then applied to the OMERACT/OARSI criteria to determine responder status.

The smart registry also measures satisfaction with the self-administered patients satisfaction scale (SAPSS), which includes four domains: overall satisfaction, satisfaction with pain, satisfaction with home and yard work, and satisfaction with recreational activities (Mahomed et al., 2011). Each of these four domains are measured on a 4-point Likert scale: very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied (Mahomed et al., 2011). A 'satisfied' patient was defined as someone who indicated 'somewhat satisfied' or 'very satisfied' for all four satisfaction domains. A 'dissatisfied' patient was defined as someone who indicated 'somewhat dissatisfied' or 'very dissatisfied' for one or more of the four domains. Distinction of 'satisfied' and 'dissatisfied' patients in this way was a pragmatic decision I made in consultation with my supervisors as the best way to facilitate purposive and theoretical sampling.

Participants were then classified into one of four groups: responder satisfied; responder dissatisfied; non-responder satisfied; non-responder dissatisfied. Grouping participants in this way was solely for the purposes of sampling and capturing a broad range of experiences. The creation of these sampling quadrants held no weight on the analytic process, nor did I hold any expectations about who 'should' be

satisfied during the interview as a result of these metrics. Further description of these sampling quadrants are described in Table 4.2.

Table 4.2. Sampling quadrants

Responder satisfied	Responder dissatisfied
Achieved either (i) a relative change of 50% or an absolute change of ≥ 20 in one of pain or function scores, or, (ii) a relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score (Pham et al., 2003).	Achieved either (i) a relative change of 50% or an absolute change of ≥ 20 in one of pain or function scores, or, (ii) a relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score (Pham et al., 2003).
Indicated somewhat satisfied or very satisfied in all four domains.	Indicated somewhat dissatisfied or very dissatisfied in one or more of the four domains
Non-responder satisfied	Non-responder dissatisfied
Did not achieve either (i) a relative change of 50% or an absolute change of ≥ 20 in one of pain or function scores, or, (ii) a relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score (Pham et al., 2003).	Did not achieve either (i) a relative change of 50% or an absolute change of ≥ 20 in one of pain or function scores, or, (ii) a relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score (Pham et al., 2003).
Indicated somewhat satisfied or very satisfied in all four domains.	Indicated somewhat dissatisfied or very dissatisfied in one or more of the four domains

4.2.1 Initial sampling

Initial sampling was aimed at answering the research questions and was considered a ‘point of departure’; at the beginning of the inquiry it is not possible to know the conceptual categories, thus initial sampling facilitates their construction (Charmaz, 2006). Recruitment began by creating an excel spreadsheet, separating eligible participants into their sampling quadrants, de-identified with demographic information (see Appendix 1). This allowed me to seek participants with a broad range of outcomes and demographic variables for the initial stages of data collection. During this initial stage of sampling, I sent a letter to 63 of 121 eligible people informing them that a researcher may contact them about being involved in a study about their knee replacement, together with the participant information sheet (see Appendix 2). This letter also included the option to immediately opt in or opt out of being contacted to participate in the study. Following this, I phoned each of the people who had not

immediately opted out, asking if they would be interested in participating in the research project. I attempted to include perspectives from all sampling quadrants with a range of ages and mix of males and females. Four patients were not appropriate to be interviewed (cognitive impairments (2), declined use of professional translator (1), and undergoing treatment for surgical complication (1)) 19 declined via letter or phone call, 11 did not respond to letter or phone call, and 29 consented to be interviewed. However, one interview was lost due to an equipment malfunction resulting in 28 interviews.

4.2.2 Theoretical sampling

Following initial sampling, theoretical sampling 'directs you where to go' (Charmaz, 2006). Once early categories and themes are identified, theoretical sampling aims to obtain data that will explicate these early ideas (Charmaz, 2006). Theoretical sampling may be considered a type of purposive sampling that is guided by categories and theoretical concerns, rather than by seeking a diverse range of experiences from the population of interest (Charmaz, 2006).

For these subsequent 'rounds' of sampling, I called participants and informed them of the study. If they expressed interest, I either emailed or mailed the participant information sheet to them. In this phase of sampling, an additional 22 people were contacted from the original pool of 121 eligible individuals. Nine patients declined participation, one did not respond to a phone call, and 12 consented to be interviewed. Initial sampling began in February 2018 and theoretical sampling concluded in February 2019.

For the inquiry, multiple stages of theoretical sampling took place that were a result of the concurrent process of data collection, analysis and reflexive memos (described further in Section 4.4 data analysis). The earliest form of this was the observation that some of the participants who indicated dissatisfaction in their 12 month questionnaire would change to report being satisfied during the interview 12 months following their questionnaire. After reflection on this phenomena, I concluded I did not have sufficient understanding of why this was happening. To explore this category of 'change', I further sought more

‘dissatisfied’ participants to test whether their level of satisfaction had changed and, if so, ask these participants to reflect on the reasons for any change (or not).

A further example of theoretical sampling was exploring the categories of ‘social support’, ‘contextual factors’, and ‘therapeutic alliance’. I theorised that these categories, which were later collapsed into ‘social and contextual factors’, were important facilitators of satisfaction. To explore these categories further, I deliberately sought participants from each sampling quadrant to ask more explicit questions about their home environment, their social networks, knowledge of others who had undergone TKR, their relationship with their surgeon, and their health care experience. I looked for patterns between the social and contextual factors, and reported levels of satisfaction of these subsequent participants. These findings were then compared back to earlier interviews to seek patterns and divergent cases.

An important phase of theoretical sampling was testing the theory of ‘response shift’ in the participants. This final stage of sampling occurred when an early theoretical model was developed. I saw the parallels between response shift phenomena and how people still reported being satisfied with their TKR despite ongoing pain and disability. However, I felt that these categories and theories were not fully saturated. I created an adaption of the response shift model for the mechanisms that I theorised were important in the study sample, and tested these categories on participants from each of the sampling quadrants. These findings were used to saturate the existing categories and finalise the development of ‘the grounded theory’.

A final phase of sampling was conducted in the follow-up study, a further two years after Study 2 (3–4 years post-TKR). The purpose of this sampling approach was to ‘test’ the conceptual model through achieving as much diversity as possible through i) the different pathways (full glass, glass half full, glass half empty), ii) key mechanism influencing levels of satisfaction (recalibration of symptoms, reframing of valued activities and conceptualisation of symptoms) and iii) the influence of thoughts, feelings, social and contextual factors. The identified participants were considered ‘key informants’. An exclusion criterion of this follow-up study was a subsequently developed cognitive impairment that prevented

participants from providing meaningful responses to the interview questions. Eleven of the 14 people identified as key informants from the baseline study of 40 participants, participated in the study. Among the three key informants who did not participate, one had developed cognitive impairment, one did not want to participate in the follow-up study, and one was unavailable for interview. Recruitment was ceased at 11 participants as sufficient diversity was captured to test the conceptual model. Description of all participants in Study 2 and 3 can be found in Table 4.3.

Table 4.3. Summary of participants

Sampling quadrant	ID number	M/F	Age at surgery	Time since TKR Study 1	Re-interviewed	Time since TKR Study 2
#NR-D	17	M	79	*17m 7d		
NR-D	20	F	77	16m 24d		
NR-D	^b 25	F	69	18m		
NR-D	32	F	81	14m 24d		
NR-D	36	F	71	16m 10d		
NR-D	39	F	74	13m 23d	Yes	+2y 10m
NR-D	40	F	71	15m 3d		
[§] NR-S	42	F	70	14m 17d		
NR-S	2	F	69	17m 18d	Yes	3y 8m
NR-S	5	M	67	18m 17d		
NR-S	^e 6	F	54	14m 7d		
NR-S	27	M	60	15m 6d		
NR-S	^b 35	M	82	14m 24d		
NR-S	37	F	65	15m 28d		
NR-S	38	F	65	16m 6d		
NR-S	41	F	79	14m 13d	Yes	2y 8m
NR-S	43	M	71	14m 17d	Yes	2y 8m
[^] R-D	12	F	78	18m 10d	Yes	3y 9m
R-D	3	M	69	20m 8d		
R-D	4	M	76	19m 2d	Yes	3y 9m
R-D	8	F	68	16m 3d		
R-D	10	F	55	14m 27d		
R-D	^e 18	F	78	16m 17d	Yes	4y
R-D	22	F	62	17m 3d		
R-D	24	F	66	25m 3d		
R-D	29	F	61	20m 9d		
R-D	30	F	63	20m 1d		
R-D	31	F	77	19m 11d		
R-D	33	F	74	13m 21d		
R-D	34	M	60	19m 2d		
^{&} R-S	1	M	73	24m 28d	Yes	3y 10m
R-S	^e 9	F	77	18m 14d		
R-S	11	M	75	14m 20d	Yes	3y 5m
R-S	13	M	69	18m 11d		

Sampling quadrant	ID number	M/F	Age at surgery	Time since TKR Study 1	Re-interviewed	Time since TKR Study 2
R-S	14	F	68	19m 9d	Yes	3y 6m
R-S	15	F	71	19m 23d		
R-S	16	M	67	20m 1d	Yes	3y 9m
R-S	ⁱ 21	F	77	18m 24d		
R-S	23	M	83	15m 16d		
R-S	26	F	81	18m 6d		

[#] Non responder dissatisfied; [§] non responder satisfied; [^] responder dissatisfied; [&] responder satisfied; * xx months xx days; ⁺ x years xx months; ^e ethnic background; ⁱ Interpreter required; ^b Indigenous Person

4.3 Data collection

This section describes how data were collected for the studied population. All 40 participants had initial semi-structured interviews, with demographic data collected between 12 and 25 months post-TKR. A further 11 participants had follow-up semi-structured interviews two years after the initial interviews to test the assumptions of the theoretical model at a later time point. All participants were sent a participant information sheet (see Appendix 2), which informed them of the purposes of the study and what to expect. Prior to the interview, the participant information sheet was discussed and individuals were given an opportunity to ask any questions before signing or providing verbal consent.

I offered all participants in initial sampling the option to meet face-to-face in a private room at the hospital, or to conduct the interview over the phone. For later stages of theoretical sampling when I returned to Perth, and during the follow-up study, only phone interviews were offered. All participants were offered a \$25 Coles/Myer gift card as reimbursement for their time, and if the participant travelled to the hospital a further \$25 Coles/Myer gift card as reimbursement for travel and parking costs.

Initial interview schedules were orientated around the four domains of the SAPSS (satisfaction overall, satisfaction with pain, satisfaction with home and yard work, satisfaction with recreation) (Mahomed et al., 2011). As the SAPSS is a commonly used tool to measure patient satisfaction after TKR, understanding responses to it would give insight into how participants interpreted the questions, and how they thought about the concept of satisfaction. Probing questions were guided by the literature

review, which informed existing theory about satisfaction in different contexts, such as marketing. As I was a novice interviewer at the time of initial sampling, in collaboration with my expert qualitative supervisor, we created a schedule with multiple prompts and example questions (see Table 4.4). The requirement of these reduced as my interview skills developed. The interview schedule was flexible so that I was able to explore new concepts and themes as they were identified, particularly in later stages of theoretical sampling (see Table 4.4). The length of the interviews ranged from 30 to 60 minutes and there was no difference between the content or time between interviews conducted over the phone or face-to-face.

Table 4.4. Initial interview schedule

Construct	Questions/probes
Broad questions	Why did you decide to have a total knee replacement? Can you tell me about your journey to getting a knee replacement? What alternatives were you offered? What do you think about alternatives to a knee replacement? How has this surgery changed things for you? What were you expecting from this surgery? Do you think these expectations are realistic? Why/why not? What do you think influenced you having these expectations? And have these been met?
Pain	How has your pain changed since before your surgery? Can you put me in your shoes and describe what your pain used to be like? And what is it like now? How do you feel about how your pain is now? When you experience pain what do you believe is causing it? Why? What do you believe your knee is telling you when it hurts? Why? Do you listen? What do you do when you get pain in your knee? Do you have much control over this pain? What would happen if you ___? Do you see this pain improving, stable or worsening? Is it predictable? Is the level of pain you have now acceptable in your opinion? Why/why not? Can you help me understand what would life look like if you were very satisfied with your level of pain? We often have mixed feelings about things – for example you said __ with this but you remain satisfied with the overall outcome – could you talk a bit more about this?
Function	How has your home/yard/recreational activities changed since before your surgery? Can you describe your previous ability to do home/yard/recreational activities? What were you limited in doing? Why? What is your function like now? How do you feel about how your function is now? Is the level of function you have now acceptable in your opinion? Why/why not?

Construct	Questions/probes
	Can you help me understand what life look like if you were very satisfied with your home/yard/recreational activities?
Stiffness	How has your stiffness changed since before your surgery? Can you describe your previous stiffness? What is your stiffness like now? How do you feel about how your stiffness is now? Is the amount of stiffness you have now acceptable in your opinion? Why/why not? Can you help me understand what life would look like if you were very satisfied with your stiffness?
Confidence	Has your confidence changed since your surgery? Why/why not? What was your confidence like before your surgery? Would you avoid activities? Why? How confident do you feel in your knee now? Why? How confident do you feel with ____? Why? What do you believe would happen if you did ____? Why? Did you complete physiotherapy after your surgery? What did it involve? How important do you think physio is? Why? In what way did it help you? Did you expect to do physio/exercise after your surgery?
Embodiment	Can you describe to me how you imagine your knee to look like now? What helped you create this image of your knee?
Immediate post-op experience	How did you find the early recovery stages? How did you cope with this? How did you feel about getting out of bed in these stages? Did you have many people supporting you during this time?
Success	Do you believe your surgery has been a success? Rate from 0% to 100% What are the main reasons for this? Who do you believe more responsible for the level of success of your surgery – you or your surgeon? What did you think of your surgeon? – did you like them? Why/why not? Did you trust your surgeon?

Follow-up interviews conducted two years after the initial interviews, were designed to test the assumptions of the theoretical model generated from the initial analysis. The interview schedule (see Table 4.5), specifically targeted all aspects of the conceptual model but remained flexible to test new concepts or ideas as they became apparent in the interviews. To allow for individualised testing of mechanisms, the interview schedule allowed for each participant's individual conceptualisation of satisfaction to be documented in the 'participant specific notes' section of the schedule. For example, if a participant presented with a strong mechanisms of 'non-bothersome conceptualisation of symptoms' this was documented in the 'participant specific notes section', along with the thoughts, feelings, social

and contextual factors which influenced this mechanism. This allowed me to ask about change or stability in satisfaction levels, specific to each participant. These interviews also ranged from 30 to 60 minutes in duration and were all conducted over the phone.

Table 4.5. Follow-up interview schedule

Construct from model	Questions
Context	It's been a couple of years since we spoke, can you tell me how your TKR has been?
Overall outcome Overall level of satisfaction // change	<p>Overall, how satisfied are you with the results of your TKR? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) why/why not?</p> <p>Last time we spoke you mentioned ____ about your satisfaction with ____, can you think why this may have changed?</p>
Symptoms // change // recalibration // re-conceptualisation	<p>Can you tell me about any pain or other symptoms you currently experience?</p> <ul style="list-style-type: none"> - Probe: night pain, comorbidities, pain behaviours, 0–10 vas scale - How did you arrive at that score out of 10? <p>Overall, how satisfied are you with the results of your TKR for improving your pain? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) why/why not?</p> <p>Last time we spoke you mentioned ____ about your satisfaction with ____, can you think why this may have changed?</p> <p>Why do you think you are still having ___ in your knee? Why do you think this? Why do you think you are no longer experiencing ___ in your knee? Probe: why helped/didn't help with your understanding? Surgeon?</p>
Function // change // re-prioritisation	<p>Can you tell me about any difficulties you have with activities at the moment?</p> <ul style="list-style-type: none"> - Probe: avoidance, modification, barriers <p>Overall, how satisfied are you with the results of your TKR for improving your ability to do home and yard work? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) why/why not?</p> <p>Overall, are you satisfied with the results of your TKR for improving your ability to do recreational activities? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) why/why not?</p> <p>Last time we spoke you mentioned ____ about your satisfaction with ____, can you think why this may have changed?</p>

Construct from model	Questions
	Can you tell me about how you have adapted/not been able to adapt to the activities that you have difficulty with? Probe: changes to lifestyle, any new activities, rehab
Conceptualisation of satisfaction	Can you help me understand, from your point of view, what it means to be very satisfied with your TKR? <ul style="list-style-type: none"> - Probe: what would it take for you to be very satisfied/more satisfied? - Probe: knowing what you know now, if you could go back in time what would you do differently? - Probe: what advice would you give to someone about to undergo a TKR to increase their chances of being satisfied with their new knee?
Expectations	Can you try and cast your mind back and remember what you expected from your TKR? Do you believe these expectations have been met? Thinking forward, what are you now expecting from your TKR? Why? <i>If changed:</i> Last time we spoke you said _____ about your expectations for your TKR, what do you think about these expectations now? Do you believe they have been met?
Social	Thinking back through the time since you had your operation, can you tell me about any family or friends who helped you along your journey? <ul style="list-style-type: none"> - Probe: present support, surgeon Have you encountered many other people that have had a TKR? What did you think about their outcomes/what did you learn from them?
Emotions	How has your TKR outcomes made you feel? <ul style="list-style-type: none"> - Probe: worry, confidence
Cognitions	What kind of mind-set did you have along your TKR journey? What do you think is important for having a successful outcome after TKR?
Care seeking	Have you had any contact with your surgeon or other health care professionals/any treatment since we last spoke? What was the purpose of the appointment? Can you tell me how the appointment went?
Participant specific notes	

4.4 Data analysis

This section explores how data were analysed and the subsequent development of ‘the grounded theory’. The process involved concurrent data analysis and collection, which allowed revision of the interview schedule, guided theoretical sampling, and subsequently resulted in theoretical saturation. Analysis was iterative and cyclic, and involved constant comparison as concepts became increasing more abstract during later stages of analysis. Constant comparison is a systematic method of theory development where each stage of analysis is transformed into the next, more developed stage (Glaser,

2008). Constant comparison facilitates comparison of data within and between participants and stages of analysis, and is considered a crucial aspect of all grounded theory (Charmaz, 2006; Glaser, 2008).

Figure 4.1 pictorially describes the analytic process aligned with a constructivist grounded theory approach to analysis (Charmaz, 2006), with each component explored in the following subsections.

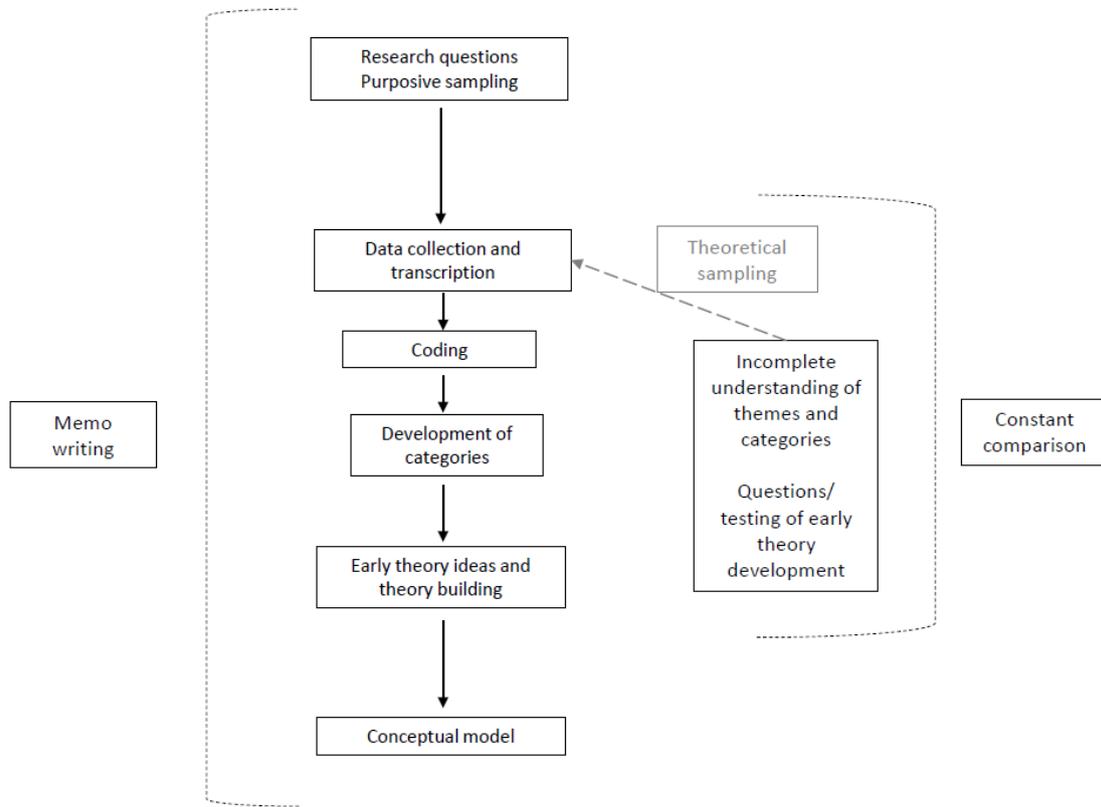


Figure 4.1. Analytic process, adapted from (Charmaz, 2015)

4.4.1 Transcription

Transcription is considered both a product and a methodological process (Bird, 2005). For the present study I viewed transcription as an opportunity to become closer, and more immersed in the data.

Additionally, during transcription, the tone and meaning brought to words can be better understood due to concurrent listening and typing (Bird, 2005). I sought to transcribe all interviews verbatim, however, due to time constraints required 30% of audio files to be professionally transcribed by rev.com. However, for files that were professionally transcribed, I re-listened to the interviews while

reading the transcripts to ensure the meaning the participants were giving to their answers were understood. During transcription all participants were assigned a code to protect identity. Additionally, any mention of surgeons, family members or locations were also give a code name to maintain anonymity.

This process of transcription was also integral to my reflexive process. As I was a novice interviewer at the time of initial interviews, transcription offered me an important opportunity to reflect on my style of questioning and how I could improve my techniques. See below example of a post-interview reflection (see Box 4.1) that assisted me to refine my interview technique and schedule:

Box 4.1. Example post interview reflection

In terms of interview technique a better flow could be achieved. Instead of back tracking on questions ask more detail when the topic is brought up. For PT_001 I wish I had probed on his experience of watching his knee surgery and how this affected his construction of his knee. Also wish I asked more about why he was so upset about the poor results his friend is experiencing – what was it about that that really troubled him?

The process of transcription facilitated early familiarisation with the data, enabling me to draw early interpretations of the interviews that could later be compared with the subsequent stages of analysis. See below example of an early interpretation of the data post transcription (see Box 4.2). I would often ‘tack on’ these thoughts at the end of the post-interview reflection.

Box 4.2. Early interpretation of interview data

Further thoughts:

PT_003 really held on to this concept that they had to do a lot on the knee – this was used as a reason for continual soreness

PT_003 experiences a lot of pain post-op. This was very significant to him and then had a bad experience with physio and refused early ambulation. This pain was surprising and confusing to him until the surgeon told him it was a difficult procedure, which gave him some reason for the constant pain – and something he decided to hold on to

Lack of accountability – my knee was complex, I don't know what they had to do to it etc.

4.4.2 Coding

To facilitate the coding process, I started by using NVivo software. However, after going through a portion of the interviews using this software, I found it hard to see the 'bigger picture' in the codes and how they would be collapsed into concepts and categories. To troubleshoot this analytical issue, I switched to using the 'comments' function in Microsoft word which allowed better visibility of the how the codes integrated into the larger context of the participants' narratives. The additional benefit of using Microsoft word was the ease in file sharing between the authorship team, who did not have NVivo software. See Appendix 3 for example Microsoft word based coding.

Coding occurred in two key stages; open coding and focused coding. These stages of analysis are aligned with Charmaz's suggest framework of analysis for constructivist grounded theory and are described below (Charmaz, 2006).

4.4.2.1 Initial coding

The aim of initial coding was to allow the researcher to remain open to all possibilities of the data (Charmaz, 2006). By conducting thorough open coding, this phase of analysis facilitates the researcher to move towards defining core conceptual categories (Charmaz, 2006). Although the goal is to remain open to all emerging ideas of the data, the constructivist approach remains aware of pre-existing knowledge in this early stage of analysis; rather than an empty head, the researcher much keep an open mind (Dey, 1999). During this stage of analysis, I endeavoured to see all possibilities of the data. To

manage personal bias due to positionality as a mid-20s female physiotherapist with theoretical knowledge of satisfaction, personal reflection and reflexive memos were kept to critically engage these perceptions.

Initial coding employed a line-by-line coding approach (Charmaz, 2006). This required me to label each line of text to remain open to new ideas that my biases may have missed had I taken a thematic approach to coding (Charmaz, 2006). I also remained very close to the data, reading and re-reading the transcripts multiple times, and re-coding several of the transcripts in attempts to see the data from alternative perspectives. Figure 4.2 is an example of line-by-line open coding in Microsoft word. Further example of coding can be found in the audit trail (see Appendix 3).

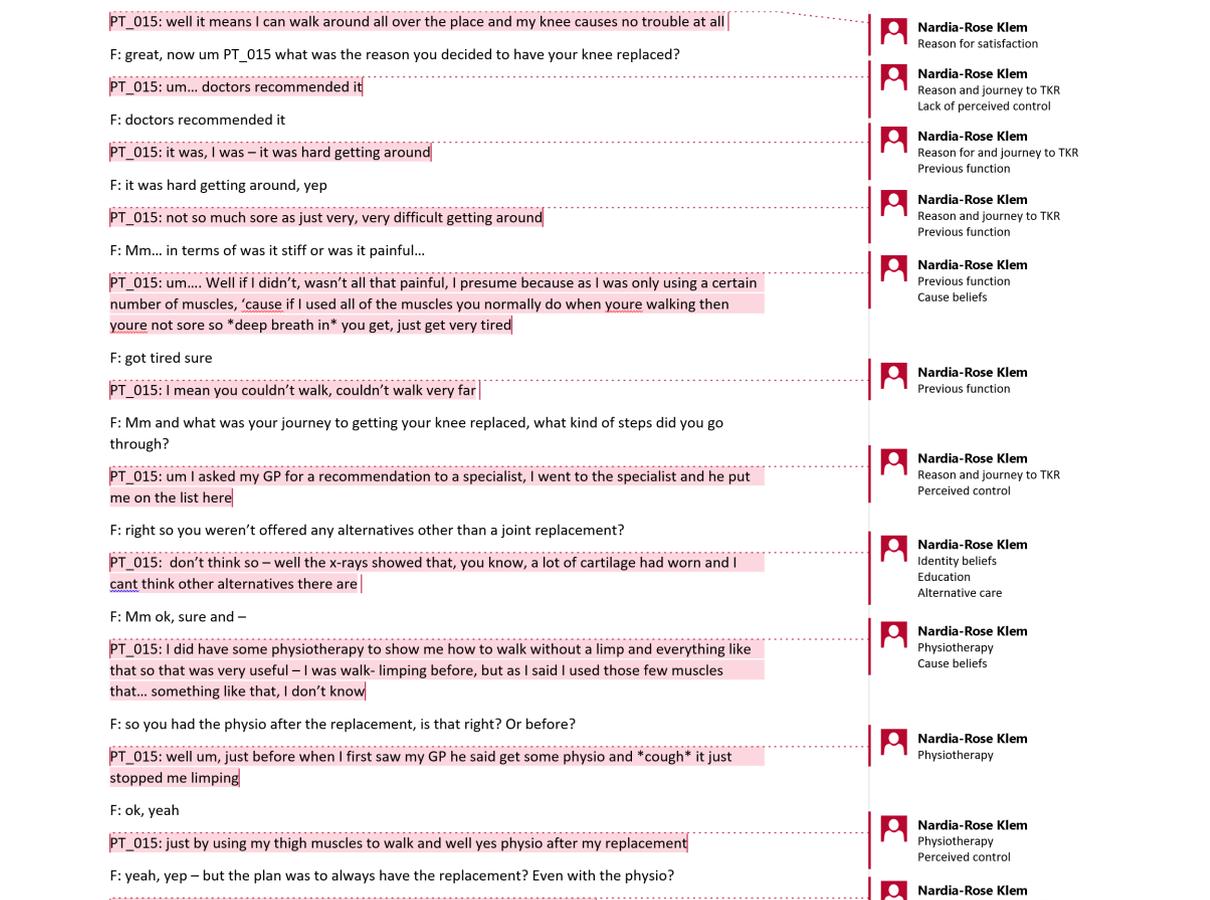


Figure 4.2. Line-by-line coding

During this stage of analysis, cross coding was conducted with the qualitative expert supervisor to ensure the codes were grounded in the raw data. Cross coding also served as a form of triangulation to

explore any further possibilities of the data. Comprehensive documentation of the cross coding performed by my supervisor can be found in the audit trail (see Appendix 3).

4.4.2.2 Focused coding

Following initial coding, focused coding aims to use the most significant codes to begin describing the raw data (Charmaz, 2006). This process requires making decisions about what initial codes make the most analytic sense to begin categorising the data (Charmaz, 2006). Focused coding in this study had strong overlap with the development of themes and categories due to the conceptual nature of this phase of analysis.

This was a cyclic stage of analysis, and involved constantly referring back to the raw data and initial codes to ensure the conceptualisation made sense to the participants’ narratives. I conducted multiple versions of this phase of analysis, to ensure conceptualisation was grounded in the raw data. This included analysing the data per sampling quadrant to seek patterns within and between groups, and then by simply comparing those who reported being satisfied to those who reported being dissatisfied during the interviews.

Unlike open codes that remained open to all possibilities of the data, focused codes were more directed at addressing each of the research questions: *what does being satisfied mean to this participant?* And *what factors and processes shape levels of satisfaction after TKR for this participant?* Table 4.6 below provides an example of the focused coding and conceptual stage of analysis, particularly orientated towards understanding the factors and processes that shaped satisfaction levels.

Table 4.6. Focused coding extract of the non-responder satisfied sampling quadrant (full focused coding tables examples can be found in the audit trail in Appendix 3)

Focused code	Relevant codes	Description/quotes
Process of care	Health care encounter, therapeutic alliance,	Most reported happiness with the process of care in the health system, including positive therapeutic alliance or a feeling of being looked after:

Focused code	Relevant codes	Description/quotes
	<p>experience of physio, alternative care, education, influence of previous surgery/TKR</p>	<p><i>Pt_002: Umm it's his [surgeon's] personality, he's got a good sense of humour, 'cause one day me son and I we were going to the hospital and we forgot we were talking and we took the wrong turn so then the receptionist rang us up and I said [to the receptionist] 'we took the wrong turn we'll be there!' As soon as I walked in he [surgeon] said 'ahh pt_002 you been yakkin' haven't you?' Nah he makes you feel at home, he makes you feel really comfortable, you know?</i></p> <p><i>Pt_006: [I'm very satisfied] because, ah, the hospital the doctors, nurse, all them very good people and they are helpful ... Then they are um very nice and the treatment, the treatment and everything very good.</i></p> <p><i>Pt_027: Because I got the vasculitis and with the kidneys – the kidney doctor they look after me they check all my blood and if something happen because the vasculitis they expecting they can come any part of my body they have to check everything so they send me to the rheumatologist, the renal doctors, and yeah anything happens yeah.</i></p> <p><i>Pt_037: That's the nursing staff, physios, everyone. I go in and out at St. Vincent's all the time for different things and look, the whole of St. Vincent's I find is absolutely fantastic.</i></p> <p><i>Pt_041: So I went onto the public system, and um, I found it was excellent.</i></p> <p>For one participant he was initially dissatisfied with his TKR outcome and process of care but was very satisfied with his revision surgery – despite still being splinted:</p> <p><i>Pt_005: My GP sent me to [hospital] in [location] and I was only in there 5 minutes and he [surgeon] said 'oh we'll do the operation we'll have you in there within a short period of time' and then – I was in 7 weeks or something – and that was it, I didn't get anything explained or nothing. Just my knee was totally bugged you could hear it grinding a mile away and I could hardly walk and I thought it was – he didn't spend a lot of time with ya.</i></p> <p><i>Pt_005: I felt confident with [surgeon] who did the second operation 'cause they had a lot of trouble with doctors, no one wanted to do it except (surgeon) ... he was the only one who did it and when we went to see him for the first time he explained everything that you wanted you hear and what he was going to do and all that and he firstly blamed it all on other people and yes, sorry, he explained it well and it was really good.</i></p>

Focused code	Relevant codes	Description/quotes
		<p><i>Pt_005: Well he drew it out at first he told me that it was going to be 3 months with this stupid thing on me knee and I couldn't move it and all that because it could undo what he was gonna do and then after that he explained and drew you know exactly what he was going to put in it and went through it and explained it all again – he did this 3 times before we had surgery.</i></p>

Focused coding also involved periodic consultation with the authorship team. The multidisciplinary group reviewed my conceptual summaries of the data, and asked analytic questions of the early interpretations. Below is summary meeting notes (see Box 4.3) from an authorship team discussion about the conceptual progression of the analysis:

Box 4.3. Meeting notes discussing the conceptual progression of the analysis

Discussion about analysis

- Nardia has completed 4 more interviews (2 NRD, 2NRS)
- Nardia still needs approx. 3 – 4 more from each NRS and NRD groups for saturation
- Michelle has since e-mailed Nardia an updated mail out where she will continue her interviews

Analysis process:

- Open coding
- Cross-coding with Sam
- Emerging thematic analysis – Nardia found the themes strongly reflected the interview schedule, therefore needed to look closer within these preliminary themes
- Refining of themes – whilst general themes were observed in the RS (such as self-efficacy, control, social support etc.) the remaining groups seemed less easy to describe. In particular, the responder dissatisfied group, which appeared to report a range of experiences and outcomes.
- Response shift phenomenon – this seemed to explain much of what was happening outside of the responder satisfied group. 4 key themes within this: reconceptualisation, recalibration, reprioritisation. Each of which prompt individuals to re-assess their outcomes and potentially report being satisfied. From the transcripts it seemed that the social aspects of each individual facilitated this shift. MD thought perhaps being in a rehab setting may assist with response shift too – seeing other people in similar situations and calibrating themselves against the outcomes of others.
- QoL as a potential parallel to satisfaction – the changes in satisfaction responses appear similar to what is seen in the QoL literature where the response shift has been mostly researched. It may be possible by measuring satisfaction we are really tapping into a QoL measure?
- 'Myth buster' – see attached document on this. This could be considered as a publication in combination with the pre-op findings from the expectations study that SB is working on. Also add in the '10 year limit'.

During this stage of analysis, I also revisited relevant literature pertaining to outcomes after TKR, particularly quality-of-life studies. During this reading I become aware of parallels with response shift phenomena, commonly described in the quality-of-life literature, and how people were adapting to their TKR outcomes.

4.4.3 Development of categories and theory

Following and overlapping focused coding, the analysis progressed from description to abstraction and understanding the relationship between categories (Charmaz, 2006). Like other stages of analysis, this involved moving back and forth between understanding the relationship between key concepts, the open coding, and the raw data (Charmaz, 2006). Theoretical sampling strongly impacted on the progression of this phase of analysis by testing emergent theory, which was done concurrently with data collection. Reviewing early theoretical ideas with the authorship team and existing literature also played an important role in developing theory.

A key focus on this stage of analysis was understanding the differences between those who reported being satisfied and dissatisfied during the interviews, in respect to each of the research questions. In answering the first question about what being satisfied means to patients after TKR, I simply compared answers from satisfied and dissatisfied participants, as to what being satisfied meant to them. These answers were semantic in nature and facilitated a direct comparison between groups. A pattern between the two groups was identified, such that participants with high and low satisfaction conceptualised what being satisfied meant differently. As this was not considered substantive theory and more descriptive, no model was created to depict this finding.

To address the second research question of understanding the factors and processes that resulted in high and low levels of satisfaction, I pursued multiple conceptual explanations. Various models were explored diagrammatically and examples of this are provided in the audit trail (see Appendix 3). The development of these theories was iterative and required continual movement between the raw data,

open and focused codes, and categories. Understanding the data at this high level required the integration of latent and semantic codes and categories, as well as abductive reasoning (Charmaz, 2006). Abductive reasoning in this body of work was concerned with linking codes and concepts as potential theory to 'test' (Bruscaglioni & Brusaglioni, 2016). Theoretical sampling played an important role in this stage of analysis, through saturating categories and confirming the assumptions of the models that were being developed. However, in consultation with my supervisory team, I found the best conceptual explanation of the data was a modified version of the response shift phenomena. I used response shift as a beginning theoretical framework, and then added contextually important factors for a TKR population. Thus, 'the grounded theory', was developed and depicted diagrammatically as a conceptual model, which provides an explanation of the factors and processes that lead to high and low levels of patient satisfaction after TKR.

4.4.4 Memos

Memos are considered an important part of the analysis in a grounded theory study as they prompt the researcher to analyse the data as it is collected, and facilitates abstraction of ideas (Charmaz, 2006). Memo writing allows the researcher to concretely manage their ideas, provides a space to be actively engaged in the data, and explicate categories (Charmaz, 2006).

The approach taken to memo writing was unstructured and free-flowing. While at times I would write lengthy reflections after interviews, more analytic style memos were sharp and orientated towards documenting the key ideas about the data. I treated memos as both analytical to explicate categories and explore theory (Charmaz, 2006), as well as reflexive to critically engage my preconceived ideas about the data from my positionality a mid-20s female physiotherapist with theoretical knowledge of satisfaction (Bradbury-Jones, 2007; Guillemin and Gillam, 2004; Pillow, 2003; Stronach et al., 2007). Additionally, memos served to monitor my progress as a novice qualitative researcher. Memos were taken at all stages of data analysis and various examples of memo writing are provided in the audit trail (see Appendix 3). The following example (see Box 4.4) is an analytic memo written during the middle of

analysis, where I was still exploring how to describe what was occurring in the sample, especially how divergent cases made sense in the bigger picture of the analysis:

Box 4.4. Example analytic memo

PT_002, PT_005, PT_006, PT_037, PT_042 and PT_027 seemed functionally limited and still experienced pain, yet did not find pain threatening, had ways to manage the pain, and perceived the improvements as enough to be satisfied. Most also reported a strong social support network, they were also happy with the process of care and had strong therapeutic alliance.

PT_005 is an example of where the survey is capturing an outcome unrelated to the TKR. PT_005 suffered a complication after TKR where he required ligament repairs. His WOMAC was the worst possible score yet he was somewhat satisfied in all domains. This was because the participant would have filled out the WOMAC during a time he was splinted from his revision surgery (not doing anything functionally). His high satisfaction was because he was so happy with his surgeon who performed the revision surgery. Interestingly he was very dissatisfied with his TKR and attributed this mostly to the surgeon who performed his original TKR. This participant does, however, show the importance of satisfaction with the process of care/ therapeutic alliance.

PT_038 changed her level of satisfaction: she explains that once she started trying to do more she realised she was dissatisfied as she felt unstable and couldn't get past 90 degrees of bend. However, from a pain point of view she was very satisfied.

4.5 Trustworthiness

The following section describes the rigour of the qualitative study and refers to the degree of confidence the reader may have in the data, interpretation, and methods used. The criteria for achieving trustworthiness aligns with the recommendations by Lincoln and Guba (1985). Each domain of trustworthiness is provided with evidence in Table 4.7.

Table 4.7. Evidence of trustworthiness in this doctoral thesis

Trustworthiness domain	Evidence
<p>Credibility <i>The confidence in the truth of the study, and therefore the findings</i></p>	<p>The process of data collection and analysis was aligned with the constructivist grounded theory approach: purposive sampling, theoretical sampling, various stages of coding, theoretical testing (see Section 4.2 recruitment and sampling).</p> <p>I was thoroughly immersed in the qualitative data, conducting several iteration of coding and ensuring all participants were able to present their views in the interview (see Section 4.3 data analysis).</p> <p>The analysis was also iterative in nature: different analytical questions of the data were asked through analysis, thus requiring me to re-examine the transcripts from a different perspective and explore different avenues of analysis (see Section 4.3 data analysis). Round table discussions with supervisors and other PhD students also facilitated viewing the data from different perspectives and challenging interpretations. These discussions included researchers and clinicians with varying backgrounds: social scientist, clinical psychologist, orthopaedic nurse, and physiotherapists.</p> <p>Reflexive journaling and debriefing was constantly undertaken to ensure preconceptions were not clouding the participants’ stories (see Section 4.3.4 memos).</p> <p>I was trained in qualitative interviews prior to the commencement of the data collection process by a qualitative expert. I conducted ‘mock’ interviews, which were watched by the senior researchers, including one qualitative expert, and constructive feedback provided. I also had the qualitative expert present for my first two interviews to ensure my techniques were sound, and to provide feedback. These experiences provided extensive feedback on my interviewing techniques, and how to improve them to provide the most trustworthy data.</p> <p>A selection of coded transcripts were given to the supervisor who is a qualitative expert. The purpose of this was to assess if the codes were grounded in the data. A further sample of three transcripts were provided to the remaining supervisors to repeat this process. At the end of this process, my supervisory team and I were satisfied that the codes represented the raw data. Therefore no additional transcripts were cross-coded.</p>
<p>Dependability <i>Stability of the data over time and over the conditions of the study</i></p>	<p>I maintained an audit trail of data. Memos were made on the different decisions made throughout the analysis and the theoretical challenges faced over time (see Section 4.3.4 memos, and Appendix 3).</p>
<p>Confirmability <i>The degree to which the findings are consistent and could be repeated</i></p>	<p>An audit trail of analysis was kept. Memos were made at different points of analysis, briefly logging the perspectives taken at that point (see Section 4.3.4 memos, and Appendix 3).</p>

Trustworthiness domain	Evidence
	<p>Decisions about analysis and interpretations of the data were discussed over meetings with the supervisory panel (see Section 4.3.4 memos, and Appendix 3).</p> <p>I am confident that given my audit trail, another researcher with similar aims of the data could derive comparable codes and theory.</p>
<p>Transferability <i>The extent to which findings are useful to other persons in other settings</i></p>	<p>A detailed description of the studied group has been provided so that readers may decide if the findings from this study are transferable to their setting (see Section 4.2.3 summary of participants).</p>
<p>Authenticity <i>Researchers fairly and completely show a range of different realities and realistically convey participants' lives</i></p>	<p>The sample were appropriate to answer the research questions. Detailed description of the data were provided: the collapsing of codes to categories, and subsequent theoretical model has been portrayed (see Section 4.3 data analysis).</p> <p>Quotes have been used to support aspects of the theoretical model (see Chapters 6 and 7).</p> <p>Case studies have also been described to further support the findings of the theoretical model (see Chapter 6).</p>

4.6 Ethical considerations

This study was conducted in accordance with the ethical standards in the 1946 declaration of Helsinki. Ethical approval was granted by St Vincent's hospital (Melbourne) human research ethics committee (HREC/17/SVHM/251) (see Appendix 4). For the follow-up interviews an amendment was made to the original ethics application, with approval granted by St Vincent's hospital (HREC/17/SVHM/251) (see Appendix 5), and reciprocal approval granted by Curtin University (HRE2017-0827) (see Appendix 5).

The research was considered low risk to the participants, however, in the case of distress caused to the participant as a result of the interview, psychological support was to be arranged (and this was not necessary for any participant). As described in the previous sections, all participants were provided with the participant information sheet (see Appendix 2) prior to commencing the study. I ensured all participants understood the purpose of the study and what to expect from the interviews prior to providing consent. Consent was also verbally 'refreshed' prior to commencing the interview. All participants were informed they may withdraw from the study at any time without consequence.

As previously described all information was confidential and all participants' identities were protected with code names. Data were kept on a secure file in the university database, where only those with permissions may access it. Backup data were also kept on my password protected laptop.

4.7 Chapter conclusion

This chapter presented the research methods used for recruitment and sampling, data generation and data analysis, which were informed by constructivist grounded theory. Semi-structured interviews with patients who had undergone TKR were the primary source of data. The analysis was congruent with the flexible and iterative nature of constructivist grounded theory and included open coding, focused coding, development of categories and theory, and analytical and reflexive memos. This chapter concluded with a discussion of the low risk of ethical issues in this research. The following chapter will present the accepted manuscript of Study 1; a systematic review of patient satisfaction questionnaires after TKR, including assessment of the content validity of the existing questionnaires.

Chapter 5: Study 1: Satisfaction after TKR is usually high but what are we measuring?

5.1 Introduction

During the course of the literature review in Chapter 2 it became apparent there were discrepant methods of measuring and quantifying satisfaction after TKR, as well as an insufficient understanding of the construct of satisfaction. Therefore, I conducted a systematic review to examine the heterogeneity in satisfaction questionnaires and whether it was reasonable to create a pooled estimate of satisfaction scores after TKR. Additionally, each of the satisfaction questionnaires were assessed for evidence of content validity, which would provide insight to the construct of patient satisfaction. A PDF version of the published manuscript can be found in Appendix 6. The permissions for use of the PDF manuscript can be found at the end of Appendix 6.

5.2 Published manuscript

ABSTRACT

Objective: Patient satisfaction is considered an important outcome measure after TKR, but the construct is complex. There is large variation both in how satisfaction is measured and estimates of the proportion of people who are satisfied after surgery. The aim of this systematic review was to i) evaluate the proportion of people reported to be satisfied after total knee replacement for osteoarthritis; and ii) assess the content validity of the utilised satisfaction measures.

Methods: We searched four literature databases with search phrases 'Total Knee Arthroplasty' OR 'Total Knee Replacement' AND 'Patient satisfaction' for studies that measured satisfaction at least 6 months post-unilateral primary TKR for knee osteoarthritis. Identified studies were assessed for risk of bias, and studies at high risk of bias were excluded (PROSPERO: CRD42017058936). Meta-analysis was not appropriate due to the heterogeneity in satisfaction instruments, thus satisfaction scores were

described. The content validity of satisfaction questionnaires was assessed using the COnsensus-based Standards for the selection of health status Measurement Instruments criteria.

Results: The present review found heterogeneity in the satisfaction questions used, as well as the satisfaction estimates from the various studies. Only two satisfaction instruments were relevant for a TKR population and both failed assessment for content validity due to lack of patient involvement during development and testing in accordance with the COnsensus-based Standards for the selection of health status Measurement Instruments criteria.

Conclusion: Future research should focus on qualitative methods to elicit patients' perspectives of satisfaction to build theoretical understanding.

INTRODUCTION

TKR surgery is considered the gold standard treatment for end stage knee osteoarthritis (OA) due to its cost-effectiveness (Higashi & Barendregt, 2011) and high rates of symptomatic and functional improvement (Ethgen et al., 2004). However, despite near-flawless surgical procedures, up to 30% of people fail to have clinically meaningful improvements in pain and disability levels post-operatively (Nashi et al., 2015). These rates of poor response highlight the importance of appropriately determining and measuring success with this procedure to facilitate improvement in outcomes.

The lack of concordance between the surgeon's and patient's appraisals of the intervention (Brokelman et al., 2003; Janse et al., 2004) underscores the importance of understanding the success of a TKR from the patient's perspective. As such, the Osteoarthritis Research Society International (OARSI) has identified cut points of patient-reported changes in pain and function as valid and reliable markers of response to TKR (Pham et al., 2003). In addition to this, patient satisfaction is considered an important outcome measure post-TKR, as endorsed by a patient and surgeon derived Delphi study conducted by the Outcome Measures in Rheumatology (Singh et al., 2017).

Despite the importance of measuring patient satisfaction as a reflection of the value of the orthopaedic intervention, the satisfaction instruments and quantification methods used after TKR are highly heterogeneous (Kahlenberg et al., 2018). A previous systematic review (Kahlenberg et al., 2018) investigated the available literature on satisfaction after TKR and found only 13% of the included studies used a satisfaction instrument which had demonstrated some form of validity. Further, 21.2% did not define how they measured satisfaction, and the remaining 65.8% drew on a variety of questions and quantification methods to measure this construct (Kahlenberg et al., 2018). These observations may explain why satisfaction estimates have been reported to vary extensively, from as high as 99% (Healy et al., 2002), to findings as low as 70% (Bourne et al., 2010; Petersen et al., 2015). The reasons for such heterogeneity have not been rigorously investigated; however, a recent study (Clement et al., 2018b) indicates the importance of how the satisfaction questions are framed. The authors found the focus of the satisfaction question (such as general satisfaction as compared to satisfaction with recreational activities) significantly affected the rates of satisfaction by as much as 10% (Clement et al., 2018a).

These findings highlight the importance of understanding the different aspects of satisfaction. According to satisfaction theory, satisfaction is multifactorial and includes numerous variables that are likely to contribute to a patient's appraisal (Batbaatar et al., 2015). When considering the complexity of satisfaction theory in combination with the heterogeneity and lack of validation of the commonly used satisfaction instruments, it is not possible for researchers and clinicians to have an understanding of what is actually being captured by the various instruments.

To create certainty around what is being measured by PROMs, including those assessing satisfaction, confirmation of content validity is essential (Terwee et al., 2018). Content validity is the degree to which the content of a PROM is an adequate reflection of the construct to be measured, and is considered the most important measurement property of a PROM (Terwee et al., 2018). Content validity comprises three key aspects: content relevance (all items should be relevant for the construct of interest), content comprehensiveness (no key aspects of the construct should be missing), and content comprehensibility

(the items should be understood by patients as intended) (Terwee et al., 2018). To achieve these three key aspects of content validity, the involvement of the patient in PROM development is essential. This includes patient involvement in theory development, item development, and item testing in terms of understanding of content and response categories.

To facilitate a better and more consistent understanding of patient satisfaction, the aims of this review were therefore to i) evaluate the proportion of people reported to be satisfied after TKR for osteoarthritis; and ii) assess the content validity of the utilised satisfaction measures.

METHODS

The review protocol was prospectively registered on PROSPERO (CRD42017058936) and reported according to PRISMA guidelines (Moher et al., 2009). Assessment of content validity of measures was additional to this protocol as the need for this aspect became apparent during the review process.

Literature search

We developed an electronic search strategy (see Appendix 7)[#] of all available data from inception until September 2018 to identify eligible studies in the MEDLINE, EMBASE, CINAHL databases and the Cochrane Database of Registered Trials. We searched the databases using the following terms: 'Total Knee Arthroplasty' OR 'Total Knee Replacement' AND 'Patient satisfaction' and imported retrieved titles and abstracts into the Endnote software (Clarivate Analytics, Philadelphia, PA, USA) and removed duplicates.

Study selection

The inclusion criteria (see Table 5.1) were devised by the research team with clinical and research expertise in TKR (AS, MD, PC); and systematic reviews (AS, PK, RF, SB). Titles and abstracts were uploaded into Covidence (Covidence, Melbourne, Victoria, Australia) to facilitate the screening process. Two reviewers (SB, RF) independently screened titles and abstracts for inclusion. Where information was not explicitly presented in the title and abstract e.g. unilateral versus bilateral TKR, the full text article was retrieved for screening. Full text articles were independently screened by three authors (SB, RF, NK). Disagreements were resolved by consultation with the other authors until consensus was reached. Given the volume of papers requiring screening, if the information to meet inclusion was not reported in the full text article, the articles were excluded without contacting the study authors.

Table 5.1. Inclusion criteria

Criteria	Definition/justification
Unilateral, primary total knee replacement	<p>We included studies in which participants underwent TKR. We excluded studies in which participants underwent unicompartmental knee replacement as satisfaction levels may differ significantly between patients with unicompartmental and TKR (Baker et al., 2007).</p> <p>We included studies where <5% of participants underwent simultaneous bilateral TKR*. This is because satisfaction levels may be significantly different among people who receive a unilateral versus simultaneous bilateral TKR (Lim et al., 2015). Studies involving participants undergoing their second primary TKR were included. Where it was unclear whether the bilateral TKRs were simultaneous or staged, it was assumed that they were simultaneous.</p> <p>We included studies where <5% of participants underwent revision TKR. This is because satisfaction levels may be significantly different among people who receive a primary versus revision TKR (Greidanus et al., 2011).</p> <p>The 5% cut-off enabled us to include relevant studies where 95% of participants met our criteria. We anticipated that a 5% threshold would not significantly impact satisfaction outcomes reported in this review.</p>
Total knee replacement for osteoarthritis of the knee	<p>We included studies where <5% of participants underwent TKR for pathologies other than osteoarthritis. This is because the concerns and priorities of patients undergoing TKR differ according to their underlying diagnosis and the satisfaction levels may be significantly different between people undergoing TKR for osteoarthritis versus</p>

Criteria	Definition/justification
	other pathology (Bullens et al., 2001). Accordingly, we excluded studies that did not explicitly state the reason for performing TKR.
Satisfaction measured ≥ 6 months post-operatively	We included studies that assessed satisfaction ≥ 6 months post-TKR in order to capture satisfaction with outcome rather than process of care, and in light of evidence that 6 months would be a sufficient minimum time-frame in which to assess satisfaction given the majority of improvement in function after TKR takes place in the first 6 months post-surgery (Kennedy et al., 2008).
Satisfaction with total knee replacement outcome	We excluded studies that assessed satisfaction with the process of care, as this is a different construct to satisfaction with treatment outcome. We also excluded studies that did not include a measure of satisfaction with treatment outcome, but instead, inferred patient satisfaction from changes in knee pain or function following TKR (Blackburn et al., 2012).
Quantitative studies	We excluded any qualitative studies as our aim was to quantify satisfaction with TKR.
Original, full text articles	We excluded review papers and conference abstracts.
Articles written in English	Given the large scope of this review, for pragmatic reasons we excluded studies that were not written in English

Assessment of methodological quality

Two reviewers (SB and NK) independently assessed risk of bias using a purposely adapted tool based on an existing tool for assessing risk of bias in prevalence studies (Hoy et al., 2012). The existing tool was modified to accommodate the range of study designs included in this review such as prospective cohort studies, retrospective studies of registry data and randomised control trials. The adapted tool comprises ten domains; each domain was scored as low or high risk of bias (see Appendix 8). Of the ten assessment items, seven were 'asterisked', which indicated immediate exclusion of a study with failure of any of these items (see Appendix 8). Studies meeting all seven asterisked items were included in the review, with studies that failed any of the remaining three non-asterisked items considered to be moderate risk. The risk of bias tool was piloted using studies that did not meet the inclusion criteria to ensure familiarity and consistency of use. The two reviewers resolved disagreements by consultation until arriving at a consensus decision.

Data extraction

Two reviewers (SB, NK) independently extracted data from each study using a standardised extraction sheet. Data extracted included characteristics of the study (geographical location, sample size); characteristics of the participants (age, percentage female); characteristics of the outcomes (satisfaction measure, duration of follow-up); and satisfaction outcome scores. Data extraction sheets from the two reviewers were compared for consistency and accuracy.

Data synthesis and analysis

Description of satisfaction after TKR

Given the multiple ways in which satisfaction was measured the authorship team took various steps to extract percentage satisfied from each study included in the review, which are detailed in Table 5.2.

Given the heterogeneity of the satisfaction instruments, it was not appropriate to meta-analyse the results (Higgins & Green, 2011). Therefore, the satisfaction results of each paper are displayed in a forest plot with corresponding description.

Table 5.2. Method of extracting percentage satisfied

Study reporting method	Approach to extract percentage satisfied
Means and SD, or proportion values of categorical satisfaction scales	Percentage satisfied was derived from the sample size
Visual analogue scales reported	A satisfaction threshold was chosen based on the 'smile face' scale, where the point at which the face begins to smile was considered to be 'satisfied' (see Figure 1); in a 1 – 10 scale, a score of 7 or more was chosen; in a 1 – 5 scale, 4 or more was chosen. The percentage of satisfied people was derived by calculating the number of people in the sample who had scores above the appropriate threshold for the data reported. This was achieved by converting the difference between the sample mean and the threshold into a z-score (the number of SD the threshold was away from the mean). The z-score was then converted to a percentile using the NORMDIST function in Excel v16.11 (Microsoft Corp, Redmond, WA, USA)
Only medians reported	An approximation of mean values was derived from the median range and sample size using the method of Hozo et al. (2005) to attain the percentage satisfied
Likert Scales	Outcomes of 'satisfied' or 'very satisfied' was regarded as a satisfied outcome
Knee Society Knee Score Satisfaction scale (Noble et al., 2012). Total score of 40 from 5 items each with a maximum score of 8	A threshold of 28 was selected to indicate satisfaction. This represented a minimum of four satisfied answers and one neutral answer across the five satisfaction items.
The Self-Administered Patient Satisfaction Scale for Primary Hip and Knee Arthroplasty (Mahomed et al., 2011). The items are scored on a 4-point Likert scale, with four response options: 25pts (very dissatisfied), 50pts (somewhat dissatisfied), 75pts (somewhat satisfied), or 100pts (very satisfied), which are averaged to give a total score.	A threshold of 68 was selected. The sum score of 68 represented three somewhat satisfied and one somewhat dissatisfied responses.
Multiple satisfaction questions under the one questionnaire	Where possible, these were individually reported as well as reporting a composite score
Papers reporting multiple follow-ups	The time point closest to 12 months was selected to be included in the review, based on evidence that this is when maximum improvement in pain and function is attained (Williams, Blakey et al., 2013).
Papers only reporting satisfaction outcomes for subgroups of the sample	These subgroup scores were combined into one total group summary score.

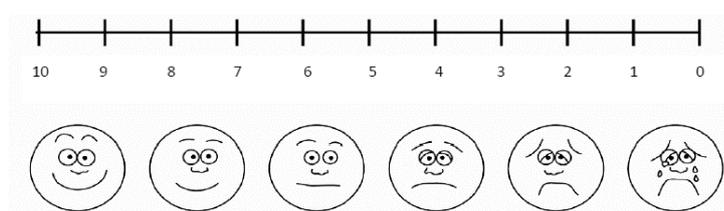


Figure 5.1. 0–10 Smile face satisfaction scale

Assessment of content validity

Studies included in the review were assessed as to whether a citation was provided for the satisfaction instrument used. The citations were evaluated according to their support for content validity of the satisfaction measure, in terms of either a development study or secondary content validity study. In addition, a specific search strategy was developed to retrieve any studies of content validity for specific satisfaction instruments used by studies in this review, which was approved by the university librarian (see Appendix 9).

Content validity of satisfaction measures was evaluated using the COnsensus-based standards for the selection of health Status Measurement INstruments (COSMIN) content validity assessment checklist. The COSMIN methodology details that strong evidence of good content validity is achieved through adequate content relevance, comprehensiveness, and comprehensibility. For a PROM to be assessed on these three aspects, the COSMIN methodology has expanded them to create the ten criteria for good content validity, which includes five items under ‘relevance’, one item under ‘comprehensiveness’, and four items under ‘comprehensibility’ (see column 1 of Tables 5.4a and 5.4b). To assess whether these ten criteria have been met, the COSMIN methodology details a systematic three step process, whereby the final stage rates the PROM against the ten criteria. Single questions used by studies that were unsupported by the literature could not be assessed for evidence of content validity, in accordance with the COSMIN assessment. This process was conducted by two authors (AS and NK).

The first phase of this process involved assessment of any development study of the satisfaction measure against steps 1a and 1b in the COSMIN assessment (see Appendix 10). Any further content

validity studies in addition to development studies were assessed against steps 2a – 2e (see Appendix 11). Step 3 was a final appraisal of the ten criteria for good content validity. Step 3 involved appraising the development study, the content validity study (if available) as well as the reviewers' opinion against the ten criteria for good content validity (see column 5 of Tables 5.4a and 5.4b).

RESULTS

Literature search and risk of bias assessment

Our search strategy identified a total of 5824 records of which 2828 records were non-duplicates. After screening of titles and abstracts, 546 papers remained for full text screening. Following this, we excluded a further 346 articles leaving 152 articles for analysis of risk of bias. Forty-three articles passed the risk of bias assessment to be included in this systematic review (see Figure 5.2), with 35 considered moderate risk due to failing one or more of the non-asterisked risk of bias items and eight considered low risk (see Appendix 12).

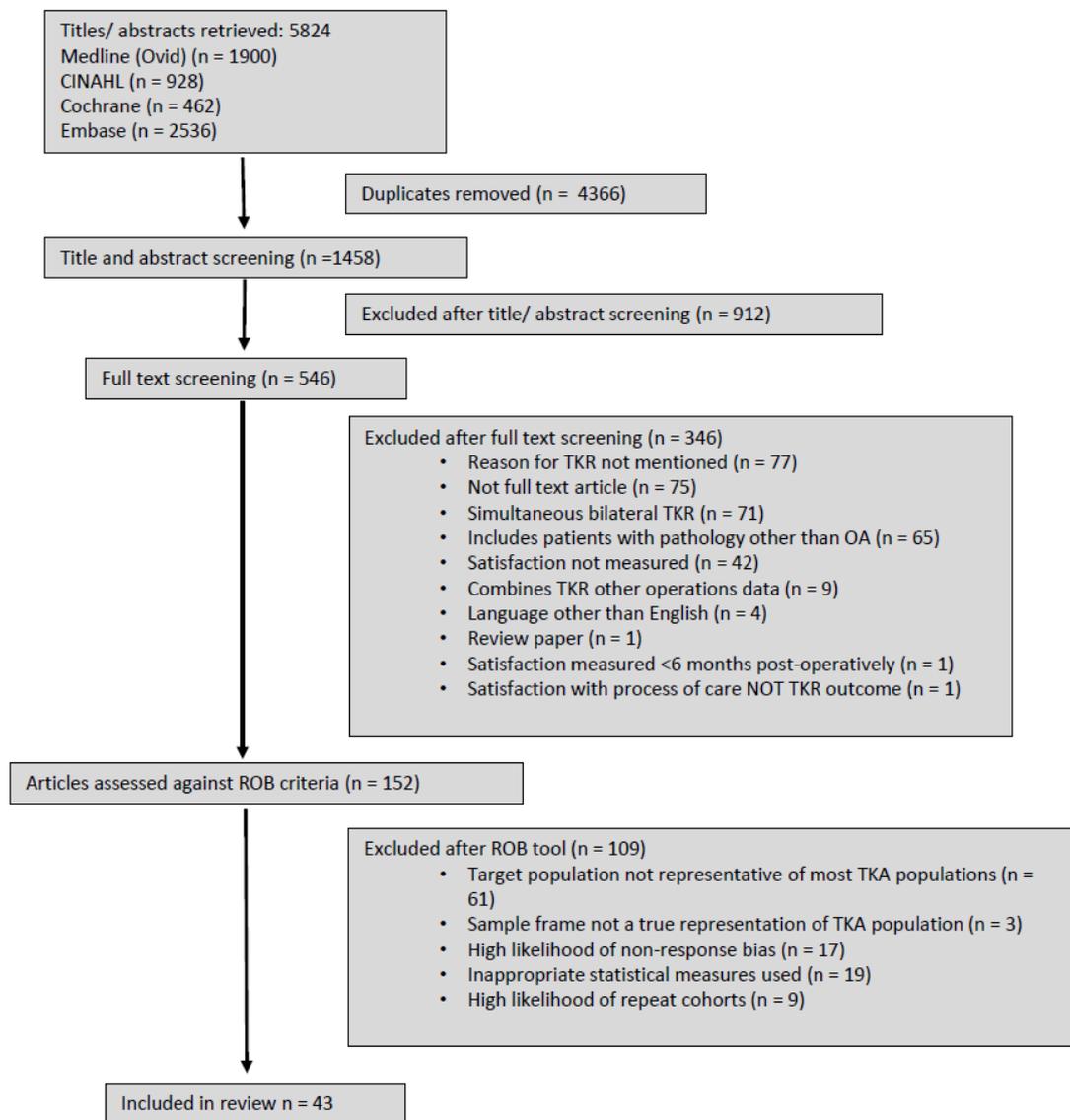


Figure 5.2. Study selection flow diagram

Study characteristics

Individual study characteristics are presented in Table 5.3.

Table 5.3. Study characteristics

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Ali et al. (2016)	2016	Sweden	68.5 (4)	RCT	74	21	Degree of satisfaction with the operated knee: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'.	Satisfaction with the operated knee
Ali et al. (2017)	2017	Sweden	72.9 (9.7)	RCT	186	16	Degree of satisfaction with the operated knee: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'.	Satisfaction with the operated knee
Aunan & Röhrli (2018)	2018	Norway	69.3 (7.4)	Prospective cohort	129	73	Patient satisfaction measures on a VAS.	Satisfaction
Baker et al. (2007)	2007	England and Wales	70.8 (9.4)	Retrospective cohort	8231	4675	'Are you satisfied with your knee replacement?': 'yes', 'no' and 'not sure'.	Satisfaction with the operated knee
Blyth et al. (2015)	2015	Scotland	65.5	Prospective cohort	198	116	Overall satisfaction: 'very satisfied', 'satisfied', 'don't know', 'unsatisfied', 'very unsatisfied'.	Satisfaction
Boese et al. (2011)	2011	USA	64	Retrospective cohort	128	90	'How happy are you with your implanted knee?': measured on a scale of 1–5 where 1 = completely dissatisfied to 5 = completely satisfied.	Satisfaction with the operated knee
Clement et al. (2018b)	2018	United Kingdom	68.6 (9.3)	Retrospective cohort	1255	757	'How satisfied are you with the results of your knee replacement surgery?' 'Very satisfied', 'somewhat satisfied', 'somewhat	Satisfaction with the operated knee

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
							dissatisfied', and 'very dissatisfied'.	
Collados-Maestre et al. (2016)	2017	Spain	71.2 (6.4)	Prospective cohort	237	164	'Patient satisfaction was evaluated yearly on a 5-point Likert scale' 'very satisfied', 'satisfied', 'neutral', 'dissatisfied', and 'very dissatisfied'.	Satisfaction with the operated knee
Collins et al. (2017)	2017	USA	69.5 (8.5)	Prospective cohort	633	375	'How satisfied are you with the results of your knee replacement surgery?' 'very satisfied' 'somewhat satisfied' 'somewhat dissatisfied' and 'very dissatisfied'.	Satisfaction with the operated knee
Culliton et al. (2018)	2018	Canada	63.5 (8)	Prospective cohort	345	221	Patient Acceptable Symptom State.	Satisfaction with symptoms
Dailiana et al. (2015)	2015	Greece	69.2 (6.7)	Prospective cohort	204	162	Patient satisfaction with the results of TKR was assessed in three aspects: overall satisfaction, satisfaction with pain relief, and satisfaction with functional improvement/ability to perform daily activities. Patients were categorised as very/mostly satisfied, somewhat satisfied, and dissatisfied. (modified Self-Administered Patient satisfaction Scale).	Satisfaction Satisfaction with function Satisfaction with pain relief

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Escobar et al. (2013)	2013	Spain	71.4 (6.9)	Prospective cohort	912	641	Patient Acceptable Symptom State.	Satisfaction with symptoms
Gaillard et al. (2017)	2017	Germany	72.7	Retrospective cohort	1059	650	Not specified. 'Very satisfied', 'satisfied', 'disappointed'.	Satisfaction
Gandhi et al. (2007)	2007	Canada	69.2 (8.8)	Prospective cohort	87	56	Are you satisfied with your limb alignment? 'Yes' or 'no'.	Aesthetics
Genet et al. (2008)	2008	France	71.7 (7)	Prospective cohort	45	28	Patient satisfaction measured on a VAS (0–100).	Satisfaction
Gildone et al. (2005)	2005	Italy	74.1 (4.8)	Prospective cohort	56	39	Satisfaction questionnaires. No response categories provided.	Satisfaction
Giurea et al. (2016)	2016	Austria	66 (NA)	Prospective cohort	86	48	Satisfaction with response categories: 'yes' or 'no'.	Satisfaction with the operated knee
Healy et al. (2002)	2002	USA	69.9 (8.7)	Prospective cohort	159	-	Patient satisfaction measured with response categories: 'yes' or 'no'.	Satisfaction with the operated knee
Hinarejos et al. (2016)	2016	Spain	72.2 (7)	Prospective cohort	474	360	Satisfaction measured on a VAS (0 = absolutely dissatisfied, 10 = absolutely satisfied).	Satisfaction
Kawakami et al. (2015)	2015	Japan	74.3 (7.8)	Prospective cohort	48	25	Satisfaction domain of the new Knee Society Knee Scoring System questionnaire.	Composite
Khuangsirikul et al. (2016)	2016	Thailand	76.9 (7.4)	Prospective cohort	144	130	The Self-Administered Patient Satisfaction Scale.	Composite
Kim, Cho et al. (2009)	2009	Korea	68.5 (5.6)	Prospective cohort	186	177	British Orthopaedic Association Patient Satisfaction Score.	Satisfaction

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Li et al. (2012)	2012	China	67.2 (7.2)	Retrospective cohort	130	97	The British Orthopaedic Association Patient Satisfaction Score.	Satisfaction
Liebs et al. (2010)	2010	Germany	69.8 (7.9)	RCT	136	114	Total Hip Arthroplasty Outcome Evaluation Questionnaire.	Satisfaction with the operated knee
Liebs et al. (2012)	2012	Germany	69.8 (8.1)	RCT	158	133	Total Hip Arthroplasty Outcome Evaluation Questionnaire.	Satisfaction with the operated knee
Lizaur-Utrilla et al. (2016)	2016	Spain	69.7 (5.9)	Prospective cohort	192	127	Satisfaction measured with response categories: 'very satisfied', 'satisfied', 'neutral', 'dissatisfied', 'very dissatisfied'.	Satisfaction with the operated knee
Mannion et al. (2009)	2009	Switzerland	67 (9)	Prospective cohort	112	7	Satisfaction with surgery measured with the response categories: 'very satisfied', 'somewhat satisfied', 'somewhat dissatisfied', 'very dissatisfied'.	Satisfaction with surgery
Matthews et al. (2013)	2013	UK	69.2 (7.7)	Prospective cohort	34	20	Patient satisfaction measured on a 10-point VAS.	Satisfaction
Mooney et al. (2016)	2016	Australia	68 (11.3)	Cross-sectional	67	43	Knee Society Score containing post-operative satisfaction scores.	Satisfaction
Murphy et al. (2014)	2014	Australia	70.8 (9.9)	RCT	40	25	Satisfaction with pain relief, physical function and overall outcome measured on a VAS (0 = completely unsatisfied to 10 = completely satisfied).	Satisfaction with function

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Nilsdotter et al. (2009a)	2009	Sweden	72 (8)	Cross-sectional	87	50	Satisfaction with result in general measured on 5-point Likert scale from 'totally satisfied' to 'very dissatisfied'. Questions about satisfaction in relation to pain relief; symptom relief; improvement in activities of daily living; and improvements in sport and recreational function. Dimensions measured on 5-point Likert scale from 'totally satisfied' to 'very dissatisfied'.	Satisfaction Satisfaction with function (activities of daily living and sports and recreation) Satisfaction with symptoms
Petersen et al. (2015)	2015	Denmark	65 (6.3)	Cross-sectional	215	139	Satisfaction with surgery measured with response categories: 'very satisfied', 'satisfied', 'not completely satisfied', 'not satisfied'.	Satisfaction with surgery
Pulavarti et al. (2014)	2014	UK	69.9 (8.3)	RCT	126	68	Satisfaction measured with response categories: 'excellent', 'good', 'fair', 'poor'.	Satisfaction
Ranawat et al. (2017)	2017	USA	71 (7.3)	Prospective cohort	193	138	Satisfaction measured on a VAS (0–10).	Satisfaction
Robertsson et al. (2000)	2000	Sweden	-	Cross-sectional	-	-	Satisfaction with the operated knee measured with response categories: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'.	Satisfaction with the operated knee

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Stickles et al. (2001)	2001	USA	69.9(11.9)	Cross-sectional	1011	637	'How satisfied are you with the results of your joint replacement?': 'very satisfied', 'somewhat satisfied', 'neutral', 'somewhat dissatisfied', 'very dissatisfied'.	Satisfaction with the operated knee
Sun et al. (2012)	2012	China	64.7 (4.4)	RCT	132	80	Satisfaction (reported as % satisfied).	Satisfaction
Von Keudell et al. (2014)	2014	USA	62.6 (11.2)	Cross-sectional	245	165	Satisfaction in respect to pain, motion, daily living function, return to sport activities and ability to kneel. Each dimension measured on a VAS (0 = not satisfied, 10 = very satisfied).	Composite
Walker et al. (2018)	2018	UK	68.9 (9.6)	Retrospective cohort	2578	1396	'How satisfied are you with the results of your knee replacement surgery' 'very satisfied', 'somewhat satisfied', 'somewhat dissatisfied', and 'very dissatisfied'.	Satisfaction with the operated knee
Warner et al. (2017)	2017	UK	73.1 (8.7)	Prospective cohort	1151	653	'Individuals were asked to state how satisfied they felt with their total joint replacement using an ordinal scale' 'very satisfied', 'not very satisfied', and 'dissatisfied'.	Satisfaction with the operated knee

Study	Year	Country	Mean age (SD)	Design	Sample size	Female (n)	Satisfaction question	Construct
Williams, O'Brien et al. (2013)	2013	UK and Ireland	70.9 (8.6)	Prospective cohort	486	314	'How do you feel overall about your replaced joint?' 'very happy', 'happy', 'OK (not perfect)', or 'never happy'.	Satisfaction with the operated knee

Satisfaction estimates

Due to the heterogeneity in the focus of the satisfaction questions used by the studies, results were grouped into 'like' constructs. Composite scales consisting of questions with different foci of satisfaction are reported as composite, and also as single items under specific constructs where possible (see Figure 5.3).

Single item satisfaction questions

The construct 'Satisfaction with the operated knee' included all questions that asked about satisfaction with the total joint replacement (TJR), TKR, operated knee, or surgery on the operated knee. Eighteen studies were included under this construct and the proportion satisfied ranged from as high as 97% (CI 90 to 100) to as low as 69% (CI 60 to 77). Two studies used a question which is part of the multi-domain Total Hip Arthroplasty Outcome Evaluation Questionnaire (THAOEQ) (Liebs et al., 2010, 2012). Thirteen studies provided no citation in support of the single item question used (Ali et al., 2016, 2017; Baker et al., 2007; Boese et al., 2011; Collins et al., 2017; Giurea et al., 2016; Healy et al., 2002; Lange et al., 2018; Robertsson et al., 2000; Stickles et al., 2001; Walker et al., 2018; Warner et al., 2017; Williams, O'Brien et al., 2013), while 3 studies cited another study that had utilised the same single item question (Clement et al., 2018b; Collados-Maestre et al., 2016; Lizaur-Utrilla et al., 2016); however, there was no further citation to support the validity of these questions.

The construct 'Satisfaction' included all questions that did not focus on any particular aspect of satisfaction. Of the 17 studies included, the proportion satisfied ranged from as high as 99% (CI 96 to 100) to as low as 73% (CI 58 to 85). One study used a question that was an item from the SAPSS (Dailiana et al., 2015), and two used an item from the surgeon-completed multi-domain British Orthopaedic Association (BOA) grading system (Kim, Cho et al., 2009; Li et al., 2012). Of the remaining studies, 13 provided no citation in support of the single-item question used (Aunan & Röhrli, 2018; Blyth et al., 2015; Chinnappa et al., 2017; Gaillard et al., 2017; Genet et al., 2008; Gildone et al., 2005; Hinarejos et al., 2016; Matthews et al., 2013; Murphy et al., 2014; Nilsson et al., 2009b; Pulavarti et

al., 2014; Ranawat et al., 2017; Sun et al., 2012), and one study provided a citation that had no evidence of satisfaction content (Mooney et al., 2016).

The construct 'Satisfaction with function' included all questions that asked about satisfaction with function, ADLs, sport, or recreation. The proportion satisfied from the three studies included ranged from 39% (CI 29 to 50) to 89% (CI 84 to 93) to. One study used an item from the SAPSS (Dailiana et al., 2015), the remaining two studies used single items with no supporting citation (Murphy et al., 2014; Nilsson et al., 2009b).

The construct 'Satisfaction with pain relief' included all questions that asked about satisfaction with pain relief. Three were included and ranged from 90% (CI 76 to 97) to 84% (CI 78 to 89). One study cited a questionnaire, the SAPSS (Dailiana et al., 2015), while the remaining two studies did not have a supporting citation for their single item question (Murphy et al., 2014; Nilsson et al., 2009b).

The construct 'Satisfaction with symptoms' included all questions that asked about satisfaction with symptoms. Three were included and ranged from 85% (CI 76 to 92) to 72% (CI 67 to 77). Two studies used a question previously considered as a Patient Acceptable Symptom State (PASS) estimate (Culliton et al., 2018; Escobar et al., 2013). The remaining study did not provide a citation in support of the single item question (Nilsson et al., 2009b).

The construct 'Satisfaction with aesthetics' included questions that asked about the visual appearance of the knee. Only one study was included, which reported a satisfaction rate of 77% (CI 67 to 85), and did not provide a citation in support of the single item question (Gandhi et al., 2007).

The construct 'Satisfaction with surgery' included all questions that asked about satisfaction with the surgery but did not have reference to knee TJR, TKR, or operated knee. Two studies were included and ranged from 90% (CI 83 to 95) to 64% (57 to 71), neither of which provided a citation in support of the single item questions (Mannion et al., 2009; Petersen et al., 2015).

Composite scores

Three studies used composite instruments of items covering different components of satisfaction, with satisfaction estimates ranging from 88% (CI 83 to 92) to 60% (45 to 74). One study used the five-item satisfaction component of the New Knee Society Knee Scoring System (KSKSS) (Kawakami et al., 2015) which covers satisfaction with pain level while sitting, pain level while lying in bed knee function while performing light household duties, and knee function while performing leisure recreational activities. One study used the four-item SAPSS (Khuangsirikul et al., 2016) covering overall satisfaction with surgery, satisfaction with pain relief, satisfaction with home and yard work, and satisfaction with recreational activities, and one study reported an unreferenced composite score of five items including satisfaction in respect to pain, motion, daily living function, return to sport activities, and ability to kneel (Von Keudell et al., 2014).

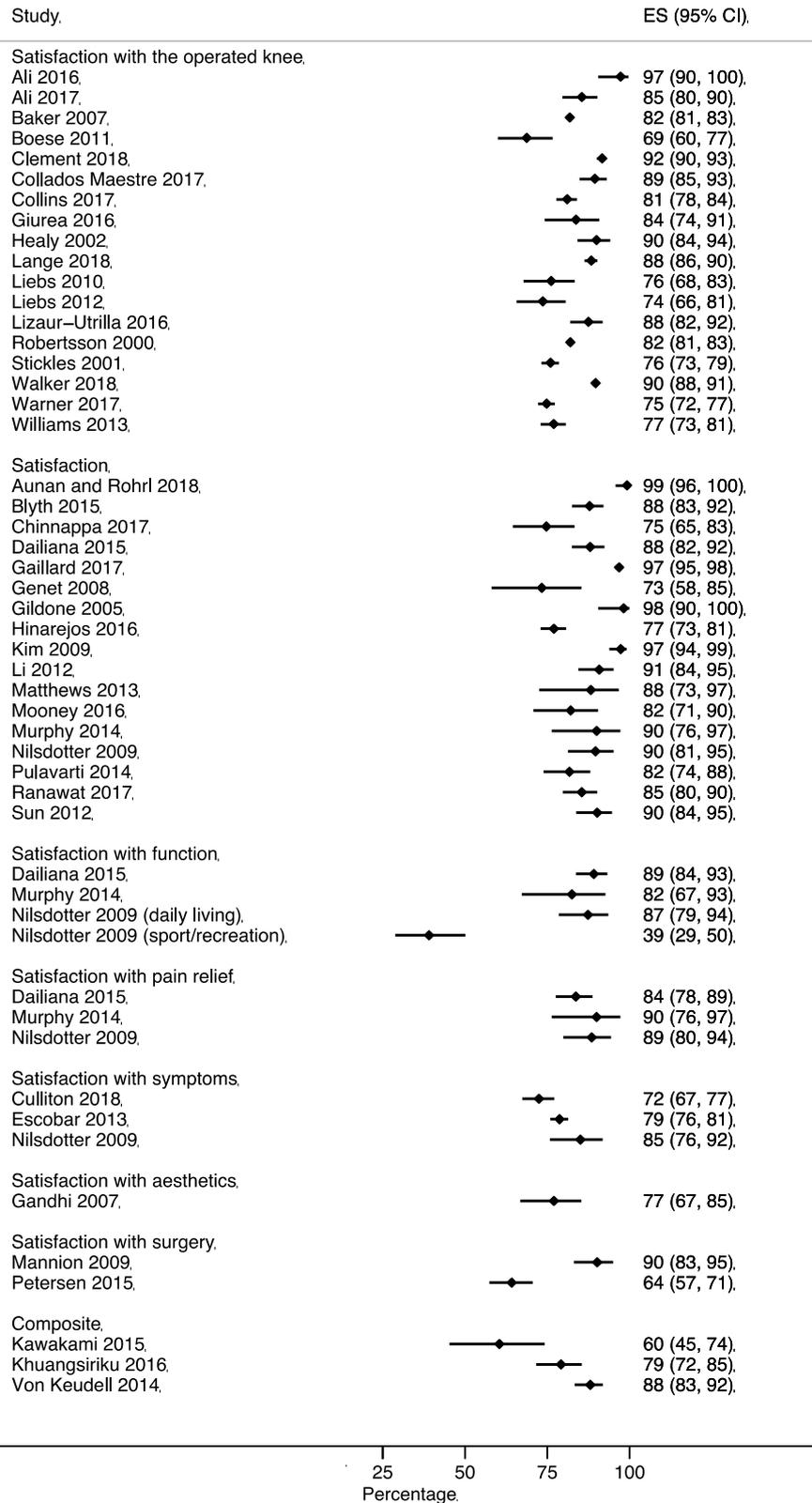


Figure 5.3. Proportion of patients satisfied after TKR. ES = effect size (in this case, proportion satisfied)

Assessment of content validity

Of the 43 articles included in the review, 15 provided a citation for the satisfaction instrument used. Of these, only nine studies, using a total of six satisfaction instruments, had a citation in support of content validity, in the form of a development study. These instruments included BOA, the new KSKSS, THAOEQ, and SAPSS, and questions previously considered indicators of PASS. The latter were excluded from further assessment as they pertain to current symptom state rather than to aspects related to TKR *per se* (Tubach et al., 2007). The BOA was excluded as it is completed by the surgeon and therefore not a PROM (Aichroth et al., 1978). The THAOEQ was excluded as it was designed for a total hip replacement population rather than a TKR population (Katz et al., 1995), and in accordance with COSMIN criteria of ‘relevance’ cannot be considered for assessment of content validity (Terwee et al., 2018). Further, the extent of development for the THAOEQ was poor and did not include patient appraisal (Katz et al., 1995). An additional search was conducted for the SAPSS and new KSKSS to retrieve any further development or content validity studies (see Appendix 3), but none were identified. Both of these instruments were then assessed for content validity as per the COSMIN criteria (see Tables 5.4a and 5.4b and Appendices 10 and 11).

Two development studies were retrieved for SAPSS: an abstract from 1998 (Mahomed et al., 1998) and a full text article from 2011 (Mahomed et al., 2011). Both of these studies failed to demonstrate all three key aspects of content validity (see Table 5.4a). Although a Delphi panel of experts was used for development of the SAPSS, this did not include patient input, which is required for content validity. Reviewer rating of the instrument passed relevance and comprehensibility. The overall rating was a low quality PROM (see Table 5.4a). One development study was retrieved for the new KSKSS (Noble et al., 2012) and this study failed to demonstrate all three key aspects of content validity. Although the new KSKSS did have patient input in its development, this did not include the satisfaction items (Noble et al., 2012). The five satisfaction items of the new KSKSS were based on the four-item SAPSS, which as previously described did not include patient appraisal. Reviewer rating of the instrument passed

relevance and comprehensibility. The overall rating was a low quality PROM (see Table 5.4b). Overall, none of the satisfaction instruments included in the review had adequate evidence of content validity.

Table 5.4a. Content validity assessment of the SAPSS

	PROM development Study 1	PROM development Study 2	Content validity study	Rating of reviewers	Overall rating per PROM	Quality of evidence
Self-administered patient satisfaction scale	Development study (Mahomed et al., 1998)	Development study (Mahomed et al., 2011)	NA	+/-/?	+/-/±	High, moderate, low, very low
Relevance	-	-		+		
1. Are the items relevant to the construct of interest?						
2. Are the included items relevant for the target population of interest?	-	-		+		
3. Are the included items relevant for the context of interest?	+	+		+		
4. Are the response options appropriate?	-	-		+		
5. Is the recall period appropriate?	-	-		?		
Relevance rating	-	-	NA	+	±	Low
Comprehensiveness	-	-		-		
6. Are all key concepts included?						
Comprehensiveness rating	-	-	NA	-	-	Low
Comprehensibility	-	-				
7. Are the PROM instructions understood by the population of interest as intended?						
8. Are the PROM items and response options understood by the population of interest as intended?	-	-				
9. Are the PROM items appropriately worded?				+		
10. Do the response options match the question?				+		
Comprehensibility rating		-	NA	+	±	Low
Content validity rating					-	Low

Table 5.4b. Content validity assessment of the new KSKSS

	PROM development study	Content validity study	Rating of reviewers	Overall rating per PROM	Quality of evidence
Satisfaction domain of the New Knee Society Knee Scoring System	Development Study (Noble et al., 2012)	NA	+/-/?	+/-/±	High, moderate, low, very low
Relevance	-		+		
1. Are the items relevant to the construct of interest?					
2. Are the included items relevant for the target population of interest?	-		+		
3. Are the included items relevant for the context of interest?	+		+		
4. Are the response options appropriate?	-		+		
5. Is the recall period appropriate?	-		?		
Relevance rating	-	NA	+	±	Low
Comprehensiveness	-		-		
6. Are all key concepts included?					
Comprehensiveness rating	-	NA	-	-	Low
Comprehensibility	-				
7. Are the PROM instructions understood by the population of interest as intended?					
8. Are the PROM items and response options understood by the population of interest as intended?	-				
9. Are the PROM items appropriately worded?			+		
10. Do the response options match the question?			+		
Comprehensibility rating	-	NA	+	±	Low
Content validity rating				-	Low

DISCUSSION

The aims of this review were to evaluate rates of patient-reported satisfaction after TKR for OA across the literature, and to assess the content validity of the satisfaction measures utilised in evaluated studies. The results demonstrate heterogeneity in not only the focus of the satisfaction questions, but also the estimate of the proportion satisfied across studies.

From the 43 included studies, eight satisfaction constructs were identified. In addition to heterogeneity in the satisfaction question used, heterogeneity in the estimate of satisfaction was also observed within constructs; most notably 39% (CI 29 to 50) compared to 89% (CI 84 to 93) in satisfaction with function. Due to the heterogeneity in satisfaction questions, it was not possible to pool all estimates, as per the Cochrane guidelines for systematic reviews (Higgins & Green, 2011). Cochrane states that in the absence of longitudinal evidence of correlation of two or more PROMs, data pooling should not be conducted, but instead, grouping of like constructs as decided intuitively by the authorship team (Higgins & Green, 2011). These findings are in alignment with the results of Kahlenberg et al. (2018) who also reported heterogeneous methods of measuring patient satisfaction after TKR (Kahlenberg et al., 2018).

The present review extends that of Kahlenberg et al. (2018) by evaluating the evidence for content validity of the utilised instruments. Two satisfaction instruments (SAPSS and new KSKSS) were cited by Kahlenberg et al. (2018) as being validated, but this was only in reference to construct validity, defined as the degree to which the scores of a PROM are consistent with hypotheses, based on the assumptions that the PROM validity measures the construct to be measured (Terwee et al., 2018), or structural validity, which relates to how well the PROM scores reflect the dimensionality of the construct (Terwee et al., 2018), not content validity. These two instruments were specifically evaluated for evidence of content validity in this current review, and no evidence for content validity was identified. Although reviewer ratings determined that both instruments had reasonable content relevance and comprehensiveness, the lack of patient involvement in the development of these instruments is a key concern for content validity.

Without patient consultation it is difficult to know whether these instruments include relevant items to accurately capture an individual's satisfaction with their TKR, whether they capture all aspects of satisfaction, nor how patients comprehend/interpret the questions. Prior to designing a PROM, theoretical understanding of the construct of interest should be robust so to inform the content of the instrument (Batbaatar et al., 2015; Sitzia & Wood, 1997). In the case of satisfaction, PROM development has preceded theoretical understanding, compounding the difficulty in understanding how to measure this construct. This leaves researchers and clinicians to make assumptions regarding what satisfaction instruments are actually measuring. This lack of theoretical grounding in patient satisfaction instruments is a likely contributor to the variability in satisfaction instruments and estimates.

Given the limited understanding of patient satisfaction after TKR, some authors have based the design of satisfaction instruments on other correlates, such as improved pain or other disease-specific questionnaires. This approach is discussed by Robertsson et al. (2000), who uses a single item question: 'three questions were asked, including one on satisfaction regarding the operated knee with four possible answers; 1) very satisfied, 2) satisfied, 3) uncertain, or 4) dissatisfied'. This question has not been validated, but has been replicated in three other studies included in the present review (Ali et al., 2016; Collados-Maestre et al., 2016; Lizaur-Utrilla et al., 2016; Robertsson et al., 2000). The authors suggest that a strategy to overcome the lack of content validity in satisfaction instruments is to demonstrate construct validity (Robertsson et al., 2000). However, the presence of an association between a satisfaction instrument and other measures, such as self-reported disability or pain, does not mean the construct of satisfaction has been adequately captured in terms of relevance and comprehensiveness. For example, in the aforementioned study, 11% of patients chose 'uncertain' as the response option, and understanding this response is difficult due to a lack of the patients' perspective (Robertsson et al., 2000).

The results of the present review also highlighted numerous concerns in the appropriateness and consistency of satisfaction instruments. As mentioned earlier, the BOA, which was utilised by two

studies (Kim, Cho et al., 2009; Li et al., 2012), is designed to be completed by the surgeon rather than the patient, therefore this assessment cannot be considered a PROM (Aichroth et al., 1978). The THOEQ, utilised by two studies (Liebs et al., 2010, 2012), in addition to not being relevant to the target population, lacked any patient involvement and was only developed from the perspective of an orthopaedic task force that aimed to design a questionnaire from a patient perspective (Katz et al., 1995). Questions considered indicators of PASS were utilised by two studies (Culliton et al., 2018; Escobar et al., 2013). Although development of PASS questions has included patient involvement regarding the relevance and the external anchors of the PASS during a special interest group meeting (Tubach et al., 2007), they pertain to current symptom state rather than to aspects related to TKR *per se* (Tubach et al., 2007). Additionally, the Osteoarthritis Research Society International, which developed the PASS, has identified problems with the consistency of the PASS question and timeline of measurement in this population, suggesting further development studies are required (Tubach et al., 2009). Lastly, Dailiana et al. (2015), who cited the SAPSS, modified the instrument to include only three items of satisfaction as opposed to the four-item questionnaire designed by Mahomed (Mahomed et al., 2011), therefore not accurately representing the original intentions of the validated instrument.

Other measures such as ‘would you recommend a joint replacement to a friend?’, ‘would you have a joint replacement again?’, or the Forgotten Joint Score (Behrend et al., 2012) have also been considered to reflect patient satisfaction after TKR in the literature. Although it may seem reasonable to assume these questions would align with satisfaction, this has not been investigated in a TKR population. Patient expectations have also been attributed to patient satisfaction after TKR (Bourne et al., 2010; Noble et al., 2006). Despite the literature search retrieving many studies measuring expectations as a means of gauging satisfaction, the authorship team chose not to include expectations as a measure of satisfaction due to being under-theorised in a health care context (Batbaatar et al., 2015; Newsome & Wright, 1999). Presently, expectations are understood from their historical origins in market research, whereby satisfaction is considered an evaluation of a purchase (Newsome & Wright, 1999). The role of expectation theory in understanding satisfaction with TKR remains unclear.

This review highlights a need for a better understanding of patient satisfaction after TKR, and suggests more care should be taken in how we interpret studies that use satisfaction as an end point. Future research should focus on conducting qualitative investigations on patient satisfaction after TKR, to build theoretical understanding and provide strong evidence of content validity. To achieve this, researchers may consider conducting focus groups or one-on-one interviews with patients who have undergone TKR, who have experienced a range of satisfaction, and pain and function outcomes. This has been demonstrated in the development of the Forgotten Joint Score, which sought patient opinion, in addition to multidisciplinary expert opinion, in choosing the items of the instrument (Behrend et al., 2012). The instrument was then further tested with a second group of patients to test the interpretation of the questions, and refine the question phrasings (Robinson et al., 2018). These same methods to achieve content validity should be applied to satisfaction instruments after TKR. A better understanding of what patient satisfaction is and how to measure it will optimise the delivery of high-quality, patient-centred care in orthopaedics.

5.3 Chapter conclusions

The findings of this systematic review have highlighted high heterogeneity and poor evidence of content validity in the currently used satisfaction questionnaires after TKR. It is clear that a better conceptualisation of the construct of satisfaction is needed to understand what is being captured when patients indicated 'satisfied' or 'dissatisfied' after TKR. To address the gaps in knowledge, the following chapter presents a published manuscript, which has qualitatively explored what satisfaction means to patients post-TKR, and what influences high and low satisfaction after TKR.

[#]This search strategy was developed with, and approved by, the librarian at Melbourne University.

Chapter 6: Study 2: What Influences Patient Satisfaction after TKA? A

Qualitative Investigation

6.1 Introduction

The following chapter addressed the lack of theoretical understanding of patient satisfaction that has driven the prolific and inconsistent use of satisfaction questionnaires after TKR. As previously highlighted in Chapters 2 and 3, the almost sole use of quantitative approaches to understanding satisfaction has been insufficient in grappling with the complexities of this construct. Therefore, I employed a qualitative methodology to understand (i) what does it mean to be satisfied after TKA? and (ii) What factors influence satisfaction levels after TKA? A PDF version of the published manuscript can be found in Appendix 13. The permission to use the published PDF version of the manuscript can be found at the end of Appendix 13.

6.2 Published manuscript

Abstract

Background Patient satisfaction is a common measure of the success of an orthopaedic intervention. However, there is poor understanding of what satisfaction means to patients or what influences it.

Questions/purposes Using qualitative study methodology in patients undergoing TKA, we asked: (1) What does it mean to be satisfied after TKA? (2) What factors influence satisfaction levels after TKA?

Methods People in a hospital registry who had completed 12-month follow-up questionnaires and were 12 – 25 months post-TKA at the time of sampling were eligible (n = 121). To recruit a sample that provided insight into a range of TKA experiences, we divided eligible candidates on the registry into quadrants based on their responder status and satisfaction level. A responder was an individual who experienced a clinically meaningful change in pain and/or function on the WOMAC according to the Outcome Measures in Rheumatology-Osteoarthritis Research Society International (OMERACT-OARSI)

responder criteria. Individuals were considered satisfied unless they indicated somewhat dissatisfied or very dissatisfied for one or more of the four items on the Self-Administered Patient Satisfaction Scale. From the resulting quadrants: responder satisfied, non-responder satisfied, non-responder dissatisfied, responder dissatisfied, we identified men and women with a range of ages and invited them to participate (n = 85). The final sample (n = 40), consisted of 10 responder satisfied, nine non-responder satisfied, eight non-responder dissatisfied, and 13 responder dissatisfied; 71% were women, with a mean age of 71 ± 7 years and a mean time since TKA surgery of 17 ± 2 months (range 13 to 25 months). Interview transcripts were analysed by looking for factors in the participants' narrative that appeared to underscore their level of satisfaction and attaching inductive (data-derived, rather than a priori derived) codes to relevant sections of text. Coded data from participants who reported high and low levels of satisfaction were compared/contrasted and emerging patterns were mapped into a conceptual model. Recruitment continued until no new information was uncovered in data analysis of subsequent interviews, signalling to the researchers that further interviews would not change the key themes identified and data collection could cease.

Results In those with high satisfaction levels, satisfaction was conceptualised as an improvement in pain and function. In those with low satisfaction levels, rather than an improvement, satisfaction was conceptualised as completely resolving all symptoms and functional limitations. In addition, we identified three pathways through which participants reached different levels of low and high satisfaction: (1) The full-glass pathway, characterised by no or minimal ongoing symptoms and functional deficits, which consistently led to high levels of satisfaction; (2) the glass-half-full pathway, characterised by ongoing symptoms and functional limitations, which led to high satisfaction; and (3) the glass-half-empty pathway, also characterised by ongoing symptoms and functional limitations, which led to low satisfaction levels. The latter two pathways were mediated by three core mechanisms (recalibration, reframing valued activities, and reconceptualisation) influenced either positively or negatively by (1) a persons' thoughts and feelings such as optimism, self-efficacy, pain catastrophising,

external locus of control; and (2) social and contextual factors such as fulfilment of social roles, therapeutic alliance, lack of family/social support.

Conclusions This qualitative study suggests that for preoperative patients in whom unrealistically high hopes for complete symptom resolution and restoration of functional capacity persists, it may be appropriate to direct them away from TKA due to the risk of low satisfaction. For postoperative patients troubled by ongoing symptoms or functional limitations, clinicians may improve levels of satisfaction by targeting the three core mechanisms (recalibration, reframing valued activities, and reconceptualisation) through addressing modifiable negative thoughts and feelings in interventions such as psychology or psychotherapy; and negative social and contextual factors by promoting a strong therapeutic alliance and engagement in community activities. Given that these factors may be identifiable preoperatively, future research is needed to explore if and how addressing them preoperatively may improve satisfaction post-TKA.

Level of Evidence Level IV, therapeutic study.

Introduction

The effect of TKA is best measured from the patient's perspective. Alongside other PROMs, such as pain and disability, satisfaction is commonly used to evaluate patients' perceptions of surgical success (Bourne et al., 2010; Bullens et al., 2001). Reflecting the growing usage of measuring patient satisfaction, it has been included as a core outcome post-TKA according to a Delphi study by the Outcomes in Rheumatology initiative (Singh et al., 2017). However, concerns have been raised regarding the meaningfulness of this measurement (Ring & Leopold, 2015). Satisfaction is likely to be influenced by various factors, such as patient expectations for TKA and how well they are addressed (Batbaatar et al., 2015, 2017; Kahlenberg et al., 2018), levels of distress (symptoms of anxiety and depression) (Batbaatar et al., 2017; Kahlenberg et al., 2018; Lavernia et al., 2015), and the hospital experience and interactions with the surgeon (Batbaatar et al., 2015, 2017). Each factor may vary from patient to patient, such that the same surgical outcome may result in discrepant satisfaction levels (Ring & Leopold, 2015). As a result, current attempts to measure patient satisfaction are limited in their ability to be meaningfully interpreted because the available measures lack the ability to capture the depth or nuance associated with a patient appraisal of surgical outcome (Ring & Leopold, 2015), and suffer strong ceiling effects. Driving these validity issues is a lack of important theoretical grounding, specifically the patient's perspective of satisfaction after TKA, to inform questionnaire development (Klem, Kent et al., 2020). Thus, research approaches such as qualitative inquiries that elicit the patient's perspective on their satisfaction after TKA are needed to improve understanding of how to measure this construct.

Creating meaning from satisfaction scores is further clouded by a lack of consensus regarding question design. Tools purporting to measure satisfaction have used single items with various foci (such as satisfaction with pain, overall satisfaction, function, surgery); some have used amalgamated scales of different components of satisfaction, while others have attributed satisfaction to other constructs such as fulfilment of expectations (Kahlenberg et al., 2018). Given that the design of the question influences

satisfaction scores (Clement, Bardgett et al., 2018), certainty of what is being captured from one type of question to the next remains unclear.

These issues are not surprising given how rarely the patient's perspective has been explored during the development of tools to measure satisfaction after TKA. As the meaning of satisfaction or dissatisfaction after TKA is unclear, efforts to interpret quantified satisfaction outcomes to this point have been speculative at best. To address these deficiencies in our understanding of patient satisfaction after TKA, and to identify potential targets for improving satisfaction, we undertook a qualitative study. Through interviews with patients who experienced a range of outcomes from TKA, the aim of this qualitative study was to shed light on how people arrive at different levels of satisfaction.

The specific questions governing this study were: (1) What does it mean to be satisfied after TKA? (2) What factors influence satisfaction levels after TKA?

Patients and methods

Study design and setting

We conducted a cross-sectional qualitative study in the orthopaedic clinic of a large tertiary hospital in metropolitan Australia. This clinic receives state-wide referrals, performs a large volume of TKAs, and routinely collects 12-month registry data on all patients who undergo a lower limb joint replacement and records patients' outcomes longitudinally.

This study was conducted in accordance with the ethical standards in the 1964 Declaration of Helsinki. Ethics approval was granted by St Vincent's Hospital (Melbourne) Human Research Ethics Committee (HREC/17/SVHM/251).

Participants

Patients who were 12 to 25 months post-TKA for knee osteoarthritis with completed 12-month registry data were eligible. The time-frame of 12 to 25 months post-TKA was considered an appropriate follow-

up as this study was concerned with identifying the factors and processes that shape satisfaction, which might then be targeted to improve satisfaction at later time points. Patients more than 18 months post-TKA at the time of sampling were included in this study as data collection spanned over six months. Patients who spoke a language other than English were eligible to participate through a qualified interpreter. Patients were ineligible if they had a cognitive impairment that prevented them from providing meaningful responses to interview questions. We sought to include people with a range of TKA outcomes and experiences in our study. To do this, we divided eligible patients into quadrants based on their OARSI responder status and satisfaction levels: responder satisfied, responder dissatisfied, non-responder satisfied, and non-responder dissatisfied (Bellamy et al., 1988; Collins et al., 2011; Escobar et al., 2012; Mahomed et al., 2011). A responder was defined as someone who had experienced a clinically meaningful change in pain and/or function after TKA (Bellamy et al., 1988; Collins et al., 2011; Escobar et al., 2012) (see Table 6.1). We emphasise that grouping people this way was simply a tool to assist purposive sampling, which enabled us to identify individuals with a range of experiences. The grouping of patients this way held no weight on the analytic process, nor was there any intention to suggest who should be satisfied or dissatisfied based on these metrics. Within each quadrant, we identified men and women with a range of ages to ensure a variety of voices were represented in our final sample.

Consistent with the qualitative framework, data collection and analysis were conducted concurrently. This enabled emerging patterns in the data to be tested in subsequent interviews. We continued to recruit individuals from each sampling quadrant until there was consensus agreement among authors that the data collected could answer our research question and that the themes identified were unlikely to change through interviews with additional participants. This consensus process took place over multiple meetings in which raw data and emerging themes were presented to the authorship team and these emerging themes were discussed, refined and challenged in the context of existing theory and clinical practice (see data analysis below).

Of the 121 people from the hospital registry who were eligible, 85 were invited to participate as a result of this purposive sampling strategy, and 41 consented and were interviewed. One interview was lost due to equipment malfunction. The proportions of each sampling quadrant from the 40 interviews were: 10 responder satisfied, nine non-responder satisfied, eight non-responder dissatisfied, and 13 responder dissatisfied. Of the remaining 44 people, 28 declined, 12 did not respond to letter or phone contact, and four were identified as inappropriate (two cognitive impairment, one undergoing treatment for surgical complication and one declined use of professional interpreter) (see Table 6.2).

During the interviews, 29 participants reported high satisfaction levels during their interviews. Of these, 11 had no or minimal symptoms or functional limitations, while 18 had some degree of ongoing symptoms or functional limitations. Eleven participants reported low satisfaction levels during their interviews, and all had ongoing symptoms or functional limitation. Our sample did not include anyone who experienced a major surgical complication.

Table 6.1. Criteria for sampling quadrants

Sampling criteria	Description
Clinical response to TKR	Pre to 12 month post-TKR WOMAC ^a change scores, normalised to a scale of 100
Responder ^b	Achieved either: <ul style="list-style-type: none"> - Relative change of 50%, or an absolute change of ≥ 20 in one of pain or function scores, or - Relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score^a
Non-Responder ^b	DID NOT achieve either: <ul style="list-style-type: none"> - Relative change of 50%, or an absolute change of ≥ 20 in one of pain or function scores, or - Relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score^a
Satisfaction	12 month post-TKR Self-Administered Patient Satisfaction scores ^c
	Domains ^c <ul style="list-style-type: none"> - Overall satisfaction, - Satisfaction with pain, - Satisfaction with home and yard work - Satisfaction with recreation
Satisfied	'Somewhat Satisfied' or 'Very Satisfied' in all four domains
Dissatisfied	'Somewhat Dissatisfied' or 'Very Dissatisfied' in one or more of the four domains

Data collection

Both face-to-face (n = 12) and phone interviews (n = 28) were conducted in a private room in the hospital's orthopaedic research department. There were no differences in the length, quality, or content between the two modes of interview. Interviews were conducted by a woman physiotherapist and PhD student (NRK) who received training from an experienced qualitative researcher (SB) and had no pre-existing relationship with any of the participants. In the interviews, participants were asked how satisfied they were with their TKA outcome and why. In addition, those reporting low levels of satisfaction were asked what it would take to be more satisfied. Participants were also encouraged to reflect on their TKA journey, including their expectations for surgery and postoperative experiences, and how they conceptualised (understood) the current symptoms they were experiencing. Interview questions remained flexible to explore/test new concepts as they arose (see Table 6.3). Interviews lasted 50 minutes on average, were audio recorded, and transcribed before analysis.

Table 6.2. Participant characteristics

Characteristic	Number of participants (%) N = 40
Age (years)	
- 50–59	2 (5)
- 60–69	16 (40)
- 70–79	18 (45)
- 80+	4 (10)
Women	28 (71)
Time since TKR (months)	
- 12–15	14 (35)
- 16–19	20 (50)
- 20–23	4 (10)
- 24–25	2 (5)
BMI (kg/m ²)	
- <19	0 (0)
- 19–24	4 (10)
- 25–29	6 (15.0)
- 30–35	13 (32.5)
- 36–40	9 (22.5)
- >40	8 (20.0)
Contralateral TKR	
- Yes before index TKR	18 (45.0)
- Yes after index TKR	7 (17.5)

Characteristic	Number of participants (%) N = 40
- No	15 (37.5)
Sampled as	
- Responder satisfied	10 (25)
- Responder dissatisfied	13 (32.5)
- Non-responder satisfied	9 (22.5)
- Non-responder dissatisfied	8 (20)

Data analysis

The present study followed a constructivist grounded theory methodology (Bunzli et al., 2017). This methodology is an inductive (data-derived, rather than a priori derived) approach to analysing primary qualitative data that facilitates the development of theory grounded in participants' voices (Charmaz, 2015). Constructivist grounded theory acknowledges the researchers' prior knowledge and experience in the data analysis and aims to understand the processes and patterns of a given phenomenon, rather than offer descriptions or narrative accounts (Charmaz, 2015). The development of theory in this way can offer useful clinical information, which can later be tested using quantitative research approaches in larger, generalisable samples. This method has successfully been applied to develop theory and guide clinical practice in the broader health literature. For example, Law et al. (2019) used constructivist grounded theory to understand how patient-practitioner mistrust hinders effective tuberculosis management and developed a clinically useful model to address mistrust and encourage treatment adherence (Law et al., 2019).

Data analysis in this study involved the full research team, which consisted of clinical and research physiotherapists (AS, PO, PK, NRK), an orthopaedic research nurse (MMD), an orthopaedic surgeon and researcher (PFC), a clinical and research psychologist (RS), and a qualitative expert (SB). The team had common research interests in improving treatment outcomes for people with chronic musculoskeletal pain.

Data analysis involved the following stages: (1) Reading and re-reading the transcripts for familiarisation by two authors (NRK, SB). (2) Coding of transcripts by two authors independently (NRK, SB). In this process, relevant sections of text related to the questions, 'What does being satisfied mean to this person?' and 'What influences the level of satisfaction in this person?' were given a code. For example, when a person described support they received from their family or friends the text fragment was coded family or social support. Although the authors were aware of pre-existing variables known to affect satisfaction levels, such as narcotic use, workplace compensation or litigation, anxiety, and depression, the purpose of this analysis was to reflect the participants' perspectives on satisfaction after TKA rather than to validate existing knowledge. Therefore, we did not decide on any codes a priori; coding was an inductive (data-derived) process based on what we identified in the participants narratives. (3) Codes from each author were merged into a comprehensive coding framework (see Table 6.4, left hand column), which consisted of clearly defined codes that covered all relevant raw data so that it could be consistently applied to all transcripts. (4) Coded data from participants who reported high and low levels of satisfaction were compared/contrasted. (5) Emerging patterns were mapped into a conceptual model through round table discussion involving the multidisciplinary authorship team. To test aspects of the model, additional participants were recruited. For example, to test the emerging theory that social support was important in the pathway to satisfaction, we recruited additional participants from the dissatisfied quadrants and asked them about the involvement of friends and family along their TKA journey. (6) We continued to refine the model until the research team perceived that it captured the experiences of all the participants in the study and provided a robust description of satisfaction, and the processes resulting in satisfaction. At this point, we considered that we had reached data saturation (no new information was discovered in data analysis, signalling to the researchers that data collection may cease).

Table 6.3. Example interview schedule

Construct	Example question
Level of satisfaction	How satisfied are you with the overall results of your TKA? <i>Probe: why/why not?</i>
Conceptualisation of a high level of satisfaction	Can you help me understand what it would take to make you satisfied/increase your satisfaction?
Expectations	Can you cast your mind back and tell me about what your expectations of surgery were?
Current symptoms	Can you tell me about any symptoms you are currently experiencing?
Level of satisfaction with symptoms	Are you satisfied with your symptom outcomes? <i>Probe: why/why not?</i>
Conceptualisation of symptoms	[If still experiencing symptoms] can you tell me about what you believe is causing your symptoms? <i>Probe: Why do you believe this?</i>
Level of satisfaction with recreational activities	Are you satisfied with your ability to do the activities you enjoy? <i>Probe: Why/why not?</i>
Conceptualisation of ideal functional outcome	Can you tell me about the activities you are currently doing? <i>Probe: is there anything you'd like to do that you can't do?</i>
Social and contextual factors	Can you tell me about any role your family and friends have played in your TKA journey?
Thoughts and feelings	How are you feeling overall about your TKA outcomes?

Study outcomes

Our primary study outcome was to understand what it meant to be satisfied after TKA from the patient's perspective. Through our process of data analysis, we specifically coded for the participant's reasoning of why they had either high or lower levels of satisfaction. These codes were collated within participants, then between participants to identify patterns and common stories driving the conceptualisation of satisfaction. After this back and forth process of testing patterns and themes, two key concepts were identified: In those with high satisfaction levels, satisfaction was conceptualised as an improvement in pain and function; whereas, in patients with low satisfaction levels, rather than an improvement, satisfaction was conceptualised as completely resolving all symptoms and functional limitations.

Our secondary study outcome was to identify what factors influenced patient satisfaction after TKA. Like our primary outcome, codes were given to fragments of the raw interview data that appeared

influential in levels of satisfaction. Themes for those with reports of high satisfaction levels were compared with those with low satisfaction levels. Patterns and discrepancies were discussed within the authorship team until consensus was reached. We identified two key concepts: For patients with minimal or no ongoing symptoms or functional limitations, they experienced a direct pathway to high satisfaction levels; in those with ongoing symptoms or functional limitations, their satisfaction level was a result of three core mechanisms (recalibration, reframing valued activities, and reconceptualisation), affected by either positive or negative thoughts and feelings, and social and contextual factors.

Study outcomes 1 and 2 are described in more detail below. Each key theme is supported with a quote from a participant indexed by the participants' identification number, their gender, age, and time since their TKA, for example: (Participant 1, Man, 65, 15 months).

Table 6.4. Coding framework and process of data reduction

Coding framework	Categories	Themes
High satisfaction - Due to reduction in symptoms/improvement in function - Due to improvement from previous state - Due to absence of symptoms/functional limitations	Satisfaction due to improvement in symptoms or functional impairments	Conceptualisation of satisfaction
Low satisfaction - Due to lack of improvement in symptoms/function - Due to continued symptoms/dysfunction - Due to not enough improvement in symptoms or function -Satisfied if no symptoms or dysfunction	Satisfied if resolution of symptoms or functional impairments	
Acceptance Adaptation Self-responsibility	Positive thoughts and feelings	Factors influencing mechanisms of change

Coding framework	Categories	Themes
Seeking knowledge Equity Self-efficacy Internal locus of control Belief of good outcome Positivity Good attitude Happiness Positive mind-set/attitude Optimism Compliance Gratitude Content Resilient		
Low motivation Dependency Care seeking Pain avoidant Low self-efficacy External locus of control Equity Expectations Pessimism Hopelessness Lack of hopefulness Catastrophising Depression/Crankiness Anxiety High emotional investment Lack of embodiment	Negative thoughts and feelings	
Social calibration Shared experience Fulfilment of social roles Therapeutic alliance Process of care Social and contextual beliefs about TKR	Social and contextual factors	
Comparison to others Comparison to previous state	Change internal standards (recalibration)	Mechanisms of change
Adaptations to activities Finding new activities Accepting reduced functional abilities	Reframing priorities and activities	
Pain/symptoms as non-bothersome Attributing symptoms to comorbidities Helpful biomedical understanding of symptoms	Change conceptualisation of symptoms	

Results

What does it mean to be satisfied after TKA?

Among the participants who reported high satisfaction levels, being satisfied meant being better off than before the operation, that is, improvement in symptoms or functional limitations (not suggesting the need to be completely pain free, or free of functional limitations). For example, Participant 01 reported being very satisfied with his TKA outcome because he had experienced an improvement in his pain, rather than a complete resolution in pain: '[I'm satisfied] because I've got more movement and less pain ... I can do all the activities without as much pain as I used to have' (Participant 01, Man, 73 years, 24 months).

In contrast to those with high satisfaction levels, for participants who reported low satisfaction levels, it was not enough to be better off than before the operation; for them, to be satisfied would require a complete resolution of symptoms and functional limitations. For example, Participant 34 explained that she would have been satisfied if she did not have any pain or functional problems engaging in the activities she enjoyed: '[I'd be satisfied if] I could ride a bike without pain. I could camp without any problems. I could get in and out my four-wheel drive without pain. I could get down on the floor with my granddaughter' (Participant 34, Woman, 60 years, 19 months).

Participant 20, who experienced persistent pain and required a walking aid, said that to be satisfied she would like her pain to have gone and her functional abilities restored: 'Well I expected the pain to go away and you know just being able to walk, you know without hanging onto – or even with a walker would be alright but just to walk would be a good idea' (Participant 20, Woman, 77 years, 16 months).

What factors influence satisfaction after TKA?

We identified three pathways to satisfaction outcomes (see Figure 6.1). The first pathway (full glass), which involved no or minimal ongoing symptoms or functional limitations, consistently led to reports of high satisfaction levels. The other two pathways (glass half full and glass half empty), which involved the

presence of ongoing symptoms and functional limitations, consistently led to differing levels of low and high satisfaction, depending on the participants' understanding of any ongoing symptoms and their perception of symptom severity; their level of participation in daily/social life; and their thoughts, feelings, social support and interactions with their surgeon. Each pathway is described in detail below and illustrated with a case study (see Table 6.5).

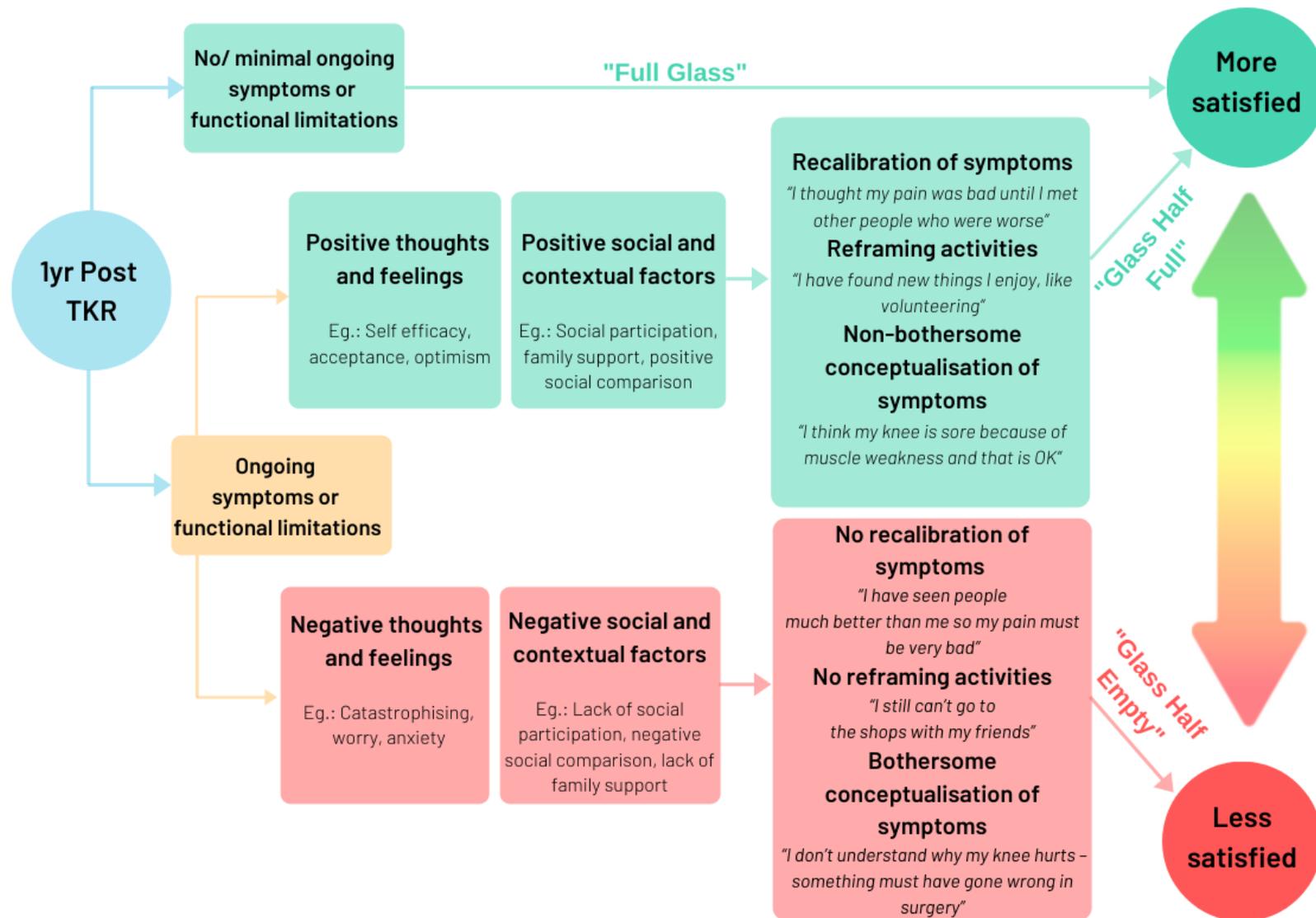


Figure 6.1. Framework of patient satisfaction post-TKA

Full glass

The full-glass pathway (n = 11) was characterised by minimal or no ongoing symptoms or functional limitations, resulting in an increased capacity to participate in a range of activities and a direct pathway to high satisfaction (see Figure 6.1). The following quote is an example of a participant who expressed a lack of functional limitations and very minimal pain. He experienced a direct pathway to satisfaction:

I'm running around the ring showing me dogs again now I've got mobility; it's fantastic it really, really, brings you right out you know, compared to what it was before. Me grand kids had to show me dogs before, so now I can show them meself. (Participant 16, Man, 67 years, 20 months)

Glass half full

The glass half full pathway (n = 18) was characterised by high satisfaction levels despite ongoing symptoms and functional limitations. These participants arrived at a high satisfaction level through one or more of three mechanisms of change: recalibration, reframing valued activities, or reconceptualisation.

The first mechanism of change involved recalibrating how severely they perceived their ongoing symptoms or function limitations. Participants did this by comparing themselves with others their age, or others who had undergone a TKA, with similar or worse outcomes. For example, after being exposed to others with a broad range of TKA outcomes through an online forum, Participant 34 recalibrated her symptoms to a lower severity:

I've spoken to numerous different people who have had the same surgery prior to me having it, in fact, prior to even me making the decision to have it. Some have said they've never looked back. Since then, I'm on different forums and there's a lot of people that are a lot, lot worse off than me, yet again, that are still having substantial pain 12 months down the track and don't have the mobility or range of movement. (Participant 34, Woman, 60 years, 19 months)

Another mechanism of change was reframing valued activities, where participants shifted their priorities in life to align with their TKA outcomes. This could take the form of letting go of or adjusting enjoyable activities or finding new activities. For example, Participant 28 was no longer able to do the things she really enjoyed but had reframed her valued activities to a modified version of what she could previously achieve and thereby reported high satisfaction:

I mean at least now I'm not suffering 24/7, I'm not having pain 24/7. It's improved from how I was greatly in everyday just walking around and you know just doing general stuff but as far as the things that I really love to do I still can't really do them. Or I can do them but to a lesser degree. (Participant 29, Woman, 61 years, 20 months)

A third mechanism of change was reconceptualisation; participants attributed their ongoing symptoms to their age and/or the aging process, a continued healing process, or other comorbidities, rather than a threatening defect with their joint replacement. For example, Participant 30 attributed the ongoing pain she experienced in her knee to her long-standing back pain. As a result of this reconceptualisation, the pain in her knee was not threatening, and she was satisfied with her TKA outcome:

There's still pain, it's more like pins and needles or a little twinge now and again, like if I move it sudden, or some sort of exercise. The back of the leg up here, into the buttocks area. Don't know if it's [the] leg causing it or my spine. But I would say it's my spine, 'cause I've got my discs L3 and all that are out. And they've prolapsed. (Participant 30, Woman, 63 years, 20 months)

Each of these change mechanisms were facilitated by positive thoughts and feelings, such as self-efficacy, optimism, and compliance. Participant 14 demonstrates how she took an active, self-efficacious approach to receiving a TKA, and how she was going to be as compliant as possible with rehabilitation:

Well, the mind tells me that you're having it done and there's no point having it, going through all this for you; and you've got to make the most of it. And try do exactly what you're told to do with the physiotherapy. (Participant 14, Woman, 68 years, 19 months)

Positive social and contextual factors, including family support, social participation, and positive therapeutic encounters, particularly with their surgeon, were also facilitators. For example, Participant 27 had much support from his family, including his grandson who encouraged him to keep active:

I didn't try the dancing yet, but I try to walk as much as possible with our grandson and with my doggy. Yeah but I can feel, I can see is a much better than before, when I walk and yeah is much better. (Participant 27, Man, 60 years, 15 months)

Participant 34 experienced a strong therapeutic alliance with a clinician who she perceived was supportive and reassuring along her TKA journey:

Same surgeon for both, but he was awesome. He was really good. Open, encouraged questions, showed me the x-rays up on the screen, didn't hurry me through a consultation. Some just push, push, push and then get you out. He said on a number of occasions, 'Anymore questions?' Yeah, I found him very efficient but, yet, he had a really good bedside manner. (Participant 34, Woman, 60 years, 19 months)

Glass half empty

The glass half empty pathway (n = 11) was characterised by low satisfaction levels in the presence of ongoing symptoms and functional limitations. Unlike participants in the glass half full pathway, these participants did not experience any of the change mechanisms described above. In approaching the analysis for this group of participants, the authors wish to emphasise the key themes identified were grounded in the participant's stories. Due to this, some factors known to affect satisfaction levels from quantitative research, such as narcotic use, did not emerge as an important factor affecting satisfaction levels from the perspectives of the participants in this sample. Further, due to the public hospital setting of our study, workers compensation or litigation cases were not relevant to our study population and, therefore, would not be expected to emerge as a key theme.

Participants did not appear to recalibrate internal standards of symptoms or function due to either a lack of exposure to others with poorer outcomes or exposure to others with better outcomes. For example, compared with her husband's outcome from TKA, Participant 40 believed her outcomes should have been better and therefore reported being dissatisfied:

Compared to my husband, I'm dissatisfied. My husband had two knee replacements, and he is walking normally, jumping up and down in bed, completely mobile, and I'm completely dependent on him. And I thought I would've been able to dress myself and just be completely mobile, just in the normal things. (Participant 40, Woman, 71 years, 15 months)

A reframing of valued activities was not apparent from interviews with participants in this pathway. Some participants in this pathway reported being unable to engage in their valued activities due to either a lack of social participation and/or emotional distress due to continued symptoms and impairments. For example, Participant 20, was unable to adjust or reframe her valued activities and, as a result, felt dissatisfied that she could not participate in social activities:

[If I was confident] I'd be going on the trips and you know sort of when they have concerts and things here down in the main lounge room, you know singers come and things like that I can't go and sit there for a couple of hours. You know half an hour would be the longest I could sit and trying to get up the pain is so bad you know I can't do anything like that now. (Participant 20, Woman, 77 years, 16 months).

The process of reconceptualisation also appeared to be absent for participants in this pathway. Some participants in this pathway attributed their ongoing symptoms to a problem with the joint replacement, often blaming this on surgical incompetence. For example, Participant 39 was troubled by a lack of explanation for her persistent symptoms. As a result, she felt something was not done correctly in the surgery:

To me I still feel there's something they didn't do properly, or (the surgeon) hasn't done it properly or there's something wrong with the actual knee. The kneecap gets really sore. I shouldn't be getting sore, and I am still getting the pain that I used to get before I had the operation. (Participant 39, Woman, 74 years, 13 months)

This perception appeared to be reinforced by negative encounters with their surgeon. Participant 34 felt dismissed by her surgeon, who did not assist in her understanding of her persistent symptoms or functional limitations.

I saw a particular doctor who, after a 4-and-a-half-hour trip down there, said, 'Let me look at the scar. It's healed nicely. Thank you very much. Goodbye'. You know? So, I was most dissatisfied with that after an 11-hour trip by the time that we got home that day. (Participant 36, Woman, 70 years, 16 months)

Other negative social and contextual factors, such as an inability to fulfil social roles and a lack of family support, as well as negative thoughts and feelings such as emotional distress, catastrophic thoughts, and anxiety all appeared to play a role in this glass half empty pathway, which led to low levels of satisfaction. Participant 20 displayed thoughts and feelings consistent with pain catastrophising and high levels of distress:

Well, the pain and the whole thing I just wish I was dead, that's how I'm feeling, you know I'd just rather not be here. [I'm] quite distressed about it because I can't go anywhere you know. Here they have bus trips and things like that, and I can't go on them because I can't walk. (Participant 20, Woman, 77 years, 16 months)

Table 6.5. Case studies

Pathway and participant	Case study
Full glass	<p>Participant 014 (Woman, 68years, 19months) described being very restricted physically and experiencing high levels of pain prior to her TKR: <i>'out of 10, 10 being the most pain, I would say that before it was about 9. I could not walk far whatsoever it absolutely restricted me on walking it restricted me on any – any social things at all. I mean, we used to go to the city, my daughter and I, to theatre and things, and we were doing it but we were having to get a taxi from hotel to theatre and things. I could not walk far at all and I was using a stick'</i>. Since undergoing both TKRs she reports being 100% satisfied and feeling unlimited in activities: <i>'really the only thing I can't do is I can't kneel down, other than that I can do everything, I swim, that's alright now, I can walk, I can play with the grandkids 'cause we do a lot of outside activities'</i>. She reported an absence of symptoms and exceeded expectations: <i>'I am very satisfied ... as I say, I don't get any pain at all', 'I really didn't think I was going to get as much gain from it as I did get'</i>. Overall, Participant 014 indicated an absence of any bothersome symptoms post-TKR, and interpreted her outcomes as a significant improvement from her previous state, resulting in a high level of satisfaction.</p>
Glass half full	<p>Participant 029 (Woman, 61years, 20months) described continued symptoms and functional impairments: <i>'I can't go to the gym anymore and I can't jog and I get a bit frustrated because I'm single and I've got a dog and he's my whole life and we used to go for really, really long walks and I used to be able to play with him and now I have – I just can't, I just can't do it, it's very frustrating!'</i> Despite this, Participant 029 reported being satisfied with the outcome from her TKR: <i>'I'm very satisfied because I was in so much pain and I was unable to do almost anything and I was almost bed ridden because of the pain that I was experiencing'</i>. To arrive at this level of satisfaction, Participant 029 appeared to have changed her priorities to align with her outcomes: <i>'Of course I'm frustrated I can't do the thing I just spoke to you about but, you know, I mean at least now I'm not suffering 24/7, I'm not having pain 24/7. So I can do a little bit and I just have to say ok that's how I am now so I can go out and I can do a little bit of gardening, I can walk the dog down the beach for a little bit, I can play with him for a little bit but – it's improved from how I was greatly in everyday just walking around and you know just doing general stuff but as far as the things that I really love to do I still can't really do them – or I can do them but to a lesser degree'</i>. Participant 029 displayed acceptance and adaptation to match her current abilities, in addition to positive thoughts and feelings. Further, from a social context perspective, her dog facilitated continued physical activity, even in a limited capacity. These influencing factors interacted positively with individual factors of 'level of pain', 'level of function', and 'expectations'; allowing her to flexibly integrate these outcomes into her lifestyle, and resulting in a high level of satisfaction</p>
Glass half empty	<p>Participant 020 (Woman, 77years, 16months) described significant pain and disability, and emotional distress, leading her to report a low level of satisfaction: <i>'The pain is unbelievable. If I don't hang onto things, I'll fall ... It's almost to the stage where I scream because it's so painful and [when] I finally get up and then, you know, sort of walking – It's only very slow and I've got</i></p>

Pathway and participant	Case study
	<p><i>my walker with me and it's a high one that I lean right over ... I try to take one step at a time and I've got to be very, very careful because I will fall over if I'm not careful, so you know, very difficult getting around'. Participant 020 believed there was a surgical error during her TKR, resulting in one leg longer than the other, causing her ongoing pain and functional limitations: 'I'm not sure but I think they put another metal bone in it or something to make it – to straighten it or to do something with it and whatever they've done they made it longer, you know, they haven't measured it properly to the other leg'. Due to this, Participant 020 was unable to arrive at a non-bothersome understanding of her symptoms. Participant 020 went on to explain that she did not feel considered by her surgeon during her review, nor did she receive a solution or explanation for her ongoing symptoms: 'Well you know we were only there a few minutes and you know he's carrying on saying it was the hips, coming from the hips, not the knees and um, you know when he sent me for an x-ray I thought well we'll go back and talk about it and see what's going on with it and um, no he'd gone, he'd gone home or whatever, he'd left, didn't wait for us to come back when he told us to come back'. The negative thoughts and feelings, in the form of emotional distress and helplessness, along with the impact of the social and contextual factor of poor therapeutic alliance acted as a barriers to arriving at a non-bothersome understanding of symptoms, thus arriving at a lower level of satisfaction.</i></p>

Discussion

Patient satisfaction is important when assessing the success of orthopaedic interventions. However, a lack of understanding of what satisfaction means to patients makes it difficult to interpret satisfaction scores (Noble et al., 2006). Through qualitative interviews with patients post-TKA, we found that satisfaction after TKA was a function of the presence or absence of ongoing symptoms and/or functional limitations. In the absence of ongoing symptoms or functional limitations, patients reported high satisfaction levels. In the presence of ongoing symptoms or functional limitations, a range of factors, some modifiable (such as, pain catastrophising, low self-efficacy, poor therapeutic alliance, and social isolation), appeared to influence a patient's pathway to higher or lower satisfaction levels.

Limitations

Consistent with our qualitative approach, we sought to capture a wide range of experiences and perspectives in our sample, so we purposely recruited people with a range of TKA outcomes. This

enabled us to capture the voices of people with not only high, but also low levels of satisfaction who are often difficult to engage in research. However, readers should be cognisant that our sample is not representative of the TKA population and does not provide an estimate of the proportion dissatisfied after TKA. Unlike quantitative studies, qualitative studies are not seeking to estimate the likely range of a parameter (such as, prevalence, odds ratio, risk ratio) from their sample that can be extrapolated to the population of interest. Instead, qualitative research seeks to gain rich descriptions from a small sample of people who have experienced the phenomenon of interest. In doing this, qualitative research is interested in diversity and understanding a range of experiences. It is important to note that qualitative research is hypothesis-generating and does not seek to definitively produce generalisable results (Leopold, 2019). Thus, the issue of selection bias is not a consideration for qualitative research; however, each reader should carefully consider our sample to see if our findings are applicable to his or her setting or context, as the participants in this study may differ from the wider population in important ways. For example, it is possible that the participants here had higher health literacy than the wider population, as patients with lower health literacy may have been less likely to accept our invitation to participate. We recruited from a single site, and thus the experiences of the participants in this study will reflect aspects of the pre- and post-TKA care that is typical to this service. Additionally, this study was set in an Australian public hospital where TKAs are government-funded procedures. Incurring a financial cost may influence expectations of care, particularly given the role that process variables, such as surgeon interactions, played in reports of satisfaction among our sample. Future studies are needed to explore if and how our model captures the experiences of patients in other settings (Batbaatar et al., 2015).

Although our model describes a process that unfolds over time, data were collected retrospectively at one time point and thus relied on the participants' recall of the TKA journey. Additionally, the scope of this study was to explore patients' conceptualisation of, and pathways to, satisfaction 12 to 25 months after TKA. Although exploration of these factors before surgery would have been an interesting and potentially useful addition to this study, it does not detract from the utility of the results to assist

clinicians in improving satisfaction levels in patients who are troubled by ongoing symptoms or functional limitations. Coding was conducted by two authors (NRK, SB) and, in accordance with the qualitative approach, was not tested for intra- or interobserver reliability. By providing an audit trail that describes the logical process of arriving at codes, themes, and theory through our own world view, we are confident that someone independent of the authorship team would be able to read the transcripts and identify similar codes in relation to our research question. Although other interpretations of our data are possible, for example, a thematic description of the lived experience after TKA, our aim was to develop a clinically useful framework to assist clinicians to improve patient satisfaction with TKA. Insights into the lived experience after TKA have been reported elsewhere (Bardgett et al., 2016; Goldsmith et al., 2017; Jeffery et al., 2011).

Although previous research has identified depression, anxiety, antecedent narcotic use, or workers compensation as predictors of patient satisfaction (de Beer et al., 2005; Franklin et al., 2010; Lavernia et al., 2015), we did not have access to this information in our registry data to describe our sample. We emphasise that the aim of the study was to elicit the participant's perception of what contributed to their level of satisfaction, and our identification of depression, anxiety and self-efficacy in the participants' narratives lends support to previous quantitative findings. Although we endeavoured to create a comfortable judgement-free environment for each interview, social desirability forces may have prevented participants from describing their experiences with narcotic use or workers compensation. Our results further suggest that this ability to adapt is influenced by a myriad of factors, including mental health and issues relating to social support or the therapeutic process. However, understanding whether satisfaction is a standalone construct, or merely a proxy for assessing the adaptability of patients (or other factors like anxiety and depression), requires further quantitative investigation. Future research should consider empirically testing the assumptions of our theoretical model and exploring its intersection with the previously known factors associated with patient satisfaction to advance orthopaedic knowledge of the utility in measuring this construct.

What does it mean to be satisfied after TKA?

Participants in this study who reported high satisfaction levels, regardless of the presence of any ongoing symptoms or functional limitation, considered satisfaction to mean some improvement in symptoms and/or functional limitations. This finding is supported by two systematic reviews, which have documented the influence of improvements in pain and function outcomes in reports of satisfaction (Gunaratne et al., 2017; Kahlenberg et al., 2018). A novel finding from our study was that all those who reported low satisfaction levels felt that to be satisfied would have called for a complete resolution of symptoms and/or functional limitations, rather than only an improvement. Our findings illustrate the need for surgeons to be more specific in their preoperative patient education pertaining to the likelihood of persistent symptoms and functional limitation after TKA. For example, surgeons can explain that a resolution of symptoms and restoration in function is unrealistic for most patients and they should reconsider the procedure if these are their expectations.

What factors influence satisfaction after TKA?

The pathways to high or low satisfaction levels in the presence of ongoing symptoms or functional limitations were influenced by a range of modifiable factors such as lack of social exposure to others with TKA, lack of participation in social activities, low self-efficacy, pain catastrophising, and poor understanding of persistent symptoms. However, those without ongoing symptoms or functional limitations experienced a direct pathway to high satisfaction levels. Contrary to what surgeons may believe (Bunzli et al., 2017), our findings demonstrate how satisfaction may have little to do with more tangible outcomes, such as complications or biomechanical factors. Instead, satisfaction likely has more to do with the patient's world view and individual traits. Previous evidence has identified the association of negative thoughts and feelings (such as anxiety and depression) (Ali et al., 2017; Kahlenberg et al., 2018), and low levels of social support (Kahlenberg et al., 2018; Kim, Chang et al., 2009) with lower satisfaction levels. Our study demonstrates how thoughts, feelings, social and contextual factors interact with ongoing symptoms or functional limitations on the pathways to different satisfaction

levels. For example, people with lower levels of satisfaction may present with negative thoughts and feelings, such as hopelessness or pain catastrophising, in combination with negative social and contextual factors including the inability to do socially enjoyable activities and poor therapeutic alliance. These factors can affect how they understand or manage their symptoms or functional limitations, thus affecting their satisfaction level. Our findings are consistent with the response shift observed in the quality-of-life evidence. Response shift describes how quality-of-life assessments can change despite no alteration in objective circumstances, as a result of recalibrating (for example, comparing one's situation to that of others who are less well off), reprioritising (such as, finding new activities to enjoy), or reconceptualising (including no longer considering health symptoms to be a threat) (Barclay-Goddard et al., 2009; Blome & Augustin, 2015). Despite many studies attributing patient satisfaction to fulfilment of expectations (Linder-Pelz, 1982; Noble et al., 2006), the findings of this study suggest that expectations are only one part of the satisfaction puzzle; the other parts include the presence or absence of ongoing symptoms or function limitations, and in the presence of them, how the individual adapts and accepts them. Our findings agree with research suggesting patients calibrate their expectations to pain and function outcomes (Levinger et al., 2019), and that expectations alone cannot predict satisfaction (Mannion et al., 2009).

The results of this work illustrate how patients can arrive at high satisfaction levels through the three core mechanisms (recalibration, reframing valued activities, and reconceptualisation), often without therapeutic intervention. However, with knowledge of these mechanisms, our findings suggest that clinicians can play an important role in facilitating higher levels of satisfaction when patients are troubled by ongoing symptoms and functional limitations. This could occur through: (1) Asking patients about any ongoing symptoms/functional limitations, what they believe is causing them, the effect they are having on their lives, and how severe they believe they are; and (2) identifying and targeting modifiable barriers to satisfaction (understanding of ongoing symptoms, social participation, confidence, self-efficacy, pain catastrophising, depression) in the context of the individual patient. Based on our conceptual model and supported by subjective reports of therapeutic encounters from the

participants in our sample, we have provided example strategies to facilitate the three mechanisms of change and address negative thoughts, feelings, social and contextual factors (see Table 6.6). Other key areas the surgeon can target include positive communication techniques, active listening, and being available for patient follow-up appointments, rather than leaving patient follow-up in the hands of junior doctors or other allied health professionals. Clinicians may also consider applying pre-TKA screening tools that can identify patients with negative thoughts and feelings, which may predict low satisfaction levels (Dowsey, Spelman et al., 2016). We emphasise that patients are likely to present with more than one modifiable barrier to satisfaction and it is unlikely that these can all be addressed in a single consultation. For patients presenting with multiple barriers, such as negative thoughts, feelings, social and contextual factors, we recommend focusing on communication strategies that are validating, reassuring, patient-centred and that build confidence, acceptance, and self-efficacy. It may be that these factors are best targeted pre-TKA to improve patient outcomes, however, further research is needed to test the efficacy of this. Following this, and a review of whether rehabilitation has been adequate, it may be appropriate to refer the patient to allied health for further support to improve the patient's satisfaction levels. Consulting services such as psychiatry and colleagues in the allied health professions like physiotherapy, occupational therapy, social work, psychology provide patients with access to a range of evidence-based interventions may be able to target the modifiable factors identified in this study, including mindfulness, which has shown to be effective in the TKA population (Dowsey et al., 2019).

Table 6.6. Helpful communication

Patient experience	Unhelpful communication	Helpful communication
<p>1. <i>'My knee feels really unstable, it keeps popping out sideways when I'm walking. I can't do the things I want to do'.</i></p>	<p><i>'The only way to fix your unstable knee is to do another total knee replacement'.</i></p> <p>Telling the patient the only option to improve their continued symptoms or functional limitations is to have another surgery leaves them dependent and with the perception they have no ability to control their symptoms, lowering self-efficacy (negative thoughts and feelings).</p>	<p>Targeting reframing of valued activities</p> <p><i>'That sounds like it is a real concern for you. Can you tell me how it is affecting you?'</i></p> <p>Validating the patients experience and gaining an insight into their illness perceptions can have positive effects on patient's (positive thoughts and feelings).</p> <p><i>'The good thing is that from the x-ray and my examination – I can assure you that your new knee joint is very stable'.</i></p> <p>Providing reassurance is important in order to reduce worry (positive thoughts and feelings).</p> <p><i>'That means we need to explore other factors like muscle strength, balance and the way you walk, that we know can influence your knee and how it behaves when you use it. That way we can help build your confidence to get back to those things that you like to do'.</i></p> <p>Placing a focus on modifiable factors to build the patient's confidence (positive thoughts and feelings) to engage in valued activities, puts the patient in charge of their health and builds self-efficacy (positive thoughts and feelings). This process will facilitate finding activities that are important to the patient, or directing attention towards new/modified activities, which the patient can find enjoyment in, resulting in reframing valued activities.</p>

Patient experience	Unhelpful communication	Helpful communication
<p>2. <i>'I don't know what's wrong with my knee and my surgeon can't tell me either. I've done everything I can and it's not very good at all. When I went to the surgeon they said "No, there's nothing wrong with it. The operation went well". I said "Well, why is it still no good?" They said they don't know'.</i></p>	<p><i>'The surgery was a success. You can see here on the x-ray that everything is perfectly in place, which means that there is nothing wrong with your new knee ... I don't know why your knee is still bothering you'.</i></p> <p>Telling the patient that there's nothing wrong with their knee and the operation went well without exploration of the patient's concerns, invalidates the patient and potentially stigmatises them (negative thoughts and feelings).</p>	<p>Targeting reconceptualisation <i>'I am hearing that your knee is really troubling you. Please can you tell me more about exactly what you are feeling and how this is affecting you?'</i> Validating the patient's experience, showing empathy and exploring their concerns helps reduce emotional distress (positive thoughts and feelings).</p> <p><i>'While it may seem hard to believe with these symptoms, it's really important for you to know that your new knee is strong and can be trusted. There are a number of other factors from your story and examination that we know can cause ongoing pain and restriction in your knee. The key thing is to work out a plan together to address these factors to get you back to living again. What do you think about that?'</i></p> <p>Reassuring patients while explaining that there are multiple reasons why a person experiences ongoing symptoms that do not involve the surgical procedure helps facilitate reconceptualisation. By using the conceptual model, the surgeon may then explore some of the other contributing factors to the patient's difficulties including the contribution of thoughts, feelings, social and contextual factors. After identifying possible influences, these factors can be addressed by the surgeon, or result in referral on to trusted allied health (positive social and contextual factors).</p>
<p>3. <i>'It's 12 months and I am still in pain. I know people who had surgery at the same time who are a lot better than me and this worries me'.</i></p>	<p><i>'There are a lot of people in a lot more pain than you at the 12-month mark – I think you are doing well'.</i></p> <p>Attempting to minimise what the patient is experiencing by using examples of people that are much worse off is not reassuring or validating, and can result in increased emotional distress (negative thoughts and feelings).</p>	<p>Targeting recalibration <i>'I am hearing that the pain is really troubling you ... can you tell me more about how this is for you'.</i> <i>'I understand this is really frustrating for you, but unfortunately there is a wide variety of outcomes after a knee replacement. While some people at 12 months report little pain or functional limitation, others still require walking aids and regularly experience pain. Everyone is on their own journey. We know symptoms continue to improve up to 2 years later – so while this is tough for you, it's important to know that we will continue to support you to get the best outcome'.</i></p> <p>Validation, active listening, ongoing support and normalising experiences are powerful tools to reduce worry and catastrophising (positive thoughts and</p>

Patient experience	Unhelpful communication	Helpful communication
		<p>feelings) for patients. This can be achieved by explaining that people experience a broad range of outcomes after TKR. To support this process, the surgeon could refer the patient to allied health where the patient can experience a social environment with others that have undergone TKR, and receive rehabilitation, emotional support and education (positive social and contextual factors). This process will facilitate recalibration.</p>

Conclusions

This qualitative study has demonstrated the importance of educating patients about the likely outcomes after TKA, especially the possibility of continued symptoms and functional limitations. In patients who continue to believe that their symptoms will be resolved, and their functional capacity completely restored, it may be appropriate to advise them away from TKA due to the risk of being dissatisfied postoperatively. In patients who are troubled by ongoing symptoms or functional limitations after TKA, the results of this study have described three core mechanisms (recalibration, reframing valued activities, and reconceptualisation), which clinicians may use as a road map to improve patient satisfaction. In patients with low satisfaction, it is important to consider the influence of negative thoughts and feelings, such as symptoms of depression, feelings of hopelessness, and poor self-efficacy, and address them through interventions such as psychology and psychiatry. Additionally, negative social and contextual factors, such as poor social support or inability to fulfil social roles, should be considered and addressed through focusing on a strong therapeutic alliance, social work referral, and seeking ways to engage patients in meaningful activities in their communities. It may be feasible to target the modifiable thoughts and feelings, as well as social and contextual factors pre-TKA, to reduce the likelihood of a patient becoming dissatisfied postoperatively. However, future empirical research is required to test the efficacy of intervening on these factors before surgery.

6.3 Chapter conclusions

The findings from this chapter have provided novel insight to the construct of satisfaction, and what influences satisfaction 1–2 years after TKR. In particular, how satisfaction is a multifactorial construct, influenced by a range of psychosocial factors in those with ongoing symptoms and functional limitations. However, there remains a paucity of knowledge regarding the long-term trajectory of satisfaction, in particular, whether satisfaction is a stable or fluid construct over time. Additionally, although the conceptual model of satisfaction 1–2 years after TKR provides novel guidance for how to improve satisfaction levels, whether these assumptions are still relevant at later follow-up requires

investigation. The following chapter will explore the stability in satisfaction levels 3–4 years post-TKR and ‘test’ the assumptions of the conceptual model developed in this chapter.

Chapter 7: Study 3: What influences patient satisfaction after total knee replacement? A qualitative long term follow-up study

7.1 Introduction

As highlighted in the literature review of Chapter 2, a longitudinal understanding of satisfaction after TKR is lacking. In particular, knowledge of whether satisfaction is a stable or fluid construct beyond the first year after TKR has not been previously investigated. Drawing from the same sample from Study 2, I re-interviewed a portion of participants to understand the trajectory of satisfaction levels in the long term. The assumptions of the conceptual model developed in Study 2 were tested to assess its relevance at later follow-up. This manuscript is currently under peer-review.

7.2 Study 3 manuscript

Abstract

Objectives

To explore whether a conceptual model of patient satisfaction previously developed 1–2 years post-TKR is still relevant 3–4 years post-TKR. Specifically, (i) what is the stability in satisfaction levels 3–4 years post-TKR?; and (ii) does the existing conceptual model of patient satisfaction after TKR apply at this later follow-up?

Design

Qualitative follow-up study. One-on-one semi-structured interviews designed to test the assumptions of the model developed from the findings of the previous study.

Setting

An urban Australian public hospital

Participants

From 40 people who participated in the original study, 11 participants were purposively sampled based on their level of satisfaction and factors driving satisfaction as reported in their first interview. There were six women and five men, the average time since TKR was three years and five months, and the average age at time of interview was 77 years.

Results

Satisfaction levels were mostly stable with the exception of three participants; two transitioned in a positive direction; one in a negative direction. The meaning of satisfaction and the factors that influenced satisfaction were consistent with the original findings. However, beliefs relating to the influence of aging on persistent knee symptoms and functional limitations were more dominant in the present study.

Conclusions

The findings provide support for patient satisfaction being a multifactorial construct that is potentially modifiable over time. Clinicians may apply the conceptual model we have described to optimise satisfaction in patients up to 3–4 years post TKR.

Article summary

Strengths and limitations of this study

- A novel insight to the meaning and processes of satisfaction up to four years post-TKR.
- Confirmatory design involving re-interviewing of participants over four years post-TKR allowed for thorough assessment of satisfaction over time.
- Consistent interviewer from the baseline study to this study facilitated the trust of the participants and therefore rich descriptions and insights.

- Sampling was restricted to the participants from the initial study, where broader sampling may have elicited different dimensions of satisfaction.
- Sampling was from a single institution where TKRs are government-funded procedures, other settings may have yielded different aspects of satisfaction.

Key words

Patient satisfaction, total knee replacement, qualitative

Introduction

Measures of satisfaction are commonly used to capture patients' appraisal of the outcome of their TKR for knee osteoarthritis. A Delphi study by the Outcome Measures in Rheumatology initiative determined satisfaction to be a core outcome measure for TKR (Singh et al., 2017). However, despite the popularity and importance of measuring this construct, heterogeneity exists regarding both the types of questions used and the quantification methods employed (Kahlenberg et al., 2018). Further, two recent systematic reviews identified the poor content validity of current tools used to measure satisfaction after TKR and in musculoskeletal primary care settings, as the patients' voice in development of these measurement tools was absent (Klem, Kent et al., 2020; Pellekooren et al., 2020). Consequently, researchers and clinicians cannot be certain as to the meaning of patient responses to current satisfaction questionnaires.

Poor content validity has likely arisen due to lack of theoretical grounding surrounding this construct (Batbaatar et al., 2015). To address this, our previous research sought to investigate what satisfaction meant to patients, and what factors and processes influenced their satisfaction levels after TKR (Klem, Smith et al., 2020). Using a constructivist grounded theory methodology (Charmaz, 2006), a conceptual model of satisfaction after TKR was developed. Satisfaction was found to mean different things to different people. Those that reported high levels of satisfaction described satisfaction as an improvement from their previous state. On the other hand, those that reported low levels of

satisfaction believed satisfaction meant a resolution in pain and restoration in functional limitations.

Our conceptual model (see Figure 7.1) described three pathways to satisfaction; (i) the 'full glass' who reported a high level of satisfaction with no/minimal ongoing symptoms or functional limitations; (ii) the 'glass half full' who reported high satisfaction and ongoing symptoms or functional limitations; and (iii) the 'glass half empty' who reported low satisfaction and ongoing symptoms or functional limitations.

For the latter two pathways, levels of satisfaction were influenced by three key mechanisms (recalibration of symptoms, reframing of valued activities and conceptualisation of symptoms) which interacted with thoughts, feelings, social and contextual factors on the pathway to high or low satisfaction. Those findings informed suggested avenues for clinicians to facilitate patients to experience greater satisfaction (Klem, Smith et al., 2020).

Given our previous study was conducted in the first two years following TKR, interviewing the same participants two years later could provide insights into to the stability of patient satisfaction over time, and whether the processes of the existing conceptual model are still valid. Such insights would help clinicians understand what drives high patient satisfaction levels in the longer term after TKR. Therefore, the research questions of this follow-up study were; (i) what is the stability in satisfaction two years following the initial inquiry?; and (ii) does the existing conceptual model of patient satisfaction after TKR apply at this later follow-up?

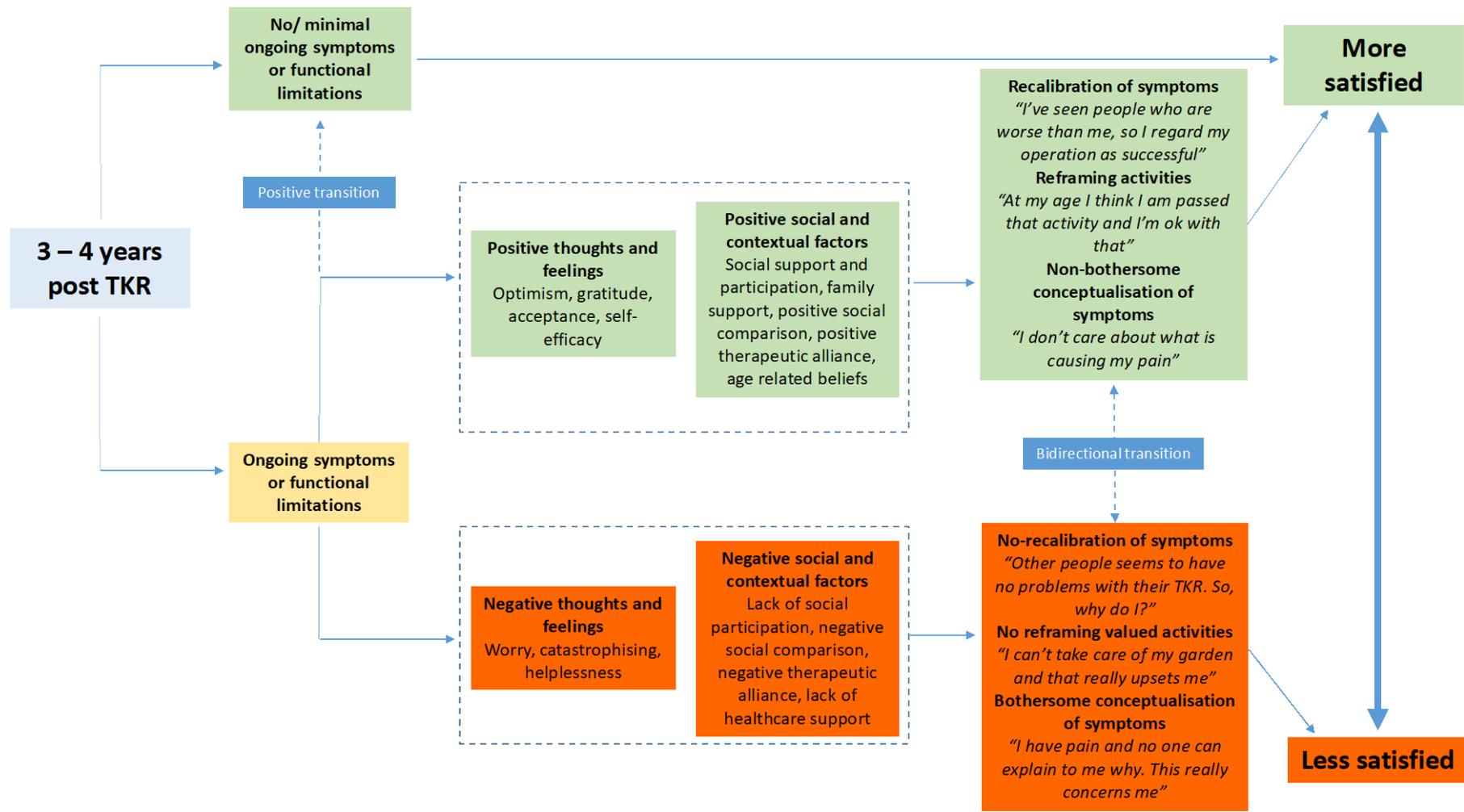


Figure 7.1. Conceptual model of patient satisfaction post-TKR

Methods

The original purposive sampling strategy can be found in our previous publication (Klem, Smith et al., 2020). In the initial (baseline) study, each participant was categorised into one of three satisfaction pathways (full glass, glass half full, glass half empty) and the key mechanisms influencing their reported level of satisfaction were identified. In the follow-up study, we selected participants two years after the baseline interview based on their satisfaction pathway and mechanisms identified from the previous study, ensuring that the different pathways and mechanisms were represented in our follow-up sample (see Figure 1). The identified participants were considered our 'key informants', where the aim of this purposive sampling was to challenge rather than confirm the conceptual model. An exclusion criterion of this follow-up study was a subsequently developed cognitive impairment that prevented participants from providing meaningful responses to the interview questions.

Consistent with the qualitative approach, data collection and analysis occurred concurrently to enable emerging patterns in the data to be tested in subsequent interviews. Sampling ceased when diversity from our original sample was achieved; i.e. all facets of the original conceptual model were feasibly tested, which in the context of this study was considered theoretical saturation (Starks & Trinidad, 2016).

Each individual selected for follow-up was contacted via telephone. If they were interested in participating, a participant information sheet was emailed or mailed to them. The lead author contacted them within three days to confirm they had read and understood the information sheet, and consented to being interviewed. All interviews were conducted via telephone because the lead author was based in a different city to the participants. Interviews were conducted by the lead author (NRK) who is a woman clinical physiotherapist, a PhD candidate with previous qualitative research experience, and who received training from a qualitative expert (SB). NRK had previously interviewed each of these participants for the baseline study two years prior, however, no other form of relationship existed between the lead author and the participants.

Prior to the commencement of the interviews, the lead author (NRK) familiarised herself with each of the baseline transcripts of the participants. This involved taking notes on how their level of satisfaction related to the existing conceptual model, in particular, which mechanisms were most influential for them. Further, it was noted how social and contextual factors, and thoughts and feelings played a role in the three mechanisms. At the beginning of each interview, NRK explained the purpose of the research and encouraged the participants to openly share their experiences. Anonymity and complete confidentiality was emphasised, in particular from their treating surgeon.

The interview schedule (see Table 7.1) was designed to test the stability of participants' satisfaction levels and the extent to which the original conceptual model (see Figure 7.1) remained relevant, while remaining flexible to explore new concepts not captured in the original model, if they emerged. Interviews lasted around 40 minutes on average, and were audio recorded and transcribed prior to analysis.

Table 7.1. Semi-structured interview schedule

Construct from model	Questions
Context	It's been a couple of years since we spoke, can you tell me how your TKR has been?
Overall outcome Overall level of satisfaction // change	Overall, how satisfied are you with the results of your TKR? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) Why/Why not? <i>If changed:</i> Last time we spoke you mentioned ____ about your satisfaction with ____, can you think why this may have changed?
Symptoms // change // recalibration // Re-conceptualisation	Can you tell me about any pain or other symptoms you currently experience? Overall, how satisfied are you with the results of your TKR for improving your pain? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) Why/Why not? <i>If changed:</i> Last time we spoke you mentioned ____ about your satisfaction with ____, can you think why this may have changed? Why do you think you are still having ____ in your knee? Why do you think you are no longer experiencing ____ in your knee?

Construct from model	Questions
Function // change // Re-prioritisation	<p>Can you tell me about any difficulties you have with activities at the moment?</p> <p>Overall, how satisfied are you with the results of your TKR for improving your ability to do home and yard work? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) Why/Why not?</p> <p>Overall, are you satisfied with the results of your TKR for improving your ability to do recreational activities? (very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied) Why/why not?</p> <p>Last time we spoke you mentioned _____ about your satisfaction with _____, can you think why this may have changed?</p> <p>Can you tell me about how you have adapted/not been able to adapt to the activities that you have difficulty with?</p>
Conceptualisation of satisfaction	Can you help me understand, from your point of view, what it means to be very satisfied with your TKR?
Expectations	<p>Can you try and cast your mind back and remember what you expected from your TKR? Do you believe these expectations have been met? Thinking forward, what are you now expecting from your TKR? Why? <i>If changed:</i> Last time we spoke you said _____ about your expectations for your TKR, what do you think about these expectations now? Do you believe they have been met?</p>
Social	<p>Thinking back through the time since you had your operation, can you tell me about any family or friends who helped you along your journey?</p> <p>Have you encountered many other people that have had a TKR? What did you think about their outcomes/what did you learn from them?</p>
Emotions	How has your TKR outcomes made you feel?
Cognitions	<p>What kind of mind-set did you have along your TKR journey? What do you think is important for having a successful outcome after TKR?</p>
Care seeking	<p>Have you had any contact with your surgeon or other health care professionals/any treatment since we last spoke? What was the purpose of the appointment? Can you tell me how the appointment went?</p>

Data analysis followed the methodology of the previous qualitative study, which employed constructivist grounded theory (Charmaz, 2006). Under a constructivist grounded theory approach, researchers seek to understand patterns and processes in the data, rather than offer descriptions (Charmaz, 2006). The prior knowledge of the researchers is acknowledged and valued in the analysis, while the researchers simultaneously reflexively engage with the data to ensure the participants'

perspectives are prioritised (Charmaz, 2006). Under this constructivist approach, participants' construction of satisfaction was central to the analysis (Charmaz, 2006). The analysis also adopted a critical lens in this follow-up study, whereby the aim of the analysis was to challenge rather than confirm the model from the baseline study. This was facilitated by discussion with the multidisciplinary authorship team in which alternative interpretations were sought and considered. The purposive sampling approach also facilitated this by targeting all aspects of the conceptual model.

Data were managed using Microsoft Word (Microsoft Corp., Redmond, WA, USA) as the lead author's preference. For the present study, analysis was conducted in several stages, which were guided by the recommendations of Charmaz (2006) (see Table 7.2). Coding was conducted by NRK and AS, where a combination of deductive codes, based on the conceptual model, and inductive codes looking at change over time were used. The analytic process was iterative, whereby, the lead author would move back and forth between the steps to ensure constant comparison between the new data and the findings of the existing model of patient satisfaction after TKR.

Table 7.2. Methods of analysis

Stage	Description
i	Familiarisation of transcripts, through reading and re-reading the data
ii	Reflexive and analytic memo writing, whereby the lead author (NRK) critically engaged her perception of the findings by writing and reflecting on these, as well as reflecting on the analytic process
iii	Coding the transcripts, guided by the initial memos produced, and by asking 'what is influencing this person's level of satisfaction?' and 'how does the original conceptual model relate to this person's experience of satisfaction?' At this stage, initial thoughts of the data were presented to members of the multidisciplinary authorship team for discussion and feedback, which included clinical and research physiotherapists, an orthopaedic research nurse, and a qualitative expert
iv	To refine the codebook from stage iii, two randomly selected transcripts were coded by AS to explore concordances and disagreements
v	Further memo writing following coding, and summarising the key findings of the participants, which required the lead author to compare the open coding findings with her original memos to create richer descriptions of the data
vi	The findings were compared with the existing conceptual model of patient satisfaction after TKR, which was again presented to the multidisciplinary authorship team for discussion and refinement

This study was conducted in accordance with the ethical standards in the 1964 Declaration of Helsinki. Ethics approval was granted by St Vincent’s Hospital (Melbourne) Human Research Ethics Committee (HREC/17/SVHM/251).

Results

Participants

Eleven of the 14 people identified as key informants from the baseline study of 40 participants, participated in the study. Among the three key informants who did not participate, one had developed cognitive impairment, one did not want to participate in the follow-up study, and one was unavailable for interview. Recruitment was ceased at 11 participants as sufficient diversity was captured to test the conceptual model. The demographic information for all participants, including their level of satisfaction and key mechanisms influencing their level of satisfaction as identified at the baseline interview, is presented in Table 7.3. There were six women and five men, the average time since TKR was three years and five months, and the average age at time of interview was 77 years.

Table 7.3. Participant characteristics

Participant	Characteristics	Levels of satisfaction and mechanisms from initial study	Levels of satisfaction and mechanisms at 2 year follow-up
01b	Male 3 years 10 months post-TKR 76 years old	Full glass No/minimal ongoing symptoms or functional limitations	Full glass No/minimal ongoing symptoms or functional limitations
02b	Female 3 years 8 months post-TKR 72 years old	Glass half full Non-bothersome conceptualisation of symptoms Reframing valued activities	Glass half full Positive conceptualisation of symptoms Reframing valued activities
04b	Male 3 years 9 months post-TKR 79 years old	Glass half empty Inability to reframe valued activities	Glass half full Positive conceptualisation of symptoms Reframed valued activities
11b	Male 3 years 5 months post-TKR 78 years old	Glass half full Non-bothersome conceptualisation of symptoms	Glass half full Positive conceptualisation of symptoms Reframed valued activities

12b	Female 3 years 9 months post-TKR 81 years old	Glass half full Recalibration of symptoms Positive conceptualisation of symptoms	Glass half empty Negative conceptualisation of symptoms Inability to reframe valued activities
14b	Female 3 years 6 months post-TKR 71 years old	Full glass No/minimal ongoing symptoms or functional limitations	Full glass No/minimal ongoing symptoms or functional limitations
16b	Male 3 years 9 months post-TKR 70 years old	Full glass No/minimal ongoing symptoms or functional limitations	Full glass No/minimal ongoing symptoms or functional limitations
18b	Female 4 years post TKR 82 years old	Glass half full Reframing valued activities	Glass half full Positive conceptualisation of symptoms
39b	Female 2 years 10 months post-TKR 77 years old	Glass half empty Negative conceptualisation of symptoms Negative calibration of symptoms	Glass half empty Negative conceptualisation of symptoms Inability to reframe valued activities Negative calibration of symptoms
41b	Female 2 years 8 months post-TKR 81 years old	Full glass No/minimal ongoing symptoms or functional limitations	Full glass No/minimal ongoing symptoms or functional limitations
43b	Male 2 years 8 months post-TKR 83 years old	Glass half full Positive conceptualisation of symptoms	Full glass No/minimal ongoing symptoms or functional limitations

Participant identification numbers are presented as the participant's identification number from the previous study followed by the letter 'B', to facilitate comparison with the previous publication (Klem, Smith et al., 2020).

Do satisfaction levels change at later follow-up?

Overall, participants reported similar levels of satisfaction as the previous study, with the exception of three participants; P43b transitioned from 'glass half full' to 'full glass'; P04b transitioned from 'glass half empty' to 'glass half full'; and P12B transitioned from 'glass half full' to 'glass half empty'. In the

following quote, P12B acknowledges that her satisfaction levels have changed and attributes this lower level of satisfaction to her recent falls:

Interviewer: ... when I called you two years ago about your knee replacement, you told me that you were somewhat satisfied with your ability to do home and yard work. What do you think has changed?

12B: Yeah, well that was before I had the falls.

These transitions were aligned with the mechanisms identified in the baseline interviews, thus, no new themes emerged from interviewing these participants about their changed level of satisfaction.

How does the existing conceptual model of patient satisfaction after TKR apply at this later follow-up?

In the following section, participants who reported no or minimal ongoing symptoms or functional limitations, and high satisfaction in this follow-up study were classified as 'full glass'. Participants who reported ongoing symptoms and/or functional limitations were classified as either 'glass half full' (those that reported high satisfaction), or 'glass half empty' (those that reported low satisfaction) in this follow-up study. Where a participant changed classification from the baseline study, this has been described under their classification from the follow-up interviews; i.e. their 'new' level of satisfaction.

Full glass

In alignment with the existing conceptual model, participants in the 'full-glass' pathway at baseline continued to report no, or minimal ongoing symptoms or functional limitations in the follow-up interviews. Participants in this pathway also reported a stable level of symptoms; no participant reported any new or changed level of symptoms. As participant P14 explains, she perceived herself as lucky due to how positive her outcomes have been:

I'm one of the lucky ones obviously because I've never had problems. I've had both done and I've never had problems ... Now, yeah, it doesn't hurt but it's a very funny sensation when I go to kneel on them. But that is all, I can squat, I can do everything bar that.

In the presence of minimal symptoms, the participants appeared to be more forthcoming with possible reasons for the occasional experience of pain compared to the baseline interviews. However, consistent with the previous enquiry, the pain itself and perceived reasons for pain, were deemed non-bothersome. P1b who previously thought his occasional symptoms may be related to his age, explained how he experiences minimal, non-bothersome, pain as a result of aging and changes to the weather, but he does not believe it negatively affects him:

It [the pain] doesn't affect me at all really. I just put it down to getting a bit old and change of weather. I get it in other parts of the body as well, I get in the elbow, ankle and the back.

Likewise, P16B who previously expressed contentment with not knowing the cause of his occasional pain, now described the effect of cold weather on his knee but felt like it was nothing to worry about:

[pain in] the knees? No, no worries. Like I said they can ache a little bit type of thing but um, ah when it gets real cold but ah, no worries – but it's time to put on long trousers now and that keeps them warm.

Glass half full pathway

Participants in the 'glass half full' pathway continued to conceptualise satisfaction as improvement from the pre-operative state. As described by P18b, she felt osteoarthritis was all through her body (including her knees) and very painful, so the TKR operation was a success:

Well [I'm satisfied] because – oh I don't know, because I have the, I had all through my legs – because I have osteoarthritis through the whole body, so my knees are – they're very sore, very bad, so ah, the operation was successful.

Additionally, P11b, who described continual difficulty walking and felt like the knee was not 100%, reported high level of satisfaction based on a previously worse state:

Comparing to what it was, yeah, absolutely satisfied, yeah.

The mechanisms that facilitated satisfaction in the presence of ongoing symptoms or functional limitations were consistent with the existing conceptual model; recalibration, reframing valued activities, and non-bothersome conceptualisation of symptoms (see Figure 7.1). However, it was apparent the mechanisms that influenced high levels of satisfaction for an individual could change over time. For P11b, his satisfaction was previously due to conceptualising his symptoms as continually improving. However, in the follow-up interview, he developed a non-bothersome conceptualisation of his symptoms through believing his symptoms were good for his age:

At my age it doesn't matter. I just walk and do everything to my knee. I don't walk if I have a lift or whatever or go anywhere out of the way. I just carry on the way I do, I'm 78 so I think I get around pretty good really for that age ... I'm just a little bit disappointed in it, but I've got to remember I'm nearly 80, so I suppose I have to be satisfied with it, wouldn't I?

Additionally, the role of social comparison to facilitate recalibration of symptoms was also present for P11b, who compared himself to others he perceived were doing worse than him:

Yeah, well, I've heard a lot of complaints about it. There's a lot of people that are not as good as me, that I know, though, and so, I don't worry about mine. I've seen [surgeon] the other day and they x-rayed me and said everything was in place, so I feel good about that too.

Similarly, for P18b, in her baseline interview, she described reframing valued activities in the form of setting small functional targets, such as gradually increasing time on her stationary bike. In the follow-up interview, her mechanisms for satisfaction were modified such that her impaired function was conceptualised to be due to her other comorbidities, particularly her spine. Although the influence of

comorbidities was apparent in her previous interview, the attribution of these to her reason for being satisfied came across more strongly in the follow-up interview:

Walking, that relates to my spine, it has nothing to do with my knees. I can't reach my toes for instance, I have to have pedicures because I can't reach my toes there, I can't bend down but that has nothing to do with my knees. That is my back so that's hard for me to distinguish you know, what I'm saying?

Participant P04b, who transitioned into this group from 'glass half empty', reframed activities based on what he considered to be reasonable for his age, and this reframing was a key mechanism for transitioning to becoming satisfied. In the baseline interview, P04b reported dissatisfaction due to an inability to do valued activities such as golf. In the follow-up interview P04b describes what he has decided as appropriate for his age:

P04b: I probably after I spoke to you, if that was 2 years ago um, I probably did start playing again with a friend of mine, ah, yeah, ah and we used to just play nine holes we'd get a cart and we'd play probably once a week and um, it got to the stage where ah, I couldn't I – I had to give it away because I couldn't walk that far – and once again, which I'm sure it was because of the other knee, I can't remember having any trouble with my right knee it was always the left knee and the hip so ...

NRK: Would you ever consider going back to it?

P04b: Nup. I figure at 80 I'm, I've passed it.

Consistent with the existing model, social and contextual factors, as well as thoughts and feelings were also influential in this pathway. In particular, the role of acceptance pertaining to age-related limitations appeared to play a larger role than in the previous study, as has been demonstrated in the previous quotes. In addition to this, a positive relationship with the surgeon who had performed their TKR continued to be an important social and contextual factor for satisfaction, as explained by P18b:

Yes, ah, terrific man, um, well I suppose he was very caring and looking after me afterwards. I like him very much, he is very calming very friendly, very reassuring and I thought he knew what he was doing, if you know what I mean.

Further, participants in this pathway generally did not express thoughts and feelings of worry and anxiety about their current symptoms. Participants explained an ability to manage doing what they wanted despite limitations. P11b expressed a lack of worry about his persistent knee clunking and adequate self-efficacy to 'work around it':

I'm not worried about it [knee clunking], no, not at this stage. I can manage it pretty good now, and so I work around it a little bit, yeah.

Likewise, P18b reported her knee instability as neither worrisome nor concerning, indicating a lack of distress related to her current symptoms or functional limitations:

If I'm standing long time ah, not that I'm walking, if I'm standing long time it sort of tends to sometimes give way on me, you know, but it's not – I'm not concerned and it's not really worrying, you know.

Glass half empty

Participants in the 'glass half empty' pathway continued to conceptualise satisfaction as complete resolution in symptoms and or functional impairments. In the follow-up interviews, 'glass half empty' participants expressed a stronger emphasis on satisfaction as meaning having a knee that felt and moved like a 'normal' knee:

[being very satisfied] ... means I'll be able to walk normally without any aids or anything or any frames or anything that I have to use and that's it ... as if I hadn't had any operations at all.

[P39b]

The three key mechanisms identified in the baseline study remained influential for 'glass half empty' participants in the follow-up study. For participant P39b, whose low level of satisfaction remained the same from the previous enquiry, her previous mechanism of a negative conceptualisation of symptoms was confirmed and strengthened; P39b underwent a revision surgery to try and address her persistent pain after her initial TKR, only to continue experiencing pain. P39b explained how she understood the cause of her symptoms:

I was in too much pain after the surgery and the way the knee was going back it was really giving me a lot of pain, and that because it was very hypo-extending back ... somehow it was stretched or something he said that they had it stretched or whatever they did. And they had to do it again, but by fixing it I think he might of, maybe, I think he might have put too much padding in. You know packed it up too much this time. Maybe, I don't know, I hope I don't have to go under again and take some of that padding off to stop that nerve. That's probably why it's pressing on the nerve now.

Additionally, due to social comparison with others who had undergone TKR and had a positive outcome, P39b recalibrated her symptoms as worse than theirs. This comparison also contributed to further confusion regarding her conceptualisation of symptoms:

She was good and she had the second one done and she's ok. There's nothing wrong with her so you know, I don't know ... And she's quite happy and she's walking as if she never ever had anything done, you know like, nothing is ever – she never even had the operations and she's fit and goes for walks and does you know, exercises and goes to the gym and all and you know, she's quite happy with it. And I'm thinking, well if you can do that well how come mine is like that, why am I having all this problems, you know.

Participant P12b, who transitioned from 'glass half full' to 'glass half empty', experienced two falls in the period since her baseline interview. Although she reported persistent symptoms in her baseline interview, at the follow-up interview she believed her pain was due to the falls. However, she reported

that her doctor assured her there was nothing internally wrong with her knee and dismissed her concerns about her pain. This led to an inability to have a positive conceptualisation of her symptoms, and subsequent reports of low levels of satisfaction:

Since I've had the fall, yes. I don't think I had very much pain at all, before I had the fall. I had to go over to [location] to have me leg x-rayed, because I had me shoulders x-rayed as well. And he said, 'There's no need to do the right one'. He x-rayed the left leg, but he didn't do the right one, that I had replaced. And he said, 'Everything there should be fine'. So, okay. And that was it ... I've told him several times that I've got pain in the knee, and so he just makes jokes; he says, 'You been playing football, have you?' I say, 'Oh yeah, of course'.

P12b further described how she was unable to do valued activities, which also contributed to her low level of satisfaction:

Very dissatisfied. I used to be able to look after my own garden, but now I've got to pay a fellow \$60 a fortnight to come and cut my lawn ... That's how bad things are, and I've got a mower, and a blower down in the shed, and rakes and what have you, but I can't use them.

Consistent with the existing model, the influence of social and contextual factors, as well as thoughts and feelings, appeared to play a role in this pathway. P39b recalls feeling unheard by her surgeon and feeling high levels of frustrations because of this. P39b told a story of how her surgeon did not believe her problems with walking until a chance encounter on the street:

... He was in the street talking to another guy. And then I went past him, and said hello and I kept passing ... he saw me and then he realised what I was talking about. And I thought well I've been trying to tell you that 12 months ago. Which I was really, really got upset about it, but it was, you know, could've done it 12 months before and wouldn't have had all that problem ... all the things I had to do and then he was thinking of getting me – oh what was it? Like bars and that put on to keep me leg straight and oh look, all the things that he was trying to do and didn't

need to do any of that. Which annoyed me really, really bad because, you know, back and forward and living in [location] into Melbourne all the time, which you know, all that time which you didn't sort of – and I tried to tell him what was going on and he just didn't – I don't know whether he wasn't listening or he wasn't – I don't know what it was. Until he saw me walk and then he said, 'Oh, I realise what you're talking about' oh it's about time.

For P12b, her low level of satisfaction was also influenced by the contextual factor of a negative relationship with health care professions, as demonstrated in the previous quote where her reports of pain following her falls were dismissed. Additionally, the experience of falls contributed to negative thoughts and feelings, particularly high levels of fear related to her knee:

And that's very frightening, so unless I've got somebody with me, I try not to go there. I go over to the plaza if I have to have my eyes tested or something, get new glasses. But otherwise, I stay away from there.

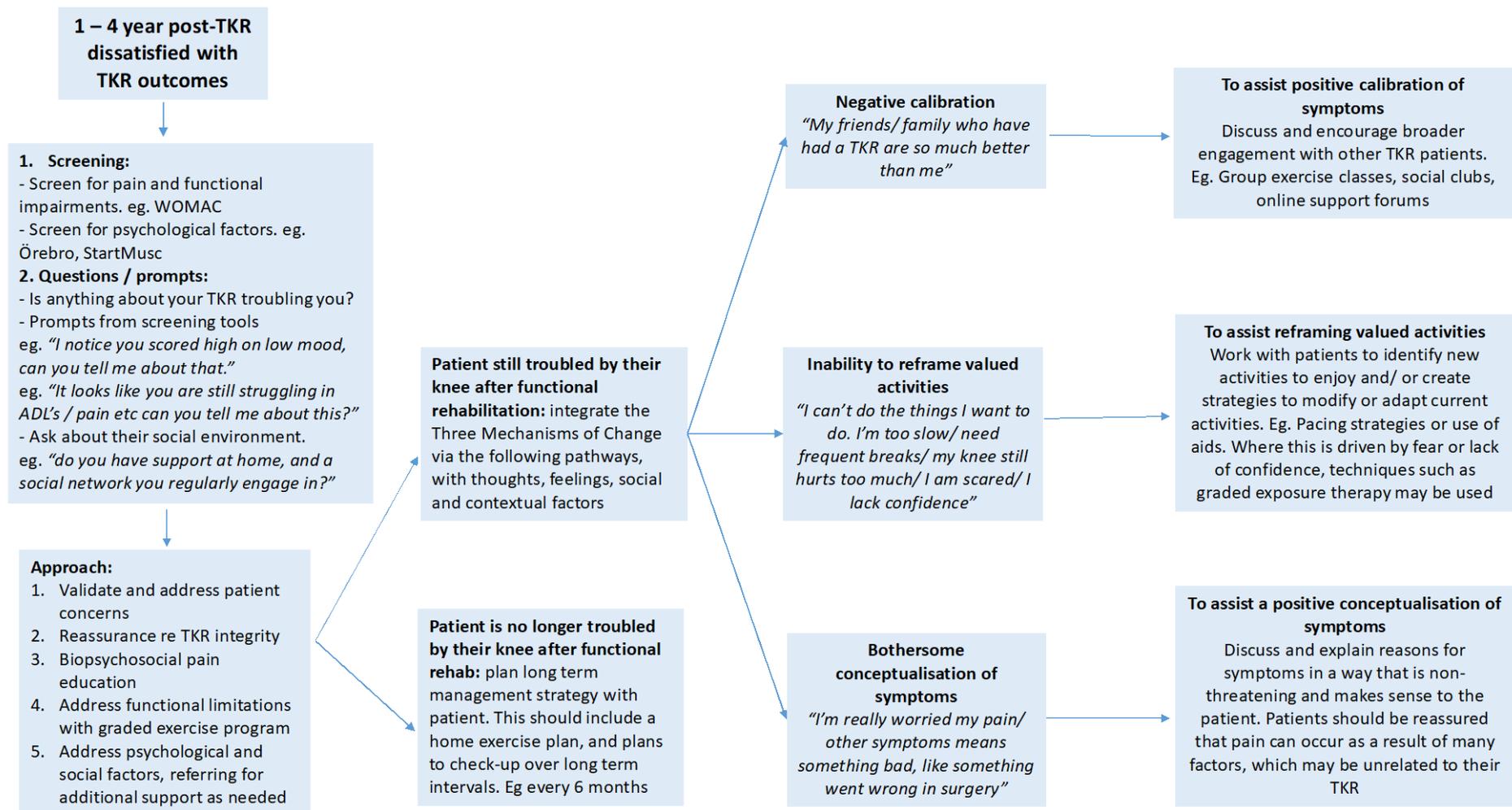


Figure 7.2. Roadmap to improve satisfaction levels post-TKR

Discussion

The findings from this qualitative follow-up study contribute to understanding the processes involved in patient satisfaction 3–4 years after TKR. This study was conducted two years following the baseline enquiry and demonstrated how the three pathways to high and low satisfaction were still relevant ('full glass', 'glass half full', and 'glass half empty'), as were the originally identified mechanisms of these pathways (recalibration, reframing valued activities, and conceptualisation of symptoms). However, participants could change their level of satisfaction or the key mechanism(s) driving their level of satisfaction over the two years following the baseline study. This highlights that both the levels of satisfaction and the reasons underpinning it are fluid over time. Further, the factors underpinning these changes are potentially modifiable with targeted intervention.

This follow-up study provides novel insight to patient satisfaction as a continually changing process up to 4 years post-TKR. Whether satisfaction changes over time after TKR, and if so how and why, has not been previously investigated. The findings from the present study indicate that patient satisfaction may be better considered as a 'moving target' due to the interaction of various psychosocial processes.

This fluidity observed in patient satisfaction suggests that clinicians should continue to monitor patient satisfaction for a number of years post TKR. Despite the changeable nature of satisfaction seen in this study, participants did not indicate any belief that their outcomes could change without further surgery. This is in agreement with previous qualitative research that found patients believe they are 'stuck with' their TKR outcomes (Jeffery et al., 2011). Thus, it is important to inform patients their outcomes are potentially modifiable over time. Additionally, in alignment with our previous study (Klem, Smith et al., 2020) and existing satisfaction literature (Batbaatar et al., 2015; Sitzia & Wood, 1997), the role of the surgeon in forging a positive therapeutic alliance was important in achieving high levels of satisfaction. This appeared to promote trust in the quality of the TKR surgery and belief of a good outcome despite continued symptoms and functional limitations. Thus, positive communication techniques and relationship building, such as active listening and validating concerns regarding the integrity of the TKR,

may be important in assisting patient to achieve high levels of satisfaction. Further, understanding the specific basis for a person's dissatisfaction, utilising the proposed conceptual model, may allow for targeted management to assist patients to feel more satisfied up to four years post-TKR.

The influence of the three key mechanisms in pathways to high and low levels of satisfaction suggest patient satisfaction is largely a function of patient adaptability. This is aligned with previous qualitative research that found patients post-TKR expressed happiness with their TKR and described their outcomes as good despite continued pain or an inability to do valued activities (Woolhead et al., 2005). The potential of patients to arrive at a positive appraisal of their TKR outcomes despite ongoing pain and/or functional limitations is an important consideration when interpreting scores on measures of patient satisfaction; high levels of satisfaction may not necessarily reflect meaningful improvement in pain and function.

This follow-up study importantly revealed the more dominant influence of negative age-related beliefs on symptoms and functional limitations compared to the baseline study. This is consistent with other qualitative and quantitative research that has found older people more readily accept that the process of aging relates to functional decline and persistent pain (Jeffery et al., 2011; Robertson & Kenny, 2016). Despite these beliefs positively influencing a non-bothersome conceptualisation of symptoms and resultant reports of high satisfaction in this study, it may promote continual disengagement from valued life activities in this cohort. For example, participant 04b stopped playing golf, which has social, cognitive and physical health benefits. The negative age-related beliefs seen in this study may reflect a stronger social narrative of age-related prejudice, which has become internalised in older adults (Hausknecht et al., 2020; WHO, 2020). Clinicians may play an important role in addressing internal negative self-perceptions of aging in patients to prevent adverse health and wellbeing outcomes (Hausknecht et al., 2019, 2020; Levy, 2001).

Clinical implications

As the findings from this study indicate that patient satisfaction is a continuous journey up to 4 years post-TKR, it may be appropriate to support vulnerable patients over this period of time. As orthopaedic surgeons may not always follow their patients beyond the first year or two post-TKR, GPs and physiotherapists may be best positioned to provide care at this stage, with referral on to other appropriate allied health as required. To assist clinicians, we propose a road map (see Figure 7.2) detailing the utilisation of the conceptual model to identify key barriers to satisfaction and potential treatment pathways for individualised management, for patients with low satisfaction up to 4 years post-TKR. In alignment with clinical guidelines (Lin et al., 2020), this ongoing support should include continuous monitoring in the form of screening tools such as the WOMAC for pain and function (Bellamy et al., 1988), and the Örebro or STarT Back for psychological factors (Butera et al., 2016; Linton et al., 2011). Screening tools can guide patient-centred communication, the importance of which was further highlighted in this study. The findings suggest that patients reporting low levels of satisfaction require validating and reassuring communication techniques, and a strong therapeutic alliance to facilitate an improvement in satisfaction levels. Our previous publication provides exemplar communication techniques to assist patients who report low levels of satisfaction (Klem, Smith et al., 2020). The identification of both physical and psychosocial barriers to achieving high satisfaction highlights the potential role of physiotherapy and psychological support in this process. The over-attribution of the perceived effects of aging on persistent symptoms and functional limitations in this study suggest clinicians may play an important role in educating patients of the potential to improve their clinical outcomes. This can include addressing implicit, negative age-related beliefs and working with patients to set realistic functional goals, or targets to improve social participation (Levy, 2001). Rehabilitation that disconfirms negative age-related beliefs, such as helping people to develop movement strategies that are non-provocative, may provide successful experiences that encourage further engagement with valued life activities. Future research may be concerned with testing the

framework proposed in this research for providing targeted care for those who remain dissatisfied post-TKR.

Strengths and limitations

To achieve a longitudinal understanding of patient satisfaction, we were required to sample from the participants in our previous study. This may have limited the scope of our findings and participants of a younger age or at longer follow-up may have identified additional factors influential to satisfaction. As no participant classified as 'full glass' reported any different or new symptoms, it is unknown if they would remain satisfied if they had developed bothersome symptoms. The sample was from a single site, an Australian public hospital, where TKRs are government-funded procedures. Thus, the experiences may reflect the aspects of care which do not transfer to other health settings.

Using a longitudinal qualitative design by re-interviewing key informant participants from the baseline study sample allowed a novel, in-depth comparison and analysis of factors related to what satisfaction means to patients, and how and why satisfaction level changes or remain the same over time.

Additionally, a consistent interviewer across the baseline and follow-up studies facilitates a trusting relationship with the participants and can yield more rich descriptions in the interviews. This also meant the interviewer was familiar with the participants' experiences, and thus was able to compare and contrast meaning over time. This is important when documenting contextual cues, such as mood, which may not be revealed in written transcripts.

Conclusions

The findings from the present study provide support for satisfaction with TKR being a fluid, multifactorial construct which is influenced by potentially modifiable factors that vary over time. The findings suggest avenues for clinicians to assist their patients to feel satisfied with their TKR outcomes up to four years post-surgery, and highlight the importance of informing TKR patients to present for care

in order to optimise their TKR outcomes, rather than accepting ongoing symptoms or functional limitations.

7.3 Chapter conclusions

The findings from this chapter provide further support for the conceptual model of patient satisfaction developed in Study 2. An important finding from this chapter was the fluidity in satisfaction scores; those with ongoing symptoms and functional limitations may continue to experience changes to their satisfaction levels in either positive or negative directions. Further, the influence of negative age-related beliefs on levels of satisfaction demonstrate the salience of working with patients to achieve their functional goals. In the following final chapter, the findings of this body of work will be summarised and discussed within the existing literature landscape, including clinical implications and future directions.

Chapter 8: Discussion

8.1 Introduction

The measurement of patient satisfaction is commonly, yet inconsistently used, to capture the patient's perspective of outcomes following TKR. The lack of theoretical development underpinning satisfaction instruments, as well as the lack of theories underpinning the construct of satisfaction, have resulted in heterogeneity in the types of questions and quantification methods used to measure patient satisfaction after TKR. Resultantly, it was not known what it means when a patient indicates they are 'satisfied' or 'dissatisfied' according to currently used questionnaires. This doctoral thesis employed a predominantly qualitative methodology to provide novel insights into the construct of satisfaction from the patient's perspective after TKR. The specific aims of this research were:

- i) Evaluate the proportion of patients reported to be satisfied after total knee replacement for osteoarthritis;
- ii) Assess the content validity of the utilised satisfaction measures;
- iii) To explore what it means for patient's to be satisfied 1–2 years after total knee replacement;
- iv) To investigate the factors that influence patient satisfaction levels 1–2 years after total knee replacement;
- v) To explore the stability of patient satisfaction 2 years following the initial inquiry;
- vi) To investigate whether the existing conceptual model of patient satisfaction after TKR applies 2 years following the initial inquiry.

This chapter will discuss the main findings of the thesis, and situate these within the existing satisfaction literature. The application of the findings to clinical contexts is then described, followed by the implications for measurement of satisfaction via questionnaires. This chapter will conclude with the

strengths and limitations in this body of work, future directions for research, methodological implications, and concluding remarks pertaining to the original research.

8.2 Summary of main findings

This thesis commenced with Study 1, a systematic review of questionnaires used to measure patient satisfaction after TKR. The findings revealed heterogeneity in the types of satisfaction questions and quantification methods used, thus a meta-analysis to obtain a pooled estimate was inappropriate. Additionally, all questionnaires were assessed as having inadequate content validity due to the lack of patient involvement in questionnaire development and testing. Therefore, there is uncertainty as to what is being captured by current TKR satisfaction questionnaires.

The findings from Study 1 led to a qualitative investigation, Study 2, which developed a conceptual model of *patient satisfaction after total knee replacement surgery* through a constructivist grounded theory methodology, presented in Chapter 5. These findings first identified how the conceptualisation of patient satisfaction appeared to be contingent upon the participant's level of satisfaction; in those that reported high satisfaction, satisfaction was conceptualised as an improvement in pain and/or function; in those that reported low satisfaction, satisfaction was conceptualised as a resolution in pain and/or a restoration of function. A conceptual model was developed based on the findings, which depicted the factors that influenced satisfaction, and theorised different pathways to a person's level of satisfaction. Those that reported no or minimal ongoing symptoms or functional limitations experienced a direct pathway to high satisfaction, whereas some of those who reported ongoing symptoms or functional limitations, achieved satisfaction through one or more three key mechanisms (recalibration, reframing valued activities, and non-bothersome conceptualisation of symptoms). These mechanisms were variously influenced by thoughts, feelings, social and contextual factors.

As Study 2 explored satisfaction in the first 1–2 years post-TKR, a follow-up study (Study 3, Chapter 6) of patient satisfaction 3–4 years after TKR was conducted to test the assumptions of the conceptual model.

In Study 3, participants from Study 2 were purposively sampled to test all dimensions of the conceptual model, including representation from each of the pathways (full glass, glass half empty, glass half full), and influencing mechanisms (recalibration, reframing valued activities, and conceptualisation of symptoms). This enquiry found conceptualisations of satisfaction, as well as the factors that influence it, were still relevant 3–4 years after TKR surgery. Satisfaction was also found to be modifiable; people could change their level of satisfaction as well as the factors that influenced their level of satisfaction. However, beliefs relating to the influence of aging on persistent knee symptoms and functional limitations were more dominant in this follow-up study.

8.3 Situating the conceptual model

The insights into patient satisfaction after TKR provided by Study 2 and 3 have not been previously described in the orthopaedic literature. The conceptual model developed in Study 2 and supported in Study 3 provides a novel understanding as to how patients arrive at high and low levels of satisfaction following TKR. In particular, the model indicates that our understanding of satisfaction may be strengthened by accounting for the following key findings:

- The meaning of satisfaction to the patient may differ depending on whether they are satisfied or not.
- High satisfaction does not necessarily relate to significant improvements in pain and function; low satisfaction does not necessarily relate to a lack of improvement in pain and function.
- In those patients with persistent symptoms or functional limitations, satisfaction likely reflects their adaptability, through three key mechanism of change (recalibration, reframing valued activities, and conceptualisation of symptoms), influenced by thoughts, feelings, social and contextual factors.
- Satisfaction remains changeable up to four years post-TKR.
- The factors underpinning satisfaction may provide potential targets for interventions post-TKR.

To understand how these findings extend our understanding of satisfaction after TKR, it may be useful to situate the conceptual model within extant satisfaction literature. The following section will compare and contrast the conceptual model with the key literature pertaining to patient satisfaction after TKR.

Although high levels of patient satisfaction are often related to clinically meaningful improvements in pain and function from TKR, this is not always the case (Baker et al., 2007). The development of the conceptual model provides contextualisation of this confusing relationship between satisfaction and clinical outcomes. The findings illustrate how for people with ongoing symptoms or functional limitations, the integration of the three mechanism of change with psychosocial factors can determine their personal level of satisfaction. Thus, patients may report high satisfaction in the presence of persistent symptoms or functional limitations through adapting their lifestyle to their current state, perceiving their outcomes as successful compared to others, or adopting a non-threatening understandings of their symptoms and functional limitation. Conversely, for patients with meaningful improvements in pain and function post-TKR but reports of lower satisfaction, the absence, or, negative influence of the three mechanisms of changes in the presence of negative thoughts, feelings, social and contextual factors can result in lower levels of satisfaction. Thus, the conceptual model provides explanation for how, through their adaptability, patients can arrive at satisfaction levels that may not reflect their pain and function outcomes post-TKR.

The conceptual model further compliments and extends on the long held assumption that patient expectations are a determinant of patient satisfaction. These assumptions date back to the 1980s, when one of the most popular satisfaction theories was developed by Linder-Pelz (1982). As a definition of 'patient satisfaction' was absent during this time, Linder-Pelz drew on job satisfaction literature to create an understanding of this construct. Under this extension of job satisfaction, patient satisfaction was thought to mean a positive appraisal of distinct dimensions of the health care. From this definition, several hypotheses of the determinants of satisfaction were created, with the primary one being satisfaction as a sum of the products of expectations and values regarding various aspects of care.

Linder-Pelz surmised that expectations were a likely determinant of patient satisfaction due to the presence of expectations in extant job satisfaction and health care literature during the time of publication. However, when this value-expectancy model of patient satisfaction was tested quantitatively, this theory failed to show alignment with satisfaction outcomes; the value-expectancy model only explained 8% variance in satisfaction scores (Linder-Pelz, 1982). This lack of alignment may have been a product of inadequate content validity of the utilised satisfaction questionnaires, in addition to a lack of theoretical understanding of the construct of patient satisfaction. Despite this, the hypothesis presented by Linder-Pelz shares some parallels with the findings of the conceptual model developed in this thesis, in particular, patient expectations. In accordance with Linder-Pelz's hypothesis, expectations were shaped alongside values. The conceptual model developed in this thesis extends this understanding of expectations by demonstrating how they could be shaped through various psychosocial factors. Linder-Pelz's theories of patient satisfaction were likely limited by being an extension of existing literature related to the psychological concept of satisfaction and job satisfaction, rather than patient satisfaction *per se*. Qualitative enquiry into patient satisfaction prior to hypothesis generation and theory testing may have captured more nuanced dimensions of patient satisfaction. In particular, the role of expectations in patient satisfaction may be considered a 'moving target'; expectations can change in alignment with the adaptability of patients. Thus, in the presence of persistent symptoms or functional limitations, patient adaptability may be a more central determinant of patient satisfaction than the patient's expectations.

Understanding patient expectations as a 'moving target' also provides context for the inconsistencies in recent quantitative research seeking to predict post-TKR satisfaction through fulfilment of pre-operative expectations (Adie et al., 2012; Bourne et al., 2010; Culliton et al., 2012; Scott et al., 2010). As the conceptual model in this thesis indicates, people can re-evaluate what they consider as an important outcome after TKR based on their current symptoms and functional capacity. This fluid nature of expectations results in a construct that is challenging to capture in studies seeking to predict satisfaction. While the findings from this doctoral thesis indicate that expectations should not be

considered the sole determinant of satisfaction, the findings also suggest that pre-operative patients require education to provide them with realistic ideals for post-operative outcomes. For example, those who were dissatisfied who desired a complete resolution of pain and functional limitations may have benefited from pre-operative consultation to address the likelihood of persistent symptoms and functional limitations. This highlights the need for shared decision making where the potential risks, benefits, and likely outcomes are clearly articulated prior to undergoing surgery. Patient education in this way may negate the need of the patient to go through a process of adapting to unexpected post-TKR symptoms or functional limitations, or result in patients choosing non-operative care rather.

The conceptual model also supports other research investigating the role of pre-operative anxiety and depression predicting lower levels of satisfaction post-TKR (Khatib et al., 2015). Although this thesis was conducted post-TKR and thus pre-TKR psychological status is not known, the findings indicate the salience of negative thoughts and feelings in pathways to lower satisfaction. In particular, participants' negative conceptualisation of symptoms, such as holding a belief that their prosthesis was put in incorrectly, was often facilitated by distress and worry. This negative conceptualisation of symptoms also tended to be catastrophic in nature, whereby the participants believed their symptoms were caused by a serious surgical error.

Similarly, the conceptual model supports research that has reported the predictive influence of socio-economic factors on levels of satisfaction after TKR, in particular, lower income, being female, and being of a minority group have predicted lower levels of satisfaction in quantitative research (Barrack et al., 2014). Although the present study did not capture these variables specifically, the influence of social and contextual factors played an important role in influencing the three mechanisms of change. For example, participants with a lack of social, family, or community support, either emotionally or financially, tended to report lower levels of satisfaction. However, those that reported high levels of support tended to be more satisfied.

The follow-up qualitative investigation, Study 3, also provides potential reasons for why quantitative research has found older patients report higher levels of satisfaction than their younger counterparts (Baker et al., 2007). For the participants in the follow-up study, age presented as a dominant social and contextual factor that facilitated the three mechanisms of change. For example, if a participant continued to experience persistent pain or was unable to conduct activities they enjoyed, they often perceived their age to be the reason why they may be experiencing these difficulties. It appeared that participants felt it was socially acceptable and expected for people of their age to experience pain and functional limitations, despite having undergone a TKR. This finding was in alignment with previous quantitative researching into aging, where negative age-related beliefs were associated with decreased leisure and social pursuits (Robertson & Kenny, 2016). Although no definitive explanation can be given for why age-related beliefs were more dominant in the follow-up study, it may be that in the earlier inquiry participants believed that the TKR still had time to resolve or take 'full effect'. This was supported by some participants indicating that they believed their knee pain was indicative of their knee still healing, 1–2 years after TKR. However, in the follow-up Study 3, 3–4 years after TKR, this was likely no longer a plausible explanation for their symptoms due to the longer time since their operation. Instead, participants conceptualised their ongoing symptoms and functional limitations as a result of the effects of their age.

This follow-up investigation also provided novel insights as to how satisfaction after TKR can change over time. Importantly, the analysis revealed how levels of satisfaction, and the factors that influence satisfaction levels, are still potentially changeable at four years post-TKR. Due to this, patient satisfaction may not be considered a stable construct. Further, given the modifiable nature of satisfaction, patients could benefit from support towards being satisfied in the longer term.

The conceptual model further demonstrates how satisfaction cannot be reduced to a single construct. Rather, in the presence of ongoing symptoms and functional limitations, satisfaction levels are the integration of various psychosocial processes, which will differ from person to person. In this way,

previous research that has investigated determinants such as therapeutic alliance (Batbaatar et al., 2017; Sitzia & Wood, 1997; Ware et al., 1978), equity theory (Linder-Pelz, 1982), and embodiment (Hudak, Hogg-Johnson et al., 2004) are relevant to the construct of satisfaction, but do not solely explain it. Therapeutic alliance was identified in Study 2 and 3 as a key social and contextual factor that could positively or negatively influence satisfaction levels. In particular, if a patient had a positive therapeutic alliance with their surgeon, they appeared to trust them more and have more confidence that the TKR surgery was of a high quality. In turn, the patient was less worried about persistent symptoms or functional limitations as they did not attribute these to surgical error. Alternatively, participants who had a negative relationship with their surgeon tended to be more sceptical about the quality of the surgery, thus, would be concerned that their symptoms were driven by surgical error. Likewise, equity theory in the form of social comparison was also an important social and contextual factor in the conceptual model. Social comparison could positively or negatively influence the mechanism 'recalibration of symptoms'; if a person felt their TKR outcomes were better than others they could experience a positive recalibration of symptoms and report satisfaction but if a person believed their outcomes were worse than others, they experienced a negative calibration of symptoms and were less satisfied. Lastly, embodiment theory, which reflects the relationship one shares with a body part (completely integrated or separate from the body or mind) (Hudak, McKeever et al., 2007; Lape et al., 2019), presented in the form of symptom coherency and was captured under the mechanism 'conceptualisation of symptoms'. Where patients had a non-bothersome understanding of their persistent knee symptoms, they reported higher satisfaction compared to those that had a bothersome conceptualisation of their symptoms. A participant's positive or negative conceptualisation of symptoms may be informed by education from their surgeon, individual and social health beliefs, and an individual's health literacy. Although not a direct representation of embodiment theory, the conceptual model illustrates the importance of how patients integrate and understand their symptoms on pathways to high and low levels of satisfaction. Although each of these theories were relevant to the determinants of patient satisfaction, their level of salience varied between participants. Due to this, it

was important to capture the overarching themes within a conceptual model that integrated all possible reasons for patients reporting high and low levels of satisfaction following TKR.

The conceptual model developed in this doctoral thesis shares parallels with existing qualitative research into satisfaction after TKR. In particular, a qualitative study published at the same time as Study 2 of this thesis investigated dissatisfaction with the outcomes of TKR (Mahdi et al., 2020). In this content analysis, the term ‘dissatisfaction’ was not found to resonate with the participants in the study, thus, the researchers changed the term to ‘discontentment’. The main category identified in the study underpinning discontentment was ‘unfulfilled expectations and needs’. In respect to the findings of Studies 2 and 3 in this thesis, expectations are considered part of the conceptualisation of satisfaction, but not the key component. In particular, some satisfied participants demonstrated the ability to be satisfied despite feeling their expectations were not met. Likewise, some dissatisfied participants reported fulfilled expectations but dissatisfaction due to other factors they did not anticipate. Thus, we know that expectations may change through the TKR journey and have variable salience to a person’s level of satisfaction. It is likely that because only dissatisfied patients were recruited in the study by Mahdi et al. (2020), rather than a broad sample encompassing high and low satisfaction in addition to a range of pain and function outcomes, the role of expectations was not fully realised in the broader context of satisfaction. The conceptual model developed in this thesis presents a greater emphasis on patients being able to adjust and adapt to their current status, rather than on expectations alone, in pathways to high and low levels of satisfaction. However, the sub-categories identified in the study by Mahdi et al. (2020) align with the findings from the present thesis. The parallels in finding are presented below in Table 8.1.

Table 8.1. Comparison of findings to Mahdi et al. (2020)

Sub categories in Mahdi et al. (2020)	Aspects of the conceptual model in the doctoral thesis
Bothersome knee pain	Ongoing symptoms or functional limitations were an entry to high or low satisfaction, influenced by the three mechanisms of change and thoughts, feelings, social and contextual factors.

Dreading that changes be complications	Captured under the mechanism 'bothersome conceptualisation of symptoms', which resulted in low satisfaction.
Inability to perform my valued activities	Captured under the mechanism 'no reframing activities', which resulted in low satisfaction.
Lacking support from health care	Captured under a social and contextual factors of either 'negative therapeutic alliance' or 'poor health care support'. These social and contextual could act as a negative influence on the three mechanisms.

These similar findings provide further support for the dependability and confirmability of this body of work. However, the level of integration of identified factors differed, which relates to the choice of methodology. The grounded theory approach taken by this doctoral thesis facilitated a greater conceptualisation of the process of satisfaction by describing how various psychosocial factors integrate to inform levels of high and low satisfaction, rather than a focus on extracting categories from the data related to satisfaction (Cho & Lee, 2014). This was primarily achieved through the thorough sampling approach and iterative analysis aligned with constructivist grounded theory. Resultantly, I was able to identify patterns in the interaction of the various psychosocial factors between those that were and were not satisfied, and how this related to their outcomes of pain and function. An additional important contribution from the study by Mahdi et al. (2020) was identifying the lack of resonance the term 'dissatisfaction' had with the participants. Although not captured in this research as the aims were concerned with theorising patient satisfaction, this may be an important avenue to explore in future research to determine better terminology to capture the patient's experience post-TKR.

Findings from another qualitative enquiry into the outcomes of TKR by Woolhead et al. (2005) also shares commonalities with the conceptual model developed in this thesis (Woolhead et al., 2005). The authors interviewed 25 participants three months before TKR, with 10 interviewed again six months after surgery. Data were analysed according to the method of constant comparison and analysis was governed by capturing data that related to the perception of outcome from the patient's point of view. In this study, most participants reported a good outcome from their TKR, however, further discussion revealed difficulties with continued pain and function. The authors concluded that participants had both

'public' and 'private' expression of their TKR, whereby their public expression was a socially desirable response of positive outcome and the private expression revealed continued difficulties. Another fundamental finding of this research was the desire of participants to rationalise, adapt to, and make sense of their persistent pain and disability. Woolhead et al. (2005) described that in the evaluation of health care, participants may introduce changes to their meaning of their self-evaluation to arrive at positive appraisals of their TKR. In previous research investigating measurement error in quality-of-life questionnaires, this phenomenon has been termed 'response shift'. Patients may change their internal standards, values, or meaning of quality of life and therefore assess their outcomes differently than if they had not adapted to their current state. As described in Chapter 1, response shift encompasses three key elements; recalibration, reprioritisation, and reconceptualisation. The finding from Woolhead et al. (2005) and the response shift theory strongly paralleled with the 'glass half full' pathway in this doctoral thesis. However, the conceptual model extends on the response shift literature by applying it to a TKR population. The integration of response shift into an understanding of patient satisfaction after TKR will now be discussed in more detail.

8.4 Response shift in satisfaction after total knee replacement

While response shift is considered a form of measurement bias in quality-of-life questionnaires, it also provides a framework for understanding how people can arrive at a positive appraisal of their health state despite no objective changes. During the analysis of Study 2, it was noted that participants either changed their level of satisfaction from what they indicated in their 12 month data, or reported satisfaction despite persistent symptoms or functional limitations. A process of adaptation was a common pattern within these participants, which shared similarities with the response shift bias seen in the quality-of-life literature. The model developed in this thesis adapted response shift theory to a TKR context and, importantly, extended it to explain why participants report low versus high levels of satisfaction in the face of continuing knee symptoms and/or functional limitations.

The first pattern of adaptation observed in this thesis was participants evaluating the success of their TKR outcomes based on how they perceived the outcomes of others. This was termed 'recalibration of symptoms', and facilitated a higher level of satisfaction if a participant saw people who they perceived as worse off than themselves, or saw a diverse range of pain and function outcomes. However, this pattern also occurred in a negative direction where a participant would arrive at a high rating of symptom severity if they were exposed to others who they perceived as better off than themselves, resulting in a lower level of satisfaction. Recalibration of symptoms occurred in the presence of the social factor of 'social comparison', which affected participants in either a positive or negative direction. This is similar to the process of 'recalibration' described in the response shift literature, where a person who experiences pain in a different area that is more painful than their TKR pain, or, is exposed to others who have more severe pain than them in a changes their understanding as to what 'severe pain' is, thus resulting in a lower rating of their pain despite no change in pain intensity (Barclay-Goddard et al., 2009; Blome & Augustin, 2015). Due to this recalibration, the person arrives at a higher rating of quality of life.

The next pattern of adaptation was the process of participants finding valued activities that matched their capacity, rather than their original targets for outcome. This was termed 'reframing valued activities' and was reflected by participants modifying their current activities, or trying new activities. Conversely, participants who felt they could not reframe their valued activities to match their pain levels and functional capacity, reported lower satisfaction. This study found the capacity for participants to reframe their valued activities was influenced by support from others, where the presence of this could assist their participation. Likewise, positive thoughts and feelings such as optimism, self-efficacy, and gratitude assisted participants to positively frame their ability to conduct valued activities. Conversely, a lack of support and negative thoughts and feelings such as distress, worry and disappointment negatively framed participants' current capacity to conduct valued activities. This was aligned with the process of 'reprioritisation' described in the response shift literature where individuals create new ideals of what is important to them, which are in alignment with their current health state (Barclay-Goddard et

al., 2009; Blome & Augustin, 2015). In this context reprioritisation could extend beyond functional activities and include spending time with loved ones. Due to redefining what is important to them, people then indicate a high quality of life.

The last pattern of adaptation was how people understood their symptoms. This was termed 'conceptualisation of symptoms', which could either be bothersome in those that reported low satisfaction, or non-bothersome in those that reported high satisfaction. In Study 2 and 3, a key finding was that a participant's conceptualisation of symptoms could be informed by social and contextual factors, particularly their relationship with their surgeon. A negative relationship often resulted in the participant blaming their surgeon for a surgical error, which they perceived as the reason for their persistent symptoms and functional limitations, while a positive relationship instilled confidence in the participant that the surgery was of high quality. Symptoms were often understood through social narratives from family or friends, which were either helpful or unhelpful. Thoughts and feelings had the potential to mediate the response to symptoms, where dissatisfied participants became worried, distressed or depressed about their persistent symptoms or functional limitations. Alternatively, those with high satisfaction tended to not worry about their symptoms, nor attribute any catastrophic reasoning to why they may be experiencing them. Conceptualisation of symptoms was similar to the process of 'reconceptualisation' described in response shift literature, whereby people redefine their definition of a high quality of life in alignment with their changed health state (Barclay-Goddard et al., 2009; Blome & Augustin, 2015). Through this new definition of what quality of life means to a person they then report high levels of quality of life.

These patterns of adaptability, aligned with response shift theory, also share some parallels with Acceptance and Commitment Theory (ACT) models of therapy. In the context of chronic pain, the objective of ACT therapy is to decrease the interference of pain and improve functioning with value-driven action, where the mechanism is thought to be acceptance (Hayes & Duckworth, 2006; Wetherell et al., 2011). Under ACT, the end goal of acceptance encourages chronic pain patients to let go of their

struggle with pain and to increase their focus towards value-based action (Hayes et al., 2006). Patients are thought to achieve this acceptance through “how a person: (1) adapts to fluctuating situational demands, (2) reconfigures mental resources, (3) shifts perspective, and (4) balances competing desires, needs, and life domains. Thus, rather than focusing on specific content (within a person), definitions of psychological flexibility have to incorporate repeated transactions between people and their environmental contexts” (Kashdan & Rottenberg, 2010). In this body of work, participants showed signs of acceptance such as coming to terms with ongoing symptoms or functional limitations, and their perceptions of age-related limitations. Whether this acceptance of their current state occurred as a result of, or prior to, the three key mechanisms is not clear and may require future inquiry to better understand this relationship in a TKR context.

This framework of satisfaction, based on an adaption of response shift theory, largely encompasses modifiable factors. In particular, unhelpful beliefs about symptoms, the ability to do valued activities, or normalising ongoing symptoms or functional limitations can all be targets for change. Additionally, thoughts, feelings, social, and contextual factors may be modified with appropriate health professional intervention. Due to this, the framework may be useful to assist those that are dissatisfied feel more satisfied after TKR. The following section will therefore explore the clinical application of this conceptual model to improving levels of satisfaction after TKR.

8.5 Implications for clinical practice

The conceptual model presents a novel framework for clinicians to facilitate an improvement in satisfaction levels for patients after TKR. Recommendations for how clinicians may use the conceptual model have been described in both Study 2 and Study 3. This section will discuss how the findings from this work may integrate into current Australian models of care for TKR.

The most recent models of care available for post-TKR include the Western Australian (WA) Elective Joint Replacement Service Model of Care developed in 2010, and the New South Wales (NSW) Evidence

Review Preoperative, Perioperative and Postoperative Care of Elective Primary Total Hip and Knee replacement developed in 2012 (Agency for Clinical Innovation, 2012; Department of Health, 2010). Both reviews concluded there was insufficient evidence to support the use of rehabilitation post-TKR, which was owed to the lack of high-quality research and relatively small effect sizes of rehabilitation relative to the effect size of the surgery itself. Further, high variation in the outcomes measures used to determine effectiveness, and definitions for what rehabilitation encompasses makes drawing conclusions on the existing body of evidence difficult. Both reviews did not identify evidence for rehabilitation after five or six months, or rehabilitation initiated in the sub-acute period. Despite the lack of evidence and guidance for rehabilitation after TKR, both remarked on how widely used post-TKR rehabilitation is in Australia. However, a systematic review conducted in 2021 examined the clinical and cost effectiveness of physiotherapy interventions for TKR, and found a benefit of physiotherapy for improving pain, function and range of motion up to 13 weeks post-surgery (Fatoye et al., 2021). Despite the clinical benefits, physiotherapy programs in the short term were found to be resource intensive and not cost effective compared to controls and, in alignment with the WA model of care and NSW evidence review, there was insufficient evidence to establish the benefit of physiotherapy in the long term. A limitation of this systematic review was the broad definition of physiotherapy, which included inpatient rehabilitation, a 10-day multidisciplinary rehabilitation program, physiotherapy at home, and group exercises once a week, with the intervention period ranging from 1 week to 12 months.

Presently, a significant gap exists in how to best support patients in their post-TKR journey, particularly beyond the first 3 month post-surgery (Agency for Clinical Innovation, 2012; Department of Health, 2010; Fatoye et al., 2021). The existing literature for post-TKR rehabilitation is limited to functional interventions targeting mobility, range of motion and pain (Agency for Clinical Innovation, 2012; Department of Health, 2010; Fatoye et al., 2021). Although the findings from this body of work suggest ongoing symptoms and functional limitations is the entry pathway to lower satisfaction and functional rehabilitation is therefore a logical first line of intervention, it is likely that some patients will not experience further improvements in clinical outcomes (Agency for Clinical Innovation, 2012). Due to

this, there is a need to maximise the level of satisfaction with current state in the face of ongoing symptoms or functional limitations. To achieve this, an individual approach may be needed beginning with positive communication techniques, such as validating and reassuring language, and active listening, as well as shared decision making regarding possible treatment pathways. Following this, intervention may target both the physical and psychosocial barriers to improving levels of satisfaction, as depicted by the conceptual model in Study 2. The treatment pathways flow diagram proposed in Study 3 may aid individualised treatment decision making for patients with low satisfaction, troubled by persistent symptoms and functional limitations, up to four years post-surgery. Although future research is required to test the efficacy of this treatment framework, in light of the current gaps in knowledge for how to support this patient group, this framework may best positioned as a starting point for high-quality, individualised biopsychosocial care up to four years post-TKR.

With respect to follow-up periods, the WA guidelines recommend a follow-up of all patients at intervals of three months, 12 months, five years, 10 years and then two yearly thereafter due to risk of aseptic prosthesis loosening after 10 years. However, the NSW evidence review reported current evidence is of low quality and thus does not allow a determination of a recommendation for follow-up; however, the evidence review proposed that face-to-face follow-up of asymptomatic TJR may be excessively costly and unnecessary. Both the WA and NSW guidelines are primarily concerned with the detection of post-operative complications. While this is important, neither guideline provides suggestions for how frequently to monitor and support those troubled by ongoing symptoms or functional limitations. The results from this body of work suggest that some patients may require support up to four years post-TKR for issues unrelated to surgical complications. The results from Studies 2 and 3 indicate positive communication techniques and forging a strong therapeutic alliance are highly important during this post-operative period to ensure that patients feel heard, and appropriate education can be provided to mediate concerns about persistent symptoms or functional limitations. In alignment with the NSW evidence review, this body of work suggests support may not be required for those reporting high satisfaction and an absence of symptoms or functional limitations. However, satisfied and dissatisfied

patients with ongoing symptoms and functional limitations may benefit from education regarding the ability to improve their outcomes up to four years post-TKR. Further research is required to determine the frequency of follow-up within this four year period, and continued follow-up beyond this. However, the findings from this body of provide an initial guideline for the need for ongoing support in some patients up to four years post-TKR.

8.5.1 Further considerations for the clinical use of the conceptual model

Despite this novel framework to improve satisfaction levels following TKR, it is acknowledged that the process of acceptance and adaptation will result in some patients reporting high satisfaction despite significant ongoing pain or functional limitations. In Study 2, this group of patients was able to accept and adapt to their current state through the three mechanism of change in the presence of positive thoughts, feelings, social and contextual factors. In Study 3, this acceptance and adaptation process was heavily facilitated by age-related beliefs. Due to this, the model suggests there may be a difference between appropriate and inappropriate acceptance of and adaptability to symptomatic and functional outcomes post-TKR. Although not definitively proven, it is possible that there is a patient group that is not seeking appropriate care due to just 'putting up with' less than optimal outcomes. This may result in progressive disability and comorbidities later in life as a result of factors such as inactivity, weight gain, increased falls risk, loss of social roles and poor mental health that require ongoing health care interventions. From a financial perspective of government health care services, it may be beneficial to intervene in this patient group in order to prevent the downstream need for support services. In addition to individualised care detailed in Studies 2 and 3, this may also encompass societal interventions related to addressing negative perceptions of aging and ageist beliefs (Hausknecht et al., 2020; Levy, 2001; WHO, 2020), as well as more general 'wellness' initiatives for later life health, similar to Living Longer Living Stronger initiatives that are targeted at over 50s (COTA Australia, 2021). However, the individual's perception of high satisfaction may be important to honour if our health care system is striving for positive patient-reported appraisals of care and outcomes. However, it is also

possible that by encouraging patients who report satisfaction despite sub-optimal outcomes to do more, some may end up dissatisfied due to being exposed to activities they cannot do, although there is no definitive evidence for this.

8.6 Implications for measurement

Patient satisfaction is considered a core outcome post-TKR (Singh et al., 2017), with scores commonly used to justify the continued use of TKR surgery to patients, clinicians and policy makers (Ring & Leopold, 2015). However, the findings from this doctoral thesis raise important considerations if measurement of post-TKR satisfaction is to be continued. The results from Study 1 did not find evidence of adequate content validity in any existing TKR patient satisfaction questionnaires. Content validity is considered the most important measurement property of a patient-reported outcome measure as it ensures three key components of a questionnaire are met: (i) relevance to the construct of interest, (ii) comprehensiveness in terms of capturing all key aspects of the construct, and (iii) comprehensibility for the intended patient group (Terwee et al., 2017, 2018). To achieve these three aspects of content validity, the COSMIN group recommend beginning with a PROM development study where the concept for the PROM is developed, as well a pilot test of the draft PROM (Terwee et al., 2018). The development study must include a clear description and theoretical origin of the construct of interest, use of appropriate qualitative methods to identify relevant PROM items for the construct and study population, and, importantly, be performed in a sample representing the target population. Following the development of the PROM, the COSMIN group recommend a specific content validity study targeting the relevance, comprehensiveness and comprehensibility of the PROM (Terwee et al., 2017). To achieve this, appropriate qualitative techniques must be used with the target population about each of the three dimensions of content validity.

In addition to the lack of involvement of TKR patients in the development of satisfaction questionnaires, another major limitation of satisfaction questionnaire development was an absence of a clear theoretical origin of patient satisfaction as a construct. The findings from this doctoral thesis have made

grounds in the underpinning theory of the construct, demonstrating how patient satisfaction may be a stronger reflection of adaptability in the presence of ongoing pain and functional limitations. This brings into question the utility of these metrics if they are assumed to reflect meaningful benefit from the surgery. Likewise, a patient can demonstrate positive clinical outcomes yet report dissatisfaction, which may unfairly undermine the quality of the surgical procedure. Given the complex processes underlying a satisfaction score reported via a questionnaire, the reductive nature of the current satisfaction questionnaires may risk censoring patients in their appraisals of the true 'success' of their TKR. Due to this, the continued use of patient satisfaction questionnaires as a reflection of meaningful benefit, or 'success', from TKR may not be appropriate in the context of large scale quantitative research. A potentially more useful questionnaire design may include open-ended questions such as *'is there anything about your TKR that is troubling you?'* or *'are there any aspects of your TKR outcomes that are bothersome for you?'* This alternative language may allow patients to more directly speak to their TKR outcomes and how these are impacting on their lives, particularly in those who report high satisfaction in the face of ongoing symptoms and functional limitations. With respect to the use of patient satisfaction with TKR as an outcome in future research, future enquiry is needed to work with post-TKR patients to identify optimal questionnaire designs to capture the patient's appraisal of outcome for this purpose.

Despite the issues in measuring patient satisfaction for the purposes of research, the evaluation of satisfaction may act as a useful vehicle to understand patient experiences within a clinical context. Unlike research, one-to-one clinical consultations offer the opportunity to explore the reasons why an individual has indicated 'dissatisfied' on their satisfaction questionnaire. Likewise, if a person describes struggling with functional limitations and persistent pain but reports high satisfaction, the clinician can further explore the basis of these limitations in order to address them. The use of satisfaction in this context must, however, consider the multidimensional nature of this construct and influence of psychosocial factors. The treatment pathways diagram in Study 3 offers guidance for how clinicians can address low satisfaction after TKR in an outpatient setting.

8.7 Strengths and limitations

The findings from this body of work must be considered in light of the strengths and weaknesses of the methodological approach. The main design considerations for Studies 1, 2 and 3 of these thesis have been discussed in the manuscript chapters 5, 6 and 7 respectively. In this section, the discussion of strengths and weaknesses will focus on the original research conducted in studies 2 and 3, and further contextualise it to the constructivist paradigm.

The purposive and theoretical sampling strategies employed in Studies 2 and 3 of this thesis may limit the generalisability of the findings. However, consistent with the qualitative approach, I aimed to capture a diverse range of experiences in Study 2, to understand the construct of satisfaction from 'all angles', unlike the study of Mahdi et al. (2020). In Study 3, sampling was aimed at testing the findings of Study 2, and in this study the maximum amount of diversity possible in terms of representing the three pathways and mechanisms of the conceptual model was achieved. For transferability of these findings to a different context, a detailed description of the study population and setting has been provided in each manuscript.

Similarly, in Study 2, twenty-eight participants declined to participate and a further twelve did not respond to contact. It is possible that these patients could have been on a different satisfaction trajectory. However I was able to purposively sample from a large registry where specific 'profiles' of individuals could be sought. For example, if a man in his 70s who was classified as a non-responder who was satisfied declined to participate, I was able to seek another participant of a very similar profile to interview. Further, I was purposeful in selecting a range of ages and ethnic backgrounds, a range of WOMAC scores, indigenous persons, and representative proportion of gender. Due to this, it is likely enough diversity was sought to understand satisfaction from multiple view-points.

Patient satisfaction was only explored from the participants' perspective. Thus the perspectives of surgeons or family members were not captured in this study, which may have provided rich insights to

the construct of satisfaction. However, consistent with the constructivist paradigm (Charmaz, 2015), this body of work was concerned with understanding the participant's construction of satisfaction, and their reasons for why they were or were not satisfied with their TKR outcomes. In this way, the participants' perceptions of outcomes were considered 'truth'. This is a novel approach to understanding satisfaction in the orthopaedic research field, as this constructivist stance to understanding patient satisfaction has not been previously conducted. This approach resulted in novel insights into the construct of satisfaction that could guide targeted solutions for patients troubled by ongoing symptoms or functional limitations.

This body of work also depicts a process that occurs over time, with data captured at two time points, 1–2 and 3–4 years post-TKR. Interviews prior to TKR may have generated useful insights related to the participants' pre-operative beliefs about what would constitute high satisfaction post-TKR. Subsequent interviews post-TKR could have then asked the participants to reflect on their pre-TKR satisfaction beliefs, and explore the salience of this to their current level of satisfaction. However, the lack of pre-operative data does not detract from the findings of this body of work. Under the constructivist paradigm, the participants' construction of previous events is integral to understanding pathways to high and low levels of satisfaction. In this way, although some accounts may not be 'truth' in an objective sense, the participant's understanding and subsequent integration of previous events strengthens the understanding of satisfaction. For example, one of the participants in Study 3 who negatively transitioned explained that her persistent pain was a result of recent falls and she did not experience pain at the time of her previous interview. However, in the baseline interview this participant reported pain and functional limitations. Although objectively this participant's recall is incorrect, how this participant has constructed her TKR journey and arrived at an understanding of her symptoms is invaluable to the understanding of this construct; the falls and subsequent dismissal from health professional had resulted in concern and fear about her symptoms and function, which was so salient she did not recall her previous symptoms from when she reported high satisfaction.

As Study 3 required a purposive sample from Study 2, it is possible that all transitions pathways were not fully represented. In particular, the 'full-glass' pathway did not demonstrate evidence of participants lowering their level of satisfaction, or developing troublesome symptoms or functional limitations. It is unknown how these participants would respond to a change in the symptom or function state, or, if this pathway is more stable in nature compared to the other two pathways. Future research with larger sample sizes may be able to explore the trajectory of this outcome pathway. Further, due to the constructivist approach to this body of work, objective differences in the severity of symptoms or functional limitations was not captured between each of the pathways. Instead, the focus of this body of work was exploring how the presence and perception of symptoms or functional limitations was integrated into an individual understanding of satisfaction after TKR. Future mixed methods research may be concerned with aligning objective markers of severity in symptoms or functional limitations with qualitative accounts of satisfaction post-TKR.

Although constructivist grounded theory acknowledges the prior knowledge and experience of the researcher, it is important the researcher prioritises the participant's accounts. In this body of work I had the world view of a woman physiotherapist, with limited qualitative research experience. Prior understandings of the multifactorial nature of pain and function were beneficial in the analytic process, however, I maintained a consistent reflexive practice to ensure I was championing the views of the participants through my researcher 'lens'. Not only did this allow me to constantly reflect on the narratives coming through the data, but it also reflect on my journey as a qualitative researcher. As has been described in Chapter 3 of this thesis, I maintained an audit trail, including reflexive memos, coding books, and thematic grouping. This was consistent with the constructivist paradigm where the construction of events from the participant is central to the analysis and findings, however, co-construction of knowledge with the researchers is acknowledged.

Member checking in the traditional sense of returned findings and transcripts to participants for verification was not conducted in this research. Although this may be considered a limitation to the

authenticity of this body of work, traditional member checking was not considered appropriate for this research design. Given much of the analysis was concerned with latent themes, including psychological processes, patients were not expected to have this level of health literacy to provide feedback on the findings. Additionally, as I was immersed in the data through listening to multiple accounts of the phenomenon, I may also be better placed to identify these latent patterns that the participant may not be aware of (Glaser, 2002). Further, returning transcripts may be a way to enable participants to reconstruct their narrative through deleting extracts if they perceive as representing them in a negative light, or if they feel they no longer represents their experiences or beliefs (Birt et al., 2016). This process of removing or changing data is in conflict with a constructivist paradigm, where knowledge is considered co-constructed between the researcher and the researched, and the construction of knowledge at one point in time is considered 'valid' in itself (Birt et al., 2016). Instead, I performed member checking within the interviews by using phrases such as: *'If I am understanding you correctly, you are telling me ... Do you feel like that is accurate?'* In this way, participants were still presented with the opportunity to clarify their meanings if I had interpreted them incorrectly. Although this approach to member checking has concerns with 'leading' or 'guiding' the interviewee, this appeared the most appropriate way for participants to clarify meaning given the purpose of this study. Further, the follow-up interviews in Study 3 presented an opportunity to explore reasons why the participants may have changed their perceptions from the baseline interview. This process of reflection enabled meaning to be co-constructed between myself and the participants, in keeping with the constructivist approach.

In light of the strengths and limitations of this qualitative research, this body of work sought to honour the individual reasons why participants were or were not satisfied following TKR. In doing so, it is hoped that this information may be clinically useful for patients who are troubled by ongoing symptoms or functional limitations following TKR to become more satisfied with their outcomes.

8.8 Future directions

As previously discussed in Section 8.6, patient satisfaction may not be best placed as an accurate reflection or measure of meaningful benefit from the TKR surgery. Future research may be concerned with qualitatively exploring how patients understand meaningful benefit from TKR, or what they believe are the markers for 'surgical success'. A 'benefit-harm' trade-off alongside qualitative enquiry of meaningful benefit and surgical success may provide patients with a more 'realistic' picture of potential TKR outcomes, which has not been robustly explored in orthopaedics (Dowsey, Scott et al., 2016).

Understanding the benefit-harm trade-off can provide valuable insights into what patients consider the minimum clinically important difference for TKR (Ferreira et al., 2013). As discussed in Chapter 2, the minimum clinically important difference has been defined for outcomes of pain and function for TKR; however, this has been based on anchoring or distribution based methods. The benefit-harm trade-off is considered a more robust way to determine the minimum clinically important difference as it allows patients to consider the benefits of the treatment against the risks, costs, inconveniences of the treatment, and a comparison between the intervention against the control (Ferreira et al., 2013). This may also be explored post-TKR to determine if patients adjust their benefit-harm trade-off, and interpretation of meaningful benefit or surgical success to align with their own outcomes. Exploration of these factors may provide greater understanding of how to best measure the benefits of the TKR for an individual.

As the findings of this body of work are hypothesis-generating in nature, future inquiries may be concerned with testing the assumptions of the conceptual model developed in Study 2. This would require the quantification of the key elements of the model, including the three key mechanisms as well as thoughts, feelings, social and contextual factors. These variables, in addition to measuring satisfaction, would require repeated testing over a four year period to quantitatively capture to process of adaptation and the variables that influence this process.

As patients do not usually have contact with surgeons or other health professionals 12 months post-TKR, and the findings of this thesis indicated dissatisfaction can occur up to four years post-surgery, innovative ways to identify suboptimal satisfaction may be useful. This could include SMS check-in every six to 12 months, which could serve as a low-cost option to flag situations where clinicians could intervene to optimise outcomes. Further research is required to assess the efficacy of monitoring patient outcomes in this way.

Future research may also explore the clinical efficacy of using the conceptual model of patient satisfaction from Study 2 and the treatment pathways diagram from Study 3 to improve satisfaction levels post-TKR. While there was an opportunity to employ mixed methods in this thesis, the findings from the systematic review suggested that existing quantitative questionnaires for satisfaction were inadequate. Due to this, once a satisfaction questionnaire with evidence of content validity has been developed, future research may benefit from a mixed methods repeated single case series design with dissatisfied patient 1–4 years post-TKR to establish feasibility, followed by a pilot randomised control trial then full randomised control trial to evaluate the treatment efficacy. If this research pipeline demonstrates effectiveness and cost-effectiveness of a biopsychosocial intervention to improve outcomes and satisfaction beyond the immediate rehabilitation period, this could be incorporated into recommended care pathways after TKR.

Lastly, as previously discussed, objective differences in the severity of symptoms or functional limitations could not be captured between each of the satisfaction pathways in this body of work. Future mixed methods research may quantitatively capture the severity of ongoing symptoms and functional limitations and align these with qualitative accounts of post-TKR satisfaction. This may be extended to explore the interplay of satisfaction, quality of life, and symptomatic trajectories over the long term. In this way, researchers and clinicians can better understand the interplay between the severity and integration of symptoms and functional limitations to an individual's level of satisfaction, which may better direct treatment pathways.

8.9 Methodological implications

A distinct lack of qualitative research in orthopaedics; a field dominated by a biomedical paradigm, was noted by the candidate during the course of this doctoral thesis. A scope of the highest ranked orthopaedic journals according to the Scimago Journal and Country Rank, that published articles on TJR, retrieved only 13 qualitative articles from inception to June 2020; three in the *Journal of Arthroplasty*, four in *Clinical Orthopaedics and Related Research*, and six in *Osteoarthritis and Cartilage*. Thus, the patient's voice and subsequent research guiding biopsychosocial solutions to patient problems are scarce in the orthopaedic literature.

In seeking to understand the reasons driving this low uptake, a literature search revealed calls for more high-quality qualitative research in health sciences and orthopaedics dating back 30 years. Holman (1992) wrote a commentary piece on how the near sole use of quantitative research in medicine has resulted in flawed standards of practice and research. Holman (1992) purports that high quality patient care requires the co-existence of generality and individuality, which requires the addition of qualitative research to the field. Howard and David (2002) discussed the weak position qualitative research had in orthopaedics and presented an argument for the increase in uptake; clinicians require the qualitative method of patient interviews to arrive at a diagnosis. Later, Beaton and Clark (2009) conducted a MEDLINE search and found only 15 qualitative studies of TKR were published since 1966. In this article the authors explore the utility of qualitative research in orthopaedics and provide guidance on the use of methodology. Varpio et al. (2017) shared a reflection on how qualitative enquiry has morphed to fit a quantitative paradigm to increase its acceptance in health sciences. The authors discuss issues in terminology and how this has a negative impact on the rigour of qualitative research. Braun and Clarke (2020) shared their experiences of reviewers critiquing reflexive thematic analysis against quantitative assessments of rigour and addressed the common misconceptions of this methodology. In particular, the authors call for researchers to better define the type of thematic analysis being conducted, and to identify the philosophical and theoretical assumptions informing the method.

My own experiences in addition to the anecdotal experiences of other musculoskeletal qualitative researchers, with regards to the review process, suggests that the scarcity of qualitative publications in orthopaedics appears to be largely driven by the assumption of editors and reviewers in these fields that qualitative research is essentially 'biased' as it does not conform to quantitative concepts of rigour. This was signposted by orthopaedic reviewers questioning the generalisability of the findings and stating that the purposive sampling approach suffered high amounts of bias (see Appendix 14). Additionally, the reviewers questioned themes that were not salient to all or the majority of participants, and also questioned the 'neutrality' of the researchers (see Appendix 14).

In addition to issues encountered during the review process, as a novice qualitative researcher, I experienced a complicated array of qualitative literature. The various publications and text books often had overlapping approaches, a lack of consistency in terminology, and a lack of practical application of qualitative research to a clinical context. Resultantly, I spent most of my first year of the candidacy making sense of the myriad of texts relevant to understanding and conducting qualitative research. Although this process is acceptable for someone undertaking a PhD, it highlighted the inaccessibility of qualitative research for those who simply want to understand how to interpret and apply it clinically.

In consultation with my supervisors, I identified two key reasons driving the continued low uptake of qualitative research. Firstly, the assumption that qualitative research is biased appears to be stemmed from a lack of understanding of the epistemological differences between qualitative and quantitative approaches to knowledge. This has likely arisen from the historically biomedical approaches to patient care seen in musculoskeletal and orthopaedic practice. Under these approaches, knowledge is assumed objective and measurable. Thus, it is unlikely people from an orthopaedic or musculoskeletal background have had exposure to qualitative 'ways of thinking'. Secondly, this poor understanding of qualitative epistemologies is likely reinforced by a lack of accessible qualitative resources contextualised to a musculoskeletal or orthopaedic setting. As I experienced during the first year of my candidacy, making sense of qualitative epistemologies and the various research designs and theories takes

considerable time. This results in a lack of opportunity for reviewers and consumers of musculoskeletal and orthopaedic research to better understand qualitative approaches to knowledge.

To address these issues, I wrote a five-part series addressing the core concepts of qualitative research and how it applies to an orthopaedic or musculoskeletal clinical setting. The intent of this series is to enhance the understanding qualitative research and how findings from qualitative research might apply to orthopaedic and musculoskeletal clinical practice. This series provides straightforward explanations of the key components of qualitative research. Rather than an exhaustive list of terms, the focus of this series is on how to appraise qualitative research and how to apply qualitative findings to clinical practice. Although explicitly written for orthopaedic and musculoskeletal practitioners as consumers of qualitative research, it was hoped that the series will also be a resource for producers and evaluators of qualitative research in the field of orthopaedics and musculoskeletal clinical science.

This series was written over five instalments. Part 1 focuses on what qualitative research is, and what types of questions qualitative research can help answer in the fields of orthopaedics and musculoskeletal therapy. This is accompanied by a glossary of commonly used qualitative terms as a quick resource to assist consumers of qualitative research when faced with unfamiliar terminology. Part 2 focuses on the core beliefs underpinning qualitative research, which differs from quantitative research. Understanding these core beliefs will help readers interpret the findings of qualitative studies. This section aims to explain the essential foundations for understanding how a qualitative study was done. Part 3 explains qualitative research designs and theory. In this instalment, real qualitative studies from the musculoskeletal field are used as examples to demonstrate how to identify the research design and theory employed, and what this means for the clinical application of the findings. Part 4 describes the methods used by qualitative researchers. This section includes a table with commonly used qualitative methods and description of what they are. Finally, Part 5 explains how to appraise the rigour of a qualitative study. This section provides a table of the trustworthiness criteria and definitions, and discusses the use of rigour checklists.

The series, which is currently under peer review, is presented in the next chapter.

8.10 Conclusions

The effects of an intervention are best measured from the patient's perspective. Satisfaction has been frequently used in orthopaedics to evaluate the patient's perception of meaningful benefit from TKR. However, a lack of theoretical development of this construct has resulted in an inability to understand what is being captured by satisfaction questionnaires, or how they intersect with pain symptoms and functional outcomes. By exploring the patient's perspective on satisfaction, this thesis has provided novel insights to what satisfaction means to patients, and what factors influence high and low levels of satisfaction after TKR.

This body of work found satisfaction to be a multifactorial and fluid construct. In the face of ongoing symptoms or functional limitations, satisfaction was strongly influenced by psychosocial processes, unrelated to the symptoms or function of the TKR. At longer follow-up, satisfaction was found to interact with age-related beliefs, which facilitated a process of acceptance of and adaptation to ongoing symptoms or functional limitations.

Current TKR satisfaction questionnaires are inadequate to capture meaningful benefit after TKR due to their lack of content validity, and the complexity of the construct of satisfaction. Rather, patients are likely to arrive at a certain response level on a satisfaction questionnaire as a result of complex psychological processes that may not relate directly to the level of pain or function of the replaced knee. Where satisfaction questionnaires are interpreted in light of these limitations, they may be used as a marker to guide further questioning in order to understand patient experiences. Where they are assumed to be an accurate reflection of clinically meaningful benefit from TKR, satisfaction questionnaires risk misleading clinicians, patients and policy makers as to the potential benefit or success of TKR.

The findings of this thesis suggests that TKR patients can achieve high levels of satisfaction through a process of adaptation closely aligned with the response shift phenomenon. With guidance from the conceptual model presented in Study 2, and the clinical road map in Study 3, clinicians may use this as a framework to assist dissatisfied patients to feel more satisfied post-TKR. This treatment approach may also be useful for patients reporting high satisfaction who attribute their ongoing symptoms and functional limitations to other factors such as aging. Beginning with positive communication techniques addressing and validating the patients concerns, clinicians can then address pain and functional limitations through functional rehabilitation. The conceptual model from Study 2 can guide practitioners to explore thoughts, feelings, social and contextual factors in addition to the three mechanisms of change, to help patients on their post-TKR journey. The findings from this body of research shows that one underpinning concept cannot explain patient satisfaction, rather, consideration of the multifactorial nature of this construct that will differ from patient to patient is needed.

It is acknowledged that the nature of this research is hypothesis-generating and future research is needed to test the assumptions of the conceptual model in a TKR population. However, this body of work has provided novel insights into the construct of satisfaction after TKR from the patient's perspective. These insights are an important addition to the satisfaction literature, which can inform the next generation of research targeting measurement of meaningful benefit, and interventions to improve outcomes for dissatisfied patients post-TKR.

This thesis will conclude with the five-part manuscript series in response to the low uptake of qualitative research in orthopaedics, described in Chapter 9.

Chapter 9: Qualitative Evidence in Practice

9.1 Introduction

In this final chapter, I present the five-part manuscript series in response to the low uptake of qualitative research in orthopaedics, described in Section 8.9. The series addresses the core concepts of qualitative research using straight forward explanations, as well as how qualitative research can aid high-quality biopsychosocial patient care in orthopaedic and musculoskeletal clinical settings. The series includes the following sections; (1) What is qualitative research and how can it help the musculoskeletal practitioner provide quality musculoskeletal care for patients?; (2) How the Matrix film trilogy can help musculoskeletal practitioners understand the foundations of qualitative research; (3) Phenomeno – what? Understanding what the qualitative researchers have done; (4) A qualitative researcher’s tool kit: methods; and (5) How to spot a high-quality qualitative study. Although I have explicitly written the series for a musculoskeletal audience, it is hope that the series would also be a resource for producers and evaluators of qualitative research in orthopaedics. This series has recently passed the first round of peer review.

9.2 Manuscript series

Part 1: What is qualitative research and how can it help the musculoskeletal practitioner provide quality musculoskeletal care for patients?

The intent of this series is to assist orthopaedic and musculoskeletal practitioners understand qualitative research. This series will also explain how the findings from qualitative research might apply to orthopaedic and musculoskeletal practice, and how to identify a high quality qualitative study. It is acknowledged that the field of qualitative research is broad, and different methodological, philosophical and theoretical standpoints have resulted in diverse qualitative research approaches. This series will not be exploring the depth and nuance associated with these diverse approaches, nor providing an

exhaustive list of terms. Instead, it will provide straightforward explanations of the key building blocks of qualitative research that are relevant to contemporary orthopaedic and musculoskeletal settings.

In this first installment, we will focus on what qualitative research is, how it can assist you as an orthopaedic or musculoskeletal practitioner, and what types of questions qualitative research can help answer. We also provide a glossary of commonly used qualitative terms as a resource for when you are faced with terminology that is unfamiliar to you (see Appendix 15). Throughout this series we will reference key qualitative texts, which we recommend you access once you have read through the basic concepts and explanations provided in this series for those new to qualitative research.

What is qualitative research?

Qualitative researchers “study things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, 2003). Simply put, qualitative research helps us to understand, analyse and interpret meaning, perspectives and experiences; focussing on the ‘how’ and ‘why’ of these phenomena. Qualitative studies are commonly hypothesis- generating, however, they serve other functions such as exploring individual cases in great depth. They may also be used in mixed-methods designs to explain, expand, and complement findings from quantitative research. Qualitative designs can focus on people as individuals, but also on organizations or different cultures.

Qualitative data are usually collected through speaking to people, observing people or analysing text. Innovative methods of data collection are constantly emerging for example, video and audio diaries, online forums and portraiture. As you can see, qualitative research is very broad. In this series, we are only going to focus on qualitative research in a musculoskeletal context. This means we will be focussing on ways qualitative research can contribute to clinical knowledge, which currently tends to preference methods which use interviews and focus groups. However, this is not to say other methods of data collection cannot be useful to clinical practice and we hope to see qualitative research in our context expand to include more diverse and innovative methods.

How qualitative research can help the musculoskeletal clinician

Musculoskeletal practice has progressed beyond a biomedical approach, to a modern understanding of pain, disability and health that considers an individual’s biological, psychological and social context (Edwards et al., 2016). Piecing together this multi-layered puzzle is a complex task for practitioners, and requires complimentary knowledge that incorporates people’s experiences, beliefs, and behaviours. Using only numerical data can limit our understanding of the complexity of interactions with regard to these factors. However, qualitative research offers robust approaches to studying psychosocial factors so we can develop targeted solutions to patient problems.

To demonstrate how qualitative research can broaden our understanding of clinical phenomena, Table 9.1 provides examples of recently published studies in JOSPT that used quantitative methods and presents a hypothetical complementary qualitative research. Although, both qualitative and quantitative research are useful independently, the combination of the two can also provide practitioners with a ‘bigger picture’ as to what may be occurring clinically. The third column describes how the findings from these qualitative research questions could inform clinical practice for practitioners.

Table 9.1. Types of questions qualitative research can answer

Quantitative research question	Potential qualitative research question	How the qualitative findings could assist clinical practice
What is the added benefit of combining dry needling with guideline-based physical therapy treatment for improving pain and disability in people with chronic neck pain? (Stieven et al., 2020)	Why do patients seek dry needling for chronic neck pain?	Can inform our understanding of why patients may seek passive interventions to address chronic symptoms. This can provide practitioners with targets for behaviour change.
Are objective criteria-based return to sport decisions successful in reducing the risk of a second anterior cruciate ligament (ACL) injury? (Losciale et al., 2019)	What are the experiences of people who did and did not return to sport successfully after ACL injury?	Findings can explain important factors in the patients’ journey that lead to successful and unsuccessful return to sport that may not be captured by objective measures, such as unhelpful beliefs about structural limitations of the graft, or the influence of the

		sporting club environment. Practitioners can then gain an insight into what is and is not helpful in returning people to activity following an injury.
Short-term Effects of Thoracic Spine Thrust Manipulation, Exercise, and Education in Individuals with Low Back Pain: A Randomized Controlled Trial (Fisher et al., 2020)	What do patients believe it means when their back is 'cracked'?	Findings may reveal beliefs about a body part being 'out of alignment' and being 'put back into place' with the use of manipulations. This may guide practitioners to provide important education to patients if they are going to apply manipulation therapy.

Summary

Qualitative research can provide practitioners with invaluable knowledge that can help them apply evidence-based interventions from a biopsychosocial perspective. In the next instalment of this series we will begin to unwrap the assumptions that govern qualitative research, which differ from quantitative studies.

Part 2: How the Matrix film trilogy can help musculoskeletal practitioners understand the foundations of qualitative research

In Part 1 of this series we looked at what qualitative research is, what types of question it can answer, and how it can assist musculoskeletal practitioners applying a biopsychosocial model of care. In part 2, we focus on the core beliefs underpinning qualitative research, which differs from quantitative research. Understanding these core beliefs will help readers interpret the findings of qualitative studies. We aim to explain the essential foundations for understanding how a qualitative study was done, relevant to a musculoskeletal context.

Ontology and epistemology reflect a research 'paradigm', which simply means the basic set of beliefs that define the worldview and guide the actions of the researcher (Flick, 2013). In quantitative research the underlying paradigm is called 'positivism'. Positivism seeks a singular answer to the research

question, such as determining the effect of an intervention on a health condition (Guba & Lincoln, 2005). As positivism underpins most quantitative research, it is assumed and rarely stated. In qualitative research on the other hand, the underlying paradigm is made explicit as the assumptions guiding the process can take many forms. In this section we will explain the assumptions underlying qualitative research; including the role that the researcher themselves plays in the research process.

Think of building a house (see Figure 9.1). The qualitative research paradigm underpinning the assumptions of our research may be considered the ‘foundations’ of the house. The foundations must be correctly selected and installed as this will be the platform on which the house is supported. The same applies to research; our ontology and epistemology are the foundational assumptions that complement the research question and guide the research. It is important to note that *all* research is underpinned by an ontology and epistemology.

Ontology

If you have seen the Matrix series, it’s likely you’ve had your mind bent by questions raised about what we know to be ‘real’. In the first movie from the trilogy, Morpheus says to Neo:

How do you define real? If you’re talking about what you can feel, what you can smell, taste and see, then ‘real’ is simply electrical signals interpreted by your brain.

Morpheus is actually touching on the concept of ontology; what reality ‘is’. Morpheus is presenting a version of reality that is based on tangible sensory input interpreted by our brain. However, reality may encompass other things, such as the emotional responses to these electrical signals, and the influence of our beliefs and experiences on reality. In musculoskeletal practice, when we practice from a biopsychosocial position, the practitioner works in a reality that is measurable (the laws of physics that govern our bodies; ‘bio’), and a reality that is constructed through human experience (the patient’s social context, beliefs, and experiences; ‘psycho’ and ‘social’). Qualitative research explores reality that is constructed through human experience, which, in a clinical setting, can be very useful for

understanding how a person's version of the world they live in influences their beliefs and behaviours. Although many variants of ontology exist, the types we are referring to here that we believe you are most likely to be exposed to are called relativism and critical realism (Guba & Lincoln, 2005)

Epistemology

Returning to our example from The Matrix, Morpheus also challenges Neo on what he knows to be true, and why:

Have you ever had a dream, Neo, that you were so sure was real? What if you were unable to wake from that dream? How would you know the difference between the dream world and the real world?

Here, Morpheus is tapping into epistemology; how can we *know* reality? How do we know what we know? Understanding approaches to knowledge provides the scaffolding for how researchers plan to address a research question, and should naturally compliment how reality is viewed (ontology) (Crotty, 1998).

In our psychologically and socially constructed reality we concede knowledge is not fully measurable. Qualitative researchers believe that because each person has different experiences, beliefs and meaning, there will be a number of different answers to a research question. This knowledge approach is often called 'constructivism'. There are many variations to epistemology in qualitative research, so you may come across other terms such as 'constructionism' or 'subjectivism'; however, these epistemologies have similar core assumptions about knowledge; there are multiple true experiences of participants, rather than an absolute and single truth (Guba & Lincoln, 2005). This position on knowledge is clinically important as it allows us to consider what our patients believe to be 'true' about a phenomenon. Knowing this can help us understand behaviours and beliefs of our patients that are relevant in the context of therapy.

The 'lens' of the researcher

The researcher's professional background, experiences, beliefs and values – their 'lens' – influence the way they see the world, and, consequently, the way they approach qualitative research. The researcher's lens is not technically considered part of the qualitative research process and is therefore not depicted in the diagram, however, as the reader you should always be aware of how the researcher's specific 'lens' is influencing the data. For instance, a study conducted by a researcher with a background in orthopaedic surgery may ask different questions and interpret the responses differently to a physical therapist conducting the same study. Understanding the researcher's lens can assist the reader to better understand how to apply the research to clinical practice.

Qualitative researchers therefore need to show evidence of 'reflexivity'; i.e. the steps they have taken to reflect on how their beliefs and experience influence the research design, data collection, and analysis. Although there is continual debate about what constitutes a 'reflexive process', it is commonly viewed as a continual process of internal dialogue and critical self-evaluation of the researcher in respect to what 'lens' they bring to the research, as well as acknowledging this lens may affect the research process and outcome (Bradbury-Jones 2007; Guillemin & Gillam 2004; Pillow, 2003; Stronach et al., 2007; Berger, 2015). The way the researcher conducts their reflexive process will vary depending on the research design chosen (more of this in Part 3). This may be in the form of 'memos' where the researcher documents and reflects on how their beliefs and experiences have influenced the data. The researcher may describe a process of memo writing at various stages of the research process, or even provide excerpts of the memos they wrote. Alternatively, in the data analysis process, two or more researchers may 'code' the data that has been collected. This process is also known as 'cross coding' and allows qualitative data to be analysed from multiple alternative perspectives. This provides the primary researcher an opportunity to reflect on how their 'lens' has influenced the data analysis.

A common misconception among people unfamiliar with qualitative research is that so-called 'researcher bias' weakens the qualitative findings. However, the process of qualitative research is one by which the researchers and participants co-create knowledge of a socially constructed reality, by the

researchers interpretation of participant experience and meaning. The role of the researcher is also be very important. For example, in some qualitative studies where the aim is to enhance clinical knowledge, it is imperative the researcher has clinical experience and knowledge in the area of interest (Thorne et al., 2016).

Summary

Qualitative research is governed by assumptions that position us to see the participants' worlds, and capture knowledge that is constructed through participants' experiences and beliefs. These assumptions also acknowledge, and value, the role of the researcher in co-creating knowledge. The readers of qualitative studies need to know who the researchers are in order to understand how the researchers' backgrounds may have influenced the research process. The next instalment of this series will explain qualitative research designs, theory, and methodology.

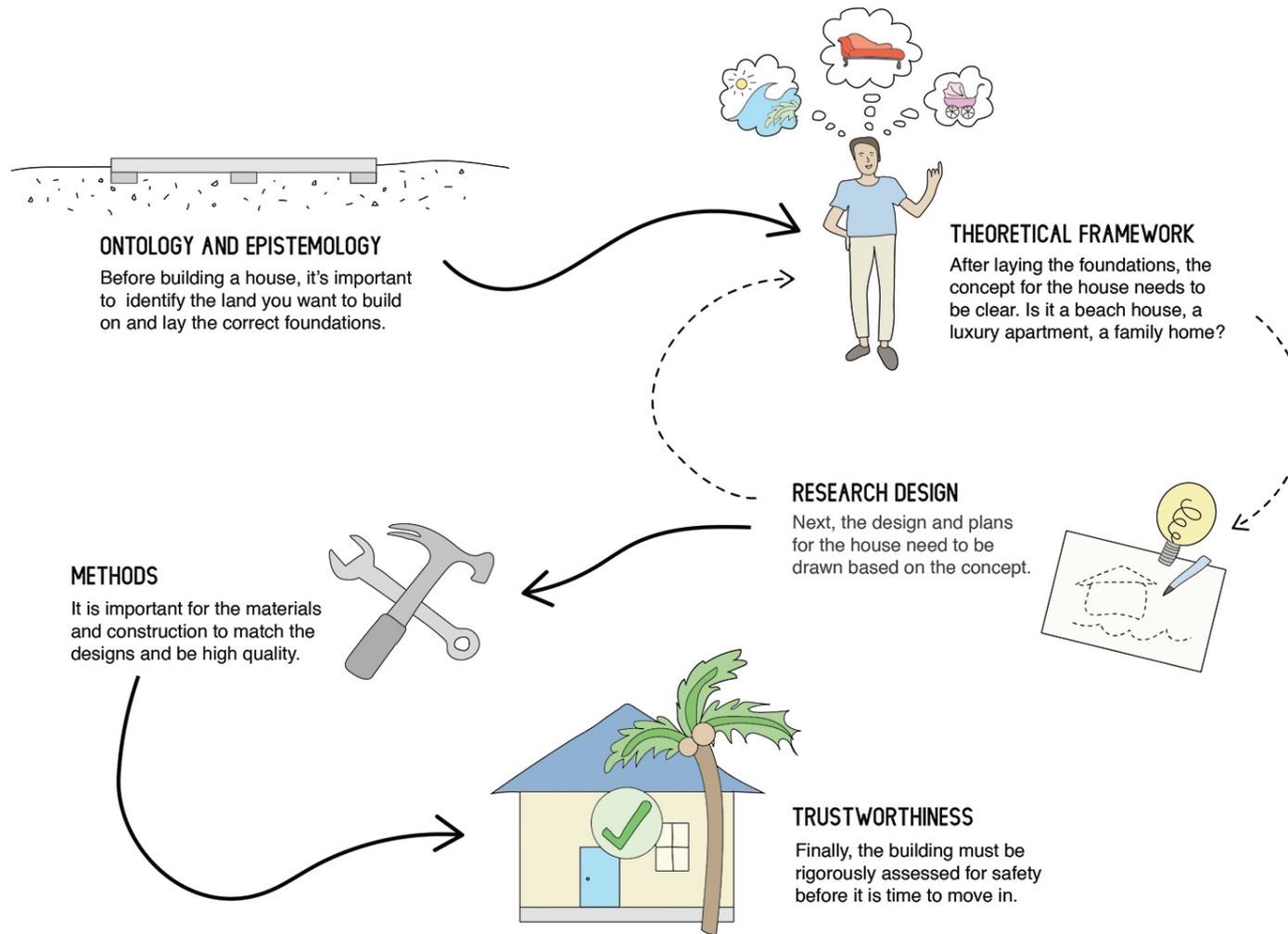


Figure 9.1. House metaphor

Part 3: Phenomeno – what? Understanding what the qualitative researchers have done

When reading any study, the reader must understand the steps taken by the researchers to arrive at their results. In Part 3 of this series on understanding qualitative research and applying it to musculoskeletal practice, we discuss how qualitative data are considered and analysed, and the choice of methods to do so (more on methods in Part 4). This section is based on the research process outline by Crotty (1998). However, we have changed the term ‘methodology’ to ‘research design’ due to the variable use of this term in the qualitative literature.

We will now focus on theoretical framework and research design – concepts that are sometimes easily delineated, while at other times they overlap and inform one another. Sometimes researchers use the term ‘methodology’ to mean one or both of the theoretical framework and research design. Despite the potential confusion, as long as the key elements of the qualitative study are explained, the study can be considered well conducted and potentially useful to clinical practice.

Although we present these concepts (theoretical perspective, research design, and methods) in a linear way, the process of qualitative research is not linear; qualitative research is circular; design, data collection, and analysis occur concurrently.

Theories and designs

Building on the ‘foundations’ for our qualitative study, the *theoretical framework* may be considered the ‘concept’ for the house (see Figure 9.1). For example, a concept for a house may be a family home, beach house, luxury apartment complex, or an ecologically sustainable tiny house. The concept for the house then guides how it is built, including the tools and materials used.

If researchers wanted to understand the experience of patients living with low back pain, they might employ a theoretical framework called *phenomenology* to design the study from the perspective of ‘understanding the lived experience’. Instead of explicitly naming a theoretical framework like phenomenology, sometimes researchers will simply describe their theoretical framework, such as

‘seeking to understand the experience of living with low back pain’. This is also acceptable, as it tells you what concept was guiding the research.

The research design is then the ‘plan’ for building the house, which must compliment the concept for the house (theoretical framework). The research design guides the choice of methods, which are like the tools and materials used. So, if we decided the concept guiding our build was a ‘beach house’, we would draw up plans that resembled a beach house (research design), and choose materials like weather-proof paint, and durable flooring (methods). In a study seeking to understand the lived experience of a patient living with low back pain, we would design a phenomenology study to facilitate an in-depth understanding of the participants’ experiences, which ends in a detailed description of these experiences. The methods (tools and materials) to achieve these objectives might include detailed one-to-one interviews, analytic techniques that allow for detailed cyclic coding, and writing diary entries (‘memos’) about the data.

Each qualitative theoretical framework and research design holds the core assumptions of epistemology and ontology described in Part 2; there are multiple true experiences from our participants, and reality is created through human experience.

In Table 9.2, we have extracted some qualitative research from the musculoskeletal literature, based on common theoretical perspectives and research designs. We have explained each component of the study; sometimes the research design and theoretical perspective are easily separated, and other times they are overlapping.

Table 9.2. Common qualitative research designs and theoretical frameworks in musculoskeletal research

Phenomenology
<p>Phenomenology is both a form of philosophy and a type of qualitative research dating back to the work of Husserl (1859-1938). The philosophical focus of phenomenology is the experience itself and how experiencing something is transformed into consciousness. The term “lived experience” is often associated with phenomenology, as researchers using this approach are often aiming to understand an individual’s lived experienced related to a particular phenomenon (Smith et al., 2009).</p> <p>Since the development of phenomenology from the work of Husserl, there have been various approaches to phenomenological research, which you can read more about in Rodrigues & Smith (2018). Here we are going to focus on interpretive phenomenology, as this is a common form seen in health science research. Interpretive phenomenology was developed by Heidegger (1889-1976), a student of Husserl’s. This approach to phenomenology uses “hermeneutics”, which is the philosophy of interpretation. Interpretive phenomenology is interested in interpreting and describing human experience, through a process of in-depth reflective inquiry (Smith et al., 2009).</p> <p>Interpretive phenomenology uses small purposeful samples who have experienced the phenomenon of interest (Smith et al., 2009). Participants are interviewed to gain rich, reflective insights to their experiences (Smith et al., 2009). Although one-to-one interviews are typically the favoured method of data collection, some researchers have also used diary entries and focus groups. Analysis in interpretive phenomenology asks the researcher to deeply immerse themselves in the data. Following this, initial notes may be taken along with developing early themes by identifying ‘chunks’ of the data (Husserl, 1970; Smith et al., 2009). These ‘chunks’ will be compared across cases and the research will consider if there are any key patterns^{17, 29}. The final stages of analysis are a deeper consideration of the patterns and themes across the cases, and how they relate to existing theory (Husserl, 1970; Smith et al., 2009).</p> <p>Phenomenological research can be particularly useful for musculoskeletal and orthopaedic research through understanding complex and emotionally laden experiences (Miller et al., 2018); an opportunity for us to walk in participant’s shoes. For example, from patient accounts, we can better understand where treatment provisions may be best placed. In <i>An interpretive phenomenological analysis of living with chronic low back pain</i> (Snelgrove & Liossi, 2009) the authors interviewed 10 people with chronic low back pain and identified three key themes; ‘maintaining integrity’, ‘the crucial nature of pain’, and ‘managing the pain’, which indicated the participants understood their pain within a biomedical model. The findings illuminated areas where practitioners can provide helpful pain education for patients experiencing this condition, especially with respect to the use of behavioural strategies due to the participants’ strong biomedical beliefs that may be resistant to cognitive approaches.</p>
Grounded theory
<p>Grounded theory was founded by Glaser and Strauss (Glaser & Strauss, 1965; Glaser & Strauss, 1967), who examined the experience of death and dying in Californian hospitals in 1967. Its development was revolutionary during a time where qualitative approaches were not considered a rigorous approach to inquiry (Charmaz, 2006; Glaser, 1967). Since the development of the original form of grounded theory (now referred to as Glaserian or classical grounded theory), divergent approaches have formed. You can read more about these different approaches in <i>Grounded Theory: Methodology and Theory Construction</i> (Charmaz, 2015). However, despite the different approaches, a key component of all grounded theory research is constructing theory through a systematic and rigorous analysis. As grounded theory research aims to create new theory, this methodological approach does not typically use existing formal theory as a guiding</p>

influence for the study. However, studies may use a conceptual framework to situate and contextualise the design of the study and findings. Grounded theory is also concerned with how meaning is created among communities, rather than individual narratives. Here we will focus on constructivist grounded theory, a contemporary form of grounded theory gaining popularity in health sciences, which exists within an interpretivist paradigm.

Constructivist grounded theory was founded by Kathy Charmaz, a former student of Glaser and Strauss. Constructivist grounded theory treats grounded theory as a series of tools for researchers to use and adapt to fit their research question, and acknowledges researchers' backgrounds as influential in the data analysis (Charmaz, 2015; Morse, 2009). Constructivist grounded theory emphasises the influence of constructivism, which centres the analysis on the participants construction of meaning and events (Morse, 2009). Constructivist grounded theory also emphasises the co-construction of meaning between the researcher and the participant (i.e. acknowledging the researcher's role in the analysis and findings) (Morse, 2009). To create rigorous theory, grounded theory research employs methods such as "theoretical sampling", where participants are purposefully selected to explore emerging key themes in the analysis (Charmaz, 2006). Additionally, "constant comparison" is often used, where the researcher is constantly comparing and moving between different stages of analysis (raw data and development of theory) to ensure the theory is grounded in the accounts of the participants (Charmaz, 2006).

Clinical decision-making and therapeutic approaches in osteopathy – A qualitative grounded theory study (Thomson et al., 2014) is an example of a constructivist grounded theory study where the authors aimed to create an explanatory theory of clinical decision-making and therapeutic approaches of experienced osteopaths in the United Kingdom. The authors purposively sample osteopaths and used one-to-one interviews. The results revealed three key viewpoints that resulted in divergent approaches to patient management; the treater; the communicator; or the educator. The results were presented in an explanatory model. The findings of this work illuminated the different approaches to, and drivers of, treatment decision-making in this profession. This study provides important information as to the provision of evidence-based practice in osteopathy.

Interpretive description

Interpretive description, a more recent methodological approach, was developed by nursing scholars as a form of qualitative inquiry into human health and illness experiences for the purpose of developing nursing knowledge (Thorne et al., 1997). The development of this methodology was in response to calls for more pragmatic forms of qualitative research, which may 'borrow' from other methodological approaches such as grounded theory or phenomenology. Interpretive description research is located within existing clinical knowledge so that it can build on previous knowledge and clinical practice (Thorne et al., 1997).

When conducting an interpretive description study, participants are sampled with the intention to explore themes emerging from the analysis and from existing theory. Data collection in interpretive description generally includes one-to-one interviews but can also include clinical papers, case reports, and media information. Analytic techniques under this methodological approach encourage the researcher to ask questions of the data such as, "what is happening here?" and "what am I learning about this?" (Thorne et al., 1997). These techniques favour broader theorising and contextualising of the data as compared to sorting and coding (Thorne et al., 1997). The analysis in interpretive description also ends with descriptions (themes and patterns between themes) rather than the development of theory.

Interpretive description has become a useful methodological approach in musculoskeletal research. *In Easy to Harm, Hard to Heal: Patient Views About the Back* (Darlow et al., 2015), the

researchers use interpretive description to advance clinical knowledge of how beliefs related to low back pain may influence the perception of threat. Twelve participants with acute low back pain and eleven participants with chronic low back pain were interviewed. Participants described their back pain as vulnerable, needing protection, and unlikely to heal. The authors also described the findings as analogous to the self-prejudice, which has been described as part of the maintenance of mental health disorders through attention bias towards negative information (Padesky, 1990). This is an example of the authors retrospectively applying their findings to an existing theoretical framework to better understand their results. The findings from this study suggest practitioners should be wary of patients holding self-prejudicial views of their back. Due to this, this study highlights the importance for practitioners to provide positive and empowering education and be wary of information that can reinforce negative beliefs.

Basic qualitative research

Basic qualitative research, otherwise known as generic qualitative research, is often described in publications simply as a “qualitative research study”, without declaring a specific approach. Similar to interpretive description, basic qualitative research offered more pragmatism than the traditional social sciences (such as grounded theory or phenomenology) qualitative research but may borrow techniques from these traditions. As discussed in Part 2, a key characteristic of qualitative research is that individuals construct reality within their social worlds. Thus, constructivism underlies a basic qualitative research approach* (Merriam & Tisdell, 2016; Patton, 1990). The overarching purpose of this approach is to understand how people make sense of their lives and experiences (Merriam, 1998; Percy et al., 2015).

Although all forms of qualitative research have some proponent of seeking to understand, basic qualitative research does not have a specific dimension of this (Caelli et al., 2003; Merriam, 1998). For example, phenomenology seeks understanding of a lived experience and grounded theory aims to build theory, whereas basic qualitative research just seeks an understanding of a particular phenomenon.

Basic qualitative research has strength in its flexibility (Percy et al., 2015). Approaches can be either inductive or deductive depending on the purpose of the research. The steps taken to answer the research question can be adapted based on the discipline or field asking the question. However, generally, the analysis will involve a thematic analysis⁸, which will start with initial codes that will collapse into categories and themes to describe the data (Percy et al., 2015). Data collection approaches can vary and may include one-to-one interviews, focus groups, observations, diary entries and so on (Percy et al., 2015). Due to the flexibility of basic qualitative research, this approach tends to fit well with mixed methods designs, whereby quantitative and qualitative research are integrated to create a broader understanding of phenomena (Percy et al., 2015). However, it should be noted that although the basic qualitative research approach is flexible it does not mean the research rigour is any less than other methodological approaches; each methodological decision must be transparent and carefully documented.

Infection after knee replacement: a qualitative study of impact of periprosthetic knee infection (Mallon et al., 2018) is an example of a basic qualitative study, where the authors interviewed 16 patients who had experienced a periprosthetic knee infection and subsequent revision surgery. The transcripts were analysed thematically and used a theoretical framework of “biographical disruption”. Biographical disruption is an explanatory theory of the disruptive experience of chronic illness (Bury, 1982), and was used as a theoretical framework to guide the analysis and findings in this study. The experiences of the participants were characterised according to three aspects of biographical disruption; onset and the problem of recognition; emerging disability and the problem of uncertainty; and chronic illness and the mobilisation of resources. The results indicated the experience of such infections were devastating for the patient and current support

services were insufficient. Thus, the researchers recommended preparing patients preoperatively for adverse events and better educating health care professionals about early signs of infection.

*Although basic qualitative research is generally accepted to be constructivist in nature, some authors may indicate a different epistemological foundation to their basic qualitative inquiry.

&Thematic analysis as a method of data analysis is not to be confused with reflexive thematic analysis and other variants, which are considered stand-alone methodological approaches. For further reading on the distinctions, see Braun and Clark (2020).

Generic qualitative analysis can also encompass different approaches to data analysis, such as constant comparison, however thematic analysis is commonly employed (Percy et al., 2015).

Summary

You have survived the hardest part of understanding qualitative research – congratulations! Although understanding the processes taken by the researchers may seem overwhelming, the bottom line is that you as the reader are clear on the theoretical framework used by the researchers to govern the study (the concept for the house). The design of the study should also be clearly described (house design plans), and what methods were selected (building materials). This information, in combination with the lens of the researcher, helps the reader decide how helpful the findings are to clinical practice, and the quality of the research. In the next part of this series we will focus on the methods of data collection and data analysis.

Part 4: A qualitative researcher's tool kit: methods

Methods are the techniques used to gather and analyse data (Crotty, 1998). The methods are like the tools and materials used to build our house (see Figure 9.1) and must complement the plan (research design) and concept (theoretical perspective) for the house.

In most qualitative research studies, the data collection and analysis occur concurrently. This is often referred to as an 'iterative' approach to analysis, meaning there is a lot of back and forth between the

developing findings, raw data, and data collection (Charmaz, 2006). This allows the researcher to explore emerging key ideas in the data by adjusting the interview schedule and the characteristics of the participants they recruit (Charmaz, 2006). It is important to note that adjusting the approach to data collection and analysis during the research process does not diminish the quality of the qualitative research. In fact, it is essential to the inductive nature of qualitative approaches – we cannot know in advance what we will uncover, so we need to make adjustment along the way to better understand the phenomenon at hand. It is similar to continually reviewing how the beach house is coming along during the build; do we need to make some adjustments to the plan to better match our concept? Or can we select some different materials and tools to improve the safety of the house? Because this iterative approach is in contrast to most quantitative research, which requires adherence to pre-specified protocols, it is sometimes perceived as a weakness of qualitative research. Providing a comprehensive audit trail of decisions made along the way is important to reassure readers of the rigour of the study (more on rigour in part 5 of this series).

When qualitative researchers analyse data they start with something called a 'code'. Codes capture features of the data that are relevant to the research question (Clarke & Braun, 2017). Coding can be inductive, meaning the codes are derived from the data i.e. the codes are created based on words or phrases used by the participants; or deductive, meaning the codes have been decided before the analysis begins and then applied to the words and phrases used by the participants (Fereday & Muir-Cochrane, 2016). Codes are then grouped together into themes according to the research question and theoretical perspective used (Clarke & Braun, 2017). An example of how transcripts are coded and then collapsed into categories and themes can be found in Appendix 16.

Depending on the research design employed, some analyses will stop at themes and are considered to be a more 'descriptive' approach to analysis. Other research designs will progress beyond themes and attempt to develop an overarching theory, which links the key ideas of the data together to make sense of the research question at hand. Some of the common methods used to collect and analyse data in

qualitative studies are given basic descriptions in Table 9.3. For more detailed descriptions of these terms please refer to the SAGE Handbook of Qualitative Research, third edition (Denzin & Lincoln, 2005), the SAGE Handbook of Grounded Theory (Bryant & Charmaz, 2010), Naturalistic Inquiry (Lincoln & Guba, 1985), Qualitative Inquiry and Research Design: Choosing Among Five Traditions (Creswell, 1998), The Foundations of Social Research (Crotty, 1998), and The SAGE Handbook of Qualitative Methods in Health Research (Bourgeault, Dingwall, & de Vries, 2010).

Table 9.3. Qualitative methods

Qualitative methods	Description
Sampling	<p>Sampling techniques used in qualitative research are aimed at recruiting a group of people who have experienced the same phenomenon or event. In sampling, we wish to seek diversity of perspectives, which allows researchers to see all angles of the phenomenon of interest; a wealthy, highly educated women’s experience of back pain may be different to a man of similar age with a lower level of education and lower income. As qualitative researchers, we want to understand the range of experiences to build our understanding of low back pain.</p> <p>To ensure diversity, qualitative researchers often use <i>purposive sampling</i>. Purposive means an intentional selection of informants based on their ability to elucidate a specific theme, concept, or phenomenon.</p> <p>Another sampling technique is <i>theoretical sampling</i>. This looks to recruit people to ‘test’ emerging ideas in the data. For example, to better understand an emerging theme about the meaning of pain, the researchers might recruit additional participants to specifically question about this. These additional people may have specific characteristics such as being female or younger to help the researchers understand how meanings differ among a diverse sample</p> <p>Sampling ends at <i>saturation</i>, the point at which the researchers believe that recruiting more participants will not change the existing key findings. There is some debate as to what constitutes saturation, however, it is most commonly used to indicate that no new ideas were found in the final interviews. Qualitative researchers seek to identify common processes underlying the experiences of a diverse sample and often these common processes can be observed among a relatively small sample. You do not see qualitative studies with hundreds of people as the aim of qualitative research is to describe the underlying processes rather than document their prevalence or frequency.</p>
Data collection strategies	<p>One-to-one interviews An interview between the researcher and one participant. Using one-to-one interviews is most useful when the researcher employs a</p>

Qualitative methods	Description
	<p>theoretical perspective where it is important to gain a rich understanding of individual experiences and beliefs, such as phenomenology.</p> <p>Focus groups A structured discussion between the researcher and a small group of people, typically 6 to 8 people. Useful to gain the opinions of a group of people, and allow participants to bounce ideas and experiences off one another.</p> <p>Narrative accounts Participants write an account of their experiences. This can be a useful tool over a longitudinal qualitative study, where the feasibility of recurrent interviews is not possible.</p> <p>Observations The researcher observes and takes note of the behaviours of a specific group of people, often in a specific setting. This can be in person or through video recording. Underused in the musculoskeletal field, observation strategies may be useful to compare participant beliefs with how they move, avoid activity, or modify activity due to a pain experience.</p>
Interview structure	<p>Unstructured interviews Interviews that take place with few, if any, interview questions. They progress in a similar way to a conversation but remain relevant to the phenomenon of interest. e.g. 'Tell me your story'; the participant is in the driving seat to lead in the direction they feel most important</p> <p>Structured interviews Strictly adhere to the use of an interview schedule and is a more rigid style of interviewing. Typically, only questions on the interview schedule are asked and the research does not explore further topics.</p> <p>Semi-structured interviews An interview schedule is used to assist the researcher through the interview process. Semi-structured interviews are like a guided conversation but allow the researcher to probe other ideas and topics as they emerge in the interview.</p>
Coding	The initial phase of data analysis that uses numerous codes (the smallest unit of data analysis) to capture features of the data that are of interest to the research question.
Memos	Notes the researcher makes while they are conducting the analysis. These are usually their emerging ideas about what is happening in the data, and the key ideas they are seeing.
Reflexive memos	Reflexive practice is important for the researcher to reflect on how their 'lens' (experiences, beliefs and knowledge) is influencing their analysis. These are usually documented as memos and help the researcher ensure the perspectives of the participants are prioritised.
Constant comparison	Comparing the data between participants, between codes, between themes, between different stages of the analysis. It can be important

Qualitative methods	Description
	for the researcher to ensure that as they move further along in their analysis, they continue to capture the key features of the participant's stories. Theoretical sampling can be a feature of constant comparison through testing emerging ideas from the analysis in subsequent interviews.
Mapping techniques	Mapping techniques can be used to visually represent the findings of the study; codes and themes can be drawn out in a mind map.
Themes	After the researcher has identified codes, these can be collapsed into larger patterns in the data called 'themes'. Themes can represent the key concepts in the participants' stories, and tie together the underlying patterns in the data. Themes in this context are not to be confused with thematic analysis as a research design. Other research designs may describe their findings in terms of the main themes of their data but have not aligned themselves with a specific thematic analysis.

What about qualitative data analysed by computers?

Qualitative research is time consuming due to the hands-on nature of reading, analysing and interpreting the data, while simultaneously recruiting participants. Natural language processing, a discipline within artificial intelligence that leverages linguistics and computer science to make human language intelligible to machines, offers an attractive solution to this problem. Natural language processing may substantially reduce the time required to wade through numerous transcripts. However, remember that the purpose of qualitative research is to understand the 'uncountable' social phenomena, which can only be achieved through our socially constructed world, and the participants may have multiple answers to research questions.

Unfortunately, natural language processing is essentially a *quantitative* way of analysing qualitative data. It typically assesses the frequency of words or phrases in the transcripts, rather than interpreting the meaning of what participants are saying with respect to the concept (theoretical perspective) and plan (research design); which is key to successful qualitative analysis. The knowledge and experience that the qualitative researcher brings to the study is important to creating clinically meaningful interpretations. Current recommendations are that qualitative researchers may use natural language

processing as an adjunct to their analysis in the form of 'second coder'; however, it should not be treated as the primary researcher (Leeson et al., 2019).

Summary

In this instalment, we looked at the specific methods, or materials and tools, used in qualitative research. In the final part of this series we will discuss how musculoskeletal practitioners can assess the quality of qualitative studies.

Part 5: How to spot a high-quality qualitative study

Rigour in qualitative research is concerned with answering important questions about the rigour of interpretations in a qualitative study, and whether these interpretations can be trusted to provide some purchase on phenomena (Guba & Lincoln, 2005). For the reader to answer these questions, qualitative studies can be compared against 'trustworthiness' criteria. Trustworthiness in qualitative research is complex, as the road to achieve a rigorous qualitative study will vary depending on the research design, context, participants, and theory employed.

However, as an introduction to understanding trustworthiness in qualitative research, we suggest you consider it like the safety inspection once the house is built; did the building team adhere to a safe building process? Were the materials used of high quality? These questions may broadly represent these important questions about the research:

- Has the qualitative researcher represented the meanings of the participants?;
- How useful are these findings to my specific context and clinical setting?; and
- Has the researcher sought and presented a diverse range of perspectives?

We have summarised the key aspects and terminology of this 'safety inspection' in Table 9.4 (Lincoln & Guba, 1985).

Many journals require a quality assessment checklist to represent trustworthiness. Some of the most common ones include Standards for Reporting Qualitative Research Checklist (O'Brien et al., 2014), the Checklist for Qualitative research (Lockwood et al., 2015), and the Consolidated criteria for reporting qualitative research (COREQ) (Tong et al, 2007). The COREQ, which is a 32 item checklist for interviews and focus groups, is currently a popular choice among musculoskeletal and orthopaedic journals to aid in publication process (Tong et al., 2007). The COREQ comprises three key domains:

- Research team and reflexivity (the researcher's lens: Part 2 of this series);
- Study design (including theoretical framework and research design: Part 3 of this series);
and
- Analysis and findings (methods of analysis and trustworthiness of findings: Parts 4 and 5 of this series).

Consensus regarding quality criteria is lacking. While the COREQ is the most widely used in musculoskeletal research, relevant items are missing. For example, the COREQ does not having a criteria for how trustworthiness was achieved, lacks emphasis on the influence of philosophy on the research process, and is only applicable to focus groups and interview data as data collection methods (Majid & Vanstone, 2018). Additionally, not all COREQ criteria are relevant for all studies. For example, in some studies it is appropriate for researchers to return transcripts and themes to participants for them to read and possibly make changes to the content (also known as member checking in the COREQ). In other studies, this is inappropriate. In some health science research the theoretical perspective used by the researchers may involve capturing psychological processes that are too unconscious for a participant to understand and provide feedback on. For a more comprehensive discussion on the use of quality assessment criteria in qualitative research see Majid and Vanstone (2018).

Although understanding where nuances exist for assessing trustworthiness in qualitative research may be difficult, the descriptions provided in Table 9.4 below should act as a broad guide for you to decide if the qualitative research findings are trustworthy and useful in clinical practice.

Table 9.4. Trustworthiness criteria

Trustworthiness criteria	Explanation
Credibility	When looking for credibility, the reader should look for whether the research design and methods used were aligned with standard qualitative approaches. For example, if a researcher claims to have used grounded theory research design, then the methods should be consistent with what grounded theory involves. This will include citing, and being faithful to, key publications to support the use of methods. The reader must understand the steps taken in the qualitative analysis.
Dependability	In qualitative research, the experience of a particular phenomenon for one participant will be different for another participant in a different context or setting. Researchers must keep a detailed log of all the activities undertaken and decisions made during data collection and analysis, also known as an 'audit trail'. This ensures that the processes completed by the researcher are repeatable, despite many different perspectives and experiences of the study population.
Confirmability	Ensuring the researcher's interpretations are derived from the participants' voices. A reader should be able to look at the data, understanding that researcher's lens, and the findings should make sense. To achieve confirmability, the researcher must maintain a well-documented and logical audit trail, recording how analytical decisions were made, and how the researcher prioritised participants' voices over the researcher's knowledge and background. This is usually achieved through reflexive memos. A second 'coder' may analyse some of the raw data and consider alternative interpretations. Participants may provide feedback on whether the researcher correctly interpreted their experiences.
Transferability	The extent to which the findings are useful in other, similar settings. To achieve this, researchers need to provide a rich, detailed description of the context, location and people studied. While similar to generalisability, transferability is concerned with findings that will apply to patients with similar characteristics in a similar setting to the current study, rather than a whole clinical population. Qualitative researchers must provide a comprehensive picture of the study sample and setting, which will help readers decide whether the findings are useful to clinical practice. For example, a study of knee osteoarthritis including patients of private hospitals in Australia may have limited transferability to patients of a public hospital in Bangladesh.
Authenticity	Whether the authors sought a range of different perspectives. Qualitative researchers must provide evidence of seeking diverse, appropriate people to answer their research question. Seeking diversity ensures the phenomenon of interest has been investigated from different angles and perspectives. Researchers should describe sampling techniques that sought breadth, and were conducted iteratively with the analysis. This allows the researchers to chase different avenues and themes in their data to gain a complex understanding of the phenomenon under study. Researchers should describe 'divergent cases' where they exist; some participants may have experiences and perspectives that were different to the other participants in the study. Divergent cases can be important for exploring different interpretations and providing direction for future research.

Bringing it all together

In this series, we aimed to help musculoskeletal practitioners understand and apply qualitative research to their practice.

Qualitative research can advance musculoskeletal care in new and exciting ways. For example, embedded into each phase of a clinical trial qualitative research can inform:

- 2) Trial rationale e.g. What are the needs and preferences of our patients?
- 3) Trial design e.g. How acceptable is the trial design to patients?
- 4) Trial evaluation e.g. What outcomes matter to patients?
- 5) Trial outcomes e.g. What drives change? Why do some people respond and not others?
- 6) Future implementation e.g. What are the barriers and facilitators to uptake of an intervention in other settings?

We hope this series has shed some light on the utility of qualitative research for musculoskeletal practitioners. Despite the confusing and inconsistent use of terminology in qualitative research, it is intended that this series can serve as an accessible resource for musculoskeletal practitioners when faced with confusing terminology, or uncertainty about the quality and clinical relevance of a qualitative study.

References

- Australian Bureau of Statistics 2018 *National Health Survey: First Results*
<https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release>. Accessed 21 July 2021
- Abraham, C. (2013). *Understanding and changing health behaviour: From health beliefs to self-regulation*. Taylor and Francis.
- Adie, S., Dao, A., Harris, I. A., Naylor, J. M., & Mittal, R. (2012). Satisfaction with joint replacement in public versus private hospitals: A cohort study. *ANZ Journal of Surgery*, *82*(9), 616–624.
<https://doi.org/10.1111/j.1445-2197.2012.06113.x>
- Agency for Clinical Innovation. (2012). *Musculoskeletal network: NSW evidence review preoperative, perioperative and postoperative care of elective primary total hip and knee replacement*.
https://aci.health.nsw.gov.au/__data/assets/pdf_file/0020/172091/EJR-Evidence-Review.PDF
- Aichroth, P., Freeman, M. A. R., Smillie, I. S., & Souter, W. A. (1978). A knee function assessment chart. From the British Orthopaedic Association Research Sub-Committee. *The Bone & Joint Journal*, *60-B*(3), 308–309. <https://doi.org/10.1302/0301-620X.60B3.681404>
- Ali, A., Lindstrand, A., Nilsson, A., & Sundberg, M. (2016). Similar patient-reported outcomes and performance after total knee arthroplasty with or without patellar resurfacing. *Acta Orthopaedica*, *87*(3), 274–279. <https://doi.org/10.3109/17453674.2016.1170548>
- Ali, A., Lindstrand, A., Sundberg, M., & Flivik, G. (2017). Preoperative anxiety and depression correlate with dissatisfaction after total knee arthroplasty: A prospective longitudinal cohort study of 186 patients, with 4-year follow-up. *Journal of Arthroplasty*, *32*(3), 767–770.
<https://doi.org/10.1016/j.arth.2016.08.033>
- Ali, A., Sundberg, M., Robertsson, O., Dahlberg, L. E., Thorstensson, C. A., Redlund-Johnell, I., Kristiansson, I., & Lindstrand, A. (2014). Dissatisfied patients after total knee arthroplasty: A registry study involving 114 patients with 8–13 years of followup. *Acta Orthopaedica*, *85*(3), 229–233. <https://doi.org/10.3109/17453674.2014.916487>
- Andrews, T. (2012). What is social constructionism? *The Grounded Theory Review*, *11*(1), 39–46.
- Aunan, E., & Röhrli, S. M. (2018). No detrimental effect of ligament balancing on functional outcome after total knee arthroplasty: A prospective cohort study on 129 mechanically aligned knees with 3 years' follow-up. *Acta Orthopaedica*, 1–7.
<https://doi.org/10.1080/17453674.2018.1485283>
- Australian Institute of Health and Welfare. (2015). *Musculoskeletal fact sheet: Osteoarthritis* (Arthritis series no. 22, cat. no. PHE 186).
- Australian Institute of Health and Welfare. (2019). *Osteoarthritis*. Retrieved from
<https://www.aihw.gov.au/getmedia/43aa73b8-e8fc-41c9-b5a9-8615345f5c59/Osteoarthritis.pdf.aspx?inline=true>
- Australian Institute of Health and Welfare. (2020). *Osteoarthritis*. Retrieved from
<https://www.aihw.gov.au/reports/chronic-musculoskeletal-conditions/osteoarthritis>
- Australian Orthopaedic Association National Joint Replacement Registry. (2016). *Hip, knee and shoulder arthroplast: Annual report 2016*. Retrieved from
<https://aoanjrr.sahmri.com/documents/10180/275066/Hip%2C%20Knee%20%26%20Shoulder%20Arthroplasty>
- Baker, P. N., Rushton, S., Jameson, S. S., Reed, M., Gregg, P., & Deehan, D. J. (2013). Patient satisfaction with total knee replacement cannot be predicted from pre-operative variables alone: A cohort study from the National Joint Registry for England and Wales. *The Bone & Joint Journal*, *95-B*(10), 1359–1365. <https://doi.org/10.1302/0301-620X.95B10.32281>
- Baker, P. N., van der Meulen, J. H., Lewsey, J., & Gregg, P. J. (2007). The role of pain and function in determining patient satisfaction after total knee replacement: Data from the National Joint

- Registry for England and Wales. *The Bone & Joint Journal*, 89-B(7), 893-900.
<https://doi.org/10.1302/0301-620X.89B7.19091>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Barclay-Goddard, R., Epstein, J. D., & Mayo, N. E. (2009). Response shift: A brief overview and proposed research priorities. *Quality of Life Research*, 18(3), 335–346. <https://doi.org/10.1007/s11136-009-9450-x>
- Bardgett, M., Lally, J., Malviya, A., & Deehan, D. (2016). Return to work after knee replacement: A qualitative study of patient experiences. *BMJ Open*, 6, e007912.
<https://doi.org/10.1136/bmjopen-2015-007912>
- Barlow, T., Clark, T., Dunbar, M., Metcalfe, A., & Griffin, D. (2016). The effect of expectation on satisfaction in total knee replacements: A systematic review. *SpringerPlus*, 5(1), 1–7.
<https://doi.org/10.1186/s40064-016-1804-6>
- Barrack, R. L., Ruh, E. L., Chen, J., Lombardi, A. V., Jr., Berend, K. R., Parvizi, J., Della Valle, C. J., Hamilton, W. G., & Nunley, R. M. (2014). Impact of socioeconomic factors on outcome of total knee arthroplasty. *Clinical Orthopaedics and Related Research*, 472(1), 86–97.
<https://doi.org/10.1007/s11999-013-3002-y>
- Batbaatar, E., Dorjdagva, J., Luvsannyam, A., & Amenta, P. (2015). Conceptualisation of patient satisfaction: A systematic narrative literature review. *Perspectives in Public Health*, 135(5), 243–250. <https://doi.org/10.1177/1757913915594196>
- Batbaatar, E., Dorjdagva, J., Luvsannyam, A., Savino, M. M., & Amenta, P. (2017). Determinants of patient satisfaction: A systematic review. *Perspectives in Public Health*, 137(2), 89–101.
<https://doi.org/10.1177/1757913916634136>
- Beaton, D. E., & Clark, J. P. (2009). Qualitative research: A review of methods with use of examples from the total knee replacement literature. *Journal of Bone and Joint Surgery (American Volume)*, 91(Suppl. 3), 107–112. <https://doi.org/10.2106/JBJS.H.01631>
- Beck, C. T. (2013). *Routledge international handbook of qualitative nursing research*. Routledge.
- Becker, R., Doring, C., Denecke, A., & Brosz, M. (2011). Expectation, satisfaction and clinical outcome of patients after total knee arthroplasty. *Knee Surgery, Sports Traumatology, Arthroscopy*, 19(9), 1433–1441. <https://doi.org/10.1007/s00167-011-1621-y>
- Bedson, J., & Croft, P. R. (2008). The discordance between clinical and radiographic knee osteoarthritis: A systematic search and summary of the literature. *BMC Musculoskeletal Disorders*, 9, 116.
<https://doi.org/10.1186/1471-2474-9-116>
- Behrend, H., Giesinger, K., Giesinger, J. M., & Kuster, M. S. (2012). The ‘forgotten joint’ as the ultimate goal in joint arthroplasty: Validation of a new patient-reported outcome measure. *Journal of Arthroplasty*, 27(3), 430–436. <https://doi.org/10.1016/j.arth.2011.06.035>
- Bellamy, N., Buchanan, W. W., Goldsmith, C. H., Campbell, J., & Stitt, L. W. (1988). Validation study of WOMAC: A health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *Journal of Rheumatology*, 15(12), 1833–1840.
- Beswick, A. D., Wylde, V., Gooberman-Hill, R., Blom, A., & Dieppe, P. (2012). What proportion of patients report long-term pain after total hip or knee replacement for osteoarthritis? A systematic review of prospective studies in unselected patients. *BMJ Open*, 2(1), e000435.
<https://doi.org/10.1136/bmjopen-2011-000435>
- Bhui, K., & Dinos, S. (2008). Health beliefs and culture. *Disease Management & Health Outcomes*, 16(6), 411–419. <https://doi.org/10.2165/0115677-200816060-00006>
- Bird, C. M. (2005). How I stopped dreading and learned to love transcription. *Qualitative Inquiry*, 11(2), 226–248. <https://doi.org/10.1177/1077800404273413>
- Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), 1802–1811.
<https://doi.org/10.1177/1049732316654870>

- Blackburn, J., Qureshi, A., Amirfeyz, R., & Bannister, G. (2012). Does preoperative anxiety and depression predict satisfaction after total knee replacement? *Knee*, *19*(5), 522–524. <https://doi.org/10.1016/j.knee.2011.07.008>
- Blome, C., & Augustin, M. (2015). Measuring change in quality of life: Bias in prospective and retrospective evaluation. *Value in Health*, *18*(1), 110–115. <https://doi.org/10.1016/j.jval.2014.10.007>
- Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Prentice-Hall.
- Blyth, M. J., Smith, J. R., Anthony, I. C., Strict, N. E., Rowe, P. J., & Jones, B. G. (2015). Electromagnetic navigation in total knee arthroplasty: A single center, randomized, single-blind study comparing the results with conventional techniques. *Journal of Arthroplasty*, *30*(2), 199–205. <https://doi.org/10.1016/j.arth.2014.09.008>
- Boese, C. K., Gallo, T. J., & Plantikow, C. J. (2011). Range of motion and patient satisfaction with traditional and high-flexion rotating-platform knees. *Iowa Orthopaedic Journal*, *31*, 73–77.
- Bourne, R. B., Chesworth, B. M., Davis, A. M., Mahomed, N. N., & Charron, K. D. (2010). Patient satisfaction after total knee arthroplasty: Who is satisfied and who is not? *Clinical Orthopaedics and Related Research*, *468*(1), 57–63. <https://doi.org/10.1007/s11999-009-1119-9>
- Bowling, A., Rowe, G., Lambert, N., Waddington, M., Mahtani, K. R., Kenten, C., Howe, A., & Francis, S. A. (2012). The measurement of patients' expectations for health care: A review and psychometric testing of a measure of patients' expectations. *Health Technology Assessment*, *16*(30), i–xii, 1–509. <https://doi.org/10.3310/hta16300>
- Bradbury-Jones, C. (2007). Enhancing rigor in qualitative health research: exploring subjectivity through Peshkin's I's. *Journal of Advanced Nursing*, *59*, 290–298.
- Brander, V., Gondek, S., Martin, E., & Stulberg, S. D. (2007). Pain and depression influence outcome 5 years after knee replacement surgery. *Clinical Orthopaedics and Related Research*, *464*, 21–26. <https://doi.org/10.1097/BLO.0b013e318126c032>
- Braun, V., & Clarke, V. (2006) Using thematic analysis in psychology, *Qualitative Research in Psychology*, *3*:2, 77-101, doi: 10.1191/1478088706qp063oa
- Braun, V., & Clarke, V. (2020). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, 1–25. <https://doi.org/10.1080/14780887.2020.1769238>
- Brinkman, J. M., Bubra, P. S., Walker, P., Walsh, W. R., & Bruce, W. J. (2014). Midterm results using a medial pivot total knee replacement compared with the Australian National Joint Replacement Registry data. *ANZ Journal of Surgery*, *84*(3), 172–176. <https://doi.org/10.1111/ans.12428>
- Brokelman, R. B., van Loon, C. J., & Rijnberg, W. J. (2003). Patient versus surgeon satisfaction after total hip arthroplasty. *Journal of Bone and Joint Surgery (British Volume)*, *85*(4), 495–498. <https://doi.org/10.1302/0301-620X.85B4.13411>
- Bruscaglioni, L. (2016). Theorizing in grounded theory and creative abduction. *Quality & Quantity*, *50*(5), 2009–2024. <https://doi.org/10.1007/s11135-015-0248-3>
- Bryant, A. (2007). A constructive/ist response to Glaser's 'constructivist grounded theory?' (Reprinted from *Forum Qualitative Sozialforschung*, vol 6). *Historical Social Research*, 106–113.
- Bryant, A., & Charmaz, K. (2007). *The SAGE handbook of grounded theory*. SAGE Publications.
- Bullens, P. H., van Loon, C. J., de Waal Malefijt, M. C., Laan, R. F., & Veth, R. P. (2001). Patient satisfaction after total knee arthroplasty: A comparison between subjective and objective outcome assessments. *Journal of Arthroplasty*, *16*(6), 740–747. <https://doi.org/10.1054/arth.2001.23922>
- Bunzli, S., Nelson, E., Scott, A., French, S., Choong, P., & Dowsey, M. (2017). Barriers and facilitators to orthopaedic surgeons' uptake of decision aids for total knee arthroplasty: A qualitative study. *BMJ Open*, *7*(11), e018614. <https://doi.org/10.1136/bmjopen-2017-018614>
- Butera, K. A., Lentz, T. A., Beneciuk, J. M., & George, S. Z. (2016). Preliminary evaluation of a modified STarT Back Screening Tool across different musculoskeletal pain conditions. *Physical Therapy*, *96*(8), 1251–1261. <https://doi.org/10.2522/ptj.20150377>

- Berger, R. (2015). Now I see it, now I don't: researcher's position and reflexivity in qualitative research. *Qualitative Research, 15*(2), 219-234.
- Caelli, K., Ray, L., & Mill, J. (2003). 'Clear as Mud': toward greater clarity in generic qualitative research. *International Journal of Qualitative Methods, 2*(1)-13. doi: 10.1177/160940690300200201
- Carr-Hill, R. A. (1992). The measurement of patient satisfaction. *Journal of Public Health Medicine, 14*(3), 236-249.
- Charmaz, K. (1990). 'Discovering' chronic illness: Using grounded theory. *Social Science and Medicine, 30*(11), 1161-1172. [https://doi.org/10.1016/0277-9536\(90\)90256-R](https://doi.org/10.1016/0277-9536(90)90256-R)
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE Publications.
- Charmaz, K. (2015). Grounded theory: Methodology and theory construction. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., pp. 402-407). Elsevier.
- Charmaz, K., & Bryant, A. (2010). *Grounded theory*.
- Chinnappa, J., Chen, D. B., Harris, I. A., & MacDessi, S. J. (2017). Predictors and functional implications of change in leg length after total knee arthroplasty. *Journal of Arthroplasty, 32*(9), 2725-2729. <https://doi.org/10.1016/j.arth.2017.04.007>
- Cho, J. Y., & Lee, E.-H. (2014). Reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. *The Qualitative Report, 19*(32), 1-20. <https://doi.org/10.46743/2160-3715/2014.1028>
- Clarke, V., & Braun, V. (2017). Thematic analysis. *The Journal of Positive Psychology, 12*(3), 297-298. <https://doi.org/10.1080/17439760.2016.1262613>
- Clement, N. D., Bardgett, M., Weir, D., Holland, J., Gerrand, C., & Deehan, D. J. (2018a). The rate and predictors of patient satisfaction after total knee arthroplasty are influenced by the focus of the question: A standard satisfaction question is required. *The Bone & Joint Journal, 100-B*(6), 740-748. <https://doi.org/10.1302/0301-620X.100B6.BJJ-2017-1292.R1>
- Clement, N. D., Bardgett, M., Weir, D., Holland, J., Gerrand, C., & Deehan, D. J. (2018b). Three groups of dissatisfied patients exist after total knee arthroplasty: Early, persistent, and late. *The Bone & Joint Journal, 100-B*(2), 161-169. <https://doi.org/10.1302/0301-620X.100B2.BJJ-2017-1016.R1>
- Clement, N. D., MacDonald, D., & Simpson, A. H. (2014). The minimal clinically important difference in the Oxford knee score and Short Form 12 score after total knee arthroplasty. *Knee Surgery, Sports Traumatology, Arthroscopy, 22*(8), 1933-1939. <https://doi.org/10.1007/s00167-013-2776-5>
- Collados-Maestre, I., Lizaur-Utrilla, A., Gonzalez-Navarro, B., Miralles-Munoz, F. A., Marco-Gomez, L., Lopez-Prats, F., & Gil-Guillen, V. (2016). Better functional outcome after single-radius TKA compared with multi-radius TKA. *Knee Surgery, Sports Traumatology, Arthroscopy, 25*(11), 3508-3514. <https://doi.org/10.1007/s00167-016-4273-0>
- Collins, J. E., Donnell-Fink, L. A., Yang, H. Y., Usiskin, I. M., Lape, E. C., Wright, J., Katz, J. N., & Losina, E. (2017). Effect of obesity on pain and functional recovery following total knee arthroplasty. *Journal of Bone and Joint Surgery (American Volume), 99*(21), 1812-1818. <https://doi.org/10.2106/JBJS.17.00022>
- Collins, N. J., Misra, D., Felson, D. T., Crossley, K. M., & Roos, E. M. (2011). Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Outcome Survey Activities of Daily Living Scale (KOS-ADL), Lysholm Knee Scoring Scale, Oxford Knee Score (OKS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Activity Rating Scale (ARS), and Tegner Activity Score (TAS). *Arthritis Care & Research, 63*(Suppl. 11), S208-S228. <https://doi.org/10.1002/acr.20632>
- Connelly, L. (2016). Trustworthiness in qualitative research. *Medsurg Nursing, 25*(6), 435-436.
- Corbin, J. (1991). Anselm Strauss: An intellectual biography. In D. R. Maines (Ed), *Social organization and social process: Essays in honour of Anselm Strauss* (pp. 17-42). New York: Aldine de Gruyter

- COTA Australia. (2012). *Living longer living stronger in Western Australia*. https://www.cota.org.au/wp-content/uploads/2017/12/2012_ills.pdf
- Crawford, D. C., Miller, L. E., & Block, J. E. (2013). Conservative management of symptomatic knee osteoarthritis: A flawed strategy? *Orthopedic Reviews*, *5*(1), e2. <https://doi.org/10.4081/or.2013.e2>
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. SAGE Publications.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). SAGE Publications.
- Crotty, M. (1998). *Foundations of social research: Meaning and perspective in the research process*. Allen & Unwin.
- Culliton, S. E., Bryant, D. M., MacDonald, S. J., Hibbert, K. M., & Chesworth, B. M. (2018). Effect of an e-learning tool on expectations and satisfaction following total knee arthroplasty: A randomized controlled trial. *The Journal of Arthroplasty*, *33*(7), 2153–2158. <https://doi.org/10.1016/j.arth.2018.02.040>
- Culliton, S. E., Bryant, D. M., Overend, T. J., MacDonald, S. J., & Chesworth, B. M. (2012). The relationship between expectations and satisfaction in patients undergoing primary total knee arthroplasty. *Journal of Arthroplasty*, *27*(3), 490–492. <https://doi.org/10.1016/j.arth.2011.10.005>
- Dailiana, Z. H., Papakostidou, I., Varitimidis, S., Liaropoulos, L., Zintzaras, E., Karachalios, T., Michelinakis, E., & Malizos, K. N. (2015). Patient-reported quality of life after primary major joint arthroplasty: A prospective comparison of hip and knee arthroplasty. *BMC Musculoskeletal Disorders*, *16*, 366. <https://doi.org/10.1186/s12891-015-0814-9>
- Darlow, B., Dean, S., Perry, M., Mathieson, F., Baxter, G. D., & Dowell, A. (2015). Easy to harm, hard to heal: Patient views about the back. *Spine*, *40*(11), 842–850. <https://doi.org/10.1097/BRS.0000000000000901>
- Davis, A. M., Perruccio, A. V., Canizares, M., Hawker, G. A., Roos, E. M., Maillefert, J. F., & Lohmander, L. S. (2009). Comparative, validity and responsiveness of the HOOS-PS and KOOS-PS to the WOMAC physical function subscale in total joint replacement for osteoarthritis. *Osteoarthritis and Cartilage*, *17*(7), 843–847. <https://doi.org/10.1016/j.joca.2009.01.005>
- Davis, A. M., Perruccio, A. V., & Lohmander, L. S. (2012). Minimally clinically important improvement: All non-responders are not really non-responders an illustration from total knee replacement. *Osteoarthritis and Cartilage*, *20*(5), 364–367. <https://doi.org/10.1016/j.joca.2012.02.005>
- de Beer, J., Petruccioli, D., Gandhi, R., & Winemaker, M. (2005). Primary total knee arthroplasty in patients receiving workers' compensation benefits. *Canadian Journal of Surgery*, *48*(2), 100–105.
- De Chesnay, M. (2014). *Nursing research using phenomenology: Qualitative designs and methods in nursing*. Springer Publishing Company.
- Denzin, N. K., & Lincoln, Y. S. (2005). *The discipline and practice of qualitative research*. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (3rd ed., pp. 1–28). SAGE Publications.
- Denzin, N. K., & Lincoln, Y. S. (2003). *Collecting and interpreting qualitative materials* (2nd ed). SAGE Publications.
- Department of Health. (2010). *Elective joint replacement service model of care*. [https://ww2.health.wa.gov.au/~/_/media/Files/Corporate/general%20documents/Health%20Net works/Musculoskeletal/Elective-Joint-Replacement-Service-Model-of-Care.pdf](https://ww2.health.wa.gov.au/~/_/media/Files/Corporate/general%20documents/Health%20Net%20works/Musculoskeletal/Elective-Joint-Replacement-Service-Model-of-Care.pdf)
- Dey, I. (1999). *Grounding grounded theory*. Academic Press.
- Dowsey, M., Castle, D., Knowles, S., Monshat, K., Salzberg, M., Nelson, E., Dunin, A., Dunin, J., Spelman, T., & Choong, P. (2019). The effect of mindfulness training prior to total joint arthroplasty on post-operative pain and physical function: A randomised controlled trial. *Complementary Therapies in Medicine*, *46*, 195–201. <https://doi.org/10.1016/j.ctim.2019.08.010>

- Dowsey, M. M., Scott, A., Nelson, E. A., Li, J., Sundararajan, V., Nikpour, M., & Choong, P. F. M. (2016). Using discrete choice experiments as a decision aid in total knee arthroplasty: Study protocol for a randomised controlled trial. *Trials*, *17*(1), 416. <https://doi.org/10.1186/s13063-016-1536-5>
- Dowsey, M. M., Spelman, T., & Choong, P. F. (2016). Development of a prognostic nomogram for predicting the probability of nonresponse to total knee arthroplasty 1 year after surgery. *Journal of Arthroplasty*, *31*(8), 1654–1660. <https://doi.org/10.1016/j.arth.2016.02.003>
- Dunbar, M. J., Richardson, G., & Robertsson, O. (2013). I can't get no satisfaction after my total knee replacement: Rhymes and reasons. *The Bone & Joint Journal*, *95-B*(11 Suppl. A), 148–152. <https://doi.org/10.1302/0301-620X.95B11.32767>
- Edwards, R. R., Dworkin, R. H., Sullivan, M. D., Turk, D. C., & Wasan, A. D. (2016). The role of psychosocial processes in the development and maintenance of chronic pain. *The Journal of Pain*, *17*(9), T70–T92. <https://doi.org/10.1016/j.jpain.2016.01.001>
- Eriksen, L. R. (1995). Patient satisfaction with nursing care: Concept clarification. *Journal of Nursing Measurement*, *3*(1), 59–76. <https://doi.org/10.1891/1061-3749.3.1.59>
- Escobar, A., García Pérez, L., Herrera-Espiñeira, C., Aizpuru, F., Sarasqueta, C., Gonzalez Sáenz de Tejada, M., Quintana, J. M., & Bilbao, A. (2013). Total knee replacement; minimal clinically important differences and responders. *Osteoarthritis and Cartilage*, *21*(12), 2006–2012. <https://doi.org/10.1016/j.joca.2013.09.009>
- Escobar, A., Gonzalez, M., Quintana, J. M., Vrotsou, K., Bilbao, A., Herrera-Espineira, C., Garcia-Perez, L., Aizpuru, F., & Sarasqueta, C. (2012). Patient acceptable symptom state and OMERACT-OARSI set of responder criteria in joint replacement. Identification of cut-off values. *Osteoarthritis and Cartilage*, *20*(2), 87–92. <https://doi.org/10.1016/j.joca.2011.11.007>
- Ethgen, O., Bruyere, O., Richey, F., Dardennes, C., & Reginster, J. Y. (2004). Health-related quality of life in total hip and total knee arthroplasty: A qualitative and systematic review of the literature. *Journal of Bone and Joint Surgery (American Volume)*, *86-A*(5), 963–974. <https://doi.org/10.2106/00004623-200405000-00012>
- Fatoye, F., Yeowell, G., Wright, J. M., & Gebrye, T. (2021). Clinical and cost-effectiveness of physiotherapy interventions following total knee replacement: A systematic review and meta-analysis. *Archives of Orthopaedic and Trauma Surgery*. <https://doi.org/10.1007/s00402-021-03784-5>
- Fereday, J., & Muir-Cochrane, E. (2016). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, *5*(1), 80–92. <https://doi.org/10.1177/160940690600500107>
- Ferreira, M. L., Herbert, R. D., Ferreira, P. H., Latimer, J., Ostelo, R. W., Grotle, M., & Barrett, B. (2013). The smallest worthwhile effect of nonsteroidal anti-inflammatory drugs and physiotherapy for chronic low back pain: A benefit–harm trade-off study. *Journal of Clinical Epidemiology*, *66*(12), 1397–1404. <https://doi.org/10.1016/j.jclinepi.2013.02.018>
- Fisher, L. R., Alvar, B. A., Maher, S. F., & Cleland, J. A. (2020). Short-term effects of thoracic spine thrust manipulation, exercise, and education in individuals with low back pain: A randomized controlled trial. *Journal of Orthopaedic and Sports Physical Therapy*, *50*(1), 24–32. <https://doi.org/10.2519/jospt.2020.8928>
- Fitzpatrick, R., & Hopkins, A. (1983). Problems in the conceptual framework of patient satisfaction research: An empirical exploration. *Sociology of Health and Illness*, *5*(3), 297–311. <https://doi.org/10.1111/1467-9566.ep10491836>
- Flick, U. (2013). *The SAGE handbook of qualitative data analysis*. SAGE Publications.
- Flick, U. (2014). *An introduction to qualitative research* (5th ed.). Metzler, K (Ed.). SAGE Publications.
- Franklin, P. D., Karbassi, J. A., Li, W., Yang, W., & Ayers, D. C. (2010). Reduction in narcotic use after primary total knee arthroplasty and association with patient pain relief and satisfaction. *Journal of Arthroplasty*, *25*(Suppl. 6), 12–16. <https://doi.org/10.1016/j.arth.2010.05.003>
- Freidin, B., & Timmermans, S. (2008). Complementary and alternative medicine for children's asthma: Satisfaction, care provider responsiveness, and networks of care. *Qualitative Health Research*, *18*(1), 43–55. <https://doi.org/10.1177/1049732307308995>

- Gaillard, R., Gaillard, T., Denjean, S., & Lustig, S. (2017). No influence of obesity on survival of cementless, posterior-stabilised, rotating-platform implants. *Archives of Orthopaedic and Trauma Surgery*, *137*(12), 1743–1750. <https://doi.org/10.1007/s00402-017-2801-0>
- Gandhi, R., de Beer, J., Petruccelli, D., & Winemaker, M. (2007). Does patient perception of alignment affect total knee arthroplasty outcome? *Canadian Journal of Surgery*, *50*(3), 181–186.
- Garriga, C., Sanchez-Santos, M. T., Judge, A., Perneger, T., Hannouche, D., Lübbecke, A., & Arden, N. K. (2018). Development of a model predicting non-satisfaction 1 year after primary total knee replacement in the UK and transportation to Switzerland. *Scientific Reports*, *8*(1), 3380–3388. <https://doi.org/10.1038/s41598-018-21713-2>
- Gelling, L. (2015). Qualitative research. *Nursing Standard* (2015), *29*(30), 43. doi:<http://dx.doi.org/10.7748/ns.29.30.43.e9749>
- Genet, F., Schnitzler, A., Lapeyre, E., Roche, N., Autret, K., Fermanian, C., & Poiraudou, S. (2008). Change of impairment, disability and patient satisfaction after total knee arthroplasty in secondary care practice. *Annales de Réadaptation et de Médecine Physique: Revue Scientifique de la Société Française de Rééducation Fonctionnelle de Réadaptation et de Médecine Physique*, *51*(8), 671–682. <https://doi.org/10.1016/j.annrmp.2008.08.002>
- Gildone, A., Manfredini, M., Biscione, R., & Faccini, R. (2005). Patella resurfacing in posterior stabilised total knee arthroplasty: A follow-up study in 56 patients. *Acta Orthopaedica Belgica*, *71*(4), 445–451.
- Giurea, A., Fraberger, G., Kolbitsch, P., Lass, R., Schneider, E., Kubista, B., & Windhager, R. (2016). The impact of personality traits on the outcome of total knee arthroplasty. *BioMed Research International*, *2016*, 5282160. <https://doi.org/10.1155/2016/5282160>
- Glaser, B. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA: Sociology Press.
- Glaser, B. (1992). *Basics of grounded theory analysis: Emergence vs. forcing*. Mill Valley, CA: Sociology Press. 436-445.
- Glaser, B. G. (1998). *Doing grounded theory: Issues and discussions*. Sociology Press.
- Glaser, B. G. (2002). Constructivist grounded theory? *The Grounded Theory Review*, *11*(1), 28–38.
- Glaser, B. G. (2008). The constant comparative method of qualitative analysis. *The Grounded Theory Review*, *7*(3).
- Glaser, B. G., & Strauss, A. L. (1965). *Awareness of dying*. Aldine Publishing Company.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing Company.
- Goh, G. S., Liow, M. H., Lim, W. S., Tay, D. K., Yeo, S. J., & Tan, M. H. (2016). Accelerometer-based navigation is as accurate as optical computer navigation in restoring the joint line and mechanical axis after total knee arthroplasty: A prospective matched study. *Journal of Arthroplasty*, *31*(1), 92–97. <https://doi.org/10.1016/j.arth.2015.06.048>
- Goldkuhl, G. (2012). Pragmatism vs interpretivism in qualitative information systems research. *European Journal of Information Systems: Special Issue: Qualitative Research Methods*, *21*(2), 135–146. <https://doi.org/10.1057/ejis.2011.54>
- Goldsmith, L. J., Suryaprakash, N., Randall, E., Shum, J., MacDonald, V., Sawatzky, R., Hejazi, S., Davis, J. C., McAllister, P., & Bryan, S. (2017). The importance of informational, clinical and personal support in patient experience with total knee replacement: A qualitative investigation. *BMC Musculoskeletal Disorders*, *18*(1), 127. <https://doi.org/10.1186/s12891-017-1474-8>
- Gopal, S., Wood, W., Myezwa, H., & Stewart, A. (2010). Intra- and inter-rater reliability of the Knee Society Knee Score when used by two physiotherapists post total knee arthroplasty. *South African Journal of Physiotherapy*, *66*(1), 21–25. <https://doi.org/10.4102/sajp.v66i1.59>
- Greidanus, N. V., Peterson, R. C., Masri, B. A., & Garbuz, D. S. (2011). Quality of life outcomes in revision versus primary total knee arthroplasty. *Journal of Arthroplasty*, *26*(4), 615–620. <https://doi.org/10.1016/j.arth.2010.04.026>

- Guba, E. G., & Lincoln, Y. S., (2005). Paradigmatic controversies, contradictions, and emerging confluences. In Denzin, N. K., & Lincoln, Y. S., (Eds), *The SAGE handbook of qualitative research* (3rd ed., 191-232). SAGE Publications.
- Guba, E. G. (1990). *The Paradigm Dialogue*. SAGE Publications.
- Guillemin, M., & Gillam, L. (2004). Ethics, reflexivity and 'ethically important moments' in research. *Qualitative Inquiry*, 10, 261–280.
- Gunaratne, R., Pratt, D. N., Banda, J., Fick, D. P., Khan, R. J. K., & Robertson, B. W. (2017). Patient dissatisfaction following total knee arthroplasty: A systematic review of the literature. *Journal of Arthroplasty*, 32(12), 3854–3860. <https://doi.org/10.1016/j.arth.2017.07.021>
- Haanstra, T. M., van den Berg, T., Ostelo, R. W., Poolman, R. W., Jansma, E. P., Cuijpers, P., & de Vet, H. C. (2012). Systematic review: Do patient expectations influence treatment outcomes in total knee and total hip arthroplasty? *Health and Quality of Life Outcomes*, 10, 152. <https://doi.org/10.1186/1477-7525-10-152>
- Halawi, M. J., Jongbloed, W., Baron, S., Savoy, L., Williams, V. J., & Cote, M. P. (2019). Patient dissatisfaction after primary total joint arthroplasty: The patient perspective. *The Journal of Arthroplasty*, 34(6), 1093–1096. <https://doi.org/10.1016/j.arth.2019.01.075>
- Hamilton, D. F., Lane, J. V., Gaston, P., Patton, J. T., MacDonald, D., Simpson, A. H., & Howie, C. R. (2013). What determines patient satisfaction with surgery? A prospective cohort study of 4709 patients following total joint replacement. *BMJ Open*, 3(4), e002525. <https://doi.org/10.1136/bmjopen-2012-002525>
- Hammond, M., Howarth, J., & Keat, R. (1991). *Understanding Phenomenology*. Oxford, UK: Basil Blackwell.
- Hartholt, E., Vuoskoski, P., & Hebron, C. (2020). Physiotherapists' lived experiences of decision making in therapeutic encounters with persons suffering from whiplash-associated disorder: A hermeneutic phenomenological study. *Musculoskeletal Care*, 18(4), 519–526. <https://doi.org/10.1002/msc.1496>
- Hausknecht, S., Clemson, L., O'Loughlin, K., McNab, J., & Low, L. (2020). *Reframing ageing in Australia*. Retrieved from <https://www.age-platform.eu/publications/reframing-ageing-australia>
- Hausknecht, S., Low, L.-F., O'Loughlin, K., McNab, J., & Clemson, L. (2019). Older adults' self-perceptions of aging and being older: A scoping review. *Gerontologist*, 60(7), e524–e534. <https://doi.org/10.1093/geront/gnz153>
- Hayes, S. C., & Duckworth, M. P. (2006). Acceptance and commitment therapy and traditional cognitive behavior therapy approaches to pain. *Cognitive and Behavioral Practice*, 13(3), 185–187. <https://doi.org/10.1016/j.cbpra.2006.04.002>
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44(1), 1–25. <https://doi.org/10.1016/j.brat.2005.06.006>
- Healy, W. L., Iorio, R., Ko, J., Appleby, D., & Lemos, D. W. (2002). Impact of cost reduction programs on short-term patient outcome and hospital cost of total knee arthroplasty. *Journal of Bone and Joint Surgery (American Volume)*, 84-A(3), 348–353. <https://doi.org/10.2106/00004623-200203000-00003>
- Henderson, J. V., Harrison, C. M., Britt, H. C., Bayram, C. F., & Miller, G. C. (2013). Prevalence, causes, severity, impact, and management of chronic pain in Australian general practice patients. *Pain Medicine*, 14(9), 1346–1361. <https://doi.org/10.1111/pme.12195>
- Heuts, P. H., Vlaeyen, J. W., Roelofs, J., de Bie, R. A., Aretz, K., van Weel, C., & van Schayck, O. C. (2004). Pain-related fear and daily functioning in patients with osteoarthritis. *Pain*, 110(1–2), 228–235. <https://doi.org/10.1016/j.pain.2004.03.035>
- Higashi, H., & Barendregt, J. J. (2011). Cost-effectiveness of total hip and knee replacements for the Australian population with osteoarthritis: Discrete-event simulation model. *PloS One*, 6(9), e25403. <https://doi.org/10.1371/journal.pone.0025403>
- Higgins, J. P. T., & Green, S. (Eds.). (2011). *Cochrane handbook for systematic reviews of interventions*. The Cochrane Collaboration.

- Hills, R., & Kitchen, S. (2007). Toward a theory of patient satisfaction with physiotherapy: Exploring the concept of satisfaction. *Physiotherapy Theory and Practice*, 23(5), 243–254.
<https://doi.org/10.1080/09593980701209394>
- Hinarejos, P., Puig-Verdie, L., Leal, J., Pelfort, X., Torres-Claramunt, R., Sanchez-Soler, J., & Monllau, J. C. (2016). No differences in functional results and quality of life after single-radius or multiradius TKA. *Knee Surgery, Sports Traumatology, Arthroscopy*, 24(8), 2634–2640.
<https://doi.org/10.1007/s00167-015-3894-z>
- Holman, H. R. (1993). Qualitative inquiry in medical research. *Journal of Clinical Epidemiology*, 46(1), 29–36. [https://doi.org/10.1016/0895-4356\(93\)90006-m](https://doi.org/10.1016/0895-4356(93)90006-m)
- Holstein, J. A., & Bubrium, J. F. (2005). Interpretive practice and social action. In Denzin, N. K., & Lincoln, Y. S., (Eds), *The SAGE handbook of qualitative research* (3rd ed., 191-232). SAGE Publications.
- Holton, J. A. (2008). Grounded theory as a general research methodology. *The Grounded Theory Review: An International Journal*, 7(2), 22-27.
- Howard, D. Davis, P. (2002). The use of qualitative research methodology in orthopaedics – tell it as it is, *Journal of Orthopaedic Nursing*, 6(3), 135-139. [https://doi.org/10.1016/S1361-3111\(02\)00051-1](https://doi.org/10.1016/S1361-3111(02)00051-1).
- Hoy, D., Brooks, P., Woolf, A., Blyth, F., March, L., Bain, C., Baker, P., Smith, E., & Buchbinder, R. (2012). Assessing risk of bias in prevalence studies: Modification of an existing tool and evidence of interrater agreement. *Journal of Clinical Epidemiology*, 65(9), 934–939.
<https://doi.org/10.1016/j.jclinepi.2011.11.014>
- Hozo, S.P., Djulbegovic, B. & Hozo, I. (2005). Estimating the mean and variance from the median, range, and the size of a sample. *BMC Med Res Methodol* 5(13). <https://doi.org/10.1186/1471-2288-5-13>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- Hsieh, M. O., & Kagle, J. D. (1991). Understanding patient satisfaction and dissatisfaction with health care. *Health and Social Work*, 16(4), 281–290. <https://doi.org/10.1093/hsw/16.4.281>
- Hudak, P. L., Hogg-Johnson, S., Bombardier, C., McKeever, P. D., & Wright, J. G. (2004). Testing a new theory of patient satisfaction with treatment outcome. *Medical Care*, 42(8), 726–739.
<https://doi.org/10.1097/01.mlr.0000132394.09032.81>
- Hudak, P. L., McKeever, P. D., & Wright, J. G. (2004). Understanding the meaning of satisfaction with treatment outcome. *Medical Care*, 42(8), 718–725.
<https://doi.org/10.1097/01.mlr.0000132398.11342.a8>
- Hudak, P. L., McKeever, P., & Wright, J. G. (2007). Unstable embodiments: A phenomenological interpretation of patient satisfaction with treatment outcome. *Journal of Medical Humanities*, 28(1), 31–44. <https://doi.org/10.1007/s10912-006-9027-4>
- Hulka, B. S., Zyzanski, S. J., Cassel, J. C., & Thompson, S. J. (1970). Scale for the measurement of attitudes toward physicians and primary medical care. *Medical Care*, 8(5), 429–436.
<https://doi.org/10.1097/00005650-197009000-00010>
- Hunt, M. R. (2009). Strengths and challenges in the use of interpretive description: Reflections arising from a study of the moral experience of health professionals in humanitarian work. *Qualitative Health Research*, 19(9), 1284–1292. <https://doi.org/10.1177/1049732309344612>
- Husserl, E. (1970). *Logical Investigations*. Routledge.
- Janse, A. J., Gemke, R. J., Uiterwaal, C. S., van der Tweel, I., Kimpen, J. L., & Sinnema, G. (2004). Quality of life: Patients and doctors don't always agree: A meta-analysis. *Journal of Clinical Epidemiology*, 57(7), 653–661. <https://doi.org/10.1016/j.jclinepi.2003.11.013>
- Jansson, M. M., Harjumaa, M., Puhto, A. P., & Pikkarainen, M. (2019). Patients' satisfaction and experiences during elective primary fast-track total hip and knee arthroplasty journey: A qualitative study. *Journal of Clinical Nursing*, 29(3–4), 567–582.
<https://doi.org/10.1111/jocn.15121>

- Jeffery, A. E., Wylde, V., Blom, A. W., & Horwood, J. P. (2011). 'It's there and I'm stuck with it': Patients' experiences of chronic pain following total knee replacement surgery. *Arthritis Care and Research*, 63(2), 286–292. <https://doi.org/10.1002/acr.20360>
- Kahlenberg, C. A., Nwachukwu, B. U., McLawhorn, A. S., Cross, M. B., Cornell, C. N., & Padgett, D. E. (2018). Patient satisfaction after total knee replacement: A systematic review. *HSS Journal*, 14(2), 192–201. <https://doi.org/10.1007/s11420-018-9614-8>
- Kamper, S. J. (2018). Bias: Linking evidence with practice. *Journal of Orthopaedic and Sports Physical Therapy*, 48(8), 667–668. <https://doi.org/10.2519/jospt.2018.0703>
- Kamper, S. J. (2019a). Interpreting outcomes 3 – clinical meaningfulness: Linking evidence to practice. *Journal of Orthopaedic and Sports Physical Therapy*, 49(9), 677–678. <https://doi.org/10.2519/jospt.2019.0705>
- Kamper, S. J. (2019b). Reliability and validity: Linking evidence to practice. *Journal of Orthopaedic and Sports Physical Therapy*, 49(4), 286–287. <https://doi.org/10.2519/jospt.2019.0702>
- Kashdan, T., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, 30 (7), 865–878 doi: 10.1016/j.cpr.2010.03.001
- Katz, J. N., Phillips, C. B., Poss, R., Harrast, J. J., Fossel, A. H., Liang, M. H., & Sledge, C. B. (1995). The validity and reliability of a total hip arthroplasty outcome evaluation questionnaire. *Journal of Bone and Joint Surgery (American Volume)*, 77(10), 1528–1534. <https://doi.org/10.2106/00004623-199510000-00007>
- Kawakami, Y., Matsumoto, T., Takayama, K., Ishida, K., Nakano, N., Matsushita, T., Kuroda, Y., Patel, K., Kuroda, R., & Kurosaka, M. (2015). Intermediate-term comparison of posterior cruciate-retaining versus posterior-stabilized total knee arthroplasty using the new knee scoring system. *Orthopedics*, 38(12), e1127–1132. <https://doi.org/10.3928/01477447-20151123-03>
- Kennedy, D. M., Stratford, P. W., Riddle, D. L., Hanna, S. E., & Gollish, J. D. (2008). Assessing recovery and establishing prognosis following total knee arthroplasty. *Physical Therapy*, 88(1), 22–32. <https://doi.org/10.2522/ptj.20070051>
- Khatib, Y., Madan, A., Naylor, J. M., & Harris, I. A. (2015). Do psychological factors predict poor outcome in patients undergoing TKA? A systematic review. *Clinical Orthopaedics and Related Research*, 473(8), 2630–2638. <https://doi.org/10.1007/s11999-015-4234-9>
- Khuangsirikul, S., Lekkreusuwan, K., & Chotanaphuti, T. (2016). 10-year patient satisfaction compared between computer-assisted navigation and conventional techniques in minimally invasive surgery total knee arthroplasty. *Computer Assisted Surgery*, 21(1), 172–175. <https://doi.org/10.1080/24699322.2016.1249959>
- Kim, T. K., Chang, C. B., Kang, Y. G., Kim, S. J., & Seong, S. C. (2009). Causes and predictors of patient's dissatisfaction after uncomplicated total knee arthroplasty. *Journal of Arthroplasty*, 24(2), 263–271. <https://doi.org/10.1016/j.arth.2007.11.005>
- Kim, T. K., Cho, H. J., Kang, Y. G., Kim, S. J., & Chang, C. B. (2009). Improved early clinical outcomes of RP/PS mobile-bearing total knee arthroplasties. *Clinical Orthopaedics and Related Research*, 467(11), 2901–2910. <https://doi.org/10.1007/s11999-009-0787-9>
- Kittelson, A. J., Stevens-Lapsley, J. E., & Schmiede, S. J. (2016). Determination of pain phenotypes in knee osteoarthritis: A latent class analysis using data from the osteoarthritis initiative. *Arthritis Care & Research*, 68(5), 612–620. <https://doi.org/10.1002/acr.22734>
- Klassen, A. F., Pusic, A. L., Scott, A., Klok, J., & Cano, S. J. (2009). Satisfaction and quality of life in women who undergo breast surgery: A qualitative study. *BMC Women's Health*, 9(1), 11. <https://doi.org/10.1186/1472-6874-9-11>
- Klem, N.-R., Kent, P., Smith, A., Dowsey, M., Fary, R., Schütze, R., O'Sullivan, P., Choong, P., & Bunzli, S. (2020). Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review. *Osteoarthritis and Cartilage Open*, 2(1), 100032.
- Klem, N.-R., Smith, A., O'Sullivan, P., Dowsey, M. M., Schütze, R., Kent, P., Choong, P. F., & Bunzli, S. (2020). What influences patient satisfaction after TKA? A qualitative investigation. *Clinical Orthopaedics and Related Research*, 478(8), 1850–1866. <https://doi.org/10.1097/CORR.0000000000001284>

- Korsch, B. M., Gozzi, E. K., & Francis, V. (1968). Gaps in doctor–patient communication. 1. Doctor–patient interaction and patient satisfaction. *Pediatrics*, *42*(5), 855–871.
- Lane, J. V., Hamilton, D. F., MacDonald, D. J., Ellis, C., & Howie, C. R. (2016). Factors that shape the patient’s hospital experience and satisfaction with lower limb arthroplasty: An exploratory thematic analysis. *BMJ Open*, *6*(5), e010871. <https://doi.org/10.1136/bmjopen-2015-010871>
- Lane, N. E., Brandt, K., Hawker, G., Peeva, E., Schreyer, E., Tsuji, W., & Hochberg, M. C. (2011). OARSI–FDA initiative: Defining the disease state of osteoarthritis. *Osteoarthritis and Cartilage*, *19*(5), 478–482. <https://doi.org/10.1016/j.joca.2010.09.013>
- Lange, J. K., Lee, Y. Y., Spiro, S. K., & Haas, S. B. (2018). Satisfaction rates and quality of life changes following total knee arthroplasty in age-differentiated cohorts. *Journal of Arthroplasty*, *33*(5), 1373–1378. <https://doi.org/10.1016/j.arth.2017.12.031>
- Lape, E. C., Hudak, P., Davis, A. M., & Katz, J. N. (2019). Body-self unity with a new hip or knee: Understanding total joint replacement within an embodiment framework. *ACR Open Rheumatology*, *1*(2), 90–96. <https://doi.org/10.1002/acr2.1014>
- Lavernia, C. J., Villa, J. M., & Iacobelli, D. A. (2015). What is the role of mental health in primary total knee arthroplasty? *Clinical Orthopaedics and Related Research*, *473*(1), 159–163. <https://doi.org/10.1007/s11999-014-3769-5>
- Law, S., Daftary, A., Mitnick, C. D., Dheda, K., & Menzies, D. (2019). Disrupting a cycle of mistrust: A constructivist grounded theory study on patient–provider trust in TB care. *Social Science and Medicine*, *240*, 112578. <https://doi.org/10.1016/j.socscimed.2019.112578>
- Leeson, W., Resnick, A., Alexander, D., & Rovers, J. (2019). Natural language processing (NLP) in qualitative public health research: A proof of concept study. *International Journal of Qualitative Methods*, *18*, 1–9. <https://doi.org/10.1177/1609406919887021>
- Leopold, S. S. (2019). Editor’s spotlight/take 5: Misconceptions and the acceptance of evidence-based nonsurgical interventions for knee osteoarthritis. A qualitative study. *Clinical Orthopaedics and Related Research*, *477*(9), 1970–1974. <https://doi.org/10.1097/CORR.0000000000000910>
- Levers, M.-J. D. (2013). Philosophical paradigms, grounded theory, and perspectives on emergence. *SAGE Open*, *3*(4). <https://doi.org/10.1177/2158244013517243>
- Levinger, P., Bartlett, J. R., Bergman, N. R., McMahan, S., Menz, H. B., & Hill, K. D. (2019). The discrepancy between patient expectations and actual outcome reduces at the first 6 months following total knee replacement surgery. *Knee Surgery, Sports Traumatology, Arthroscopy*, *27*(7), 2042–2050. <https://doi.org/10.1007/s00167-018-5210-1>
- Levy, B. R. (2001). Eradication of ageism requires addressing the enemy within. *Gerontologist*, *41*(5), 578–579. <https://doi.org/10.1093/geront/41.5.578>
- Li, B., Bai, L., Fu, Y., Wang, G., He, M., & Wang, J. (2012). Comparison of clinical outcomes between patellar resurfacing and nonresurfacing in total knee arthroplasty: Retrospective study of 130 cases. *Journal of International Medical Research*, *40*(5), 1794–1803. <https://doi.org/10.1177/030006051204000517>
- Liebs, T. R., Herzberg, W., Ruther, W., Haasters, J., Russlies, M., & Hassenpflug, J. (2010). Ergometer cycling after hip or knee replacement surgery: A randomized controlled trial. *Journal of Bone and Joint Surgery (American Volume)*, *92*(4), 814–822. <https://doi.org/10.2106/JBJS.H.01359>
- Liebs, T. R., Herzberg, W., Ruther, W., Haasters, J., Russlies, M., & Hassenpflug, J. (2012). Multicenter randomized controlled trial comparing early versus late aquatic therapy after total hip or knee arthroplasty. *Archives of Physical Medicine and Rehabilitation*, *93*(2), 192–199. <https://doi.org/10.1016/j.apmr.2011.09.011>
- Lim, J. B., Chou, A. C., Chong, H. C., Lo, N. N., Chia, S. L., Tay, K. J., & Yeo, S. J. (2015). Are patients more satisfied and have better functional outcome after bilateral total knee arthroplasty as compared to total hip arthroplasty and unilateral total knee arthroplasty surgery? A two-year follow-up study. *Acta Orthopaedica Belgica*, *81*(4), 682–689.
- Lin, I., Wiles, L., Waller, R., Goucke, R., Nagree, Y., Gibberd, M., Straker, L., Maher, C. G., & O’Sullivan, P. B. (2020). What does best practice care for musculoskeletal pain look like? Eleven consistent

- recommendations from high-quality clinical practice guidelines: Systematic review. *British Journal of Sports Medicine*, 54(2), 79–86. <https://doi.org/10.1136/bjsports-2018-099878>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications.
- Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (4th ed., pp. 97–128). SAGE Publications.
- Linder-Pelz, S. (1982a). Social psychological determinants of patient satisfaction: A test of five hypothesis. *Social Science and Medicine*, 16(5), 583–589. [https://doi.org/10.1016/0277-9536\(82\)90312-4](https://doi.org/10.1016/0277-9536(82)90312-4)
- Linder-Pelz, S. U. (1982b). Toward a theory of patient satisfaction. *Social Science and Medicine*, 16(5), 577–582. [https://doi.org/10.1016/0277-9536\(82\)90311-2](https://doi.org/10.1016/0277-9536(82)90311-2)
- Lingard, E. A., Katz, J. N., Wright, R. J., Wright, E. A., Sledge, C. B., & Kinemax Outcomes Group. (2001). Validity and responsiveness of the Knee Society Clinical Rating System in comparison with the SF-36 and WOMAC. *Journal of Bone and Joint Surgery (American Volume)*, 83-A(12), 1856–1864.
- Linton, S. J., Nicholas, M., & MacDonald, S. (2011). Development of a short form of the Örebro Musculoskeletal Pain Screening Questionnaire. *Spine (Phila Pa 1976)*, 36(22), 1891–1895. <https://doi.org/10.1097/BRS.0b013e3181f8f775>
- Lizaur-Utrilla, A., Martinez-Mendez, D., Miralles-Munoz, F. A., Marco-Gomez, L., & Lopez-Prats, F. A. (2016). Negative impact of waiting time for primary total knee arthroplasty on satisfaction and patient-reported outcome. *International Orthopaedics*, 40(11), 2303–2307. <https://doi.org/10.1007/s00264-016-3209-0>
- Lluch Girbes, E., Nijs, J., Torres-Cueco, R., & Lopez Cubas, C. (2013). Pain treatment for patients with osteoarthritis and central sensitization. *Physical Therapy*, 93(6), 842–851. <https://doi.org/10.2522/ptj.20120253>
- Lockwood C, Munn Z, Porritt K (2015). Qualitative research synthesis: methodological guidance for systematic reviewers utilizing meta-aggregation. *International Journal of Evidence Based Healthcare*, 13(3):179–187.
- Losciale, J. M., Zdeb, R. M., Ledbetter, L., Reiman, M. P., & Sell, T. C. (2019). The association between passing return-to-sport criteria and second anterior cruciate ligament injury risk: A systematic review with meta-analysis. *Journal of Orthopaedic and Sports Physical Therapy*, 49(2), 43–54. <https://doi.org/10.2519/jospt.2019.8190>
- Luo, J. Y. N., Liu, P. P., & Wong, M. C. M. (2018). Patients' satisfaction with dental care: A qualitative study to develop a satisfaction instrument. *BMC Oral Health*, 18(1), 15–10. <https://doi.org/10.1186/s12903-018-0477-7>
- Madill, A., Jordan, A., Shirley, C., (2000). Objectivity and reliability in qualitative analysis: realist, contextualist and radical constructionist epistemologies. *The Journal of Philosophy, Psychology and Scientific Methods*, 91, 1-20.
- Mahdi, A., Svantesson, M., Wretenberg, P., & Hälleberg-Nyman, M. (2020). Patients' experiences of discontentment one year after total knee arthroplasty: A qualitative study. *BMC Musculoskeletal Disorders*, 21(1), 29–11. <https://doi.org/10.1186/s12891-020-3041-y>
- Mahomed, N., Gandhi, R., Daltroy, L., & Katz, J. N. (2011). The self-administered patient satisfaction scale for primary hip and knee arthroplasty. *Arthritis*, 2011, 591253. <https://doi.org/10.1155/2011/591253>
- Mahomed, N., Sledge, C., Daltroy, L., Fossel, A., & Katz, J. (1998). Self-administered patient satisfaction scale for joint replacement arthroplasty. *The Bone & Joint Journal*, 80(Suppl. 1), 9.
- Majid, U., & Vanstone, M. (2018). Appraising qualitative research for evidence syntheses: A compendium of quality appraisal tools. *Qualitative Health Research*, 28(13), 2115–2131. <https://doi.org/10.1177/1049732318785358>
- Mallon C. M., Gooberman-Hill, R., & Moore, A. J. (2018). Infection after knee replacement: a qualitative study of impact of periprosthetic knee infection. *BMC Musculoskeletal Disorders*, 19:352-352. doi: 10.1186/s12891-018-2264-7

- Mannion, A. F., Junge, A., Taimela, S., Muntener, M., Lorenzo, K., & Dvorak, J. (2001). Active therapy for chronic low back pain: Part 3. Factors influencing self-rated disability and its change following therapy. *Spine*, *26*(8), 920–929. <https://doi.org/10.1097/00007632-200104150-00015>
- Mannion, A. F., Kampfen, S., Munzinger, U., & Kramers-de Quervain, I. (2009). The role of patient expectations in predicting outcome after total knee arthroplasty. *Arthritis Research & Therapy*, *11*(5), R139. <https://doi.org/10.1186/ar2811>
- March, L. M., & Bagga, H. (2004). Epidemiology of osteoarthritis in Australia. *Medical Journal of Australia*, *180*(Suppl. 5), S6–S10. <https://doi.org/10.5694/j.1326-5377.2004.tb05906.x>
- Martin, V. B., Scott, C., Brennen, B., & Durham, M. G. (2018). What is grounded theory good for? *Journalism & Mass Communication Quarterly*, *95*(1), 11–22. <https://doi.org/10.1177/1077699018759676>
- Matthews, D. J., Hossain, F. S., Patel, S., & Haddad, F. S. (2013). A cohort study predicts better functional outcomes and equivalent patient satisfaction following UKR compared with TKR. *HSS Journal*, *9*(1), 21–24. <https://doi.org/10.1007/s11420-012-9326-4>
- Maxwell, R. J. (1984). Quality assessment in health. *British Medical Journal (Clinical Research Edition)*, *288*(6428), 1470–1472. <https://doi.org/10.1136/bmj.288.6428.1470>
- McWilliam, C. L. (2010). Phenomonology. In I. Bourgeault, R. Dingwall & R. de Vries (Eds.), *The SAGE Handbook of Qualitative Methods in Health Research* (pp. 229-248). SAGE Publications.
- Mead, G. H. (1963). *Mind, self and society from the stand-point of a social behaviorist*. Charles W. Morris (Ed.). University of Chicago Press.
- Merkouris, A., Papathanassoglou, E. D. E., & Lemonidou, C. (2004). Evaluation of patient satisfaction with nursing care: Quantitative or qualitative approach? *International Journal of Nursing Studies*, *41*(4), 355–367. <https://doi.org/10.1016/j.ijnurstu.2003.10.006>
- Merriam, S. B. (1998). *Qualitative research and case study applications in education / Sharan B. Merriam*. (2nd ed). San Francisco: Jossey-Bass Publishers.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: a guide to design and implementation*. (4th ed.) San Francisco: CA Jossey-Bass.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Group, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*(7), e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Mokkink, L. B., Prinsen, C., Patrick, D. L., Alonso, J., Bouter, L. M., de Vet, H. C. W., & Terwee, C. B. (2018). *COSMIN methodology for systematic reviews of Patient-Reported Outcome Measures (PROMs): User Manual*. COSMIN.
- Mooney, L. T., Smith, A., Sloan, K., & Clark, G. W. (2016). The effect of the native kinematics of the knee on the outcome following total knee arthroplasty. *The Bone & Joint Journal*, *98-B*(11), 1471–1478. <https://doi.org/10.1302/0301-620X.98B11.BJJ-2016-0144.R1>
- Morse, J. M. (2009). *Developing grounded theory: The second generation*. Taylor and Francis.
- Murphy, M., Journeaux, S., Hides, J., & Russell, T. (2014). Does flexion of the femoral implant in total knee arthroplasty increase knee flexion: A randomised controlled trial. *Knee*, *21*(1), 257–263. <https://doi.org/10.1016/j.knee.2012.10.028>
- Murphy, S. L., Lyden, A. K., Phillips, K., Clauw, D. J., & Williams, D. A. (2011). Association between pain, radiographic severity, and centrally-mediated symptoms in women with knee osteoarthritis. *Arthritis Care & Research*, *63*(11), 1543–1549. <https://doi.org/10.1002/acr.20583>
- Nashi, N., Hong, C. C., & Krishna, L. (2015). Residual knee pain and functional outcome following total knee arthroplasty in osteoarthritic patients. *Knee Surgery, Sports Traumatology, Arthroscopy*, *23*(6), 1841–1847. <https://doi.org/10.1007/s00167-014-2910-z>
- Neogi, T., Felson, D., Niu, J., Nevitt, M., Lewis, C. E., Aliabadi, P., Sack, B., Torner, J., Bradley, L., & Zhang, Y. (2009). Association between radiographic features of knee osteoarthritis and pain: Results from two cohort studies. *BMJ*, *339*, b2844. <https://doi.org/10.1136/bmj.b2844>
- Newsome, P. R., & Wright, G. H. (1999). A review of patient satisfaction: 1. Concepts of satisfaction. *British Dental Journal*, *186*(4 Spec. No.), 161–165. <https://doi.org/10.1038/sj.bdj.4800052>

- Nilsdotter, A. K., Toksvig-Larsen, S., & Roos, E. M. (2009a). A 5 year prospective study of patient-relevant outcomes after total knee replacement. *Osteoarthritis and Cartilage*, *17*(5), 601–606. <https://doi.org/10.1016/j.joca.2008.11.007>
- Nilsdotter, A. K., Toksvig-Larsen, S., & Roos, E. M. (2009b). Knee arthroplasty: Are patients' expectations fulfilled? A prospective study of pain and function in 102 patients with 5-year follow-up. *Acta Orthopaedica*, *80*(1), 55–61. <https://doi.org/10.1080/17453670902805007>
- Noble, P. C., Conditt, M. A., Cook, K. F., & Mathis, K. B. (2006). The John Insall Award: Patient expectations affect satisfaction with total knee arthroplasty. *Clinical Orthopaedics and Related Research*, *452*, 35–43. <https://doi.org/10.1097/01.blo.0000238825.63648.1e>
- Noble, P. C., Scuderi, G. R., Brekke, A. C., Sikorskii, A., Benjamin, J. B., Lonner, J. H., Chadha, P., Daylamani, D. A., Scott, W. N., & Bourne, R. B. (2012). Development of a new Knee Society scoring system. *Clinical Orthopaedics and Related Research*, *470*(1), 20–32. <https://doi.org/10.1007/s11999-011-2152-z>
- Núñez, M., Lozano, L., Núñez, E., Segur, J. M., Sastre, S., Maculé, F., Ortega, R., & Suso, S. (2009). Total knee replacement and health-related quality of life: Factors influencing long-term outcomes. *Arthritis and Rheumatism*, *61*(8), 1062–1069. <https://doi.org/10.1002/art.24644>
- O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: a synthesis of recommendations. *Academic Medicine*, *89*(9), 1245–1251
- Orlikowski, W. J., & Baroudi, J. J. (1991). Studying technology in organizations: research approaches and assumptions. *Information systems research*, *2*(1), 1–28.
- Pascoe, G. C. (1983). Patient satisfaction in primary health care: A literature review and analysis. *Evaluation and Program Planning*, *6*(3–4), 185–210. [https://doi.org/10.1016/0149-7189\(83\)90002-2](https://doi.org/10.1016/0149-7189(83)90002-2)
- Padesky, C. A. (1990). Schema and self-prejudice. *International Cognitive Therapy Newsletter*. 6:6-7.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newbury Park, CA.
- Pellekooren, S., Ostelo, R., Pool, A., van Tulder, M., Jansma, E., & Chiarotto, A. (2020). Content validity of patient reported outcome measurement instruments for patient satisfaction in primary care: Systematic review of studies involving patients with musculoskeletal complaints. *Journal of Orthopaedic and Sports Physical Therapy*, 1–42.
- Percy, W. H., Kostere, K., & Kostere, S. (2015). Generic qualitative research in psychology. *Qualitative report*. 20:76-85. doi: 10.46743/2160-3715/2015.2097
- Petersen, K. K., Simonsen, O., Laursen, M. B., Nielsen, T. A., Rasmussen, S., & Arendt-Nielsen, L. (2015). Chronic postoperative pain after primary and revision total knee arthroplasty. *Clinical Journal of Pain*, *31*(1), 1–6. <https://doi.org/10.1097/AJP.0000000000000146>
- Pham, T., Van Der Heijde, D., Lassere, M., Altman, R. D., Anderson, J. J., Bellamy, N., Hochberg, M., Simon, L., Strand, V., Woodworth, T., & Dougados, M. (2003). Outcome variables for osteoarthritis clinical trials: The OMERACT-OARSI set of responder criteria. *Journal of Rheumatology*, *30*(7), 1648–1654.
- Pillow, W. S. (2003). Confession, catharsis, or cure? Rethinking the uses of reflexivity as methodological power in qualitative research. *International Journal of Qualitative Studies in Education*, *16*, 175–196.
- Pouli, N., Das Nair, R., Lincoln, N. B., & Walsh, D. (2013). The experience of living with knee osteoarthritis: Exploring illness and treatment beliefs through thematic analysis. *Disability and Rehabilitation*, *36*(7), 600–607. <https://doi.org/10.3109/09638288.2013.805257>
- Pulavarti, R. S., Raut, V. V., & McLauchlan, G. J. (2014). Patella denervation in primary total knee arthroplasty: A randomized controlled trial with 2 years of follow-up. *Journal of Arthroplasty*, *29*(5), 977–981. <https://doi.org/10.1016/j.arth.2013.10.017>
- Ramkumar, P. N., Harris, J. D., & Noble, P. C. (2015). Patient-reported outcome measures after total knee arthroplasty: A systematic review. *Bone & Joint Research*, *4*(7), 120–127. <https://doi.org/10.1302/2046-3758.47.2000380>

- Ranawat, C. S., White, P. B., West, S., & Ranawat, A. S. (2017). Clinical and radiographic results of Attune and PFC Sigma knee designs at 2-year follow-up: A prospective matched-pair analysis. *Journal of Arthroplasty*, 32(2), 431–436. <https://doi.org/10.1016/j.arth.2016.07.021>
- Ring, D., & Leopold, S. S. (2015). Editorial – Measuring satisfaction: Can it be done? *Clinical Orthopaedics and Related Research*, 473(10), 3071–3073. <https://doi.org/10.1007/s11999-015-4485-5>
- Roberts, D. A. (1989). 'Working for patients' the 1989 white paper on the health service: An over-review and commentary. *Teaching Public Administration*, 9(1), 33–40. <https://doi.org/10.1177/014473948900900103>
- Robertson, D. A., & Kenny, R. A. (2016). 'I'm too old for that' – The association between negative perceptions of aging and disengagement in later life. *Personality and Individual Differences*, 100, 114–119. <https://doi.org/10.1016/j.paid.2016.03.096>
- Robertsson, O., Dunbar, M., Pehrsson, T., Knutson, K., & Lidgren, L. (2000). Patient satisfaction after knee arthroplasty: A report on 27,372 knees operated on between 1981 and 1995 in Sweden. *Acta Orthopaedica Scandinavica*, 71(3), 262–267. <https://doi.org/10.1080/000164700317411852>
- Robinson, P. G., Rankin, C. S., Lavery, J., Anthony, I., Blyth, M., & Jones, B. (2018). The validity and reliability of the modified forgotten joint score. *Journal of Orthopaedics*, 15(2), 480–485. <https://doi.org/10.1016/j.jor.2018.03.029>
- Rodriguez, A., & Smith, J. (2018). Phenomenology as a healthcare research method. *Evidence Based Nursing*. 21:96-98. doi: 10.1136/eb-2018-102990
- Satu, E., & Kyngas, H. (2007). The qualitative content analysis process. *Research Methodology*, 62(1), 107-115.
- Schreiber, R. S., & Stern, P. N. (Eds.) (2001). *Using grounded theory in nursing*. Springer.
- Scopaz, K. A., Piva, S. R., Wisniewski, S., & Fitzgerald, G. K. (2009). Relationships of fear, anxiety, and depression with physical function in patients with knee osteoarthritis. *Archives of Physical Medicine and Rehabilitation*, 90(11), 1866–1873. <https://doi.org/10.1016/j.apmr.2009.06.012>
- Scott, C. E., Bugler, K. E., Clement, N. D., MacDonald, D., Howie, C. R., & Biant, L. C. (2012). Patient expectations of arthroplasty of the hip and knee. *Journal of Bone and Joint Surgery (British Volume)*, 94(7), 974–981. <https://doi.org/10.1302/0301-620X.94B7.28219>
- Scott, C. E. H., Howie, C. R., MacDonald, D., & Biant, L. C. (2010). Predicting dissatisfaction following total knee replacement: A prospective study of 1217 patients. *Journal of Bone and Joint Surgery (British Volume)*, 92(9), 1253–1258. <https://doi.org/10.1302/0301-620X.92B9.24394>
- Shan, L., Shan, B., Suzuki, A., Nouh, F., & Saxena, A. (2015). Intermediate and long-term quality of life after total knee replacement: A systematic review and meta-analysis. *Journal of Bone and Joint Surgery (American Volume)*, 97(2), 156–168. <https://doi.org/10.2106/JBJS.M.00372>
- Silverman, D., (1970). *The theory of organizations: a sociological framework*. Heineman, London.
- Singh, J., Dowsey, M., & Choong, P. (2017). Patient endorsement of the outcome measures in rheumatology (OMERACT) total joint replacement (TJR) clinical trial draft core domain set. *BMC Musculoskeletal Disorders*, 18(1), 111. <https://doi.org/10.1186/s12891-017-1464-x>
- Sitzia, J., & Wood, N. (1997). Patient satisfaction: A review of issues and concepts. *Social Science and Medicine*, 45(12), 1829–1843. [https://doi.org/10.1016/S0277-9536\(97\)00128-7](https://doi.org/10.1016/S0277-9536(97)00128-7)
- Smith, J.A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: theory, method and research*. Los Angeles: London SAGE.
- Snelgrove, S., & Lioffi, C. (2009). An interpretative phenomenological analysis of living with chronic low back pain. doi: 10.1348/135910709X402612.
- Somers, T. J., Keefe, F. J., Godiwala, N., & Hoyler, G. H. (2009). Psychosocial factors and the pain experience of osteoarthritis patients: New findings and new directions. *Current Opinion in Rheumatology*, 21(5), 501–506. <https://doi.org/10.1097/BOR.0b013e32832ed704>
- Somers, T. J., Keefe, F. J., Pells, J. J., Dixon, K. E., Waters, S. J., Riordan, P. A., Blumenthal, J. A., McKee, D. C., LaCaille, L., Tucker, J. M., Schmitt, D., Caldwell, D. S., Kraus, V. B., Sims, E. L., Shelby, R. A., & Rice, J. R. (2009). Pain catastrophizing and pain-related fear in osteoarthritis patients:

- Relationships to pain and disability. *Journal of Pain and Symptom Management*, 37(5), 863–872. <https://doi.org/10.1016/j.jpainsymman.2008.05.009>
- Sperka, L. (2019). Selecting, understanding and applying theory as a neophyte researcher. *Qualitative Research in Sport, Exercise and Health*, 11(3), 348–363. <https://doi.org/10.1080/2159676X.2018.1510430>
- Stajduhar, K. I., Balneaves, L., & Thorne, S. E. (2001). A case for the ‘middle ground’: Exploring the tensions of postmodern thought in nursing. *Nursing Philosophy*, 2(1), 72–82. <https://doi.org/10.1046/j.1466-769x.2001.00033.x>
- Staniszewska, S., & Ahmed, L. (1999). The concepts of expectation and satisfaction: Do they capture the way patients evaluate their care? *Journal of Advanced Nursing*, 29(2), 364–372. <https://doi.org/10.1046/j.1365-2648.1999.00897.x>
- Stanton, T. R., Lin, C. W., Bray, H., Smeets, R. J., Taylor, D., Law, R. Y., & Moseley, G. L. (2013). Tactile acuity is disrupted in osteoarthritis but is unrelated to disruptions in motor imagery performance. *Rheumatology (Oxford, England)*, 52(8), 1509–1519. <https://doi.org/10.1093/rheumatology/ket139>
- Starks, H., & Trinidad, S. B. (2016). Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory. *Qualitative Health Research*, 17(10), 1372–1380. <https://doi.org/10.1177/1049732307307031>
- Stern, P. (2009). Glasserian Grounded Theory. In J. Morse (Eds.), *Developing grounded theory the second generation* (pp. 54-84). Left Coast Press Inc.
- Stickles, B., Phillips, L., Brox, W. T., Owens, B., & Lanzer, W. L. (2001). Defining the relationship between obesity and total joint arthroplasty. *Obesity Research*, 9(3), 219–223. <https://doi.org/10.1038/oby.2001.24>
- Stieven, F. F., Ferreira, G. E., Wiebusch, M., de Araújo, F. X., da Rosa, L. H. T., & Silva, M. F. (2020). Dry needling combined with guideline-based physical therapy provides no added benefit in the management of chronic neck pain: A randomized controlled trial. *The Journal of Orthopaedic and Sports Physical Therapy*, 50(8), 447–454. <https://doi.org/10.2519/jospt.2020.9389>
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press.
- Stronach, I., Garratt, D., Pearce, C., Piper, H. (2007) Reflexivity, the picturing of selves, the forging of method. *Qualitative Inquiry*, 13, 179–203.
- Sun, Y. Q., Yang, B., Tong, S. L., Sun, J., & Zhu, Y. C. (2012). Patelloplasty versus traditional total knee arthroplasty for osteoarthritis. *Orthopedics*, 35(3), e343–348. <https://doi.org/10.3928/01477447-20120222-14>
- Swan, J. E., Sawyer, J. C., Van Matre, J. G., & McGee, G. W. (1985). Deepening the understanding of hospital patient satisfaction: Fulfillment and equity effects. *Journal of Health Care Marketing*, 5(3), 7.
- Terwee, C. B., Prinsen, C. A. C., Chiarotto, A., de Vet, H. C. W., Bouter, L. M., Alonso, J., Westerman, M. J., Patrick, D. L., & Mokkink, L. B. (2018). COSMIN standards and criteria for evaluating the content validity of health-related patient-reported outcome measures: A Delphi study. *Quality of Life Research*, 27(5), 1159–1170. <https://doi.org/10.1007/s11136-018-1829-0>
- Terwee, C. B., Prinsen, C. A. C., Chiarotto, A., Westerman, M. J., Patrick, D. L., Alonso, J., Westerman, M. J., Patrick, D. L., Mokkink, L. B. (2018). COSMIN methodology for assessing the content validity of PROMs.
- Terwee, C. B., Roorda, L. D., Dekker, J., Bierma-Zeinstra, S. M., Peat, G., Jordan, K. P., Croft, P., & de Vet, H. C. W. (2010). Mind the MIC: Large variation among populations and methods. *Journal of Clinical Epidemiology*, 63(5), 524–534. <https://doi.org/10.1016/j.jclinepi.2009.08.010>
- Thornberg, R., Charmaz, K. (2014). Grounded theory and theoretical codind. In U. Flick (Eds.), *The SAGE handbook of qualitative data analysis* (pp. 153-169). SAGE Publications.
- The Royal Australian College of General Practitioners. Guidelines for the management of knee and hip osteoarthritis. 2nd edn. East Melbourne, Vic: RACGP, 2018.

- Thomson, O.P., Petty, N.J., & Moore, A.P. (2014). Clinical decision-making and therapeutic approaches in osteopathy – A qualitative grounded theory study. *Manual Therapy*, 19:44-51. <https://doi.org/10.1016/j.math.2013.07.008>
- Thorne, S., Kirkham, S. R., & Flynn-Magee, K. (2016). The analytic challenge in interpretive description. *International Journal of Qualitative Methods*, 3(1), 1–11. <https://doi.org/10.1177/160940690400300101>
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19(6), 349–357. <https://doi.org/10.1093/intqhc/mzm042>
- Tubach, F., Giraudeau, B., & Ravaud, P. (2009). The variability in minimal clinically important difference and patient acceptable symptom state values did not have an impact on treatment effect estimates. *Journal of Clinical Epidemiology*, 62(7), 725–728. <https://doi.org/10.1016/j.jclinepi.2008.09.012>
- Tubach, F., Ravaud, P., Baron, G., Falissard, B., Logeart, I., Bellamy, N., Bombardier, C., Felson, D., Hochberg, M., van der Heijde, D., & Dougados, M. (2005). Evaluation of clinically relevant states in patient reported outcomes in knee and hip osteoarthritis: The patient acceptable symptom state. *Annals of the Rheumatic Diseases*, 64(1), 34–37. <https://doi.org/10.1136/ard.2004.023028>
- Tubach, F., Ravaud, P., Beaton, D., Boers, M., Bombardier, C., Felson, D. T., van der Heijde, D., Wells, G., & Dougados, M. (2007). Minimal clinically important improvement and patient acceptable symptom state for subjective outcome measures in rheumatic disorders. *Journal of Rheumatology*, 34(5), 1188–1193.
- Urquhart, C. (2002). Regrounding grounded theory—Or reinforcing old prejudices? A brief reply to Bryant. *Journal of Information Technology Theory and Application*, 4(3), 43-54.
- Urquhart, D. M., PhyoMaung, P. P., Dubowitz, J., Fernando, S., Wluka, A. E., Raajmaakers, P., Wang, Y., & Cicuttini, F. M. (2015). Are cognitive and behavioural factors associated with knee pain? A systematic review. *Seminars in Arthritis and Rheumatism*, 44(4), 445–455. <https://doi.org/10.1016/j.semarthrit.2014.07.005>
- Varpio, L., Ajjawi, R., Monrouxe, L. V., O'Brien, B. C., & Rees, C. E. (2017). Shedding the cobra effect: Problematising thematic emergence, triangulation, saturation and member checking. *Medical Education*, 51(1), 40–50. <https://doi.org/10.1111/medu.13124>
- Von Keudell, A., Sodha, S., Collins, J., Minas, T., Fitz, W., & Gomoll, A. H. (2014). Patient satisfaction after primary total and unicompartmental knee arthroplasty: An age-dependent analysis. *Knee*, 21(1), 180–184. <https://doi.org/10.1016/j.knee.2013.08.004>
- Walker, T., Zahn, N., Bruckner, T., Streit, M. R., Mohr, G., Aldinger, P. R., Clarius, M., & Gotterbarm, T. (2018). Mid-term results of lateral unicondylar mobile bearing knee arthroplasty: A multicentre study of 363 cases. *The Bone & Joint Journal*, 100-B(1), 42–49. <https://doi.org/10.1302/0301-620X.100B1.BJJ-2017-0600.R1>
- Ware, J. E., Jr., Davies-Avery, A., & Stewart, A. L. (1978). The measurement and meaning of patient satisfaction. *Health and Medical Care Services Review*, 1(1), 1, 3–15.
- Warner, S. C., Richardson, H., Jenkins, W., Kurien, T., Doherty, M., & Valdes, A. M. (2017). Neuropathic pain-like symptoms and pre-surgery radiographic severity contribute to patient satisfaction 4.8 years post-total joint replacement. *World Journal of Orthopedics*, 8(10), 761–769. <https://doi.org/10.5312/wjo.v8.i10.761>
- Waters, S., Edmondston, S. J., Yates, P. J., & Gucciardi, D. F. (2016). Identification of factors influencing patient satisfaction with orthopaedic outpatient clinic consultation: A qualitative study. *Manual Therapy*, 25, 48–55. <https://doi.org/10.1016/j.math.2016.05.334>
- Webster, F., Perruccio, A. V., Jenkinson, R., Jaglal, S., Schemitsch, E., Waddell, J. P., Venkataramanan, V., Bytautas, J., & Davis, A. M. (2015). Understanding why people do or do not engage in activities following total joint replacement: A longitudinal qualitative study. *Osteoarthritis and Cartilage*, 23(6), 860–867. <https://doi.org/10.1016/j.joca.2015.02.013>

- Wetherell, J. L., Afari, N., Rutledge, T., Sorrell, J. T., Stoddard, J. A., Petkus, A. J., Solomon, B. C., Lehman, D. H., Liu, L., Lang, A. J., & Atkinson, H. J. (2011). A randomized, controlled trial of acceptance and commitment therapy and cognitive-behavioral therapy for chronic pain. *Pain, 152*(9), 2098–2107. <https://doi.org/10.1016/j.pain.2011.05.016>
- Whitfield, M., & Baker, R. (1992). Measuring patient satisfaction for audit in general practice. *Quality in Health Care, 1*(3), 151–152. <https://doi.org/10.1136/qshc.1.3.151>
- Wilkinson, R. G., & Marmot, M. G. (Eds.). (2006). *Social determinants of health* (2nd ed.). Oxford University Press.
- Williams, B. (1994). Patient satisfaction: A valid concept? *Social Science and Medicine, 38*(4), 509–516. [https://doi.org/10.1016/0277-9536\(94\)90247-X](https://doi.org/10.1016/0277-9536(94)90247-X)
- Williams, D. P., Blakey, C. M., Hadfield, S. G., Murray, D. W., Price, A. J., & Field, R. E. (2013). Long-term trends in the Oxford knee score following total knee replacement. *The Bone & Joint Journal, 95-B*(1), 45–51. <https://doi.org/10.1302/0301-620X.95B1.28573>
- Williams, D. P., O'Brien, S., Doran, E., Price, A. J., Beard, D. J., Murray, D. W., & Beverland, D. E. (2013). Early postoperative predictors of satisfaction following total knee arthroplasty. *Knee, 20*(6), 442–446. <https://doi.org/10.1016/j.knee.2013.05.011>
- Woolf, A. D., & Pfleger, B. (2003). Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization, 81*(9), 646–656.
- Woolhead, G. M., Donovan, J. L., & Dieppe, P. A. (2005). Outcomes of total knee replacement: A qualitative study. *Rheumatology (Oxford, England), 44*(8), 1032–1037. <https://doi.org/10.1093/rheumatology/keh674>
- World Health Organization. (2020). *Ageing: Ageism*. <https://www.who.int/westernpacific/news/q-a-detail/ageing-ageism>
- Zabawa, L., Li, K., & Chmell, S. (2019). Patient dissatisfaction following total knee arthroplasty: External validation of a new prediction model. *European Journal of Orthopaedic Surgery & Traumatology, 29*(4), 861–867. <https://doi.org/10.1007/s00590-019-02375-w>

Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Appendices

Appendix 1: Excel spreadsheet: Purposive sampling

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
PKC03	Randomisation	Quadrant	Interpreter_Required	Gender	Age_at_surgery	Surgery_Type	Surgery_Side	Date_of_Surgery	QoL_Eval_1_Satisfaction_Qn_1_12m	QoL_Eval_1_Satisfaction_Qn_2_12m	QoL_Eval_1_Satisfaction_Qn_3_12m	QoL_Eval_1_Satisfaction_Qn_4_12m	QoL_Eval_1_Surgery_Abin_12m	VOMAC_Pain_score_preop	QoMOC_Motion_score_preop	QoMOC_Function_score_preop	QoMOC_Total_score_preop	QoMOC_Pain_score_12m	QoMOC_Mo
1	NK0076	1.00	1	No	Female	70	Primary	Right	17/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	6	45	63	1	
2	NK0027	1.00	1	No	Female	78	Primary	Right	27/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	11	3	36	50	1	
3	NK0050	1.00	1	Yes	Male	71	Primary	Right	11/04/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	4	34	48	5	
4	NK0135	1.00	1	Yes	Male	81	Primary	Left	4/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	14	4	51	69	2	
5	NK0011	1.00	1	No	Female	81	Primary	Right	29/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	3	44	59	8	
6	NK0023	1.00	1	No	Male	74	Primary	Right	11/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	8	56	80	3	
7	NK0058	1.00	1	No	Male	75	Primary	Left	30/11/2016	Somewhat satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	7	3	28	38	3	
8	NK0014	1.00	1	No	Male	77	Primary	Right	2/08/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	17	7	61	85	15	
9	NK0125	1.00	1	No	Female	60	Primary	Left	15/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	6	39	55	2	
10	NK0103	1.00	1	Yes	Female	68	Primary	Right	5/04/2016	Very satisfied	Somewhat satisfied	Very satisfied	Very satisfied	17	8	63	88	4	
11	NK0071	1.00	1	No	Male	68	Primary	Right	9/08/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	14	5	46	65	9	
12	NK0079	1.00	1	No	Male	56	Primary	Right	30/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	13	8	45	66	11	
13	NK0038	1.00	1	No	Female	65	Primary	Right	29/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	14	8	50	72	0	
14	NK0162	1.00	1	Yes	Male	82	Primary	Left	1/08/2016	Somewhat satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	11	5	45	61	7	
15	NK0056	1.00	1	No	Male	73	Primary	Right	10/05/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	9	4	27	40	2	
16	NK0047	1.00	1	No	Female	83	Primary	Left	3/06/2016	Very satisfied	Very satisfied	Somewhat satisfied	Very satisfied	12	5	39	56	0	
17	NK0059	1.00	1	No	Female	68	Primary	Right	13/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	5	36	53	0	
18	NK0133	1.00	1	No	Male	57	Primary	Left	4/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	15	8	53	76	1	
19	NK0026	1.00	1	Yes	Female	75	Primary	Right	30/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	11	3	40	54	4	
20	NK0101	1.00	1	No	Female	73	Primary	Right	13/05/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	8	57	81	0	
21	NK0036	1.00	1	No	Male	83	Primary	Left	14/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	9	5	37	51	1	
22	NK0109	1.00	1	Yes	Female	70	Primary	Left	9/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	14	7	36	57	0	
23	NK0004	1.00	1	No	Female	71	Primary	Left	29/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	6	54	76	0	
24	NK0063	1.00	1	No	Female	56	Primary	Left	15/09/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	7	49	72	5	
25	NK0064	2.00	1	Yes	Female	64	Primary	Left	8/09/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	17	8	59	84	0	
26	NK0015	2.00	1	No	Female	67	Primary	Left	24/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	2	31	41	0	
27	NK0085	2.00	1	Yes	Female	79	Primary	Right	21/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	2	68	96	0	
28	NK0127	2.00	1	No	Male	65	Primary	Left	3/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	3	23	38	3	
29	NK0059	2.00	1	No	Female	68	Primary	Right	11/10/2016	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	5	2	54	71	10	
30	NK0090	2.00	1	No	Female	65	Primary	Right	3/08/2016	Very satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	16	6	62	86	5	
31	NK0124	2.00	1	No	Female	66	Primary	Left	12/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	11	6	39	56	0	
32	NK0080	2.00	1	No	Female	68	Primary	Left	28/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	5	41	58	5	
33	NK0016	2.00	1	No	Female	77	Primary	Left	18/08/2016	Very satisfied	Very satisfied	Somewhat satisfied	Very satisfied	10	4	38	52	2	
34	NK0092	2.00	1	No	Female	60	Primary	Left	3/03/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	13	5	47	65	5	
35	NK0005	2.00	1	No	Male	68	Primary	Right	23/08/2016	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	15	4	47	66	6	
36	NK0018	2.00	1	No	Male	63	Primary	Right	29/07/2016	Somewhat satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	11	4	41	56	10	
37	NK0161	2.00	1	No	Female	67	Primary	Left	1/09/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	15	5	47	67	0	
38	NK0025	2.00	1	No	Female	69	Primary	Right	12/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	6	50	68	0	
39	NK0031	2.00	1	No	Male	67	Primary	Left	21/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	9	5	41	55	0	
40	NK0144	2.00	1	No	Female	58	Primary	Left	1/07/2016	Very satisfied	Very satisfied	Very satisfied	Somewhat satisfied	13	8	53	72	4	
41	NK0017	2.00	1	No	Male	65	Primary	Right	9/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	14	6	64	84	0	
42	NK0100	2.00	1	No	Female	81	Primary	Right	25/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	14	8	64	86	0	
43	NK0048	2.00	1	Yes	Female	59	Primary	Left	28/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	8	58	82	0	
44	NK0001	2.00	1	Yes	Female	63	Primary	Right	2/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	13	6	55	74	5	
45	NK0042	2.00	1	No	Female	66	Primary	Right	14/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	4	3	39	53	6	
46	NK0116	2.00	1	No	Male	66	Primary	Right	23/06/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	17	8	57	82	0	
47	NK0044	2.00	1	No	Female	48	Primary	Left	10/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	5	0	15	20	0	
48	NK0158	2.00	1	No	Male	65	Primary	Right	2/08/2016	Very satisfied	Very satisfied	Somewhat satisfied	Very satisfied	12	5	35	52	11	
49	NK0113	3.00	1	No	Female	59	Primary	Right	12/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	8	46	62	0	
50	NK0099	3.00	1	Yes	Male	70	Primary	Right	12/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	16	8	57	81	15	
51	NK0104	3.00	1	No	Female	73	Primary	Right	13/10/2016	Very satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	19	6	55	80	0	
52	NK0075	3.00	1	No	Female	74	Primary	Left	9/08/2016	Very satisfied	Somewhat satisfied	Very satisfied	Very satisfied	10	4	27	41	0	
53	NK0061	3.00	1	No	Female	63	Primary	Right	4/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	6	20	36	2	
54	NK0147	3.00	1	No	Female	82	Primary	Right	17/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	15	6	37	51	0	
55	NK0062	3.00	1	No	Female	44	Primary	Right	5/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	18	8	58	84	5	
56	NK0152	3.00	1	No	Female	70	Primary	Left	7/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	18	8	81	87	0	
57	NK0160	3.00	1	No	Male	56	Primary	Right	4/08/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	11	5	47	65	9	
58	NK0037	3.00	1	No	Male	65	Primary	Left	4/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	17	8	53	78	0	
59	NK0120	3.00	1	No	Male	71	Primary	Right	15/08/2016	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	14	6	45	65	2	
60	NK0126	3.00	1	No	Female	67	Primary	Right	10/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	5	41	58	0	
61	NK0088	3.00	1	No	Female	76	Primary	Right	3/05/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	5	2	21	27	0	
62	NK0082	3.00	1	No	Male	70	Primary	Left	15/08/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	4	42	57	0	
63	NK0136	3.00	1	Yes	Female	82	Primary	Left	30/11/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	15	6	52	73	0	
64	NK0021	3.00	1	No	Female	62	Primary	Left	18/10/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	11	7	34	48	0	
65	NK0129	3.00	1	Yes	Male	85	Primary	Left	11/07/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	10	4	46	60	0	
66	NK0043	3.00	1	Yes	Female	69	Primary	Left	9/11/2016	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	12	6	68	96	15	
67	NK0052	3.00	1	No	Male	78	Primary	Right	15/08/2016	Very satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	8	3	40	55	27	
68	NK0022	3.00	1	Yes	Female	78	Primary	Left	15/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	12	3	61	83	0	
69	NK0065	3.00	1	No	Female	64	Primary	Right	24/11/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	15	6	52	73	1	
70	NK0121	3.00	1	No	Female	67	Primary	Right	9/05/2016	Very satisfied	Very satisfied	Very satisfied	Very satisfied	15	6	83	83	5	
71	NK0084	3.00	1	No	Female	67	Primary	Left	2/06/2016	Very satisfied	Somewhat satisfied	Very satisfied	Very satisfied	13	5	46	64	0	
72	NK0108	3.00	1	No	Male	76	Primary	Right	11/11/2016	Very satisfied	Very satisfied	Somewhat satisfied	Somewhat satisfied	14	8	49	71	5	
73	NK0020	3.00	1	No	Male	58	Primary	Right	6/10/2016	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	Somewhat satisfied	17	6	43	66	10	
74	NK0110	3.00	1	No	Female	73	Primary	Right	15/07/2016	Somewhat satisfied	Very satisfied	Very satisfied	Very satisfied	13	6	45	64	5	



Participant Information Sheet/Consent Form

St. Vincent's Hospital (Melbourne)

Patients

Title	<i>"It looks good but it feels bad". Understanding 'failed' Total Knee Replacement from the patients' perspective</i>
Short Title	<i>Understanding 'failed' Knee Replacements</i>
Protocol Number	<i>LRR 179/17</i>
Project Sponsor	<i>St Vincent's Hospital Melbourne Physiotherapy Research Foundation</i>
Coordinating Principal Investigator/ Principal Investigator	<i>Dr Samantha Bunzli</i>
Associate Investigator(s)	<i>Ms Nardia Klem, Dr Michelle Dowsey, Dr. Anne Smith, Dr Peter Kent, Prof. Peter O'Sullivan, Prof Peter Choong,</i>
Study Co-ordinator	<i>Dr Samantha Bunzli</i>
Location	<i>St Vincent's Hospital, Melbourne</i>

Part 1 What does my participation involve?

1 Introduction

You are invited to take part in this research project. This is because you have undergone a total knee replacement at St. Vincent's Hospital. This research project aims to understand why some people are not happy with their knee replacement. We will do this by comparing the experiences of people who are happy with those who are not happy with their knee replacement 12 months after surgery.

This Participant Information Sheet/Consent Form tells you about the research project. It explains what is involved to help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local doctor.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. You will receive the best possible care whether or not you take part.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

Dear [participant]

This is a letter to let you know that a researcher from St Vincent's Hospital (where you had your knee surgery) may contact you by telephone soon about whether you would like to take part in a research project.

This project will involve interviews from a range of people like yourself who have had a total knee replacement, to find out about people's different experiences with this surgery. Taking part in the project will involve:

- An interview of approximately one hour at St Vincent's Hospital, Melbourne, or over the phone (whichever you prefer)
- The interview will take place between February 5th 2018 and March 20th 2018
- You will be reimbursed \$25 for your time (and up to an additional \$25 for parking and transport upon provision of receipts if you prefer a face to face interview).

The researcher will need your permission to record the interview. You will remain anonymous and any information you provide will remain confidential.

You will receive written information about the study and a consent form to sign before taking part.

If you would like to register to consider being part of this research project before you receive a telephone call, you can get in contact with us by:

- E-mail: SMARTRegistry@svha.org.au
- OR**
- Answering the questions on the next page and returning in the attached reply paid envelop

Thank you for your time in reading this letter.

Yours sincerely,

Nardia Klem
Physiotherapist
PhD Candidate, Curtin University

If you are interested in being interviewed please fill in the following questions. You may tick multiple answers.

Name _____

Best contact number _____

Preference of day(s) of the week for an interview

Weekdays
(Phone or face to face interviews)

Monday	<input type="checkbox"/>
Tuesday	<input type="checkbox"/>
Wednesday	<input type="checkbox"/>
Thursday	<input type="checkbox"/>
Friday	<input type="checkbox"/>

Weekends
(Phone interviews only)

Saturday	<input type="checkbox"/>
Sunday	<input type="checkbox"/>

Preference on time(s) of day for an interview

9am – 11am	<input type="checkbox"/>
11am – 1pm	<input type="checkbox"/>
1pm – 3pm	<input type="checkbox"/>
3pm – 5pm	<input type="checkbox"/>

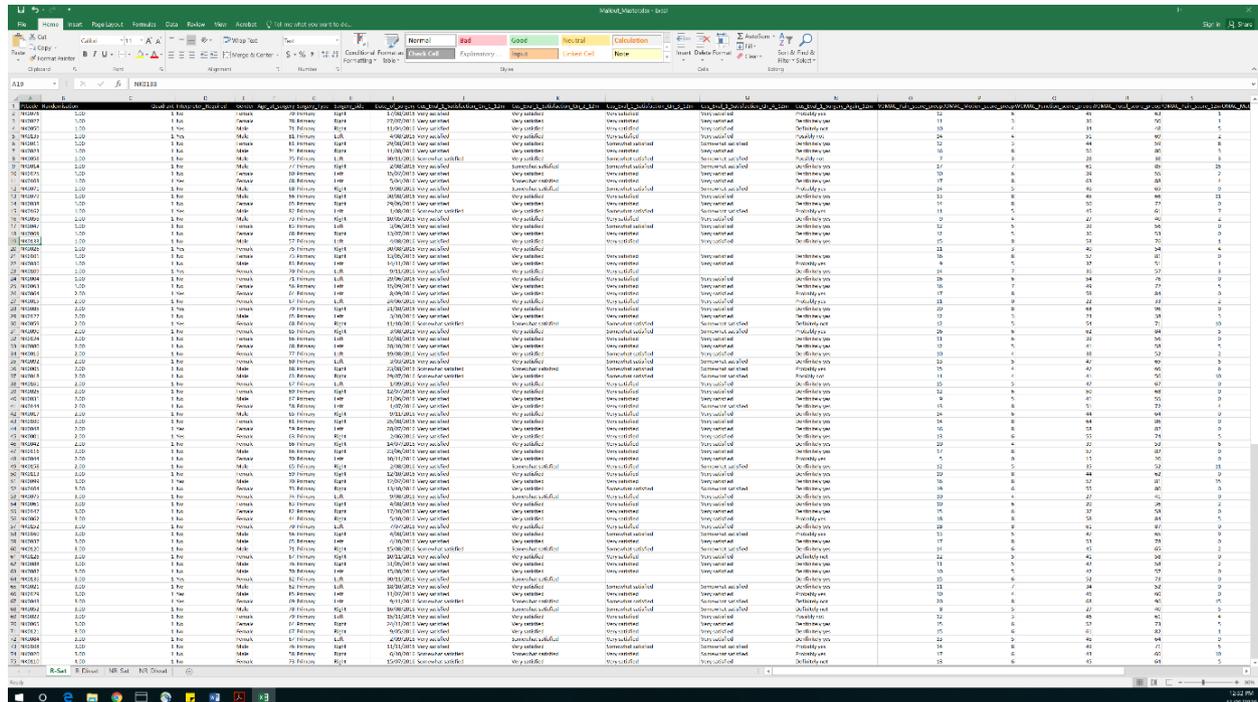
Preference of type(s) of interview

Face to face	<input type="checkbox"/>	Phone call	<input type="checkbox"/>
--------------	--------------------------	------------	--------------------------

Appendix 3: Audit trail

1. Purposive sampling:

Screen shot of Excel spreadsheet, which contained demographic information, as well as 12 months pain, function, and satisfaction scores. This information facilitated purposive and theoretical sampling.



2. Data collection and transcription:

Data were saved in individual participant files. Each file contained the audio file, verbatim transcript and a reflexive memo.

The screenshot shows a Windows File Explorer window with the following details:

- Address Bar:** D:\Data Collection & Analysis 2018-19\Raw Data
- Navigation Pane (Left):**
 - Quick access
 - Documents
 - Downloads
 - Pictures
 - Updated Submission
 - Codebooks
 - Coding
 - Methodology
 - Phase 2 mapping June
 - Creative Cloud Files
 - OneDrive - Curtin
 - OneDrive - Personal
 - This PC
 - 3D Objects
 - Desktop
 - dmp (son1.curtin.edu.au (isilon server son1...))
 - Documents
 - Downloads
 - Music
 - Pictures
 - Videos
 - System (C:)
 - Seagate Expansion Drive (D:)
 - DATA (N:)
 - Research (R:)
 - Public Transfer (T:)
 - Application Drive (U:)
 - dmp (\\son1.curtin.edu.au) (Z:)
 - Seagate Expansion Drive (D:)
 - Biomech Data
 - Candidacy ER Re-submission
 - Chapters
 - Data Collection & Analysis 2018-19** (Selected)
 - Data collection and analysis 2020
 - Desktop
 - Discussion paper
 - Documents
 - ED Files
 - Ethics amendment
 - Expectations Quali
 - Grant Applications
 - Hard drive files
 - Literature 2018-19
 - Literature 2020
 - Meetings
 - Myths manuscript
 - OARSI Conference
 - OPUS
- Main Pane (Right):**

Name	Date modified	Type	Size
Back up audio	22/03/2019 12:26 PM	File folder	
Mock Interviews	22/03/2019 12:26 PM	File folder	
New folder	22/03/2019 12:30 PM	File folder	
PT_001 XC	1/04/2020 9:43 AM	File folder	
PT_002 XC	24/04/2020 11:57 AM	File folder	
PT_003	10/10/2019 8:43 AM	File folder	
PT_004	17/04/2020 11:58 AM	File folder	
PT_005	15/06/2020 10:46 AM	File folder	
PT_006	10/10/2019 9:06 AM	File folder	
PT_007	6/08/2019 9:55 AM	File folder	
PT_008	4/04/2019 3:47 PM	File folder	
PT_009	9/04/2019 9:53 AM	File folder	
PT_010	10/10/2019 9:06 AM	File folder	
PT_011	15/05/2020 11:42 AM	File folder	
PT_012	12/05/2020 12:06 PM	File folder	
PT_013	10/10/2019 9:06 AM	File folder	
PT_014 XC	1/04/2020 8:04 AM	File folder	
PT_015	30/04/2019 1:10 PM	File folder	
PT_016	6/04/2020 12:57 PM	File folder	
PT_017	3/06/2020 2:01 PM	File folder	
PT_018	15/05/2020 8:34 AM	File folder	
PT_019	22/03/2019 12:32 PM	File folder	
PT_020 XC	13/03/2020 8:50 AM	File folder	
PT_021	10/10/2019 9:06 AM	File folder	
PT_022 XC	23/01/2020 10:20 AM	File folder	
PT_023	20/08/2019 3:22 PM	File folder	
PT_024	22/03/2019 12:33 PM	File folder	
PT_025 XC	22/03/2019 12:33 PM	File folder	
PT_026	10/10/2019 8:57 AM	File folder	
PT_027 XC	10/10/2019 9:05 AM	File folder	
PT_029 XC	10/10/2019 9:06 AM	File folder	
PT_030	10/10/2019 8:58 AM	File folder	
PT_031	10/10/2019 9:05 AM	File folder	
PT_032	10/10/2019 9:07 AM	File folder	
PT_033	10/07/2019 8:28 AM	File folder	
PT_034	7/08/2019 9:09 AM	File folder	
PT_035	22/03/2019 12:34 PM	File folder	
PT_036	28/05/2019 10:45 AM	File folder	
PT_037	6/09/2019 7:46 AM	File folder	
PT_038	6/09/2019 7:41 AM	File folder	
PT_039	20/04/2020 11:22 AM	File folder	
PT_040	6/09/2019 7:41 AM	File folder	
PT_041	6/05/2020 8:50 AM	File folder	
PT_042	6/08/2019 10:53 AM	File folder	
PT_043	28/04/2020 1:42 PM	File folder	

D:\Data Collection & Analysis 2018-19\Raw Data\PT_001 XC

File Home Share View

Pin to Quick access Copy Paste Cut Copy path Move to Copy to Delete Rename New folder New item Easy access Properties Edit History Select all Select none Invert selection

Clipboard Organize New Open Select

← → ↑ Seagate Expansion Drive (D:) > Data Collection & Analysis 2018-19 > Raw Data > PT_001 XC

Name	Date modified	Type	Size
PT_001 Reflection.docx	9/02/2018 6:53 AM	Microsoft Word Doc...	12 KB
PT_001 Transcript.docx	18/02/2020 10:57 AM	Microsoft Word Doc...	29 KB
PT_001.wav	7/02/2018 12:16 PM	WAV File	391,337 KB
PT_001.WMA	1/01/2016 1:02 AM	WMA File	9,059 KB

4 items

3. Coding, development of themes and categories and early theory ideas

Each transcript was openly coded with their codes condensed into a corresponding code book. For transcripts from earlier participants, the doctoral candidate chose to ‘map’ the integration of key codes to visually understand the interaction of the features for the participant. This was a useful exercise for the doctoral candidate given her minimal coding experience in the earlier stages. Early code books with sub codes were then developed. Cross coding was also undertaken by the doctoral candidate’s supervisor who is a qualitative expert. Following this, codes were collapsed into categories with supporting quotes and analytic notes and memos. Categories were also created for each sampling quadrant to explore patterns within and between each group.

PT_010 open coding:

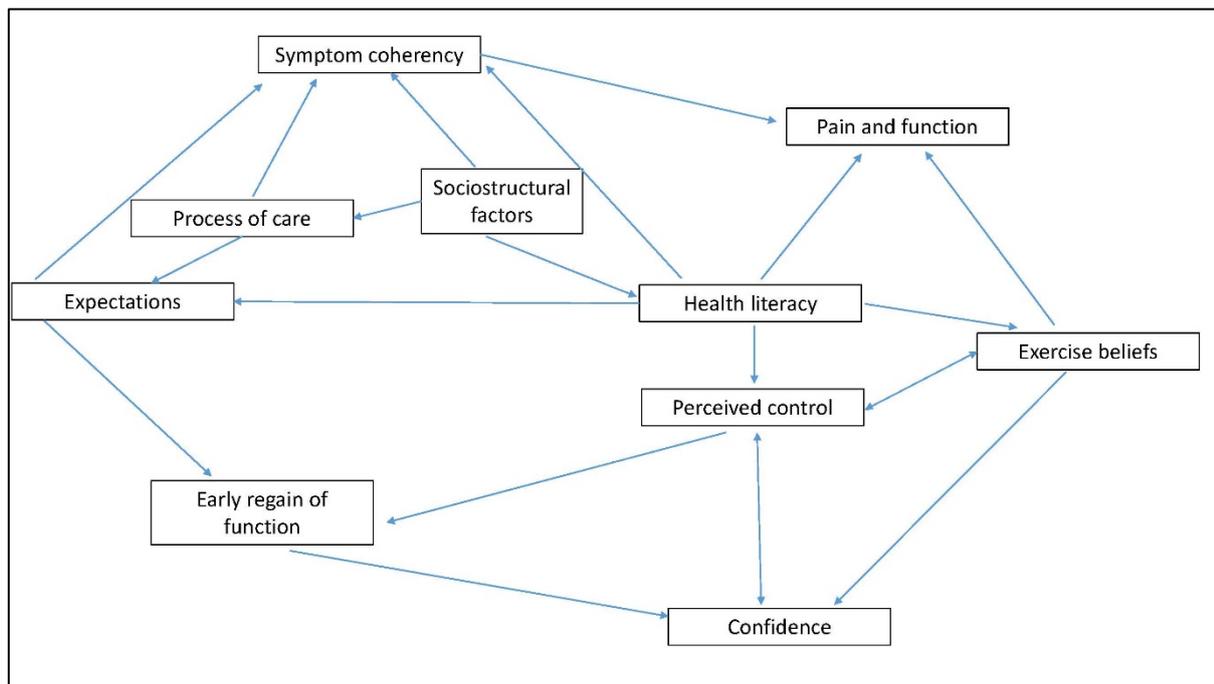
<p>happen and my back got really ah... ah worse and I had x-rays done there on my back and I said to Mr (surgeon) do you replace a spine as well you know, put a new spine in and he laughed and he said maybe 10 year’s time or something and I said forget it too late, I – this is ah, bad and at least I could move without pain in my knees</p>	<p>Nardia-Rose Klem Comorbidities: separate to knee Current pain: reduction</p>
<p>F: sure ok, so do you think your expectations of these surgeries have been met?</p> <p>PT_018: yes, for the surgery I think yes, but I can’t walk but of course it has nothing to do with the knees, yes</p>	<p>Nardia-Rose Klem Expectations: fulfilled Comorbidities: separate to knees</p>
<p>F: ok alright so you – you can walk but not without the walker, but that’s not due to the knee</p> <p>PT_018; that’s right</p>	<p>Nardia-Rose Klem Level of satisfaction: very satisfied</p>
<p>F: ok alright, so let’s move onto the next question from the satisfaction questionnaire and it is, how satisfied are you with the results of your total knee replacement surgery for improving your pain, very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied</p> <p>PT_018: very satisfied</p>	<p>Nardia-Rose Klem Reason for satisfaction</p>
<p>F: very satisfied, for both knees?</p> <p>PT_018: both knees</p> <p>F: both knees ok great, and can you tell me why?</p> <p>PT_018: I have no pain</p> <p>F: no pain</p> <p>PT_018: no</p> <p>F: do you ever get any pain?</p>	<p>Nardia-Rose Klem Current pain – non threatening Identity beliefs Cause beliefs</p>
<p>PT_018: ohh, no, no ah, if I have pain it is more muscular you know with the arthritis, if I, if I lay in bed and for a long time without moving you know that is more muscular it’s not the – the joint itself</p> <p>F: ok so it’s not joint pain</p> <p>PT_018: no</p> <p>F: ok and are you talking about your knees or are you talking about your back when you talk about the muscles?</p> <p>PT_018: my knees</p> <p>F: yep your knees ok, can um PT_018 put me in your shoes and help me understand what your pain in your knees was like before your surgery</p> <p>PT_018: *moaning* on a scale of 1 to 10 they 12</p> <p>F: a 12, right!</p> <p>PT_018: it was very painful and I, I can tolerate pain and I got used to it but it was miserable and I say, some days I said I can’t cope anymore you know and then I said alright how much will the operation be anything from 35,000 up depends on how it goes and how much complication and all that and I said well I have to take out a mortgage on my house or something and ah that is when ah, when this got ah ah... this lady or nurse or whatever at the hospital said leave it with me she said I</p>	<p>Nardia-Rose Klem Previous pain</p> <p>Nardia-Rose Klem Previous pain</p> <p>Nardia-Rose Klem Perception of self</p> <p>Nardia-Rose Klem Previous pain Previous coping</p> <p>Nardia-Rose Klem Health care experience</p>

Codes and sub codes:

Name		
Cause beliefs	Therapeutic alliance	Repeat TKR
Bone on bone	Timeline beliefs	Already had one
Disuse	Sx controllability	lack of alternative
Comorbidities	Worsen without TKR	Yes
Considered separate	Visual representation of knee	Socio-structural
Effect on knee	Bone on bone	Burden to others
Confidence	Image of TKR	Success
Awareness	Muscle support	Combined responsibility
Mobility	Previous pain	Idealised outcome
Yes	Quality of life	Yes
Consequence beliefs	Improvement	Perceived control
Current function	Reason for satisfaction	Rehab
Bothersomeness of limitations	Comorbs limiting	Physio and rehab
Improvement from previous	Improvement in function	High importance
Limitations	Reduction in pain	Progress
Valued activities	Rehab	Stability
Current pain	Recommend to a friend	Strength
Improvement from previous	Importance of rehab	Sx control
Location	Yes	Previous function
Equity	Influence of previous TKR	Limitations
Expectations	Importance of rehab	Weakness
Improved function	Positive experience	Identity beliefs

Name		
Reduction in pain	Level of satisfaction	Comorbidities
Health care experience	Somewhat satisfied	Muscle pain
Disagreements	Very satisfied	Weakness
Lack of access	Meaning of pain	
lack of alternative care	Disuse	
Wait period	Non-threatening	

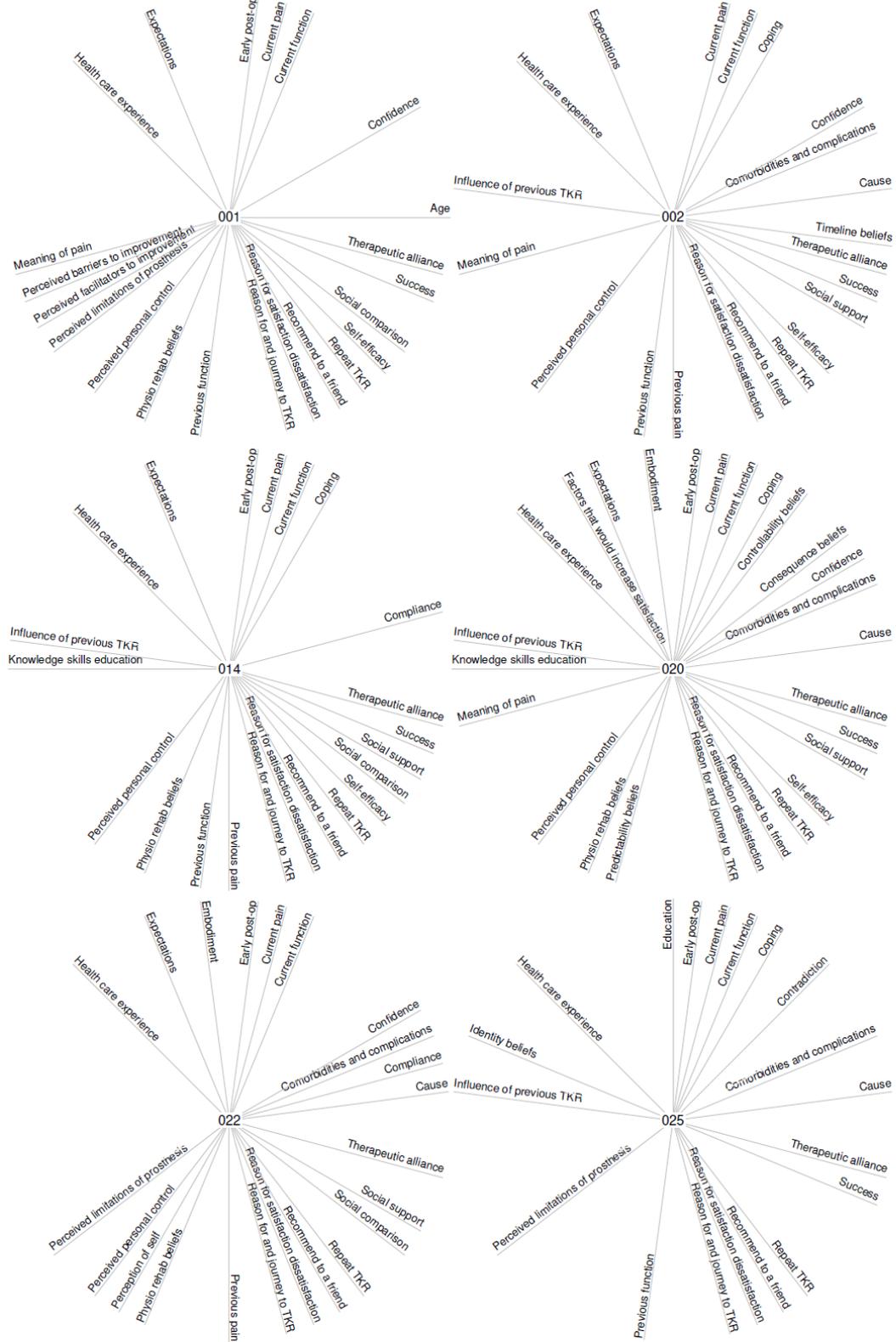
Mapping to assist understanding how the key codes intersected to inform satisfaction levels:

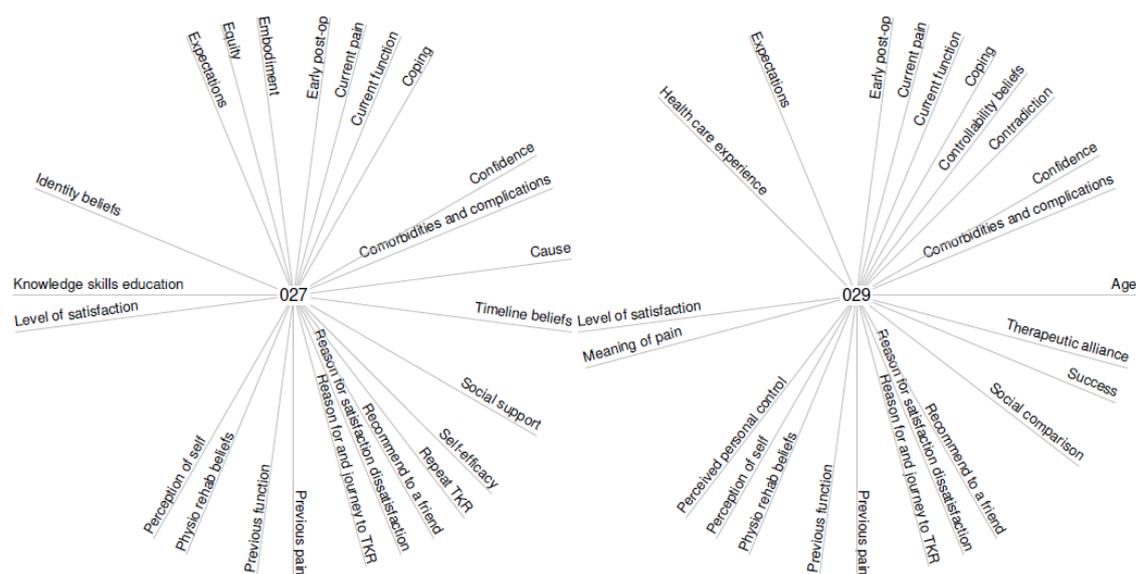


Cross coding on supervisor’s custom made software to gain an alternative perspective on the data. This assisted in confirming any key themes and facilitated discussion around alternative ways to view the data:

Summary of codes across all files

Code plots across all files





List of codes used across all files

Age, Cause, Comorbidities and complications, Compliance, Confidence, Consequence beliefs, Contradiction, Controllability beliefs, Coping, Current function, Current pain, Early post-op, Education, Embodiment, Equity, Expectations, Factors that would increase satisfaction, Health care experience, Identity beliefs, Influence of previous TKR, Knowledge skills education, Level of satisfaction, Meaning of pain, Perceived barriers to improvement, Perceived facilitators to improvement, Perceived limitations of prosthesis, Perceived personal control, Perception of self, Physio rehab beliefs, Predictability beliefs, Previous function, Previous pain, Reason for and journey to TKR, Reason for satisfaction dissatisfaction, Recommend to a friend, Repeat TKR, Self-efficacy, Social comparison, Social support, Success, Therapeutic alliance, Timeline beliefs

Table of codes and line numbers used across all files

code name	file	line numbers
Age	[001]	25
	[029]	127, 172, 244, 259, 323
Cause	[002]	213
	[020]	169, 375, 421, 531
	[022]	53, 151
	[025]	197, 282, 399, 609
	[027]	193
Comorbidities and complications	[002]	271
	[020]	161
	[022]	121, 130
	[025]	35, 45, 69, 97, 115, 129, 200, 219, 254, 293, 423, 443, 456, 484, 613
	[027]	57, 70
[029]	101	
Compliance	[014]	11, 182
	[022]	45, 326, 337, 346

Confidence	[001]	72
	[002]	338, 394
	[020]	41, 409, 449
	[022]	259, 270
	[027]	275, 293
	[029]	315
Consequence beliefs	[020]	256, 394
Contradiction	[025]	447
	[029]	101, 123, 172
Controllability beliefs	[020]	68, 265, 279
	[029]	177
Coping	[002]	69, 80, 215
	[014]	282
	[020]	244, 289
	[025]	273
	[027]	254
	[029]	133, 143, 315
Current function	[001]	31, 63, 226, 288, 318, 340
	[002]	127, 502
	[014]	88, 306, 342
	[020]	41, 79, 86, 459
	[022]	240, 284
	[025]	140, 190, 390, 409, 427, 509
	[027]	38, 92, 241, 265, 305, 344, 359
	[029]	155, 169, 209
Current pain	[001]	6, 25, 234, 261, 271, 285
	[002]	71, 96, 102, 209, 467
	[014]	135, 153
	[020]	68, 129, 143, 244, 256
	[022]	25, 140, 151
	[025]	190
	[027]	75, 171, 180
	[029]	123, 136
Early post-op	[001]	95, 351
	[014]	233
	[020]	350, 506
	[022]	326, 351
	[025]	306
	[027]	33, 423, 444
	[029]	259, 297, 344, 355, 371
Education	[025]	588, 596
Embodiment	[020]	169, 360, 369, 427
	[022]	40, 65, 81, 93, 102, 169, 310, 332, 349, 458
	[027]	293

Equity	[027]	157, 252
Expectations	[001]	228
	[002]	288, 301, 477
	[014]	108, 125, 326, 379
	[020]	74
	[022]	25, 181, 208, 353
	[027]	64, 80, 92, 168, 359
	[029]	59, 68, 79, 147, 155, 249
Factors that would increase satisfaction	[020]	47, 392
Health care experience	[001]	95, 246, 340, 432, 501
	[002]	24, 435
	[014]	39, 483, 509
	[020]	181
	[022]	225, 410, 449
	[025]	342, 361
	[029]	270, 283, 304, 451
Identity beliefs	[025]	140
	[027]	210
Influence of previous TKR	[002]	18
	[014]	32, 265
	[020]	65
	[025]	332
Knowledge skills education	[014]	426
	[020]	432
	[027]	217
Level of satisfaction	[027]	148
	[029]	205
Meaning of pain	[001]	303
	[002]	66
	[020]	248
	[029]	147
Perceived barriers to improvement	[001]	162, 201
Perceived facilitators to improvement	[001]	159, 201
Perceived limitations of prosthesis	[001]	50
	[022]	302
	[025]	250
Perceived personal control	[001]	124, 159
	[002]	306, 481, 486, 499
	[014]	291, 296, 495
	[020]	531
	[022]	326
	[029]	155, 315, 323
Perception of self	[022]	162
	[027]	440
	[029]	155, 249, 289
Physio rehab beliefs	[001]	116, 124, 183, 413

	[014]	192, 291, 296, 362, 495
	[020]	379, 480, 503
	[022]	337
	[027]	397
	[029]	334
Predictability beliefs	[020]	396
Previous function	[001]	307
	[002]	422
	[014]	76, 101
	[025]	133
	[027]	359
	[029]	401
Previous pain	[002]	71, 355
	[014]	153
	[022]	118, 162
	[027]	38, 180
	[029]	90, 114, 401
Reason for and journey to TKR	[001]	6, 18
	[014]	53, 441
	[020]	65, 91, 116
	[022]	194, 214
	[025]	155, 161
	[027]	48, 114
	[029]	20, 28, 41, 65
Reason for satisfaction dissatisfaction	[001]	37, 376, 384
	[002]	41, 102, 114, 127, 165
	[014]	11, 39, 135, 306, 342
	[020]	15, 27
	[022]	25, 110, 118, 240, 292, 299
	[025]	35, 55, 179, 246, 364
	[027]	28, 126, 133, 174, 320, 330, 353, 377
	[029]	11, 84, 101, 189, 225, 407
Recommend to a friend	[001]	413
	[002]	245
	[014]	167
	[020]	537
	[022]	384
	[025]	573
	[027]	479
	[029]	328, 334
Repeat TKR	[001]	399
	[002]	229
	[014]	453
	[020]	254
	[022]	368
	[025]	531, 569

	[027]	393, 465
Self-efficacy	[001]	134, 190
	[002]	288, 328, 394
	[014]	182
	[020]	279
	[027]	444
Social comparison	[001]	79, 134, 432
	[014]	176
	[022]	175
	[029]	344, 381, 429
Social support	[002]	394
	[014]	219, 277
	[020]	337
	[022]	359
	[027]	333, 456
Success	[001]	340, 471
	[002]	474, 481
	[014]	470
	[020]	514, 525
	[025]	551
	[029]	391
Therapeutic alliance	[001]	478
	[002]	253, 306
	[014]	379, 412, 426
	[020]	215
	[022]	395, 426
	[025]	604
	[029]	416, 434, 451
Timeline beliefs	[002]	489
	[027]	316, 325, 354

Created with Codesort v0.74 Copyright ©2012, 2013, 2016 PR Buenzli and S Bünzli.

Codes collapsed into categories:

- Level of satisfaction [VS, SS, SD, VD]
 - General
 - Pain
 - Home and yard
 - Recreation
- Repeat TKR
 - Yes/ No
 - Reason for
- Recommend to a friend
 - Yes/ No
 - Reason for
 - Advice
- Success
 - Yes/ No
 - Percentage
- Reason for satisfaction
 - Increased mobility
 - Decreased pain/ increased manageability
 - Valued activities
 - Independence
 - Expectations?
- Reason for dissatisfaction
 - No change to mobility/ worsened
 - No change to pain/ worsened/ comorbidity pain
 - Inability to conduct valued activities
 - Lack of independence
 - Disembodiment
 - Expectations?
- Symptom coherency
 - CSM
 - Meaning of pain – threat/ non-threat
 - Age
 - Acceptability
- Embodiment
 - Embodied
 - Disembodied
 - Visual representation of knee
 - Altered body image
 - Relationship with surgeon
- Post-op experience
 - Social support
 - Physio/ rehab
 - Pain management
 - Social influences
 - Therapeutic alliance
 - Comorbidities and complications
 - Education
 - Equity
 - Health literacy
- Barriers to improvement
 - Perceived limitations of prosthesis
 - Perception of self
 - Socio-structural barriers
 - Age
 - Comorbidities/ complications

- Facilitators to improvement
 - Perceived advantages of prosthesis
 - Perception of self
 - Socio-structural facilitators
 - Social support
 - Surgical competence/therapeutic alliance
- Current function
 - Improvement/lack of
 - Valued activities/identity
 - Adaptations
 - Hopefulness/hopelessness of improvement
 - Increased/decreased QoL
 - Confidence
- Current pain
 - Improvement/lack of
 - Relationship with symptom coherency
 - Inability to do valued activities
 - Bothersomeness/lack of
 - Hopefulness/hopelessness of improvement
 - Increased/decreased QoL
 - Confidence
- Process of care
 - Health care experience
 - Therapeutic alliance
 - Alternative therapies
 - Social influences
 - Journey to and reason for TKR
 - Education
 - Equity
 - Health literacy
- Perceived control
 - Decision making
 - ELOC
 - ILOC
 - Self-efficacy
 - Motivation
 - Knowledge/skills/education/health literacy
 - Goal setting

Quotes & Categories

Theme/code	Example quotes
<p>Age</p>	<p>PT_029: Because yeah, because I think now I've – I've realised that it, it's really got um, I think then I realised that it hasn't got as much to do with the surgery as it has to do with my age, yep so you know because I look at people around me who are my age and they wouldn't ever attempt to do the stuff that you know that I'd like to do yeah, that I used to do, so I think I've come to terms with it a bit more because I've realised you know, well you know you are 63 you're not 30 anymore yep so um I think that now um, yeah.</p>
<p>Comorbidities and complications Can quite dramatically affect a patient's level of satisfaction if they are unable to discern the two types of pain.</p>	<p>F: Do you feel that – what do you feel is limiting you most from these activities? PT_012: Well mostly my back um ... ah limits me from doing a lot of things um when I tried to vacuum or run the carpet sweeper over the floor or even mop the kitchen floor – I've only got a little galley kitchen and to mop that floor oh my back really kills me by the time I'm finished so it's more my back that anything. [RD]</p>
<p>Current function Appear to not be as important in affecting satisfaction as a reduction in pain. Threshold may be to ability to regain some independence and/or ability to conduct valued activities or activities that reflect a sense of their identity. Additionally, much of the functional measures did not relate to some individuals so it was not a useful outcome to capture.</p>	<p>PT_012: Um ... I'm not dissatisfied with it at all because I can still move around ... I'm still very happy that I can still move around without a stick or crutches or, or without aids of some sort um ... as far as playing football or cricket like I used to, forget it. [RD] PT_029: Well considering my age um, and how I was before yeah very acceptable, I've you know, no one like to admit there getting old and you know no one like to admit that with that comes sort of this sort of problems but yeah I think it's very acceptable, I mean I've got – compared to how I was it's 1000%. [RD]</p>
<p>Current pain People tend to be satisfied as long as there is a reduction in this and there seems to be some component of control or non-threatening nature of the pain if they do still experience pain. Seems to be a general lack of coherence about the pain – unsure of cause and belief it shouldn't be there. For some, if they can create some sense of it, it seems to assist satisfaction and/or acceptance.</p>	<p>PT_012: If you've got a new piece in your knee it shouldn't be painful but then when you stop and think that the parts that they've put in there and the size of everything, they can't make it exactly the same size and fit in the way the other one, my own knee fitted because that grew inside my leg, whereas the one that they've put in now, they've put it in, they've made that and put it there. [RD] PT_029: ... the pain is basically gone, I mean it might flare up like I said if I'm, I walk long distances or if I go to a shopping centre and spend a lot of time walking around, yes the pain will flare up and I'll get it again and it'll keep me awake at night but um generally speaking it's, it's basically gone. [RD] PT_013: Yes, to a certain – except for the pain ah like in the winter I already go through um but that's normal I 'spose with people who have operations all ... ahh ... ya know, I'm a diabetic</p>

	as well so, umm yeah but it's a lot better than what it was. A hell of a lot better. [RS]
<p>Education</p> <p>Throughout the process of TKR – from pre-op understanding of pain to explanation of procedure and post-op explanation of pain. Seems to assist some to be more satisfied, some don't want to know about the education side of things, some are able to come to a place of acceptance with education.</p>	<p>F: Yeah right, what did – what were you told about the x-rays? PT_029: Um that it was almost bone on bone. F: Yeah ok, and how was that explained to you in terms of the meaning of that? PT_029: Meaning that you know um that it was just going – there was nothing really I could do except have a knee replacement. [RD]</p> <p>PT_013: I spoke to other people 'bout it but they haven't had that problem ... with the knee there's movement – side movement I can feel it just goes clink, clink, clink, clink so I gotta put up with it, they say yeah that's normal I gotta accept that answer that, that's how it is. [RS]</p> <p>F: Do you think there's anything important for them to know before they go in? PT_012: No because a lot of advice you give people frightens them. [RD]</p>
<p>Embodiment</p> <p>This theme wasn't present in all participants but when it was it seemed to be a pretty significant factor. Sometimes it did contribute to dissatisfaction and other times it didn't. This lack of coherence is often coupled with a lot of contradiction and internal confusion.</p>	<p>PT_012: ... Um, but the knee, some days I think ahhh it belongs to somebody else – it doesn't seem to fit, but there's the x-rays and everything and all of the doctors in the hospital have all said yes it does fit and it is right um ... ah, sometimes it seems as if when I'm walking, um, somethings goes out of place and it pinches.</p>
<p>Expectations</p> <p>Can change with time. Some have poor pre-op recall, others admit that their initial expectations were different. The fulfilment or lack of fulfilment seems inconsistent in affecting satisfaction. Again, at the end of the day the primary expectation that must be met is a reduction in pain.</p>	<p>F: And before your surgery, if you can try and cast your mind back, what were you hoping to get out of it? PT_012: Um ... free of pain.</p> <p>PT_029: Um ... apart from the jogging um ... I guess, and apart from not being able to um like do gardening and stuff, I can't kneel um, which is a bit of a bummer but um ... yeah most of them were, most of my expectations were met, I mean my, my whole thing with it was the pain was really debilitating and interfering with my life on a daily basis and if I was, if I was going to get rid of that I'd be happy and I have gotten rid of that, I mean you know there's things I can't do um but I'm ok with that um the pain was the main thing. [RD]</p> <p>PT_029: I do remember putting that I was you know somewhat dissatisfied, I remember being somewhat dissatisfied because I was angry and I was upset and frustrated about it you know um, I probably had a high expectation even though I was told not to, I even had a higher expectation of what I could do after the surgery because I'm very determined and I thought well I'll do this you know. [RD]</p>

	<p>PT_013: Well not having – speaking to anybody prior to that in depth of what of what they went through I didn't know. I thought it's gotta be better than what it is now, or at that time, and the doctor said ... went to the hospital (hospital) and said yes ... your movement, walking and x-rays and what have you they said oh yes because they know I had no cartilage left it was just bone on bone. [RS]</p>
Health care experience	<p>Maybe not important ...on review doesn't appear a key themes informing outcomes based satisfaction</p>
Ideal outcome Usually unrealistic, perhaps not valuable to ask patients.	<p>F: Ok, alright, alright um, now PT_012 can you help me understand, if you imagine you're very satisfied with what you do in the home and the yard, what would that look like to you? PT_012: Oh it'd look like heaven! Ah ... I'd like that very much. F: And what would you be able to do if you were very satisfied? PT_012: If I was very satisfied id be able to do it all meself but unfortunately I can't.</p>
Identity beliefs Varies from assumptions about structures to lack of any idea whatsoever.	<p>PT_012: Well ... I would have thought that it would have been the nerves in the knee ... um, ya nerves acting in all different ways and I just sort of thought that ya know, that the nerves might not be in place or whatever they are or ... I don't really know. [RD]</p> <p>PT_013: Oh well frustration comes into it and then oh well yeah ... 'cause it, well it's, probably still to do with the knee, but what part of the knee is – is causing that problem? Whether it's um, my mind, oh yeah there's pain there but it shouldn't be there. Oh well why's it there? Ah. [RS]</p>
Influence of previous TJR This seems to have the strongest influence on expectations of the following replacement.	
Meaning of pain Seems to mean absolutely nothing to people or cause them to worry/ take action.	<p>F: Ok, ok when you do get that pain, what do you think your knee's trying to tell you? PT_012: Um ... ah I don't know ... um, probably just needs a massage so that I can rub the knee and ahh I just rub me hand around the knee all around the knee and ah whatever it is seems to go. [RD]</p>
Perceived control Appears to be a divide between people who take control of their situation with regards to surgery and post-op rehab/education and those who do not. The former tend to be more satisfied.	<p>[In response to ADLs] PT_012: And besides why should I do it when somebody else can do it for me? *laughs* [RD]</p> <p>PT_012: Um the replacement has been put in there and, and they're hoping that it will work, well it's obviously working because I can walk without a stick. [RD]</p> <p>PT_013: Ah ... well it's part of me, it's my knee in my leg and ah it's up to me to work on it to get, well, accept the pain that I've got and not to be a sook or talk about it just try and work through it. [RS]</p> <p>PT_013: But it's up to you! You're – it's your knee replacement so you think you can go further is always the thought that oh,</p>

	<p>can I do this? 'cause what happens if I fall or, I lose control of the knee, that is going through your brain, oh I don't know – ooh it's up to you! Feel like you can go further? Yes. And if you say no, ok we'll stop and that was great, I've never had that before so you've gotta push, ya know you can't push it too far because ya know. [RS]</p>
<p>Perception of self Influences the way they view themselves in society and whether having the TKR has contributed to this or hindered it. Also affects how they approach recovery. Perception of self has interplay with age and valued activities too.</p>	<p>PT_012: I don't like having to ask people to help. [RD]</p> <p>PT_012: Yes I do, yeah, I can, I can stand a lot of pain I don't, I don't take pain killers if I don't have to. [RD]</p> <p>PT_029: Because I, before I got a problem with my knee um I was always working out a couple of hours a day and I would jog and you know I was – led quite an active life and it just totally prohibited all of those things and my life was just – I just felt like an invalid and I couldn't do anything that I usually used to do so you know I juts I had to have something done.</p>
<p>Physio and Rehab For some it really helped with confidence – tangible improvement and sense of self control. It didn't seem to be helpful if the individual's LoC was placed on the therapist, however.</p>	<p>PT_013: Well yeah very good, very good up and down stairs walking around, walking around the hospital floor that I was in then we walk up to another floor ah on the steps there, wouldn't go right to the start so many steps, how are you going? Yep. Do you feel like you can go further? Yes, yes. And tell me when you can't. I'd say stop and we'd stop so that was really good – gives you confidence. [RS]</p>
<p>Previous function Varies between just before operation to well before onset of OA when they were much more functional.</p>	
<p>Previous pain Description is nearly always very severe and preventing participation in life.</p>	
<p>Prosthesis limitations Interplay with confidence and limits what people are willing to try and do – individuals have beliefs of what the replacement can and can't do.</p>	<p>PT_012: As I say I can't bend down – I can't kneel down to do anything um ... I try not to bend the knee too far back because I don't want that to pop out or break or whatever but um ... But also the hips hold me up. [RD]</p>
<p>Reason for dissatisfaction May be related to an unsatisfactory reduction in pain or an inability to do certain functional tasks. However, dissatisfaction in one domain doesn't necessarily mean they are dissatisfied overall.</p>	

<p>Reason for satisfaction Nearly always comes down to a reduction in pain or ability to do valued activity/regained independence (usually linked with a reduction in pain) – as an improvement from previous.</p>	<p>PT_012: Yeah ... um, I'm happy that I can walk without a stick, that's why I'm very satisfied, because I can walk without the stick and, and ah I can walk! Ah before I couldn't walk without the stick ya know – ma knee would sorta give out on me and um ... Now I've had the knee done, ahh I can walk without a stick so, yeah that's I'm very satisfied. [RD]</p> <p>PT_029: I'm very satisfied because prior to the surgery I could do nothing, I couldn't do anything at all so of course I'm frustrated I can't do the thing I just spoke to you about but um you know I mean at least now I'm not suffering 24/7, I'm not having pain 24/7 so I can do a little bit and I just have to say ok that's how I am now so I can go out and I can do a little bit of gardening, I can walk shaggy down the beach for a little bit, I can play with him for a little bit but um, yeah it, it you know, you have – it's improved from how I was greatly in everyday just walking around and you know just doing general stuff but um as far as the things that I really love to do I still can't really do them – or I can do them but to a lesser degree. [RD]</p> <p>PT_013: Well ... it's not dissatisfied with what's going on, I think there could be a lot more improvement – not going through that process before, and what you expect that um, I expected to have ya know, pain free ... And that sort of ... question whether very satisfied or somewhat satisfied I was a bit between those two, so that's why um if I say very satisfied, oh why did I say that, somewhat satisfied seems to be yeah, room for improvement on my part. [RS]</p>
<p>Reason for TKR Overall the underlying driving factors are extensive pain, functional limitation (due to pain), and a lack of alternative care available.</p>	
<p>Recommend to a friend Overall most participants responded 'yes' unless they had a very poor outcome.</p>	<p>F: Ok PT_012 would you recommend having a total knee replacement to a friend? PT_012: Yes F: And why's that? PT_012: Why go through all that pain if you don't have to. [RD]</p>
<p>Repeat TKR Varying answers – depended on their understanding of the question.</p>	<p>PT_012: Ahh ... Oh I'm 80 so how many more operations am I going to even need? Um ... yeah if it was necessary yes I would have it done. [RD]</p>
<p>Social influences Can shape expectations and shape appraisal of own outcomes (both positively and negatively). Others' experiences can also influence approaches to rehab and functional tasks etc.</p>	<p>PT_012: I mean ya know, you see people walking down the street – we've got a fella here in (location) and he's really, really, cripple but he's still moving around. He must so very satisfied that he can walk around that's – how I feel, I'm very happy that I can walk around so without having to take a stick with me more crutches with me or ... or take a walker. [RD]</p>

	<p>PT_012: And um ... and for a long, long time and then ya know ah when I've had ma hips done I had to watch what I did and – 'cause they told me they're the quickest things to pop out and I know that for a fact because a friend of mine had hers done one day and come out of hospital and then just put on, in the car and her knee – her hip popped out, had to go back to the hospital so ... [RD]</p>
<p>Social support Certainly seems present in those who are satisfied. Dissatisfied seem to either have some support or minimal.</p>	
<p>Success Success was always present with satisfaction. Varying reasons for why the participants thought the surgery was a success.</p>	<p>F: Ok, alright, alright PT_012 can you tell me do you think your surgery has been a success? PT_012: Yes. F: And why do you think that? PT_012: Because I can walk. [RD]</p> <p>F: So can I just – if I'm just hearing correctly, you think it was so successful because of (surgeon). PT_012: Well not only him, I mean it's a good hospital. I've got a lot of confidence in the hospital um ... they wouldn't have those surgeons there if they weren't good um ... and ya know the staff there looked after me like you wouldn't believe and nothing was too much trouble for the girls um ... yeah. [RD]</p>
<p>Therapeutic alliance Relationship and attitude towards surgeon. Seems to be quite tied up with individuals who have issues with embodiment of those with suboptimal outcomes who perceive it to be the responsibility of the surgeon.</p>	
<p>Visual representation of knee Seems to be tied up with embodiment issues. Some are bothered by the visual understanding of the prosthesis other are not.</p>	<p>PT_012: Um ... I tried to imagine where they were going to put the piece and um ... thinking looking at the photo and looking at my knee, I thought how is all that going to fit in there and I thought they're experts they know what they're doing, leave it to them. [RD]</p>

Additional notes:

- *PT_012 and PT_029 was categorised as a RD; however, reported being satisfied during interview*

GROUP ANALYSIS

Responder satisfied

Description of group

My broad sense of this group is that there was a low fear of pain. Only some expressed some frustration with not understanding their pain but overall it wasn't consuming for them. There was a general theme of wanting to take control of their rehab in combination with good health literacy. Generally, they were all satisfied with the process of care and had a good therapeutic alliance. One lady actually expressed some dissatisfaction with her medical management in hospital but was very pleased with her surgeon so was satisfied overall. Interestingly, both expectations and confidence was variable in this group – see notes below table.

N = 10

Theme	Relevant codes	Description/quotes
Symptom coherency – <i>there might be too much this theme is covering?</i>	Cause beliefs, identity beliefs, meaning of pain, control beliefs, consequence beliefs, timeline beliefs, coherency, coping, visual representation of knee	<p>Some were unsure about the ongoing pain they were experiencing but overall the presence of pain came across as non-threatening and as something they were actively trying to improve it, or were optimistic they could improve it. Some really showed no interest in their symptoms and a sense making process of it wasn't really relevant to them:</p> <p><i>PT_016: I thought it [the pain] might have been that they can't completely get rid of the arthritis but ah like the surgeons even say, we don't know either! So if they don't know how do we know? *laughs* well all they can say, you get a pain there.</i></p> <p><i>F: What do you tend to do when you start feeling a little bit of pain?</i> <i>PT_009: Nothing, I just don't take any notice of it.</i></p> <p><i>F: So when you get that pain, what do you do to manage it?</i> <i>PT_011: manage it? Not much, take a couple of Panadol, if that, couple of Panadol and ah take me weight off it for a while and rest and I'm right again. Don't do much at all, it's a sort of strange – not like it used to be no.</i></p>
Process of care	Therapeutic alliance, process of care, health care experience	<p>Generally satisfied with the process of care, including rehab and nursing staff, and their surgeon:</p> <p><i>PT_001: I'm a big advocate of public health, especially this hospital. I was given a choice of here and (hospital 1) which is closer to us but (hospital 2) didn't have a good reputation</i></p> <p><i>PT_014: Right, the first part of that was I was scheduled to have it done originally ... I think it's (hospital 1) and because then I had been over a year waiting he said – contacted me and said I could get it done quickly if I'd happily go down to (hospital 2) ... and I said yes no problem at all and for my first</i></p>

		<i>visit there I was fully satisfied with how I was treated and also the fact of how they explained everything.</i>
Pain and function	Current pain, current function, valued activities, important activities, previous pain, previous function	<p>All reported improvements in pain and function. All were not necessarily pain free nor lacking functional limitations, however. The improvements were enough to be satisfied and seemed to allow participation within their social, family, or cultural context:</p> <p><i>PT_001: I still get a little bit of annoying pain but it's not major, it's nothing to take pills for or anything like that ... it's to do with my age I think.</i></p> <p><i>PT_013: It's not, I'm saying, it's not excessive the pain it's just a niggling pain and yeah no, it's going to get better just keep doing what you're doing, go through the pain, work through it.</i></p> <p><i>PT_014: Oh well, [it's improved] 99% really the only thing I can't do is I can't kneel down, other than that I can do everything, I swim, that's alright now ah ... I can walk, I can play with the grandkids because we do a lot of outside activities, I mean we play lots.</i></p>
Sociostructural factors	Social support, sociostructural factors, social influences, cultural activities	<p>All had support from social, family, or cultural circles. Many of them came into the interview with their significant other:</p> <p><i>PT_014: But ya know none of it was a problem, he [husband] was very good and I managed perfectly and I've got a daughter around the corner and she's always around for driving and things.</i></p> <p><i>PT_016: I'm running around the ring showing me dogs again now I've got mobility, is fantastic it really, really, brings you right out you know, compared to what it was before. Me grandkids had to show me dogs before so now I can show them meself.</i></p>
Positive exercise beliefs – <i>maybe this overlaps with health literacy?</i>	Physio, exercise beliefs, rehab	<p>All report the importance of doing exercises and attribute this to their improvements in pain and function. Some expressed this as the importance to be compliant to education given:</p> <p><i>PT_011: Very pleased from the point of view of pain it's only – and I think the stronger the muscles, I think the pain will, I'll eliminate that pain.</i></p> <p><i>PT_014: Well the mind tells me that you're having it done and there's no point having it, going through all this for you and it's expensive having it done and you've got to make the most of it and try do exactly what you're told to do with the physiotherapy, I think the physiotherapy is just as important as having the replacement.</i></p>

		<p><i>PT_015: I just stick at things no problem ... I had physiotherapy that was ya know came with the after the operation and just making sure I did all the exercises I needed to and moved as much as I needed to and I have a feeling if I hadn't kept all that up, things wouldn't have been so good.</i></p>
Health literacy	Education, health literacy, journey to TKR, reason for TKR	<p>Most expressed some understanding of the process of a TKR, the requirements to getting it better, the importance of overall health, and an interest in better understanding their outcomes. Including understanding comorbidities are separate to the TKR outcomes:</p> <p><i>PT_011: Yeah just get yourself tidy because it's only for you, not for joe blow or surgeon, it's for you, if you're healthy and you don't smoke and you don't drink, drink probably wouldn't hurt you, but smoking noo it's out the door, I noticed the difference when I give away smoking.</i></p> <p><i>F: What kind of information your surgeon provide you with before your surgery?</i></p> <p><i>PT_016: Just about everything and um the booklet and so forth you know, that tells you a heck of a lot you know, really heck of a lot, ah, like I've already said – the crutches for helping my wife for setting up the length and everything else because I got me own.</i></p> <p><i>PT_021: So I still find it hard to bend my knees, especially when I'm getting off and getting on the tram and so I guess ah, I need to use my stick when I'm getting on and off so I know the pain is more related to the two tumours at the lower part of my spine and not with the knee surgery.</i></p>
Low fear of surgery – <i>maybe this overlaps with health literacy too?</i>	Fear, health care experience, process of care, early post-op experience, visual representation of knee	<p>All described a low fear of surgery and some had experience with prior surgeries, which helped with this. Some even expressed a level of interest in their surgeries:</p> <p><i>PT_009: Oh mentally [not being scared] it helps you – they scare the day lights out of you before operation they tell you it may happen this, that may happen ... I wasn't worried, no, not a bit. Maybe if I was your age I would have worried, because you are young but to me, I don't care if I go out tomorrow.</i></p> <p><i>F1: You watched the whole surgical video? Wow</i></p> <p><i>PT_001: When they open the leg up – you're not going to get that back together. But they stitch you back up. It's very interesting. I would recommend it actually.</i></p> <p><i>PT_015: When I came round from the anaesthetic I couldn't feel anything. They give you nerve blockers and everything, apart from being shoved around, although I suppose they shoved the bit of metal up my thigh you know, it was a very interesting experience [being sedated].</i></p>

<p>Control – <i>Maybe this code needs to be thought about more. Overlaps with symptom coherency a bit in terms of symptom control beliefs</i></p>	<p>Perceived control, goal setting. Self-efficacy, internal locus of control</p>	<p>Sense of control over their outcomes and symptoms, including self-efficacy and internal locus of control. Most report taking control of their rehab and feeling responsible for their outcomes:</p> <p><i>PT_016: Almost definitely [physio helped] the right one yes, the left one well I basically did the work meself, my biggest physio was what I shouldn't be doing – was climbing ladders.</i></p> <p><i>PT_001: I don't think rehab is a good thing in a private hospital. Because what you doing is laying in a bed and they come and give you exercises once a day or whatever and what else? They take you down the swimming pool and make you swim or something. You can do all that at home.</i></p> <p><i>PT_011: Yeah I, I don't do a lot – I got a bike and I got another exercise machine there for my arms and so on so I do them but the bike is very good yeah don't have to do much a day, twice or three time a day and I find it just loosens you up so good yep.</i></p> <p><i>PT_013: Relax, get your brain into perspective or into synch with it then yeah try and put the pain out of your mind – it's not, I'm saying it's not excessive the pain it's just a niggling pain and yeah no, it's going to get better just keep doing what you're doing, go through the pain, work through it.</i></p>
---	--	--

Notes:

- Expectations: everyone's experience of their TKR expectations seems to be different. Some report all expectations were met, others say it's more than they expected, while some people report this did not meet their expectations.
- Confidence: variability in confidence – some very confident, some lacking confidence due to knee, other lacking confidence due to comorbs or age. Some activity avoidant, others are not.

Early categories and ideas of theory were incomplete. Questions pertaining to how people's level of satisfaction changes, and the influence of social factors remained unclear. Theoretical sampling was undertaken to specifically explore people who indicated they were dissatisfied in their 12 month registry data.

4. Theoretical sampling; exploration of divergent cases and testing of theories

In particular the authorship team were interested in the differences between those who were satisfied and those who were dissatisfied; how social factors and intrapersonal factors varied between the two groups. Example of looking at the dissatisfied group is below.

SOCIAL FACTORS

Dissatisfied

Lack of social participation	Lack of shared experience/normalisation	Lack of family participation
Lack of social network	High needs of TKR	Negative personal experience
?Lack of exposure to other TKR	Negative social calibration	Social marginalisation
Confirming negative TKR beliefs	Family beliefs of her outcome/symptoms	Unable to fulfil social/ family role

Code groups/ themes

Lack of reprioritisation

Lack of social participation
 Lack of social network
 High needs of TKR
 Lack of family participation
 Unable to fulfil social/ family role
 Social marginalisation

Recalibration

Lack of shared experience/ normalisation
 Negative social calibration

Reconceptualisation

Negative therapeutic alliance
 Negative process of care
 Social context supports negative appraisal of symptoms/ outcome

004 (overall satisfied)

- Belief that wife and daughter would perceived Sx are self-inflicted
- Normalisation of surgery at his age – observations
- Unsure of other people’s experiences with TKR
- Inability to get on floor with grandsons
- **Imp**ression: he tends to feel a sense of responsibility over his outcomes. This appears to be reinforced by his family. Seems surgery as quite a normal need for his age group.

008 (overall satisfied)

- Observing others with worse outcomes
- Knowledge of someone hurting their TKR form doing work on the ground
- Lives on own, doesn’t want adult kids to worry
- External help with cleaning

In consultation with my supervisors, I decided to move away from analysing the transcripts by sampling quadrant, to instead look at those who were satisfied and dissatisfied and look for patterns and processes within these groups. See the below example of a comparison between those who were satisfied and dissatisfied in their interviews, with analytic memo notes of these findings related to how these differences exist at different levels:

Theme comparison		
This stage of analysis was to 'test' the presence of 'satisfied' themes in the dissatisfied group.		
Theme	Satisfied	Dissatisfied
Perceived improvement in pain and function	Yes	Yes and No
Positive Sx coherency	Yes	No – unsureness, biomedical beliefs, distress about this
Self-efficacious behaviours	Yes – this can be within the response shift world view they have created	No – lack of self-belief/belief of control
Response shift	Yes	No
Expectations	Met and unmet	Met, unmet, unexpected
Social factors	Some level of participation, support, or positive comparison	Can have some level of support, but generally did not have positive comparison or participation
Do the interaction of these themes occur at different levels?		
Meso related factors tend to pop up in different forms within each of the themes.		
Meso		
<ul style="list-style-type: none"> - Social context <ul style="list-style-type: none"> o Support, participation, identity, valued activities, social comparison 		
<i>Influence the:</i>		
Micro		
<ul style="list-style-type: none"> - Factors of self <ul style="list-style-type: none"> o Self-efficacious behaviours o Response shift/expectations o ?Sx coherency – this may be separate, or may be affected by process of care or 		

I also looked closely at how participants were changing through mechanisms similar to literature on 'response shift', or an acceptance process of continued pain and poor function.

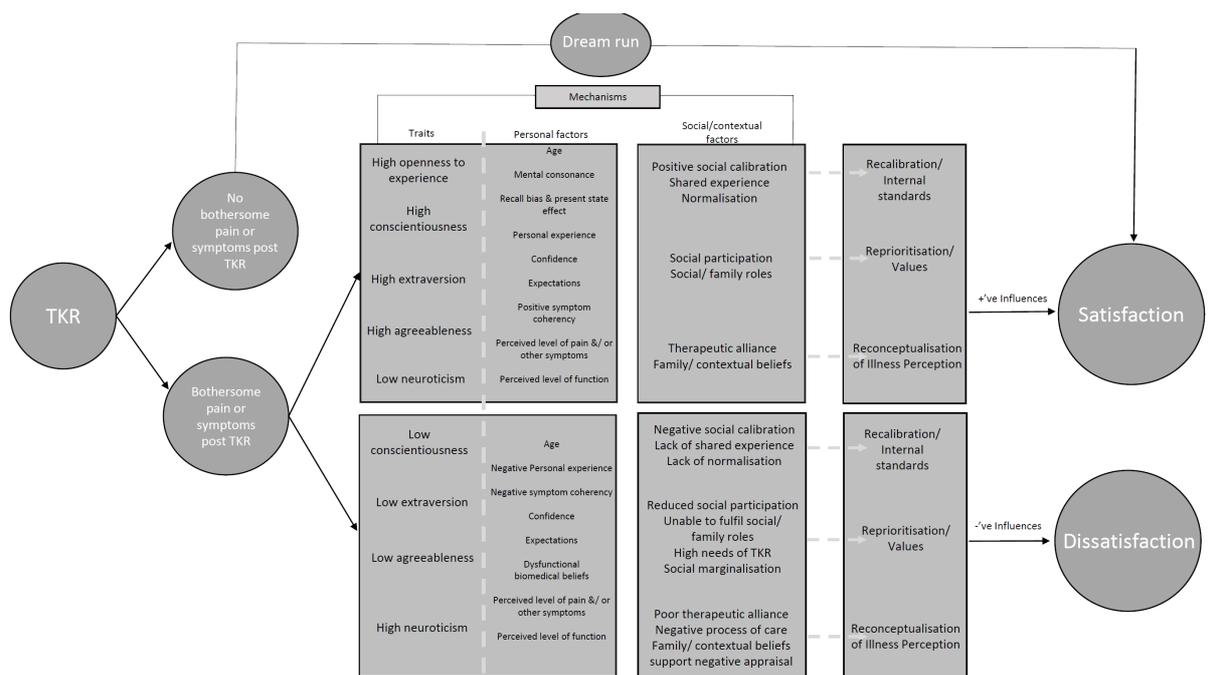
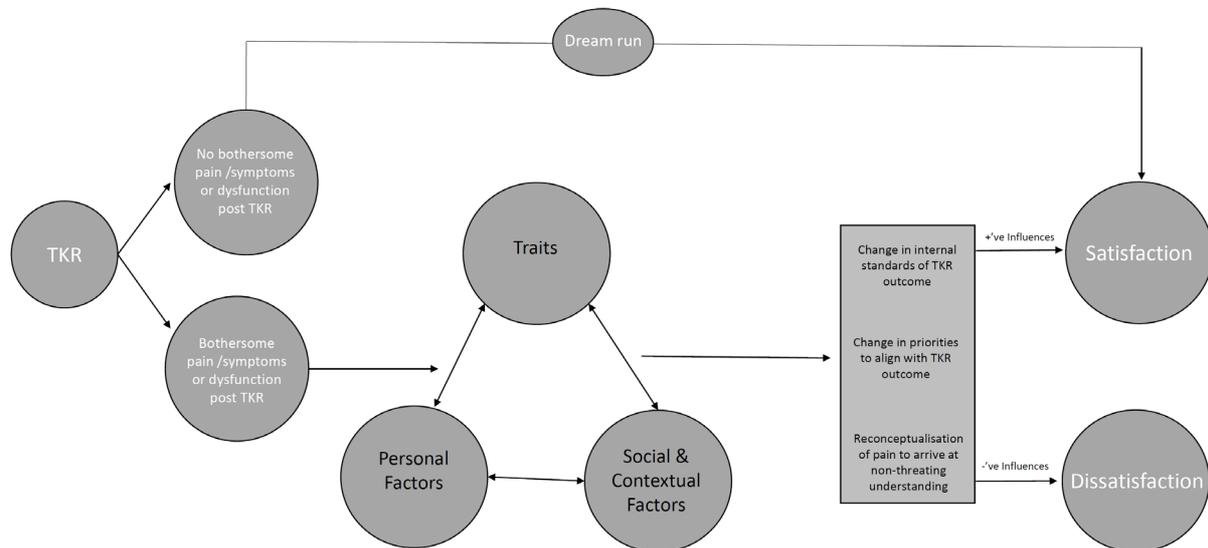
<p>SOCIAL FACTORS</p> <p>Specific analysis on the social influences in each participant's story, and if this relates to their perception of outcome (directly and indirectly). This analysis also took into consideration aspects of response able, change in internal standards (not treated), change in values (representation), or meaning of the target construct (Reconceptualisation).</p> <p>Codes</p> <table border="1"> <tr> <td>Social calibration</td> <td>Social participation</td> <td>Social pairing</td> </tr> <tr> <td>Social context/ family context</td> <td>Cultural context</td> <td>Social beliefs</td> </tr> <tr> <td>Independent in relationships</td> <td>Impressions</td> <td>Social evaluation</td> </tr> <tr> <td>Social support/ family support</td> <td>Travel</td> <td>Positive therapeutic alliance</td> </tr> <tr> <td>Social participation</td> <td>Rejection/ isolation</td> <td>Unmet expectations</td> </tr> <tr> <td>Reconceptualisation</td> <td>Reconceptualisation</td> <td>Influence pain/ activity behaviours</td> </tr> <tr> <td>Positive therapeutic alliance</td> <td>Internal standards</td> <td></td> </tr> <tr> <td>Age</td> <td>Understanding of symptoms</td> <td></td> </tr> </table> <p>Code groups/ emerging themes</p> <table border="1"> <tr> <td>(Re)Calibration</td> <td>(Re)Conceptualisation</td> </tr> <tr> <td> <ul style="list-style-type: none"> Rehabilitation Social calibration Internal standards Social pairing Unmet expectations </td> <td> <ul style="list-style-type: none"> Reconceptualisation Understanding of symptoms Age Positive therapeutic alliance </td> </tr> <tr> <td>Context</td> <td>Participation</td> </tr> <tr> <td> <ul style="list-style-type: none"> Social context/ family context Independent in relationships/ relationship dynamic Cultural context Social support/ family support Social benefits/ education Influence pain/ activity behaviours </td> <td> <ul style="list-style-type: none"> Social participation Cultural context Travel Social context Independence Therapeutic alliance Positive </td> </tr> <tr> <td>(Re)Rejection/ isolation</td> <td></td> </tr> <tr> <td> <ul style="list-style-type: none"> Reconceptualisation Social participation Social context Age Unmet expectations </td> <td></td> </tr> </table> <p>Satisfied</p> <p>001 (RS)</p> <ul style="list-style-type: none"> Support from wife – encouraged him to help himself post-op Conversation to people with worse outcomes Normalisation of TR at their age from observation 	Social calibration	Social participation	Social pairing	Social context/ family context	Cultural context	Social beliefs	Independent in relationships	Impressions	Social evaluation	Social support/ family support	Travel	Positive therapeutic alliance	Social participation	Rejection/ isolation	Unmet expectations	Reconceptualisation	Reconceptualisation	Influence pain/ activity behaviours	Positive therapeutic alliance	Internal standards		Age	Understanding of symptoms		(Re)Calibration	(Re)Conceptualisation	<ul style="list-style-type: none"> Rehabilitation Social calibration Internal standards Social pairing Unmet expectations 	<ul style="list-style-type: none"> Reconceptualisation Understanding of symptoms Age Positive therapeutic alliance 	Context	Participation	<ul style="list-style-type: none"> Social context/ family context Independent in relationships/ relationship dynamic Cultural context Social support/ family support Social benefits/ education Influence pain/ activity behaviours 	<ul style="list-style-type: none"> Social participation Cultural context Travel Social context Independence Therapeutic alliance Positive 	(Re)Rejection/ isolation		<ul style="list-style-type: none"> Reconceptualisation Social participation Social context Age Unmet expectations 			<ul style="list-style-type: none"> Belief of directly causing poor outcomes from observation Strong alliance with surgeons Impressions: relationship dynamic is not reflective of being dependent. Very observant of others around him and how he stacks up comparatively <p>002 (NRS)</p> <ul style="list-style-type: none"> Strong family support and encouragement Participation within capacity in family context Strong alliance with surgeon – feels like they are on a friendly level/ feels at home Impressions: receives a lot of social support and encouragement from her daughter in law. Within her functional capacity (uses BWW) able to participate with in family context through caring for their numerous animals, working around the shops, doing some housework and cooking <p>003 (RD)</p> <ul style="list-style-type: none"> Belief of continued healing Thought would be better than he is but feels like it's an improvement because he can walk Wife present for support Positive relationship with surgeon – believed the discourse that the surgeon had to do 'a lot of cutting here and a lot of cutting there', as a reason for persistent pain Impressions: change in internal standards, informed by relationship with surgeon <p>005 (NRS)</p> <ul style="list-style-type: none"> Support from wife Social observation that everyone seems to have pain after TR and it takes a long time to go away – pain after TR is therefore normal Initial surgery was very unhappy with the surgeon. Revision surgery was very pleased with the surgeon – no one wanted to operate on him but the surgeon took the on. He felt well informed and that his surgeon was very competent Comments: DG can't even use his operated leg as it is still in a period of immobilisation – however he feels like the second surgeon fixed it Impressions: Pain acceptability due to social companions. Strong influence of interaction with surgeon – felt as though he was cared for and in the hands of someone competent <p>006 (NRS)</p> <ul style="list-style-type: none"> Children help with home and yard work Consistently refer to surgeon as the reason for the success of her knee Impressions: surgeon as the main reason for success and satisfaction. With her surgeon was a very good man <p>009 (RS)</p> <ul style="list-style-type: none"> Ascribed against TR Children feel he should do TR as soon as possible, so as to have the surgery while young. Wife also felt he needed an intervention for his knee – he would complain to her about pain and she would say he needed to do something about it. Impressions: are too scared to have TR – has been advising them to go through with it 	<p>Nardis-Rosa Klem Social calibration Social family context, independent in relationships</p> <p>Nardis-Rosa Klem Social support Social participation</p> <p>Nardis-Rosa Klem Reconceptualisation Positive therapeutic alliance</p> <p>Nardis-Rosa Klem Social calibration Positive therapeutic alliance</p> <p>Nardis-Rosa Klem Social calibration Positive therapeutic alliance</p> <p>Nardis-Rosa Klem Social calibration Positive therapeutic alliance</p>
Social calibration	Social participation	Social pairing																																					
Social context/ family context	Cultural context	Social beliefs																																					
Independent in relationships	Impressions	Social evaluation																																					
Social support/ family support	Travel	Positive therapeutic alliance																																					
Social participation	Rejection/ isolation	Unmet expectations																																					
Reconceptualisation	Reconceptualisation	Influence pain/ activity behaviours																																					
Positive therapeutic alliance	Internal standards																																						
Age	Understanding of symptoms																																						
(Re)Calibration	(Re)Conceptualisation																																						
<ul style="list-style-type: none"> Rehabilitation Social calibration Internal standards Social pairing Unmet expectations 	<ul style="list-style-type: none"> Reconceptualisation Understanding of symptoms Age Positive therapeutic alliance 																																						
Context	Participation																																						
<ul style="list-style-type: none"> Social context/ family context Independent in relationships/ relationship dynamic Cultural context Social support/ family support Social benefits/ education Influence pain/ activity behaviours 	<ul style="list-style-type: none"> Social participation Cultural context Travel Social context Independence Therapeutic alliance Positive 																																						
(Re)Rejection/ isolation																																							
<ul style="list-style-type: none"> Reconceptualisation Social participation Social context Age Unmet expectations 																																							
<ul style="list-style-type: none"> Feels compared to other people his age he is really fit and healthy Support from children and wife around the home and yard Ability to participate in cultural activities – Zorba the Greek. This makes wife happy. Also able to go to social clubs and stay in much longer Ability to participate in taking care of hobby farm Avoids ladders due to social information – stories from friends having knees collapse while on ladder Positive therapeutic alliance Impressions: social participation important for DG, especially due to Greek social club/ dancing culture. A lot of social support – he was encouraged to do something about his knee and not feel victimised. Feels like compared to other people his age he is very fit and healthy <p>010 (RD)</p> <ul style="list-style-type: none"> Minimal discussion of social or contextual factors Discusses not wanting to be a burden to the people around her – particularly with the need to stop while going for walks and making the people with her stop too/ reflective of need for independence Refers to the TR meaning a better QoL – ability to cycle and walk and have more mobility Belief that surgery was very important Encouraging her friends to have one too Impressions: QoL seems quite independent – expression of a need to be high functioning. Could be a facet of social participation <p>011 (RS)</p> <ul style="list-style-type: none"> A lot of support from wife Algebra of going travelling with wife again – important activity for them both Confidence in surgeon Social information about the benefits of going to hydro and getting massages – believes these are helping a lot Promising being mobile and pain free at home over pursuing himself at golf Impressions: main social context seems to be him and his wife. Wife was present in interview and sounded like provided him with a lot of support – particularly after he was sick from the operation. Travel seems like a really important activity for them both and they are hopeful they will now get one last trip in. His repositioned being pain free at home to playing golf. <p>012 (RD)</p> <ul style="list-style-type: none"> Social education – heard story of a TR popping out so is very careful Support from neighbours, grandson and dog – seems to be independent though Happy with TR for the sake that she can still move around, despite being quite limited Change in internal standards Comparison to others around her age that have broken mobility – holds the belief that they may or be very satisfied that they can still move/ change in internal standards Belief that the surgeon and the hospital did their best Describes a process of coming to an understanding of her symptoms – at times confused but has confidence in understanding that the TR can never fit perfectly 	<p>Nardis-Rosa Klem Social calibration Social support Social calibration</p> <p>Nardis-Rosa Klem Social participation/ Independence?</p> <p>Nardis-Rosa Klem Social support Social participation/ belief Impressions</p>	<ul style="list-style-type: none"> Impressions: DG reports a lot of limitations and loss of independence. She reports being grateful for what she has, however, feels like a realisation of internal standards. Also seems there's been a process of a re-conceptualisation of her symptoms and trying to come to terms with why the knee <p>013 (RS)</p> <ul style="list-style-type: none"> Social comparison – sees people having both excellent and very poor outcomes Learned from others they still experience pain too, and that the weather influences their symptoms Expectations unmet but learnt through talking with other people he has similar outcomes to most Believes that he has pushed himself more than most people Has found he has a clicking symptom that isn't shared by other people – has decided he just needs to accept this Large amount of support and advocating from wife – was present during interview Strong therapeutic alliance – reason for accepting clicking symptoms Impressions: recalibration informed by social comparison. Reconceptualisation of age (celebration) through surgeon education and talking with other people who had experienced TR. High amounts of support from wife <p>014 (RS)</p> <ul style="list-style-type: none"> Observed others not participate in rehab – believes rehab is the reason for her successful outcomes High amounts of social support Ability to play with grandkids Outcomes exceeded expectations of ability to participate Ability to go out on the boat with the family – important family activity Trust in surgeon – very reassuring Reports social things are important to her – recall this was very limited pre-op Impressions: DG reports an ability to participate socially <p>015 (RS)</p> <ul style="list-style-type: none"> High amounts of social support – lives in daughter's granny flat Observed friends having TRs and being perfectly fine. Has heard people have poor outcomes but doesn't know much about them Feels that at her age it's very normal to need TR Belief that surgeon was very skilled Impressions: although she was advised to have a good experience given what she had observed around her and the acceptability of needing a TR at her age <p>016 (RS)</p> <ul style="list-style-type: none"> Strong therapeutic alliance Participation in valued activities – loves showing his dogs at dog shows. Couldn't do this previously as he couldn't run around the farm Golden's go down to play tennis – new dog Comes from very small country town 	<p>Nardis-Rosa Klem Reconceptualisation – internal standards Reconceptualisation – understanding of symptoms Social calibration</p> <p>Nardis-Rosa Klem Reconceptualisation Reconceptualisation Social support Internal standards</p> <p>Nardis-Rosa Klem Social participation Social support</p> <p>Nardis-Rosa Klem Social calibration Social of health Dept</p>																																				

As well as the presence of personality factors in the pathways to satisfaction:

Traits	Cognitions, Emotions, and Behaviours
Satisfied	
High openness to experience	Acceptance Adaptation
High conscientiousness	Self-responsibility Seeking knowledge Equity Self-efficacy ILOC
High extraversion	Belief of good outcome Positive mindset Good attitude Positivity Happiness Positive attitude
High agreeableness	Expectations Optimism Compliance Gratitude
Low neuroticism	Content Resilient
Dissatisfied	
Low conscientiousness	Low motivation Dependency Care seeking
Low extraversion	Pain avoidant Low self-efficacy ELOC
Low agreeableness	Equity Expectations
High neuroticism	Pessimism Hopelessness Lack of hopefulness Catastrophising Depression Crankiness Anxiety High emotional investment Lack of embodiment

5. Theory building and Conceptual model

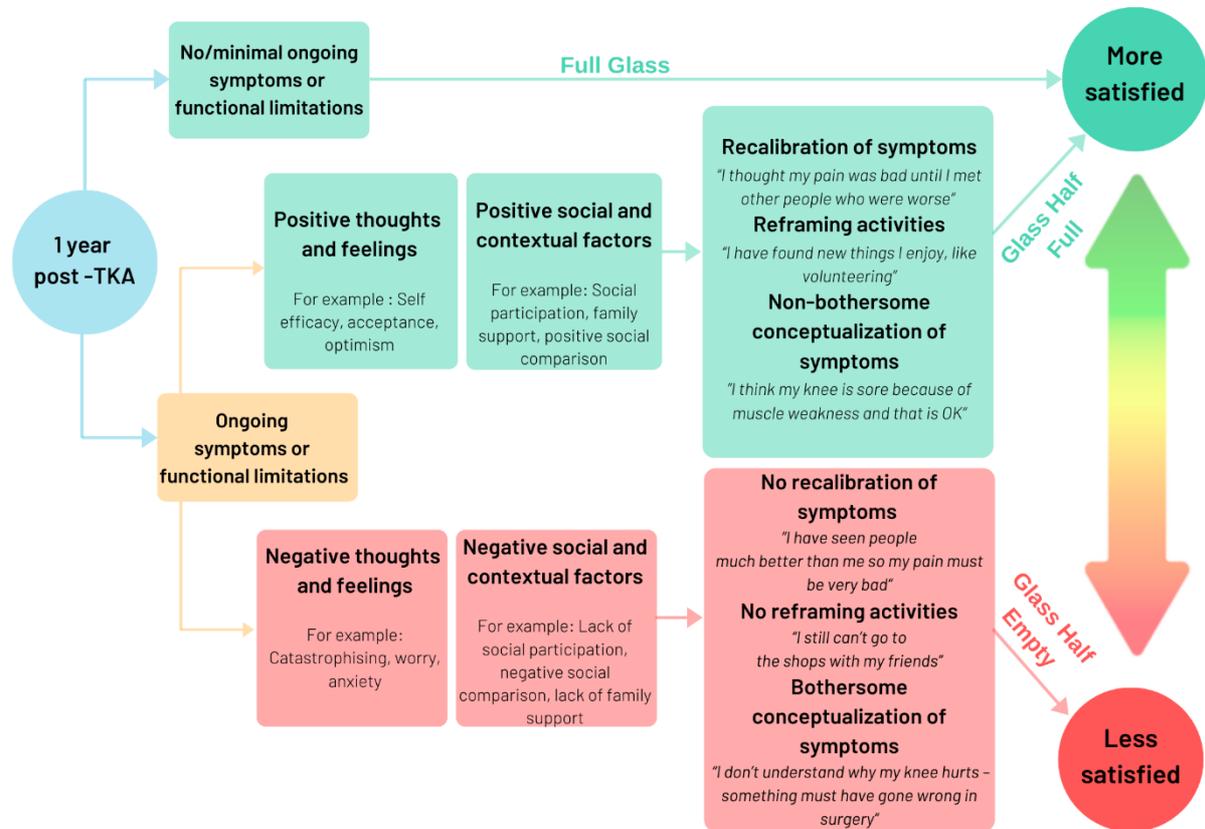
I then explored the integration of response shift mechanisms and personality traits in an early conceptual model:



However, after consulting the raw data and early coding frameworks, it was decided on in a consensus meeting that this theory did not reflect the raw data well enough and further consideration was needed to represent the processes in this sample.

After further consultation with my supervisors, I acknowledged that personal factors were important but were more accurately represented by positive and negative emotions and cognitions, as this better reflected the raw data. However, it was decided that the inclusion of social and contextual factors, as well as the mechanisms of change adapted from response shift were important to keep. A

final model was decided on, which represented to raw data and adequately summarised the initial coding and thematic analysis.



6. Memos and reflexive notes

I wrote a reflexive memo immediate after each interview. These memos included early impressions and summaries of the interview, as well as occasional reflections of her growth as an interviewer.

Example reflexive account from participant 005:

Another phone interview I found challenging. Obvious contradictions in what this participant was saying – almost seemed like on the surface he was telling me what I wanted to hear but then when probed came out his actual beliefs.

This was a tricky one as the original surgery was a right TKR, which then suffered complications and required a ligament recon around 3 months ago. He is also very obese and suffers multiple comorbs. His WOMAC was the worst possible score; however, his satisfaction was high. This seemed to be because the survey was given after his revision surgery – so he was in a brace and couldn't do anything functionally. However, he really like his surgeon on the revision, which explains his high satisfaction.

Therapeutic alliance appear to be a key theme for this person – he was very upset that things weren't explained to him well the first time and lays a level of blame on the surgeon for the poor outcome and requirement of revision surgery. He also initially has minimal confidence in his knee but since having his second surgery feels much more confident and optimistic about the future.

Further thoughts:

Relationship between therapeutic alliance and knee confidence – if there is a good relationship there then they feel more confident in their knee? Then confidence affects satisfaction?

I feel like his actual actions in managing his pain/recovery are not has he reports – he says he is stubborn and pushes on but when probed on a specific example, he reports days of rest. It's like his perception of self isn't what occurs in reality.

During different stages on analysis I wrote notes on the findings and conceptual ideas, to keep track of her thoughts and ask questions of the data. This can be seen in the previous audit documents. An additional example is provided on an intrapersonal analysis:

Intrapersonal factors analysis – satisfied

Codes

Self-efficacy	Gratitude	Equity	Met expectations
Goal setting	ILOC	Positive attitude	Confidence
Optimism	Perception as old/aging	Positive mindset	Unmet expectations
Good attitude	Some expectations met	Confidence to a certain degree	Positivity
Lack of confidence	Life satisfaction	Pragmatic	Belief of good outcome
Happiness	Reconceptualisation of expectations	Acceptance	Acceptance of aging
Adaptation	Recall bias/present state effect	Resilient	Compliance
Health literacy	Exceeded expectations		

NB: recall bias *In those that haven't indicated a 'dream run' this notion of recalling how much worse they were prior to TKR seems very present – not sure what to call it? Belief of improvement?*

Impressions

- **Confidence is highly variable** and doesn't seem to affect satisfaction – I think this makes sense if the individual has experienced a response shift they will have adapted to their lack of confidence
- Much reference to the need to be **positive** – almost as if they were priming themselves to believe the intervention would be successful. Associated with **optimism**: belief that they would continue to improve. Some describe being happy, or the choice to be happy.
- **Expectations highly variable** – same reasoning as confidence
- **Pragmatism** possibly important – the action of some to deal with their current state realistically, rather than the theoretical notion of the TKR should have solved everything. May be associated with **adaptation**
- **Equity (gratitude?)** important to some – free service, amazing surgeons etc. lack of equity present in those with dissatisfaction: some report not feeling like they reaped the benefits from the effort they put into rehab
- **Recall bias/present state effect (belief of improvement?)** – the notion that they were so much worse off before as justification for the success of the TKR. Many recall very, very high amounts of previous pain and disability.
- **Self-efficacy/ILOC/goal setting** – present in many who report satisfaction. Striving to improve, continuing with exercises, pushing themselves. This may be associated with compliance to professional advice/health literacy

Code groups/early thoughts

Sam grouped the codes as follows:

Looking at the satisfied group the recurring psychological constructs that jump out at me are:

- Good self-efficacy (includes confidence, ILOC, maybe even health literacy)
- Positive affect (optimism, positivity, happiness)
- Cognitive flexibility (pragmatism, acceptance, adaptation. Perhaps 'adaptation' is an outcome rather than a psychological 'trait' ... not sure!)

Thought that the recall bias/present state effect fitted into the response-shift rather than the intrapersonal factors

Testing on remaining transcripts

Slight modifications:

- Good self-efficacy (ILOC, health literacy, goal setting) **NB:** positive health intentions with self-efficacy; goal setting seems to be associated with self-efficacy
- Positive affect (optimism, positivity, happiness, gratitude, hopefulness) **NB:** people seem to be glass half full with gratitude and hopefulness; notion of being hopeful for improvement
- Cognitive flexibility (pragmatism, compliance, acceptance, adaptability) **NB:** compliance as the ability to take on new health information and apply it

Removal of confidence as it was variable in this group – low, moderate and high confidence was present.

After re-looking at the data, age does come up a bit – age can shape expectations, or facilitate the Reconceptualisation of expectations

Unsure about whether self-efficacy is the umbrella term for that group, or if there is a better title that self-efficacy fits under?

Intrapersonal factor analysis – dissatisfied

Codes

Pessimism	Unexpected outcome	Pain avoidant	Hopelessness
Helplessness	Lack of embodiment	Young perception of self	Low motivation
Lack of confidence	Care seeking	Old perception of self	Lack of hopefulness
Unmet expectations	Ugly knee	Low self-efficacy	Desire to 'do more'
Distress	Inequality	ELOC	Catastrophising
Pain catastrophising	High emotion investment	Depression	Crankiness
Anxiety	Dependency		

Impression

- Expectations – variable
- Tended to have a lack of confidence
- Age was quite variable – some accepted they were aging, others didn't
- Lack of optimism, hopefulness – didn't believe things could get better, pessimism
- Feeling of inequality – didn't get out the effort put in
- Emotion burden – feelings of hopelessness, helplessness, depression, anxiety, catastrophic thoughts/pain catastrophising, distress, crankiness. Reports of a high emotional investment in the procedure
- Lack of self-efficacy or belief in ability to achieve outcomes/control symptoms, low motivation
- Implicit theory of change? Present state effect? – constructing the belief that they have not benefited as they are not pain free/still have unwanted symptoms?

Code groups/early thoughts

Sam grouped the codes as follows:

Looking at the dissatisfied group it seems to me that the key recurring psychological constructs you have identified are:

- Low self-efficacy
- Negative affect (includes hopelessness, pessimism, anxiety, and depression)
- Fixed perception of self

Nil changes to these groups. Each of the participants seem to fit into one or more of these groups. (Unable to test on 'fresh' transcripts due to low numbers of dissatisfied).

Additionally, where I met with my supervisors to discuss the findings and development of the conceptual model, these notes were integrated in the analysis or taken as separate meeting notes:

Meeting 19.07.16

AS, RS, NK

Aim of today's meeting was to discuss how the codes of 'personal factors' align with models of personality traits, and how these fit into the satisfaction model.

- Discussion of needing to clarify what constitutes as 'personal factors'. For example 'aging' should be removed as is not a cognition or belief. Instead, how the person interprets or understands the aging process is what we are interested in.
- How do these personal factors fit into the model? Discussion of the difference between state and trait: people who are prone to catastrophising tend to have the personality trait of neuroticism, which persists across different contexts (not just health). Similar to the difference between weather and climate.
- The big 5 of personality traits: openness to experience, conscientiousness, extraversion, agreeableness, neuroticism – this is the best and most well validated theory of personality, therefore this might be a useful one to tap into
 - The thought being people who are quite flexible would be open to experience
 - Comparison to the recent coding books – factors such as pessimism, anxiety, helplessness, distress, catastrophising etc. would be related neuroticism. Pain avoidance would be linked to a lack of openness.
- Discussion of focus on state vs trait – divide the 'personal factor' box in the model into a trait → state, which then leads to the → social → satisfied or dissatisfied
 - Acknowledge that we will not capture every single trait
- Discussion of changing the model to *the 3 facets of response* – this indicates that individuals don't necessarily need to have changed after the TKR, their values etc. may have already been set low or high prior to the intervention based on the traits, states and social factors. However, individuals are also able to experience change (response shift) through this model.

Plan

- Nardia to go back through the code books and group according to trait and state
- Re-organise the model according to this
- Then discuss writing the manuscript – Nardia to contact Sam on how to structure the writing of this book in a meeting with everyone to make a plan for the manuscript.

Appendix 4: St Vincent's Hospital ethics approval



**ST VINCENT'S
HOSPITAL**
MELBOURNE

A FACILITY OF ST VINCENT'S HEALTH AUSTRALIA

St Vincent's Hospital
(Melbourne) Limited
ABN 22 052 110 755

41 Victoria Parade Fitzroy VIC 3065
PO Box 2900 Fitzroy VIC 3065

Telephone 03 9288 2211
Facsimile 03 9288 3399
www.svhm.org.au

08 November 2017

Dr Samantha Bunzli
Department of Surgery
St Vincent's Hospital Melbourne

Dear Dr Bunzli,

LNR HREC reference number: HREC/17/SVHM/251

St Vincent's local reference number: LRR 179/17

Study Title: 'It looks good but it feels bad'. Understanding 'failed' Total Knee Replacement from the perspectives of patients and their surgeons

Approval is given in accordance with the research conforming to the *National Health and Medical Research Council Act 1992* and the *National Statement on Ethical Conduct in Human Research 2007 (updated May 2015)*

This HREC is organised and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Research Involving Humans 2007 (updated May 2015), and in accordance with the Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95), the Health Privacy Principles described in the Health Records Act 2001 (Vic) and Section 95A of the Privacy Act 1988 (and subsequent Guidelines).

Approval Date: 08 November 2017

Ethical approval is given for this research project to be conducted at the following sites:

- **St Vincent's Hospital Melbourne**

This approval will be ratified by St Vincent's Hospital (Melbourne) HREC at the next meeting.

Approved documents

The following documents have been reviewed and approved:

Document	Version	Date
National Ethics Application Form	2.2 (2014)	30.10.17
Protocol	2	10.10.17
Participant Information and Consent Form (Surgeons)	2	10.10.17
Participant Information and Consent Form (Patients)	2	10.10.17
Interview Guide (Surgeons)	2	30.10.17
Interview Guide (Patients)	2	30.10.17

UNDER THE STEWARDSHIP OF MARY AIKENHEAD MINISTRIES

Facilities
St Vincent's Hospital Melbourne
Caritas Christi Hospice
St George's Health Service
Prague House

Appendix 5: St Vincent's Hospital ethics amendments and Curtin University reciprocal ethics approval



**ST VINCENT'S
HOSPITAL**
MELBOURNE

A FACILITY OF ST VINCENT'S HEALTH AUSTRALIA

St Vincent's Hospital

11 December 2019

Dr Samantha Bunzli
Department of Surgery
St Vincent's Hospital Melbourne

Dear Dr Bunzli,

LNR HREC reference number: HREC/17/SVHM/251
St Vincent's local reference number: LRR 179/17

Study Title: 'It looks good but it feels bad'. Understanding 'failed' Total Knee Replacement from the perspectives of patients and their surgeons

The Executive of the St Vincent's Hospital (Melbourne) Human Research Ethics Committee (HREC) has reviewed and approved the following amendments:

Amendment Approval Date: 11 December 2019

Approved Documents

Document	Version	Date
Study Protocol	5.0	09 Dec 19
Summary of Changes	-	-
SVHM Site Specific PICF – Follow up	4.0	29 Nov 19
Follow-up Interview Schedule	1.0	29 Nov 19

Governance Approval has been granted for this amendment at the following site:

- St Vincent's Hospital Melbourne
- St Vincent's Hospital Melbourne affiliated facilities (if applicable)

Approval Status: FINAL

Approval is given in accordance with the research conforming to the National Health and Medical Research Council Act 1992 and the National Statement on Ethical Conduct in Human Research 2007 (including all updates)

Approval is subject to:

- The Principal Researcher is to ensure that all associate researchers are aware of the terms of approval and to ensure the project is conducted as specified in the

St Vincent's Hospital Melbourne

St George's Health Service

UNDER THE STEWARDSHIP OF MARY AIKENHEAD MINISTRIES

application and in accordance with the National Statement on Ethical Conduct in Human Research 2007 (including all updates)

- The Principal Researcher is to notify the Research Governance Unit of all significant safety issues in accordance with the *NHMRC Guidance: Safety monitoring and reporting in clinical trials involving therapeutic goods (including all updates)*.
- Submit an Annual Safety Report for the duration of the project.
- Immediate notification of any unforeseen events that may affect the continuing ethical acceptability of the project;
- Notification and reasons for ceasing the project prior to its expected date of completion;
- Submit to the reviewing HREC for approval of any proposed amendments to the project including any proposed changes to the Protocol, Participant Information and Consent Form/s, Investigator Brochure and other study materials.
- Submission of reviewing HREC approval for any proposed modifications to the project.
- Submission of a final report and papers published on completion of project.
- Projects may be subject to an audit or any other form of monitoring by the Research Governance Unit at any time.

St Vincent's Hospital Reference: 179/17
Please quote these numbers on all Correspondence

This approval will be noted by the full HREC at the next available meeting.

Site-Specific Assessment (SSA)

A copy of this letter must be forwarded to the Principal Investigator(s) and the Research Governance Officer(s) at each participating site covered by this HREC approval. Please note that, in addition to HREC approval of an amendment, SSA authorisation is required at all sites participating in the project. Each participating site must issue governance approval of the amendment before the amendment can be implemented at individual sites.

The HREC wishes you and your colleagues every success in your research.

Yours sincerely,



Lily Woods
Research Integrity Assistant
Research Governance Unit
St Vincent's Hospital (Melbourne)

UNDER THE STEWARDSHIP OF MARY AIKENHEAD MINISTRIES

Facilities
St Vincent's Hospital Melbourne
Caritas Christi Hospice
St George's Health Service
Prague House



27-Nov-2017

Name: Anne Smith
Department/School: School of Physiotherapy and Exercise Science
Email: Anne.Smith@exchange.curtin.edu.au

Dear Anne Smith

RE: Reciprocal ethics approval
Approval number: HRE2017-0827

Thank you for your application submitted to the Human Research Ethics Office for the project "It looks good but feels bad". Understanding 'failed' Total Knee replacements from the perspectives of patients and their surgeons.

Your application has been approved by the Curtin University Human Research Ethics Committee (HREC) through a reciprocal approval process with the lead HREC.

The lead HREC for this project has been identified as St. Vincent's hospital, Melbourne.

Approval number from the lead HREC is noted as HREC/17/SVHM/251.

The Curtin University Human Research Ethics Office approval number for this project is **HRE2017-0827**. Please use this number in all correspondence with the Curtin University Ethics Office regarding this project.

Approval is granted for a period of one year from **27-Nov-2017** to **26-Nov-2018**. Continuation of approval will be granted on an annual basis following submission of an annual report.

Personnel authorised to work on this project:

Name	Role
Smith, Anne	CI
Klem, Nardia-Rose	Student
O'Sullivan, Peter	Co-Inv
Kent, Peter	Supervisor

You must comply with the lead HREC's reporting requirements and conditions of approval. You must also:

- Keep the Curtin University Ethics Office informed of submissions to the lead HREC, and of the review outcomes for those submissions
- Conduct your research according to the approved proposal

- Report to the lead HREC anything that might warrant review of the ethics approval for the project
- Submit an annual progress report to the Curtin University Ethics Office on or before the anniversary of approval, and a completion report on completion of the project. These can be the same reports submitted to the lead HREC.
- Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
- Data and primary materials must be managed in accordance with the [Western Australian University Sector Disposal Authority \(WAUSDA\)](#) and the [Curtin University Research Data and Primary Materials policy](#)
- Where practicable, results of the research should be made available to the research participants in a timely and clear manner
- The Curtin University Ethics Office may conduct audits on a portion of approved projects.

This letter constitutes ethical approval only. This project may not proceed until you have met all of the Curtin University research governance requirements.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely



Professor Peter O'Leary
Chair, Human Research Ethics Committee

Appendix 6: Study 1: Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review

Osteoarthritis and Cartilage Open 2 (2020) 100032



Contents lists available at ScienceDirect

Osteoarthritis and Cartilage Open

journal homepage: www.elsevier.com/journals/osteoarthritis-and-cartilage-open/2665-9131



Review

Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review



Nardia-Rose Klem^{a,*}, Peter Kent^{a,b}, Anne Smith^a, Michelle Dowsey^{c,d}, Robyn Fary^a, Rob Schütze^a, Peter O'Sullivan^a, Peter Choong^{c,d}, Samantha Bunzli^d

^a Curtin University, School of Physiotherapy and Exercise Science, Building 408, Brand Drive, Bentley, Western Australia, 6102, Australia

^b Department of Clinical Biomechanics and Sports Science, Campusvej 55, University of Southern Denmark, Odense, M 5230, Denmark

^c Department of Orthopaedics, St Vincent's Hospital Melbourne

^d The University of Melbourne, Department of Surgery, St Vincent's Hospital Melbourne, Level 2, Clinical Sciences Building, 29 Regent St, Fitzroy, Victoria, 3065, Australia

ARTICLE INFO

Keywords:

Satisfaction
Total knee replacement
Total knee arthroplasty
Osteoarthritis
Content validity

SUMMARY

Objective: Patient satisfaction is considered an important outcome measure after total knee replacement, but the construct is complex. There is large variation both in how satisfaction is measured and estimates of the proportion of people who are satisfied after surgery. The aim of this systematic review was to i) evaluate the proportion of people reported to be satisfied after total knee replacement for osteoarthritis; and ii) assess the content validity of the utilised satisfaction measures.

Methods: We searched four literature databases with search phrases 'Total Knee Arthroplasty' OR 'Total Knee Replacement' AND 'Patient satisfaction' for studies that measured satisfaction at least 6 month post-unilateral primary total knee replacement for knee osteoarthritis. Identified studies were assessed for risk of bias, and studies at high risk of bias were excluded (PROSPERO: CRD42017058936). Meta-analysis was not appropriate due to the heterogeneity in satisfaction instruments, thus satisfaction scores were described. The content validity of satisfaction questionnaires was assessed using the COnsensus-based Standards for the selection of health status Measurement Instruments criteria.

Results: The present review found heterogeneity in the satisfaction questions used, as well as the satisfaction estimates from the various studies. Only two satisfaction instruments were relevant for a Total Knee Replacement population and both failed assessment for content validity due to lack of patient involvement during development and testing in accordance with the COnsensus-based Standards for the selection of health status Measurement Instruments criteria.

Conclusion: Future research should focus on qualitative methods to elicit patients' perspectives of satisfaction to build theoretical understanding.

1. Introduction

Total knee replacement (TKR) surgery is considered the gold standard treatment for end stage knee osteoarthritis (OA) due to its cost effectiveness [1] and high rates of symptomatic and functional improvement [2]. However, despite near-flawless surgical procedures, up to 30% of people fail to have clinically meaningful improvements in pain and disability levels post-operatively [3]. These rates of poor response highlight the importance of appropriately determining and measuring success with this procedure to facilitate improvement in outcomes.

The lack of concordance between the surgeon's and patient's appraisals of the intervention [4,5] underscores the importance of understanding the success of a TKR from the patient's perspective. As such, the Osteoarthritis Research Society International (OARSI) has identified cut points of patient-reported changes in pain and function as valid and reliable markers of response to TKR [6]. In addition to this, patient satisfaction is considered an important outcome measure post TKR, as endorsed by a patient and surgeon derived Delphi study conducted by the Outcome Measures in Rheumatology [7].

Despite the importance of measuring patient satisfaction as a reflection of the value of the orthopaedic intervention, the satisfaction

* Corresponding author. Curtin University, School of Physiotherapy and Exercise Science, Building 408, Brand Drive, Bentley, Western Australia, 6102, Australia.
E-mail address: n.klem@postgrad.curtin.edu.au (N.-R. Klem).

<https://doi.org/10.1016/j.ocarto.2020.100032>

Received 29 July 2019; Accepted 20 January 2020

2665-9131/© 2020 Osteoarthritis Research Society International (OARSI). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

instruments and quantification methods used after TKR are highly heterogeneous [8]. A previous systematic review [8] investigated the available literature on satisfaction after TKR and found only 13% of the included studies used a satisfaction instrument which had demonstrated some form of validity. Furthermore, 21.2% did not define how they measured satisfaction, and the remaining 65.8% drew on a variety of questions and quantification methods to measure this construct [8]. These observations may explain why satisfaction estimates have been reported to vary extensively, from as high as 99% [9], to findings as low as 70% [10,11]. The reasons for such heterogeneity have not been rigorously investigated, however a recent study [12] indicates the importance of how the satisfaction questions are framed. The authors found the focus of the satisfaction question (such as general satisfaction as compared to satisfaction with recreational activities) significantly affected the rates of satisfaction by as much as 10% [13].

These findings highlight the importance of understanding the different aspects of satisfaction. According to satisfaction theory, satisfaction is multifactorial and includes numerous variables that are likely to contribute to a patient's appraisal [14]. When considering the complexity of satisfaction theory in combination with the heterogeneity and lack of validation of the commonly used satisfaction instruments, it is not possible for researchers and clinicians to have an understanding of what is actually being captured by the various instruments.

To create certainty around what is being measured by patient reported outcome measures (PROMs), including those assessing satisfaction, confirmation of content validity is essential [15]. Content validity is the degree to which the content of a PROM is an adequate reflection of the construct to be measured, and is considered the most important measurement property of a PROM [15]. Content validity comprises three key aspects: content relevance (all items should be relevant for the construct of interest), content comprehensiveness (no key aspects of the construct should be missing), and content comprehensibility (the items should be understood by patients as intended) [15]. To achieve these three key aspects of content validity, the involvement of the patient in PROM development is essential. This includes patient involvement in theory development, item development, and item testing in terms of understanding of content and response categories.

To facilitate a better and more consistent understanding of patient satisfaction, the aims of this review were therefore to i) evaluate the proportion of people reported to be satisfied after TKR for osteoarthritis; and ii) assess the content validity of the utilised satisfaction measures.

2. Methods

The review protocol was prospectively registered on PROSPERO (CRD42017058936) and reported according to PRISMA guidelines [16]. Assessment of content validity of measures was additional to this protocol as the need for this aspect became apparent during the review process.

2.1. Literature search

We developed an electronic search strategy (See Appendix 1) of all available data from inception until September 2018 to identify eligible studies in the MEDLINE, EMBASE, CINAHL databases and the Cochrane Database of Registered Trials. We searched the databases using the following terms: 'Total Knee Arthroplasty' OR 'Total Knee Replacement' AND 'Patient satisfaction' and imported retrieved titles and abstracts into the Endnote software (Clarivate Analytics, Philadelphia, PA, USA) and removed duplicates.

Table 1

Inclusion criteria.

Criteria	Definition/justification
Unilateral, primary total knee replacement	We included studies in which participants underwent total knee replacement. We excluded studies in which participants underwent unicompartmental knee replacement as satisfaction levels may differ significantly between patients with unicompartmental and total knee replacement [17]. We included studies where <5% of participants underwent simultaneous bilateral TKR*. This is because satisfaction levels may be significantly different among people who receive a unilateral versus simultaneous bilateral TKR [18]. Studies involving participants undergoing their second primary TKR were included. Where it was unclear whether the bilateral TKRs were simultaneous or staged, it was assumed that they were simultaneous. We included studies where <5% of participants underwent revision TKR. This is because satisfaction levels may be significantly different among people who receive a primary versus revision TKR [19]. The 5% cut-off enabled us to include relevant studies where 95% of participants met our criteria. We anticipated that a 5% threshold would not significantly impact satisfaction outcomes reported in this review.
Total knee replacement for osteoarthritis of the knee	We included studies where <5% of participants underwent TKR for pathologies other than osteoarthritis. This is because the concerns and priorities of patients undergoing TKR differ according to their underlying diagnosis and the satisfaction levels may be significantly different between people undergoing TKR for osteoarthritis versus other pathology [20]. Accordingly, we excluded studies that did not explicitly state the reason for performing TKR.
Satisfaction measured ≥ 6 months post-operatively	We included studies that assessed satisfaction ≥ 6 months post TKR in order to capture satisfaction with outcome rather than process of care, and in light of evidence that 6 months would be a sufficient minimum time-frame in which to assess satisfaction given the majority of improvement in function after TKR takes place in the first 6 months post-surgery [21].
Satisfaction with total knee replacement outcome	We excluded studies that assessed satisfaction with the process of care, as this is a different construct to satisfaction with treatment outcome. We also excluded studies that did not include a measure of satisfaction with treatment outcome, but instead, inferred patient satisfaction from changes in knee pain or function following TKR [22].
Quantitative studies	We excluded any qualitative studies as our aim was to quantify satisfaction with TKR.
Original, full text articles Articles written in English	We excluded review papers and conference abstracts. Given the large scope of this review, for pragmatic reasons we excluded studies that were not written in English.

2.2. Study selection

The inclusion criteria (Table 1) were devised by the research team with clinical and research expertise in TKR (AS, MD, PC); and systematic reviews (AS, PK, RF, SB). Titles and abstracts were uploaded into Covidence (Covidence, Melbourne, Victoria, Australia) to facilitate the screening process. Two reviewers (SB, RF) independently screened titles and abstracts for inclusion. Where information was not explicitly presented in the title and abstract e.g. unilateral versus bilateral TKR, the full text article was retrieved for screening. Full text articles were independently screened by three authors (SB, RF, NK). Disagreements were resolved by consultation with the other authors until consensus was reached. Given the volume of papers requiring screening, if the information to meet inclusion was not reported in the full text article, the articles were excluded without contacting the

study authors.

2.3. Assessment of methodological quality

Two reviewers (SB and NK) independently assessed risk of bias using a purposely adapted tool based on an existing tool for assessing risk of bias in prevalence studies [17]. The existing tool was modified to accommodate the range of study designs included in this review such as prospective cohort studies, retrospective studies of registry data and randomised control trials. The adapted tool comprises ten domains; each domain was scored as low or high risk of bias (see Appendix 2). Of the ten assessment items, seven were ‘asterisked’, which indicated immediate exclusion of a study with failure of any of these items (see Appendix 2). Studies meeting all seven asterisked items were included in the review, with studies that failed any of the remaining three non-asterisked items considered to be moderate risk. The risk of bias tool was piloted using studies that did not meet the inclusion criteria to ensure familiarity and consistency of use. The two (SB and NK) reviewers resolved disagreements by consultation until arriving at a consensus decision.

2.4. Data extraction

Two reviewers (SB and NK) independently extracted data from each study using a standardised extraction sheet. Data extracted included characteristics of the study (geographical location, sample size); characteristics of the participants (age, percentage female); characteristics of the outcomes (satisfaction measure, duration of follow-up); and satisfaction outcome scores. Data extraction sheets from the two reviewers were compared for consistency and accuracy.

2.5. Data synthesis and analysis

2.5.1. Description of satisfaction after TKR

Given the multiple ways in which satisfaction was measured the authorship team took various steps to extract percentage satisfied from each study included in the review, which are detailed in Table 2.

Given the heterogeneity of the satisfaction instruments, it was not appropriate to meta-analyse the results [22]. Therefore, the satisfaction results of each paper are displayed in a forest plot with corresponding description (see Fig. 1).

2.5.2. Assessment of content validity

Studies included in the review were assessed as to whether a citation was provided for the satisfaction instrument used. The citations were evaluated according to their support for content validity of the satisfaction measure, in terms of either a development study or secondary content validity study. In addition, a specific search strategy was developed to retrieve any studies of content validity for specific satisfaction instruments used by studies in this review, which was approved by the university librarian (see Appendix 3).

Content validity of satisfaction measures was evaluated using the COnsensus-based standards for the selection of health Status Measurement INstruments (COSMIN) content validity assessment

Table 2 Method of extracting percentage satisfied.

Study reporting method	Approach to extract percentage satisfied
Means and SD, or proportion values of categorical satisfaction scales	Percentage satisfied was derived from the sample size
Visual analogue scales reported	A satisfaction threshold was chosen based on the ‘smile face’ scale, where the point at which the face begins to smile was considered to be ‘satisfied’ (see Fig. 1); in a 1–10 scale, a score of 7 or more was chosen; in a 1–5 scale, 4 or more was chosen. The percentage of satisfied people was derived by calculating the number of people in the sample who had scores above the appropriate threshold for the data reported. This was achieved by converting the difference between the sample mean and the threshold into a z-score (the number of SD the threshold was away from the mean). The z-score was then converted to a percentile using the NORMDIST function in Excel v16.11 (Microsoft Corp, Redmond, WA, USA)
Only medians reported	An approximation of mean values was derived from the median range and sample size using the method of Hoza [18] to attain the percentage satisfied
Likert Scales	Outcomes of ‘satisfied’ or ‘very satisfied’ was regarded as a satisfied outcome
Knee Society Knee Score Satisfaction scale [19]. Total score of 40 from 5 items each with a maximum score of 8	A threshold of 28 was selected to indicate satisfaction. This represented a minimum of 4 satisfied answers and 1 neutral answer across the 5 satisfaction items.
The Self-Administered Patient Satisfaction Scale for Primary Hip and Knee Arthroplasty [20]. The items are scored on a 4-point Likert scale, with 4 response options: 25 pts (very dissatisfied), 50 pts (somewhat dissatisfied), 75 pts (somewhat satisfied), or 100 pts (very satisfied), which are averaged to give a total score.	A threshold of 68 was selected. The sum score of 68 represented 3 somewhat satisfied and 1 somewhat dissatisfied responses.
Multiple satisfaction questions under the one questionnaire	Where possible, these were individually reported as well as reporting a composite score
Papers reporting multiple follow-ups	The time point closest to twelve months was selected to be included in the review, based on evidence that this is when maximum improvement in pain and function is attained [21].
Papers only reporting satisfaction outcomes for subgroups of the sample	These subgroup scores were combined into one total group summary score.

checklist. The COSMIN methodology details that strong evidence of good content validity is achieved through adequate content relevance, comprehensiveness, and comprehensibility. For a PROM to be assessed on these three aspects, the COSMIN methodology has expanded them to create the ten criteria for good content validity, which includes five items under ‘relevance’, one item under

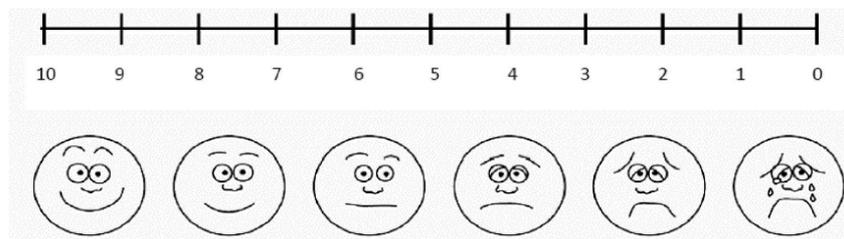


Fig. 1. 0–10 Smile face satisfaction scale.

'comprehensiveness', and four items under 'comprehensibility' (see column 1 of Tables 4a and 4b). To assess whether these ten criteria have been met, the COSMIN methodology details a systematic three step process, whereby the final stage rates the PROM against the ten criteria. Single questions used by studies that were unsupported by the literature could not be assessed for evidence of content validity, in accordance with the COSMIN assessment. This process was conducted by two authors (AS and NK).

The first phase of this process involved assessment of any development study of the satisfaction measure against steps 1a and 1b in the COSMIN assessment (see Appendix 4). Any further content validity studies in addition to development studies were assessed against steps 2a – 2e (see Appendix 5). Step 3 was a final appraisal of the ten criteria for good content validity. Step 3 involved appraising the development study, the content validity study (if available) as well as the reviewers' opinion against the ten criteria for good content validity (see column 5 of Tables 4a and 4b).

3. Results

3.1. Literature search and risk of bias assessment

Our search strategy identified a total of 5824 records of which 2828 records were non-duplicates. After screening of titles and abstracts, 546 papers remained for full text screening. Following this, we excluded a further 346 articles leaving 152 articles for analysis of risk of bias. Forty-three articles passed the risk of bias assessment to be included in this

systematic review (see Fig. 2), with 35 considered moderate risk due to failing one or more of the non-asterisked risk of bias items and eight considered low risk (see Appendix 6).

3.2. Study characteristics

Individual study characteristics are presented in Table 3.

3.3. Satisfaction estimates

Due to the heterogeneity in the focus of the satisfaction questions used by the studies, results were grouped into 'like' constructs. Composite scales consisting of questions with different foci of satisfaction are reported as composite, and also as single items under specific constructs where possible (see Fig. 3).

3.3.1. Single item satisfaction questions

The construct 'Satisfaction with the operated knee' included all questions that asked about satisfaction with the total joint replacement (TJR), TKR, operated knee, or surgery on the operated knee. Eighteen studies were included under this construct and the proportion satisfied ranged from as high as 97% (CI 90 to 100) to as low as 69% (CI 60 to 77). Two studies used a question which is part of the multi-domain Total Hip Arthroplasty Outcome Evaluation Questionnaire (THAOEQ) [44,45]. Thirteen studies provided no citation in support of the single item question used [9,23,24,26,28,30,38,54,55,58–61], while 3 studies cited another study that had utilised the same single item question [12,29,46];

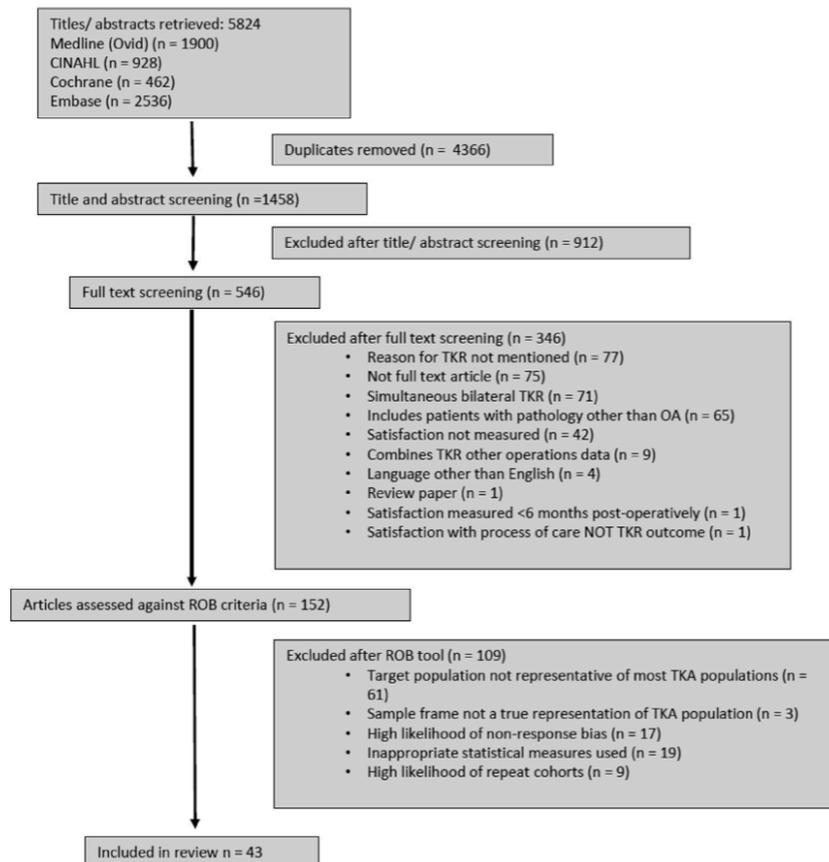


Fig. 2. Study selection flow diagram.

Table 3
Study characteristics.

Study	Year	Country	Mean age (SD)	Design	Sample Size	Female (n)	Satisfaction question	Construct
Ali et al. [23]	2016	Sweden	68.5 (4)	RCT	74	21	Degree of satisfaction with the operated knee: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'	Satisfaction with the operated knee
Ali et al. [24]	2017	Sweden	72.9 (9.7)	RCT	186	16	Degree of satisfaction with the operated knee: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'	Satisfaction with the operated knee
Aunan and Rohl [25]	2018	Norway	69.3 (7.4)	Prospective cohort	129	73	Patient satisfaction measures on a VAS	Satisfaction
Baker et al. [26]	2007	England and Wales	70.8 (9.4)	Retrospective cohort	8231	4675	"Are you satisfied with your knee replacement?": 'yes', 'no' and 'not sure'.	Satisfaction with the operated knee
Blyth et al. [27]	2015	Scotland	65.5	Prospective cohort	198	116	Overall satisfaction: 'very satisfied', 'satisfied', 'don't know', 'unsatisfied', 'very unsatisfied'	Satisfaction
Boese et al. [28]	2011	USA	64	Retrospective cohort	128	90	"How happy are you with your implanted knee?": measured on a scale of 1–5 where 1 = completely dissatisfied to 5 = completely satisfied	Satisfaction with the operated knee
Clement et al. [12]	2018	United Kingdom	68.6 (9.3)	Retrospective cohort	1255	757	'How satisfied are you with the results of your knee replacement surgery?' 'Very satisfied', 'somewhat satisfied', 'somewhat dissatisfied', and 'very dissatisfied'	Satisfaction with the operated knee
Collados-Maestre et al. [29]	2017	Spain	71.2 (6.4)	Prospective cohort	237	164	'Patient satisfaction was evaluated yearly on a 5-point Likert scale' 'very satisfied', 'satisfied', 'neutral', 'dissatisfied', and 'very dissatisfied'	Satisfaction with the operated knee
Collins et al. [30]	2017	USA	69.5 (8.5)	Prospective cohort	633	375	'How satisfied are you with the results of your knee replacement surgery?' 'very satisfied', 'somewhat satisfied', 'somewhat dissatisfied' and 'very dissatisfied'	Satisfaction with the operated knee
Culliton et al. [31]	2018	Canada	63.5 (8)	Prospective cohort	345	221	Patient Acceptable Symptom State	Satisfaction with symptoms
Dailiana et al. [32]	2015	Greece	69.2 (6.7)	Prospective cohort	204	162	Patient satisfaction with the results of TKR was assessed in three aspects: overall satisfaction, satisfaction with pain relief, and satisfaction with functional improvement/ability to perform daily activities. Patients were categorized as very/mostly satisfied, somewhat satisfied, and dissatisfied. (modified Self-Administered Patient Satisfaction Scale)	Satisfaction with symptoms
Escobar et al. [33]	2013	Spain	71.4 (6.9)	Prospective cohort	912	641	Patient Acceptable Symptom State	Satisfaction
Gaillard et al. [34]	2017	Germany	72.7	Retrospective cohort	1059	650	Not specified. 'Very satisfied', 'satisfied', 'disappointed'	Satisfaction
Gandhi et al. [35]	2007	Canada	69.2 (8.8)	Prospective cohort	87	56	Are you satisfied with your limb alignment? 'Yes' or 'No'	Aesthetics
Genet et al. [36]	2008	France	71.7 (7)	Prospective cohort	45	28	Patient satisfaction measured on a VAS (0–100)	Satisfaction
Gildone et al. [37]	2005	Italy	74.1 (4.8)	Prospective cohort	56	39	Satisfaction questionnaires. No response categories provided	Satisfaction
Giurea et al. [38]	2016	Austria	66 (NA)	Prospective cohort	86	48	Satisfaction with response categories: 'Yes' or 'No'	Satisfaction with the operated knee
Healy et al. [9]	2002	USA	69.9 (8.7)	Prospective cohort	159	–	Patient satisfaction measured with response categories: 'yes' or 'no'	Satisfaction with the operated knee
Hinarejos et al. [39]	2016	Spain	72.2 (7)	Prospective cohort	474	360	Satisfaction measured on a VAS (0 = absolutely dissatisfied, 10 = absolutely satisfied)	Satisfaction
Kawakami et al. [40]	2015	Japan	74.3 (7.8)	Prospective cohort	48	25	Satisfaction domain of the new Knee Society Knee Scoring System questionnaire	Composite
Khuangsiriku et al. [41]	2016	Thailand	76.9 (7.4)	Prospective cohort	144	130	The Self-Administered Patient Satisfaction Scale	Composite
Kim et al. [42]	2009	Korea	68.5 (5.6)	Prospective cohort	186	177	British Orthopaedic Association Patient Satisfaction Score	Satisfaction
Li et al. [43]	2012	China	67.2 (7.2)	Retrospective cohort	130	97	The British Orthopaedic Association Patient Satisfaction Score	Satisfaction
Liebs et al. [44]	2010	Germany	69.8 (7.9)	RCT	136	114	Total Hip Arthroplasty Outcome Evaluation Questionnaire	Satisfaction with the operated knee
Liebs et al. [45]	2012	Germany	69.8 (8.1)	RCT	158	133	Total Hip Arthroplasty Outcome Evaluation Questionnaire	Satisfaction with the operated knee
Lizaur-Urtila et al. [46]	2016	Spain	69.7 (5.9)	Prospective cohort	192	127	Satisfaction measured with response categories: 'very satisfied', 'satisfied', 'neutral', 'dissatisfied', 'very dissatisfied'	Satisfaction with the operated knee
Mannion et al. [47]	2009	Switzerland	67 (9)	Prospective cohort	112	7	Satisfaction with surgery measured with the response categories: 'very satisfied', 'somewhat satisfied', 'somewhat dissatisfied', 'very dissatisfied'	Satisfaction with surgery
Matthews et al. [48]	2013	UK	69.2 (7.7)	Prospective cohort	34	20	Patient satisfaction measured on a 10-point VAS.	Satisfaction

(continued on next page)

Table 3 (continued)

Study	Year	Country	Mean age (SD)	Design	Sample Size	Female (n)	Satisfaction question	Construct
Mooney et al. [49]	2016	Australia	68 (11.3)	Cross-sectional	67	43	Knee Society Score containing post-operative satisfaction scores Satisfaction with pain relief, physical function and overall outcome measured on a VAS (0 = completely unsatisfied to 10 = completely satisfied)	Satisfaction with function
Murphy et al. [50]	2014	Australia	70.8 (9.9)	RCT	40	25		
Nilsdotter et al. [51]	2009	Sweden	72 (8)	Cross-sectional	87	50	Satisfaction with result in general measured on 5-point Likert scale from 'totally satisfied' to 'very dissatisfied'. Questions about satisfaction in relation to pain relief; symptom relief; improvement in activities of daily living; and improvements in sport and recreational function. Dimensions measured on 5-point Likert scale from 'totally satisfied' to 'very dissatisfied'.	Satisfaction with function (activities of daily living and sports and recreation) Satisfaction with symptoms
Petersen et al. [10]	2015	Denmark	65 (6.3)	Cross-sectional	215	139	Satisfaction with surgery measured with response categories: 'very satisfied', 'satisfied', 'not completely satisfied', 'not satisfied'	Satisfaction with surgery
Pulavarti et al. [52]	2014	UK	69.9 (8.3)	RCT	126	68	Satisfaction measured with response categories: 'excellent', 'good', 'fair', 'poor'	Satisfaction
Ranawat et al. [53]	2017	USA	71 (7.3)	Prospective cohort	193	138	Satisfaction measured on a VAS (0–10)	Satisfaction
Robertsson et al. [54]	2000	Sweden	–	Cross-sectional	–	–	Satisfaction with the operated knee measured with response categories: 'very satisfied', 'satisfied', 'uncertain', 'dissatisfied'	Satisfaction with the operated knee
Stieckles et al. [55]	2001	USA	69.9 (11.9)	Cross-sectional	1011	637	"How satisfied are you with the results of your joint replacement?": 'very satisfied', 'somewhat satisfied', 'neutral', 'somewhat dissatisfied', 'very dissatisfied'	Satisfaction with the operated knee
Sun et al. [56]	2012	China	64.7 (4.4)	RCT	132	80	Satisfaction (reported as % satisfied)	Satisfaction Composite
Von Keudell et al. [57]	2014	USA	62.6 (11.2)	Cross-sectional	245	165	Satisfaction in respect to pain, motion, daily living function, return to sport activities and ability to kneel. Each dimension measured on a VAS (0 = not satisfied, 10 = very satisfied)	Satisfaction with the operated knee
Walker et al. [58]	2018	UK	68.9 (9.6)	Retrospective cohort	2578	1396	'How satisfied are you with the results of your knee replacement surgery', 'very satisfied', 'somewhat satisfied', 'somewhat dissatisfied', and 'very dissatisfied'	Satisfaction with the operated knee
Warner et al. [59]	2017	UK	73.1 (8.7)	Prospective cohort	1151	653	Individuals were asked to state how satisfied they felt with their total joint replacement using an ordinal scale 'very satisfied', 'not very satisfied', and 'dissatisfied'	Satisfaction with the operated knee
Williams et al. [60]	2013	UK and Ireland	70.9 (8.6)	Prospective cohort	486	314	'How do you feel overall about your replaced joint?' 'very happy', 'happy', 'OK (not perfect)', or 'never happy'	Satisfaction with the operated knee

Table 4a
Content validity assessment of the SAPSS.

	PROM development study 1	PROM development study 2	Content validity study	Rating of reviewers	Overall rating per PROM	Quality of evidence
Self-administered patient satisfaction scale	Development study [67]	Development study [20]	NA	+/-/?	+/-/±	High, moderate, low, very low
Relevance						
1. Are the items relevant to the construct of interest?	-	-		+		
2. Are the included items relevant for the target population of interest?	-	-		+		
3. Are the included items relevant for the context of interest?	+	+		+		
4. Are the response options appropriate?	-	-		+		
5. Is the recall period appropriate?	-	-		?		
Relevance rating	-	-	NA	+	±	Low
Comprehensiveness						
6. Are all key concepts included?	-	-		-		
Comprehensiveness rating	-	-	NA	-	-	Low
Comprehensibility						
7. Are the PROM instructions understood by the population of interest as intended?	-	-				
8. Are the PROM items and response options understood by the population of interest as intended?	-	-				
9. Are the PROM items appropriately worded?				+		
10. Do the response options match the question?				+		
Comprehensibility rating		-	NA	+	±	Low
Content validity rating					-	Low

Legend: - Fail + Pass ? Insufficient information ± Inconsistent.

however, there was no further citation to support the validity of these questions.

The construct ‘Satisfaction’ included all questions that did not focus on any particular aspect of satisfaction. Of the 17 studies included, the proportion satisfied ranged from as high as 99% (CI 96

to 100) to as low as 73% (CI 58 to 85). One study used a question that was an item from the Self-Administered Patient Satisfaction Scale (SAPSS) [32], and 2 used an item from the surgeon-completed multi-domain British Orthopaedic Association (BOA) grading system [42,43]. Of the remaining studies, 13 provided no citation in support

Table 4b
Content validity assessment of the new KSKSS.

	PROM development study	Content validity study	Rating of reviewers	Overall rating per PROM	Quality of evidence
Satisfaction domain of the New Knee Society Knee Scoring System	Development Study [68]	NA	+/-/?	+/-/±	High, moderate, low, very low
Relevance					
1. Are the items relevant to the construct of interest?	-		+		
2. Are the included items relevant for the target population of interest?	-		+		
3. Are the included items relevant for the context of interest?	+		+		
4. Are the response options appropriate?	-		+		
5. Is the recall period appropriate?	-		?		
Relevance rating	-	NA	+	±	Low
Comprehensiveness					
6. Are all key concepts included?	-		-		
Comprehensiveness rating	-	NA	-	-	Low
Comprehensibility					
7. Are the PROM instructions understood by the population of interest as intended?	-				
8. Are the PROM items and response options understood by the population of interest as intended?	-				
9. Are the PROM items appropriately worded?			+		
10. Do the response options match the question?			+		
Comprehensibility rating	-	NA	+	±	Low
Content validity rating				-	Low

Legend: - Fail + Pass ? Insufficient information ± Inconsistent.

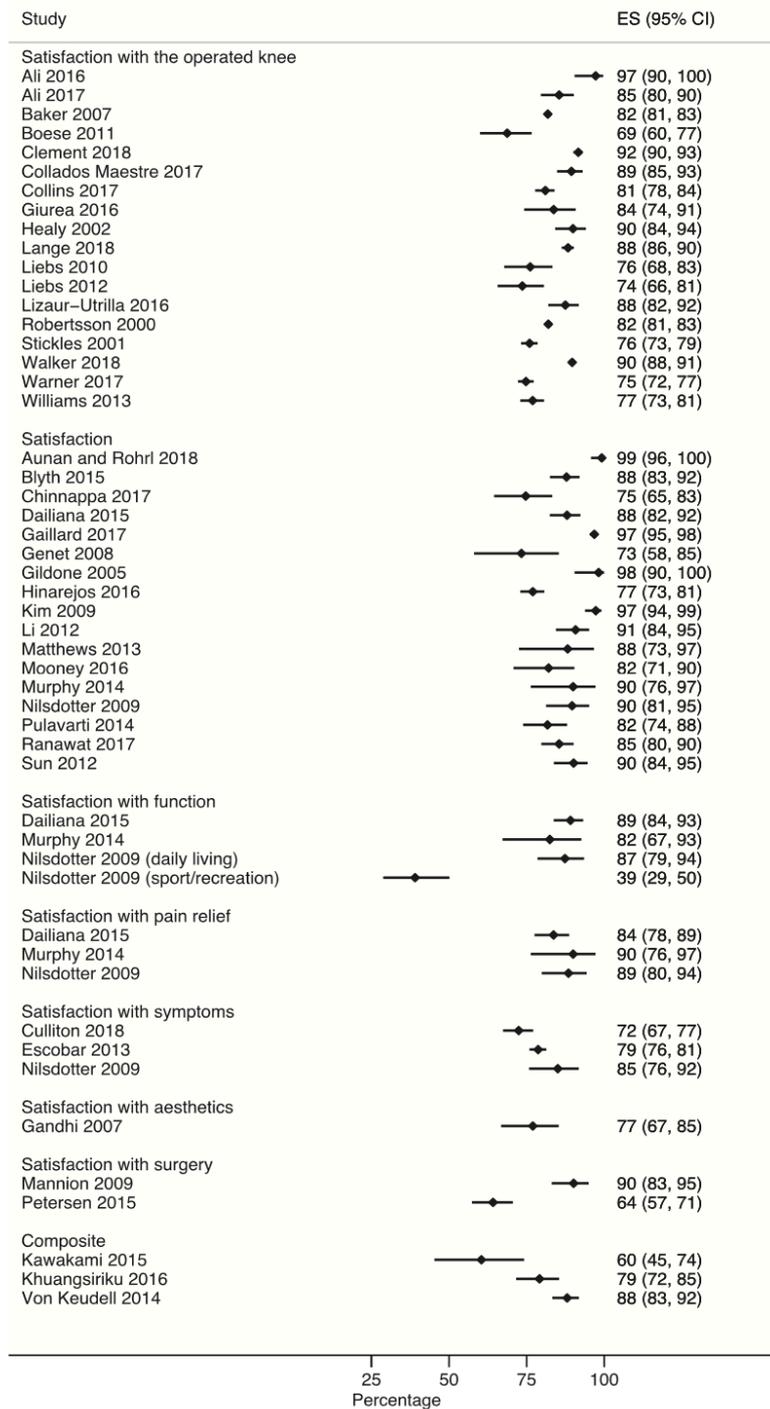


Fig. 3. Proportion of patients satisfied after TKR. ES = effect size.

of the single item question used [25,27,34,36,37,39,48,50,52,53,56,62,63], and 1 study provided a citation that had no evidence of satisfaction content [49].

The construct 'Satisfaction with function' included all questions that asked about satisfaction with function, ADLs, sport, or recreation. The proportion satisfied from the 3 studies included ranged from 89% (CI 84 to 93) to 39% (CI 29 to 50). One study used an item from the SAPSS [32], the remaining 2 studies used single items with no supporting citation [50,63].

The construct 'Satisfaction with pain relief' included all questions that asked about satisfaction with pain relief. Three were included and ranged from 90% (CI 76 to 97) to 84% (CI 78 to 89). One study cited a questionnaire, the SAPSS [32], while the remaining 2 studies did not have a supporting citation for their single item question [50,63].

The construct 'Satisfaction with symptoms' included all questions that asked about satisfaction with symptoms. Three were included and ranged from 85% (CI 76 to 92) to 72% (CI 67 to 77). Two studies used a question previously considered as a Patient Acceptable Symptom State (PASS) estimate [31,33]. The remaining study did not provide a citation in support of the single item question [63].

The construct 'Satisfaction with aesthetics' included questions that asked about the visual appearance of the knee. Only 1 study was included, which reported a satisfaction rate of 77% (CI 67 to 85), and did not provide a citation in support of the single item question [35].

The construct 'Satisfaction with surgery' included all questions that asked about satisfaction with the surgery but did not have reference to knee TJR, TKR, or operated knee. Two studies were included and ranged from 90% (CI 83 to 95) to 64% (57–71), neither of which provided a citation in support of the single item questions [10,47].

3.3.2. Composite scores

Three studies used composite instruments of items covering different components of satisfaction, with satisfaction estimates ranging from 88% (CI 83 to 92) to 60% (45–74). One study used the five-item satisfaction component of the New Knee Society Knee Scoring System (KSKSS) [40] which covers satisfaction with pain level while sitting, pain level while lying in bed, knee function while performing light household duties, and knee function while performing leisure recreational activities. One study used the four item SAPSS [41] covering overall satisfaction with surgery, satisfaction with pain relief, satisfaction with home and yard work, and satisfaction with recreational activities, and 1 study reported an unreferenced composite score of 5 items including satisfaction in respect to pain, motion, daily living function, return to sport activities, and ability to kneel [57].

3.4. Assessment of content validity

Of the 43 articles included in the review, 15 provided a citation for the satisfaction instrument used. Of these, only 9 studies, using a total of 6 satisfaction instruments, had a citation in support of content validity, in the form of a development study. These instruments included BOA, the new KSKSS, THAOEQ, and SAPSS, and questions previously considered indicators of Patient Acceptable Symptom State (PASS). The latter were excluded from further assessment as they pertain to current symptom state rather than to aspects related to TKR *per se* [64]. The BOA was excluded as it is completed by the surgeon and therefore not a PROM [65]. The THAOEQ was excluded as it was designed for a total hip replacement population rather than a TKR population [66], and in accordance with COSMIN criteria of 'relevance' cannot be considered for assessment of content validity [15]. Furthermore, the extent of development for the THAOEQ was poor and did not include patient appraisal [66]. An additional search was conducted for the SAPSS and new KSKSS to retrieve any further development or content validity studies (See Appendix 3), but none were identified. Both of these instruments were then assessed for content validity as per the COSMIN criteria (see Tables 4a and 4b and Appendices 4 and 5).

Two development studies were retrieved for SAPSS: an abstract from

1998 [67] and a full text article from 2011 [20]. Both of these studies failed to demonstrate all three key aspects of content validity (see Table 4a). Although a Delphi panel of experts was used for development of the SAPSS, this did not include patient input, which is required for content validity. Reviewer rating of the instrument passed relevance and comprehensibility. The overall rating was a low quality PROM (see Table 4a). One development study was retrieved for the new KSKSS [68] and this study failed to demonstrate all three key aspects of content validity. Although the new KSKSS did have patient input in its development, this did not include the satisfaction items [68]. The five satisfaction items of the new KSKSS were based on the four item SAPSS, which as previously described did not include patient appraisal. Reviewer rating of the instrument passed relevance and comprehensibility. The overall rating was a low quality PROM (see Table 4b). Overall, none of the satisfaction instruments included in the review had adequate evidence of content validity.

4. Discussion

The aims of this review were to evaluate rates of patient reported satisfaction after TKR for OA across the literature, and to assess the content validity of the satisfaction measures utilised in evaluated studies. The results demonstrate heterogeneity in not only the focus of the satisfaction questions, but also the estimate of the proportion satisfied across studies.

From the 43 included studies, 8 satisfaction constructs were identified. In addition to heterogeneity in the satisfaction question used, heterogeneity in the estimate of satisfaction was also observed within constructs; most notably 39% (CI 29 to 50) compared to 89% (CI 84 to 93) in satisfaction with function. Due to the heterogeneity in satisfaction questions, it was not possible to pool all estimates, as per the Cochrane guidelines for systematic reviews [22]. Cochrane state that in the absence of longitudinal evidence of correlation of 2 or more PROMs, data pooling should not be conducted, but instead, grouping of like constructs as decided intuitively by the authorship team [22]. These findings are in alignment with the results of Kahlenberg [8] who also reported heterogeneous methods of measuring patient satisfaction after TKR [8].

The present review extends that of Kahlenberg [8] by evaluating the evidence for content validity of the utilised instruments. Two satisfaction instruments (SAPSS and new KSKSS) were cited by Kahlenberg [8] as being validated, but this was only in reference to construct validity, defined as the degree to which the scores of a PROM are consistent with hypotheses, based on the assumptions that the PROM validity measures the construct to be measured [15], or structural validity, which relates to how well the PROM scores reflect the dimensionality of the construct [15], not content validity. These 2 instruments were specifically evaluated for evidence of content validity in this current review, and no evidence for content validity was identified. Although reviewer ratings determined that both instruments had reasonable content relevance and comprehensiveness, the lack of patient involvement in the development of these instruments is a key concern for content validity.

Without patient consultation it is difficult to know whether these instruments include relevant items to accurately capture an individual's satisfaction with their TKR, whether they capture all aspects of satisfaction, or how patients comprehend/interpret the questions. Prior to designing a PROM, theoretical understanding of the construct of interest should be robust so to inform the content of the instrument [14,69]. In the case of satisfaction, PROM development has preceded theoretical understanding, compounding the difficulty in understanding how to measure this construct. This leaves researchers and clinicians to make assumptions regarding what satisfaction instruments are actually measuring. This lack of theoretical grounding in patient satisfaction instruments is a likely contributor to the variability in satisfaction instruments and estimates.

Given the limited understanding of patient satisfaction after TKR, some authors have based the design of satisfaction instruments on other correlates, such as improved pain or other disease-specific questionnaires. This approach is discussed by Robertsson et al. [54], who used a single item question: 'three questions were asked, including one on satisfaction regarding the operated knee with four possible answers; 1) very satisfied, 2) satisfied, 3) uncertain, or 4) dissatisfied'. This question has not been validated, but has been replicated in three other studies included in the present review [23,29,46]. The authors suggest that a strategy to overcome the lack of content validity in satisfaction instruments is to demonstrate construct validity [54]. However, the presence of an association between a satisfaction instrument and other measures, such as self-reported disability or pain, does not mean the construct of satisfaction has been adequately captured in terms of relevance and comprehensiveness. For example, in the aforementioned study, 11% of patients chose 'uncertain' as the response option, and understanding this response is difficult due to a lack of the patients' perspective [54].

The results of the present review also highlighted numerous concerns regarding the appropriateness and consistency of satisfaction instruments. As mentioned earlier, the BOA, which was utilised by two studies [42,43], is designed to be completed by the surgeon rather than the patient, therefore this assessment cannot be considered a PROM [65]. The THOEQ, utilised by two studies [44,45], in addition to not being relevant to the target population, lacked any patient involvement and was only developed from the perspective of an orthopaedic task force that aimed to design a questionnaire from a patient perspective [66]. Questions considered indicators of PASS were utilised by two studies [31,33]. Although development of PASS questions has included patient involvement regarding the relevance and the external anchors during a special interest group meeting [64], they pertain to current symptom state rather than to aspects related to TKR *per se* [64]. Additionally, the Osteoarthritis Research Society International, which developed the PASS, has identified problems with the consistency of the PASS question and timeline of measurement in this population, suggesting further development studies are required [70]. Lastly, Dailiana [32], who cited the SAPSS, modified the instrument to include only three items of satisfaction as opposed to the four-item questionnaire designed by Mahomed [25], therefore not accurately representing the original intentions of the validated instrument.

Other measures such as 'would you recommend a joint replacement to a friend?', 'would you have a joint replacement again?', or the Forgotten Joint Score [71] have also been considered to reflect patient satisfaction after TKR in the literature. Although it may seem reasonable to assume these questions would align with satisfaction, this has not been investigated in a TKR population. Patient expectations have also been attributed to patient satisfaction after TKR [11,72]. Despite the literature search retrieving many studies measuring expectations as a means of gauging satisfaction, the authorship team chose not to include expectations as a measure of satisfaction due to it being undertheorised in a healthcare context [14,73]. Presently, expectations are understood from their historical origins in market research, whereby satisfaction is considered an evaluation of a purchase [73]. The role of expectation theory in understanding satisfaction with TKR remains unclear.

This review highlights a need for a better understanding of patient satisfaction after TKR, and suggests more care should be taken in how we interpret studies that use satisfaction as an end point. Future research should focus on conducting qualitative investigations on patient satisfaction after TKR, to build theoretical understanding and provide strong evidence of content validity. To achieve this, researchers may consider conducting focus groups or one on one interviews with patients who have undergone TKR, who have experienced a range of satisfaction, and pain and function outcomes. This has been demonstrated in the development

of the Forgotten Joint Score, which sought patient opinion, in addition to multidisciplinary expert opinion, in choosing the items of the instrument [71]. The instrument was then further tested with a second group of patients to test the interpretation of the questions, and refine the question phrasings [74]. These same methods to achieve content validity should be applied to satisfaction instruments after TKR. A better understanding of what patient satisfaction is and how to measure it will optimise the delivery of high quality, patient-centred care in orthopaedics.

Author contributions

All authors have read and approved the present submission to Osteoarthritis and Cartilage Open. Substantial contributions to the research design, or the acquisition, analysis or interpretation of data was completed by NK, SB, PK, MD, PO, RS, RF and AS. Drafting the paper, or critical revisions were completed by NK, SB, PK, MD, PO, RS, PC and AS.

Declaration of Competing Interest

This work was supported by the Centre for Research Excellence in Total Joint Replacement (APP1116325), under a National Health & Medical Research Council, Australia, grant. In addition, personal declarations are as follows:

COI Anne Smith reports grants from National Health & Medical Research Council, during the conduct of the study.

COI Peter O'Sullivan reports grants from National Health & Medical Research Council, during the conduct of the study.

COI Peter Choong reports grants from National Health & Medical Research Council, during the conduct of the study; personal fees from Stryker, personal fees from Johnson & Johnson, grants from Medacta, personal fees from Kluwer, outside the submitted work. Additionally, COI Peter Choong is supported by a National Health & Medical Research Council Practitioner Fellowship (APP1154203).

COI Michelle Dowsey reports grants from National Health & Medical Research Council, during the conduct of the study; grants from Medacta, outside the submitted work.

Additionally, COI Michelle Dowsey is supported by a National Health & Medical Research Council Career Development Fellowship (APP1122526).

Acknowledgements

The authorship teams does not wish to declare any acknowledgements.

Appendix 1. Search strategy in Medline

-
1. Patient* adj5 satisf*.mp
 2. Knee adj3 replac*.mp
 3. Knee adj2 arthroplasty.mp
 4. 2 or 3
 5. 1 and 4
-

mp denotes keyword.

Appendix 2. Satisfaction with Total Knee Replacement - Risk of Bias Tool

This tool is designed to assess the risk of bias in studies of satisfaction after Total Knee Replacement (TKR). Please read the additional notes for each item when initially using the tool. Note: If there is insufficient information in the article to permit a judgement for a particular item, please answer No (HIGH RISK) for that particular item.

Risk of bias item	Criteria for answers (please circle one option)	Additional notes and examples
<i>External Validity</i>		
1. Was the study's target population representative of most TKR populations on relevant demographic and clinical variables, e.g. age, sex, pain severity, osteoarthritis grade?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The study's target population was a close representation of most TKR populations. • No (HIGH RISK): The study's target population was clearly NOT representative of most TKR populations. 	<p>The target population refers to the group of patients to which the results of the study will be generalised. Examples:</p> <ul style="list-style-type: none"> • The study was a survey of patients in a hospital department and the sample was drawn from a list that included all individuals operated on over a two-year period. The answer is: Yes (LOW RISK). • The study was conducted in one province only, and it is not clear if this was representative of the national population. The answer is: No (HIGH RISK). • The study was undertaken asking responses from people considering revision surgery and it is clear this was not representative of most TKR populations. The answer is: No (HIGH RISK). <p>The sampling frame is a list of the sampling units in the target population and the study sample is drawn from this list. Examples:</p> <ul style="list-style-type: none"> • The sampling frame was a database of every individual who received a TKR within a hospital. The answer is: Yes (LOW RISK). • The study asked responses from anonymous people in an online chat group. The answer is: Yes (LOW RISK). <p>In a survey, only part of the sampling frame is sampled. In these instances, consecutive or random selection of the sample helps minimise study bias. Examples:</p> <ul style="list-style-type: none"> • Every person in a consecutive sample was surveyed. The answer is: Yes (LOW RISK). • The sample was selected using simple random sampling. The answer is: Yes (LOW RISK). • A clinician asked a non-consecutive sample of his/her patients. The answer is: No (HIGH RISK). <p>Examples:</p> <ul style="list-style-type: none"> • The response rate was 68%; however, the researchers did an analysis and found no significant difference between responders and non-responders in terms of age, sex and clinician status. The answer is: Yes (LOW RISK). • The response rate was 65% and the researchers did NOT carry out an analysis to compare relevant characteristics between responders and non-responders. The answer is: No (HIGH RISK). • The response rate was 69% and the researchers did an analysis and found a significant difference in age, sex and clinical status between responders and non-responders. The answer is: No (HIGH RISK).
2. Was the sampling frame a true or close representation of the TKR population?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The sampling frame was a true or close representation of the TKR population. • No (HIGH RISK): The sampling frame was NOT a true or close representation of the TKR population. 	
3. Was some form of consecutive or random selection used to select the sample?	<ul style="list-style-type: none"> • Yes (LOW RISK): Some form of consecutive or random selection was used to select the sample (e.g. simple random sampling, stratified random sampling, cluster sampling, systematic sampling). • No (HIGH RISK): Some form of consecutive or random selection was NOT used to select the sample. 	
4. Was the likelihood of non-response bias minimal?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The response rate for the study was $\geq 75\%$, OR, an analysis was performed that showed no significant difference in relevant demographic and clinical characteristics between responders and nonresponders • No (HIGH RISK): The response rate was $< 75\%$, and if any analysis comparing responders and non-responders was done, it showed a significant difference in relevant demographic and clinical characteristics between responders and non-responders. 	
<i>Internal Validity</i>		
5. Were data collected* directly from the participants (as opposed to a proxy)?	<ul style="list-style-type: none"> • Yes (LOW RISK): All data were collected directly from the participants. • No (HIGH RISK): In some instances, data were collected from a proxy. 	<p>A proxy is a representative of the subject. Examples:</p> <ul style="list-style-type: none"> • All eligible participants were surveyed directly. The answer is: Yes (LOW RISK). • A clinician, or series of clinicians, estimated how satisfied their patients were. The answer is: No (HIGH RISK). <p>In a study, the following participant definition was used: "All participants must have had a TKR, which is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability." The answer is: Yes (LOW RISK).</p> <ul style="list-style-type: none"> • In a study, the following participant definition was used: "Participants needed to have received some form of knee surgery." The answer is: No (HIGH RISK).
6. Was an acceptable participant definition TKR used in the study?*	<ul style="list-style-type: none"> • Yes (LOW RISK): An acceptable participant definition was used. • No (HIGH RISK): An acceptable case participant definition was NOT used. 	<p>The authors used a questionnaire, which had previously been validated. They also tested the inter-rater reliability of the questionnaire. The answer is: Yes (LOW RISK).</p> <ul style="list-style-type: none"> • The authors developed their own questionnaire and did not test this for validity or reliability. The answer is: No (HIGH RISK). <p>The mode of data collection is the method used for collecting information from the subjects. The most common modes are face-to-face interviews, telephone interviews and self-administered questionnaires. Examples:</p> <ul style="list-style-type: none"> • All eligible subjects had a face-to-face interview. The answer is: Yes (LOW RISK). • Some subjects were interviewed over the telephone and some filled in postal questionnaires. The answer is: No (HIGH RISK). <p>The measurement period is the length of time post-surgery. The shorter the measurement period, the greater the likelihood of the participant's satisfaction being about the operative and rehabilitation process rather than about the medium-term or longer-term residual pain and functional capacity. Examples:</p> <ul style="list-style-type: none"> • Participants were asked about satisfaction with TKR when they were 12-months post-surgery. The answer is: Yes (LOW RISK). • Participants were asked about satisfaction when they were 2-months post-surgery. The answer is: No (HIGH RISK). <p>Note: A follow-up of > 6 months was part of the inclusion criteria for this review. Therefore all studies with < 6 months were excluded from further consideration in the full text screening.</p>
7. Was the study instrument that measured satisfaction shown to have reliability and validity (if necessary)?	<ul style="list-style-type: none"> • Yes (LOW RISK): The study instrument had been shown to have reliability and validity, e.g. test-retest, piloting, validation in a previous study, etc. • No (HIGH RISK): The study instrument had NOT been shown to have reliability or validity 	
8. Was the same mode of data collection used for all participants?	<ul style="list-style-type: none"> • Yes (LOW RISK): The same mode of data collection was used for all subjects. • No (HIGH RISK): The same mode of data collection was NOT used for all subjects. 	
9. Was the length of the measurement period of satisfaction with TKR appropriate?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The shortest measurement period of satisfaction with TKR was appropriate. • No (HIGH RISK): The shortest measurement period was not appropriate 	

(continued on next page)

(continued)

Risk of bias item	Criteria for answers (please circle one option)	Additional notes and examples
10. Were the statistical measures of satisfaction appropriate?*	<ul style="list-style-type: none"> Yes (LOW RISK): The paper presented adequate description of how the summary statistics were calculated, the statistics were appropriate and would be possible to be reproduced in a replication study. No (HIGH RISK): The paper did not present adequate description of the statistics or one or more of these were inappropriate. 	<ul style="list-style-type: none"> The individual items in the satisfaction questionnaire were scored and summarised using the method the questionnaire developers validated, and a group mean score was reported with 95% confidence intervals. The answer is: Yes (LOW RISK). It is not clear how the measure of satisfaction was scored and/or summarised. The answer is: No (HIGH RISK).
11. Summary item on the overall risk of study bias	<ul style="list-style-type: none"> LOW RISK OF BIAS: Further research is very unlikely to change our confidence in the estimate. MODERATE RISK OF BIAS: Further research is likely to have an important impact on our confidence in the estimate and may change the estimate. HIGH RISK OF BIAS: Further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate. 	

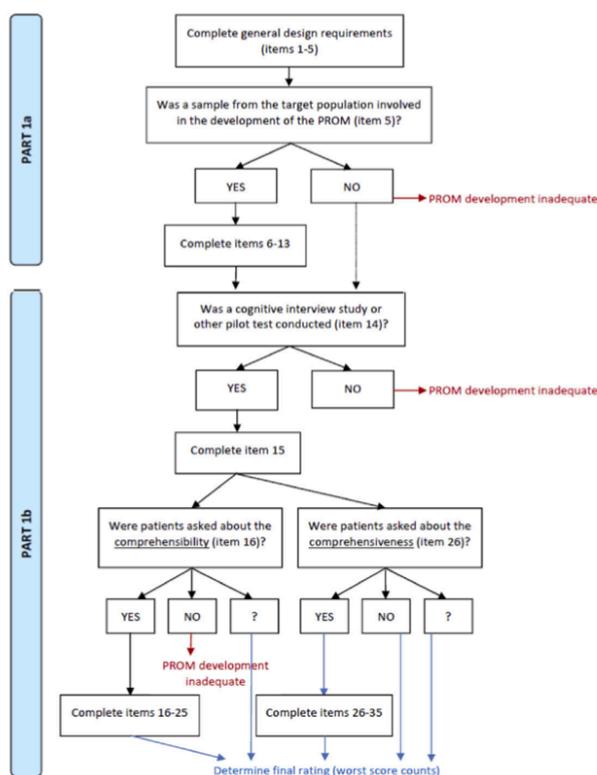
Items with an asterisk will exclude a paper from further consideration (items 1, 2, 4, 5, 6, 9 and 10).

Appendix 3. Content validity search strategy example

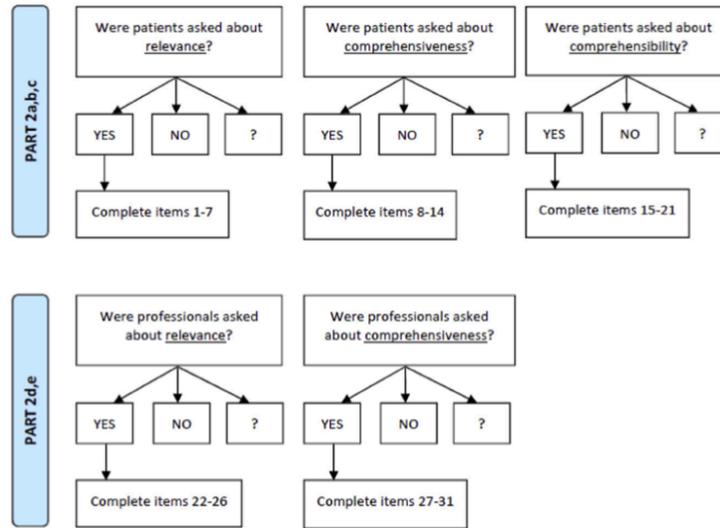
Eg: New Knee Society Knee Scoring System.
MEDLINE, SCOPUS, Embase.

#	Searches	Results	Type
1	[(prophylactic OR "stability study" OR "content validity" OR validity OR validation) AND (questionnaire OR survey OR questionnaire) AND (osteoarthritis OR osteoarthritis) AND (knee OR knee)]	40840	Advanced
2	New Knee Society Knee Scoring System.mp. [(mp=title, abstract, original title, name of substance word, subject heading word, heading sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonym)]	7	Advanced
3	1 AND 2	5	Advanced

Appendix 4. COSMIN assessment of PROM development studies.



Appendix 5. COSMIN assessment of PROM content validity studies.



Determine the final rating (worst score counts) for each part separately (page 15)

Appendix 6. Risk of Bias results of all included studies

	Study target population representative of TKR populations*	Sampling frame a true or close representation of TKR populations*	Consecutive or random sample used	Likelihood of non-response bias minimal*	Data collected directly from participants*	Acceptable participant definition TKR used*	Study instrument that measured satisfaction shown to have reliability and validity	Same mode of data collection used for all participants	Appropriate length of measurement period of satisfaction with TKR*	Appropriate statistical measures of satisfaction*	
Ali et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Ali et al., 2017	+	+	+	+	+	+	-	+	+	+	Moderate risk
Aunan and Rohl 2018	+	+	+	+	+	+	-	+	+	+	Moderate risk
Baker et al., 2007	+	+	+	+	+	+	-	+	+	+	Moderate risk
Blyth et al., 2015	+	+	+	+	+	+	-	+	+	+	Moderate risk
Boese et al., 2011	+	+	+	+	+	+	-	+	+	+	Moderate risk
Chinnappa et al., 2017	+	+	+	+	+	+	-	+	+	+	Moderate risk
Clement et al., 2013	+	+	+	+	+	+	-	+	+	+	Moderate risk
Collados Maestre et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Collins et al., 2017	+	+	+	+	+	+	-	+	+	+	Moderate risk
Culliton et al., 2018	+	+	+	+	+	+	+	+	+	+	Low risk
Dailiana et al., 2015	+	+	+	+	+	+	+	+	+	+	Low risk

(continued on next page)

(continued)

	Study target population representative of TKR populations*	Sampling frame a true or close representation of TKR populations*	Consecutive or random sample used	Likelihood of non-response bias minimal*	Data collected directly from participants*	Acceptable participant definition TKR used*	Study instrument that measured satisfaction shown to have reliability and validity	Same mode of data collection used for all participants	Appropriate length of measurement period of satisfaction with TKR*	Appropriate statistical measures of satisfaction*	
Escobar et al., 2013											
Gaillard et al., 2017	+	+	+	+	+	+	-	+	+	+	Moderate risk
Gandhi et al., 2007	+	+	+	+	+	+	-	+	+	+	Moderate risk
Genet et al., 2008	+	+	+	+	+	+	-	+	+	+	Moderate risk
Gildone et al., 2005	+	+	+	+	+	+	-	+	+	+	Moderate risk
Giurea et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Healy et al., 2002	+	+	+	+	+	+	-	+	+	+	Moderate risk
Hinarejos et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Kawakami et al., 2015	+	+	+	+	+	+	+	+	+	+	Low risk
Khuangsirku et al., 2016	+	+	+	+	+	+	+	-	+	+	Moderate risk
Kim et al., 2009	+	+	+	+	+	+	+	+	+	+	Low risk
Lange et al., 2018	+	+	+	+	+	+	-	+	+	+	Moderate risk
Li et al., 2012	+	+	+	+	+	+	+	+	+	+	Low risk
Liebs et al., 2010	+	+	+	+	+	+	+	+	+	+	Low risk
Liebs et al., 2012	+	+	+	+	+	+	+	+	+	+	Low risk
Lizaur Utrilla et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Mannion et al., 2009	+	+	+	+	+	+	-	+	+	+	Moderate risk
Matthews et al., 2013	+	+	-	+	+	+	-	+	+	+	Moderate risk
Mooney et al., 2016	+	+	+	+	+	+	-	+	+	+	Moderate risk
Murphy et al., 2014	+	+	-	+	+	+	-	+	+	+	Moderate risk
Nilsdotter et al., 2009	+	+	+	+	+	+	-	+	+	+	Moderate risk
Petersen et al., 2015	+	+	+	+	+	+	-	+	+	+	Moderate risk
Pulavarti et al., 2014	+	+	+	+	+	+	-	+	+	+	Moderate risk
Ranawat et al., 2017	+	+	+	+	+	+	-	-	+	+	Moderate risk
Robertsson et al., 2000	+	+	+	+	+	+	-	+	+	+	Moderate risk
Stickles et al., 2001	+	+	+	+	+	+	-	+	+	+	Moderate risk
Sun et al., 2012	+	+	+	+	+	+	-	+	+	+	Moderate risk
Von keudell et al., 2014	+	+	-	+	+	+	-	-	+	+	Moderate risk
Walker et al., 2018	+	+	+	+	+	+	-	+	+	+	Moderate risk
Warner e al. 2017	+	+	+	+	+	+	-	+	+	+	Moderate risk
Williams et al., 2013	+	+	+	+	+	+	-	+	+	+	Moderate risk

An asterisk (*) denotes a 'fatal flaw' criteria, where failure of any of these items results in immediate exclusion.

References

[1] H. Higashi, J.J. Barendregt, Cost-effectiveness of total hip and knee replacements for the Australian population with osteoarthritis: discrete-event simulation model, *PloS One* 6 (9) (2011), e25403, <https://doi.org/10.1371/journal.pone.0025403>.

[2] O. Ethgen, O. Bruyere, F. Richy, C. Dardennes, J.Y. Reginster, Health-related quality of life in total hip and total knee arthroplasty. A qualitative and systematic review of the literature, *J. Bone Jt. Surg. Am.* 86-A (5) (2004) 963-974 [cited May]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/15118039>.

[3] N. Nashi, C.C. Hong, L. Krishna, Residual knee pain and functional outcome following total knee arthroplasty in osteoarthritic patients, *Knee Surg. Sports Traumatol. Arthrosc.* 23 (6) (2015) 1841-1847, <https://doi.org/10.1007/s00167-014-2910-z> [cited Jun].

[4] A.J. Janse, R.J. Gemke, C.S. Uiterwaal, I. van der Tweel, J.L. Kimpen, G. Sinnema, Quality of life: patients and doctors don't always agree: a meta-analysis, *J. Clin.*

- Epidemiol. 57 (7) (2004) 653–661, <https://doi.org/10.1016/j.jclinepi.2003.11.013> [cited Jul].
- [5] R.B. Brokelman, C.J. van Loon, W.J. Rijnberg, Patient versus surgeon satisfaction after total hip arthroplasty, *J. Bone Jt. Surg. Br.* 85 (4) (2003) 495–498 [cited May]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/12793551>.
- [6] T. Pham, D. Van Der Heijde, M. Lassere, R.D. Altman, J.J. Anderson, N. Bellamy, et al., Outcome variables for osteoarthritis clinical trials: the OMERACT-OARSI set of responder criteria, *J. Rheumatol.* 30 (7) (2003) 1648–1654 [cited Jul]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/12858473>.
- [7] J. Singh, M. Dowsey, P. Choong, Patient Endorsement of the Outcome Measures in Rheumatology (OMERACT) Total Joint Replacement (TJR) Clinical Trial Draft Core Domain Set [Article], 2017.
- [8] C.A. Kahlenberg, B.U. Nwachukwu, A.S. McLawhorn, M.B. Cross, C.N. Cornell, D.E. Padgett, Patient satisfaction after total knee replacement: a systematic review, *HSS J [Review]* 14 (2) (2018) 192–201, <https://doi.org/10.1007/s11420-018-9614-8> [cited Jul].
- [9] W.L. Healy, R. Iorio, J. Ko, D. Appleby, D.W. Lemos, Impact of cost reduction programs on short-term patient outcome and hospital cost of total knee arthroplasty, *J. Bone Jt. Surg. Am.* 84-A (3) (2002) 348–353 [cited Mar]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/11886902>.
- [10] K.K. Petersen, O. Simonsen, M.B. Laursen, T.A. Nielsen, S. Rasmussen, L. Arendt-Nielsen, Chronic postoperative pain after primary and revision total knee arthroplasty, *Clin. J. Pain* 31 (1) (2015) 1–6, <https://doi.org/10.1097/AJP.0000000000000146> [cited Jan].
- [11] R.B. Bourne, B.M. Chesworth, A.M. Davis, N.N. Mahomed, K.D. Charron, Patient satisfaction after total knee arthroplasty: who is satisfied and who is not? *Clin. Orthop. Relat. Res.* 468 (1) (2010) 57–63, <https://doi.org/10.1007/s11999-009-1119-9> [cited Jan].
- [12] N.D. Clement, M. Bardgett, D. Weir, J. Holland, C. Gerrand, D.J. Deehan, Three groups of dissatisfied patients exist after total knee arthroplasty: early, persistent, and late, *Bone Joint J.* 100-B (2) (2018) 161–169, <https://doi.org/10.1302/0301-620X.100B2.BJJ-2017-1016.R1> [cited Feb].
- [13] N.D. Clement, M. Bardgett, D. Weir, J. Holland, C. Gerrand, D.J. Deehan, The rate and predictors of patient satisfaction after total knee arthroplasty are influenced by the focus of the question: a standard satisfaction question is required, *Bone Joint J.* 100B (6) (2018) 740–748, <https://doi.org/10.1302/0301-620X.100B6.BJJ-2017-1292.R1> [cited June].
- [14] E. Batbaatar, J. Dorjadgava, A. Luvsannyam, P. Amenta, Conceptualisation of patient satisfaction: a systematic narrative literature review, *Perspect. Public Health* 135 (5) (2015) 243–250, <https://doi.org/10.1177/1757913915594196> [cited Sep].
- [15] C.B. Terwee, C.A.C. Prinsen, A. Chiarotto, M.J. Westerman, D.L. Patrick, J. Alonso, et al., COSMIN Methodology for Assessing the Content Validity of PROMs, 2018. <https://cosmin.nl/wp-content/uploads/COSMIN-methodology-for-content-validity-user-manual-v1.pdf>.
- [16] D. Moher, A. Liberati, J. Tetzlaff, D.G. Altman, P. Group, Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement, *PLoS Med.* 6 (7) (2009), e1000097, <https://doi.org/10.1371/journal.pmed.1000097> [cited Jul 21].
- [17] D. Hoy, P. Brooks, A. Woolf, F. Blyth, L. March, C. Bain, et al., Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement, *J. Clin. Epidemiol.* 65 (9) (2012) 934–939, <https://doi.org/10.1016/j.jclinepi.2011.11.014> [cited Sep].
- [18] S.P. Hozo, B. Djulbegovic, I. Hozo, Estimating the mean and variance from the median, range, and the size of a sample, *BMC Med. Res. Methodol.* 5 (13) (2005), <https://doi.org/10.1186/1471-2288-5-13> [cited Apr 20].
- [19] G.R. Scuderi, R.B. Bourne, P.C. Noble, J.B. Benjamin, J.H. Lonner, W.N. Scott, The new knee society knee scoring system, *Clin. Orthop. Relat. Res.* 470 (1) (2012) 3–19, <https://doi.org/10.1007/s11999-011-2135-0> [cited Jan].
- [20] N. Mahomed, R. Gandhi, L. Dalroy, J.N. Katz, The self-administered patient satisfaction scale for primary hip and knee arthroplasty, *Arthritis* 2011 (2011) 591253, <https://doi.org/10.1155/2011/591253>.
- [21] D.P. Williams, C.M. Blakey, S.G. Hadfield, D.W. Murray, A.J. Price, R.E. Field, Long-term trends in the Oxford knee score following total knee replacement, *Bone Joint Lett. J* 95-B (1) (2013) 45–51, <https://doi.org/10.1302/0301-620X.95B1.28573> [cited Jan].
- [22] *Cochrane Cochrane*, in: J. Higgins, S. Green (Eds.), *Handbook for systematic reviews*, 2011.
- [23] A. Ali, A. Lindstrand, A. Nilsson, M. Sundberg, Similar patient-reported outcomes and performance after total knee arthroplasty with or without patellar resurfacing, *Acta Orthop.* 87 (3) (2016) 274–279, <https://doi.org/10.3109/17453674.2016.1170548> [cited Jun].
- [24] A. Ali, A. Lindstrand, M. Sundberg, G. Flivik, Preoperative anxiety and depression correlate with dissatisfaction after total knee arthroplasty: a prospective longitudinal cohort study of 186 patients, with 4-year follow-up, *J. Arthroplasty* 32 (3) (2017) 767–770, <https://doi.org/10.1016/j.arth.2016.08.033> [cited Mar].
- [25] E. Anan, S.M. Rohrl, No detrimental effect of ligament balancing on functional outcome after total knee arthroplasty: a prospective cohort study on 129 mechanically aligned knees with 3 years' follow-up, *Acta Orthop.* (2018) 1–7, <https://doi.org/10.1080/17453674.2018.1485283> [cited Jun 08].
- [26] P.N. Baker, J.H. van der Meulen, J. Lewsey, P.J. Gregg, National Joint Registry for E, Wales. The role of pain and function in determining patient satisfaction after total knee replacement. Data from the National Joint Registry for England and Wales, *J. Bone Jt. Surg. Br.* 89 (7) (2007) 893–900, <https://doi.org/10.1302/0301-620X.89B7.19091> [cited Jul].
- [27] M.J. Blyth, J.R. Smith, I.C. Anthony, N.E. Strict, P.J. Rowe, B.G. Jones, Electromagnetic navigation in total knee arthroplasty—a single center, randomized, single-blind study comparing the results with conventional techniques, *J. Arthroplasty* 30 (2) (2015) 199–205, <https://doi.org/10.1016/j.arth.2014.09.008> [cited Feb].
- [28] C.K. Boese, T.J. Gallo, C.J. Plantikow, Range of motion and patient satisfaction with traditional and high-flexion rotating-platform knees, *Iowa Orthop. J.* 31 (2011) 73–77. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/22096424>.
- [29] I. Collados-Maestre, A. Lizaur-Utrilla, B. Gonzalez-Navarro, F. Miralles-Munoz, L. Marco-Gomez, F. Lopez-Prats, et al., Better Functional Outcome after Single-Radius TKA Compared with Multi-Radius TKA, 2017 [Article].
- [30] J.E. Collins, L.A. Donnell-Fink, H.Y. Yang, I.M. Usiskin, E.C. Lape, J. Wright, et al., Effect of obesity on pain and functional recovery following total knee arthroplasty, *J. Bone Jt. Surg. Am.* 99 (21) (2017) 1812–1818, <https://doi.org/10.2106/JBJS.17.00022> [cited Nov 01].
- [31] S. Culliton, D. Bryant, S. MacDonald, K. Hibbert, B. Chesworth, Effect of an E-Learning Tool on Expectations and Satisfaction Following Total Knee Arthroplasty: a Randomized Controlled Trial, 2018 [Article In Press].
- [32] Z.H. Dailiana, I. Papakostidou, S. Varitimidis, L. Liaropoulos, E. Zintzaras, T. Karachalios, et al., Patient-reported quality of life after primary major joint arthroplasty: a prospective comparison of hip and knee arthroplasty, *BMC Musculoskel. Disord.* 16 (2015) 366, <https://doi.org/10.1186/s12891-015-0814-9> [cited Nov 26].
- [33] A. Escobar, L. Garcia Perez, C. Herrera-Espineira, F. Aizpuru, C. Sarasqueta, M. Gonzalez Saenz de Tejada, et al., Total knee replacement; minimal clinically important differences and responders, *Osteoarthritis Cartilage* 21 (12) (2013) 2006–2012, <https://doi.org/10.1016/j.joca.2013.09.009> [cited Dec].
- [34] R. Gaillard, T. Gaillard, S. Denjean, S. Lustig, No influence of obesity on survival of cementless, posterior-stabilised, rotating-platform implants, *Arch. Orthop. Trauma Surg.* 137 (12) (2017) 1743–1750, <https://doi.org/10.1007/s00402-017-2801-0> [cited Dec].
- [35] R. Gandhi, J. de Beer, D. Petrucci, M. Winemaker, Does patient perception of alignment affect total knee arthroplasty outcome? *Can. J. Surg.* 50 (3) (2007) 181–186 [cited Jun]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/17568489>.
- [36] F. Genet, A. Schnitzler, E. Lapeyre, N. Roche, K. Autret, C. Fermanian, et al., Change of impairment, disability and patient satisfaction after total knee arthroplasty in secondary care practice, *Ann. Readapt. Med. Phys* 51 (8) (2008) 671–676, <https://doi.org/10.1016/j.annrmp.2008.08.002>, 676–82. [cited Nov].
- [37] A. Gildone, M. Manfredini, R. Biscione, R. Faccini, Patella resurfacing in posterior stabilised total knee arthroplasty: a follow-up study in 56 patients, *Acta Orthop. Belg.* 71 (4) (2005) 445–451 [cited Aug]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/16185000>.
- [38] A. Giurea, G. Fraberger, P. Kolbitsch, R. Lass, E. Schneider, B. Kubista, et al., The impact of personality traits on the outcome of total knee arthroplasty, *BioMed Res. Int.* 2016 (2016) 5282160, <https://doi.org/10.1155/2016/5282160>.
- [39] P. Hinarejos, L. Puig-Verdie, J. Leal, X. Pelfort, R. Torres-Claramunt, J. Sanchez-Soler, et al., No differences in functional results and quality of life after single-radius or multiradius TKA, *Knee Surg. Sports Traumatol. Arthrosc.* 24 (8) (2016) 2634–2640, <https://doi.org/10.1007/s00167-015-3894-z> [cited Aug].
- [40] Y. Kawakami, T. Matsumoto, K. Takayama, K. Ishida, N. Nakano, T. Matsushita, et al., Intermediate-Term comparison of posterior cruciate-retaining versus posterior-stabilized total knee arthroplasty using the new knee scoring system, *Orthopedics* 38 (12) (2015) e1127–e1132, <https://doi.org/10.3928/01477447-20151123-03> [cited Dec].
- [41] S. Khuangsirikul, K. Lekkreusuan, T. Chotanaphuti, 10-Year patient satisfaction compared between computer-assisted navigation and conventional techniques in minimally invasive surgery total knee arthroplasty, *Comput. Assist. Surg.* 21 (1) (2016) 172–175, <https://doi.org/10.1080/24699322.2016.1249959> [cited Dec].
- [42] T.K. Kim, H.J. Cho, Y.G. Kang, S.J. Kim, C.B. Chang, Improved early clinical outcomes of RP/PS mobile-bearing total knee arthroplasties, *Clin. Orthop. Relat. Res.* 467 (11) (2009) 2901–2910, <https://doi.org/10.1007/s11999-009-0787-9> [cited Nov].
- [43] B. Li, L. Bai, Y. Fu, G. Wang, M. He, J. Wang, Comparison of clinical outcomes between patellar resurfacing and nonresurfacing in total knee arthroplasty: retrospective study of 130 cases, *J. Int. Med. Res.* 40 (5) (2012) 1794–1803, <https://doi.org/10.1177/030006051204000517>.
- [44] T.R. Liebs, W. Herzberg, W. Ruther, J. Haasters, M. Russlies, J. Hassenpflug, Ergometer cycling after hip or knee replacement surgery: a randomized controlled trial, *J. Bone Jt. Surg. Am.* 92 (4) (2010) 814–822, <https://doi.org/10.2106/JBJS.H.01359> [cited Apr].
- [45] T.R. Liebs, W. Herzberg, W. Ruther, J. Haasters, M. Russlies, J. Hassenpflug, et al., Multicenter randomized controlled trial comparing early versus late aquatic therapy after total hip or knee arthroplasty, *Arch. Phys. Med. Rehabil.* 93 (2) (2012) 192–199, <https://doi.org/10.1016/j.apmr.2011.09.011> [cited Feb].
- [46] A. Lizaur-Utrilla, D. Martinez-Mendez, F.A. Miralles-Munoz, L. Marco-Gomez, F.A. Lopez-Prats, Negative impact of waiting time for primary total knee arthroplasty on satisfaction and patient-reported outcome, *Int. Orthop.* 40 (11) (2016) 2303–2307, <https://doi.org/10.1007/s00264-016-3209-0> [cited Nov].
- [47] A.F. Mannion, S. Kampfen, U. Munzinger, I. Kramers-de Quervain, The role of patient expectations in predicting outcome after total knee arthroplasty, *Arthritis Res. Ther.* 11 (5) (2009) R139, <https://doi.org/10.1186/ar2811>.
- [48] D.J. Matthews, F.S. Hossain, S. Patel, F.S. Haddad, A cohort study predicts better functional outcomes and equivalent patient satisfaction following UKR compared with TKR, *HSS J.* 9 (1) (2013) 21–24, <https://doi.org/10.1007/s11420-012-9326-4> [cited Feb].
- [49] L.T. Mooney, A. Smith, K. Sloan, G.W. Clark, The effect of the native kinematics of the knee on the outcome following total knee arthroplasty, *Bone Joint Lett. J* 98-B

- (11) (2016) 1471–1478, <https://doi.org/10.1302/0301-620X.98B11.BJJ-2016-0144.R1> [cited Nov].
- [50] M. Murphy, S. Journeaux, J. Hides, T. Russell, Does flexion of the femoral implant in total knee arthroplasty increase knee flexion: a randomised controlled trial, *Knee* 21 (1) (2014) 257–263, <https://doi.org/10.1016/j.knee.2012.10.028> [cited Jan].
- [51] A.K. Nilsdotter, S. Toksvig-Larsen, E.M. Roos, A 5 year prospective study of patient-relevant outcomes after total knee replacement, *Osteoarthritis Cartilage* 17 (5) (2009) 601–606, <https://doi.org/10.1016/j.joca.2008.11.007> [cited May].
- [52] R.S. Pulavarti, V.V. Raut, G.J. McLauchlan, Patella denervation in primary total knee arthroplasty - a randomized controlled trial with 2 years of follow-up, *J. Arthroplasty* 29 (5) (2014) 977–981, <https://doi.org/10.1016/j.arth.2013.10.017> [cited May].
- [53] C.S. Ranawat, P.B. White, S. West, A.S. Ranawat, Clinical and radiographic results of attune and PFC sigma knee designs at 2-year follow-up: a prospective matched-pair analysis, *J. Arthroplasty* 32 (2) (2017) 431–436, <https://doi.org/10.1016/j.arth.2016.07.021> [cited Feb].
- [54] O. Robertsson, M. Dunbar, T. Pehrsson, K. Knutson, L. Lidgren, Patient satisfaction after knee arthroplasty: a report on 27,372 knees operated on between 1981 and 1995 in Sweden, *Acta Orthop. Scand.* 71 (3) (2000) 262–267, <https://doi.org/10.1080/000164700317411852> [cited Jun].
- [55] B. Stickles, L. Phillips, W.T. Brox, B. Owens, W.L. Lanzer, Defining the relationship between obesity and total joint arthroplasty, *Obes. Res.* 9 (3) (2001) 219–223, <https://doi.org/10.1038/oby.2001.24> [cited Mar].
- [56] Y.Q. Sun, B. Yang, S.L. Tong, J. Sun, Y.C. Zhu, Patelloplasty versus traditional total knee arthroplasty for osteoarthritis, *Orthopedics* 35 (3) (2012) e343–e348, <https://doi.org/10.3928/01477447-20120222-14> [cited Mar 7].
- [57] A. Von Keudell, S. Sodha, J. Collins, T. Minas, W. Fitz, A.H. Gomoll, Patient satisfaction after primary total and unicompartmental knee arthroplasty: an age-dependent analysis, *Knee* 21 (1) (2014) 180–184, <https://doi.org/10.1016/j.knee.2013.08.004> [cited Jan].
- [58] T. Walker, N. Zahn, T. Bruckner, M.R. Streit, G. Mohr, P.R. Aldinger, et al., Mid-term results of lateral unicompartmental mobile bearing knee arthroplasty: a multicentre study of 363 cases, *Bone Jt. J. [Multicenter Study]* 100-B (1) (2018) 42–49, <https://doi.org/10.1302/0301-620X.100B1.BJJ-2017-0600.R1> [cited Jan].
- [59] S.C. Warner, H. Richardson, W. Jenkins, T. Kurien, M. Doherty, A.M. Valdes, Neuropathic pain-like symptoms and pre-surgery radiographic severity contribute to patient satisfaction 4.8 years post-total joint replacement, *World J. Orthoped.* 8 (10) (2017) 761–769, <https://doi.org/10.5312/wjo.v8.i10.761> [cited Oct 18].
- [60] D.P. Williams, S. O'Brien, E. Doran, A.J. Price, D.J. Beard, D.W. Murray, et al., Early postoperative predictors of satisfaction following total knee arthroplasty, *Knee* 20 (6) (2013) 442–446, <https://doi.org/10.1016/j.knee.2013.05.011> [cited Dec].
- [61] J.K. Lange, Y.Y. Lee, S.K. Spiro, S.B. Haas, Satisfaction rates and quality of life changes following total knee arthroplasty in age-differentiated cohorts, *J. Arthroplasty* 33 (5) (2018) 1373–1378, <https://doi.org/10.1016/j.arth.2017.12.031> [cited May].
- [62] J. Chinnappa, D.B. Chen, I.A. Harris, S.J. MacDessi, Predictors and functional implications of change in leg length After total knee arthroplasty, *J. Arthroplasty* 32 (9) (2017) 2725–2729, <https://doi.org/10.1016/j.arth.2017.04.007>, e1. [cited 09].
- [63] A.K. Nilsdotter, S. Toksvig-Larsen, E.M. Roos, Knee arthroplasty: are patients' expectations fulfilled? A prospective study of pain and function in 102 patients with 5-year follow-up, *Acta Orthop.* 80 (1) (2009) 55–61, <https://doi.org/10.1080/17453670902805007> [cited Feb].
- [64] F. Tubach, P. Ravaut, D. Beaton, M. Boers, C. Bombardier, D.T. Felson, et al., Minimal clinically important improvement and patient acceptable symptom state for subjective outcome measures in rheumatic disorders, *J. Rheumatol.* 34 (5) (2007) 1188–1193 [cited May]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/17477485>.
- [65] P. Aichroth, M.A.R. Freeman, L.S. Smillie, W.A. Souter, A knee function assessment chart. From the British Orthopaedic Association Research Sub-Committee, *J. Bone Jt. Surg. Br. Vol. 60-b* (3) (1978) 308–309, <https://doi.org/10.1302/0301-620X.60B3.681404>.
- [66] J.N. Katz, C.B. Phillips, R. Poss, J.J. Harrast, A.H. Fossel, M.H. Liang, et al., The validity and reliability of a total hip arthroplasty outcome evaluation questionnaire, *J. Bone Jt. Surg. Am.* 77 (10) (1995) 1528–1534 [cited Oct]; Available from: <http://www.ncbi.nlm.nih.gov/pubmed/7593061>.
- [67] N. Mahomed, C. Sledge, L. Daltroy, A. Fossel, J. K. Self-administered patient satisfaction scale for joint replacement arthroplasty, *J. Bone Jt. Surg. Br.* 80 (Suppl 1:9) (1998).
- [68] P.C. Noble, G.R. Scuderi, A.C. Brekke, A. Sikorskii, J.B. Benjamin, J.H. Lonner, et al., Development of a new Knee Society scoring system, *Clin. Orthop. Relat. Res.* 470 (1) (2012) 20–32.
- [69] J. Sitzia, N. Wood, Patient satisfaction: a review of issues and concepts, *Soc. Sci. Med.* 45 (12) (1997) 1829–1843 [cited Dec]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/9447632>.
- [70] F. Tubach, B. Giraudeau, P. Ravaut, The variability in minimal clinically important difference and patient acceptable symptom state values did not have an impact on treatment effect estimates, *J. Clin. Epidemiol.* 62 (2009) 725–728.
- [71] H. Behrend, K. Giesinger, J.M. Giesinger, M.S. Kuster, The "forgotten joint" as the ultimate goal in joint arthroplasty: validation of a new patient-reported outcome measure, *J. Arthroplasty* 27 (3) (2012) 430–436 e1, <https://doi.org/10.1016/j.arth.2011.06.035> [cited Mar].
- [72] P.C. Noble, M.A. Conditt, K.F. Cook, K.B. Mathis, The John Insall Award: patient expectations affect satisfaction with total knee arthroplasty, *Clin. Orthop. Relat. Res.* 452 (2006) 35–43, <https://doi.org/10.1097/01.blo.0000238825.63648.1e> [cited Nov].
- [73] P.R. Newsome, G.H. Wright, A review of patient satisfaction: 1. Concepts of satisfaction, *Br. Dent. J.* 186 (4 Spec No) (1999) 161–165 [cited Feb 27]; Available from: <https://www.ncbi.nlm.nih.gov/pubmed/10205951>.
- [74] P.G. Robinson, C.S. Rankin, J. Lavery, I. Anthony, M. Blyth, B. Jones, The validity and reliability of the modified forgotten joint score, *J. Orthop.* 15 (2) (2018) 480–485, <https://doi.org/10.1016/j.jor.2018.03.029> [cited Jun].

OAC-O permission email correspondence

Dear Nardia

I think looking at the website:

For open access articles	<p>Authors sign an exclusive license agreement, where authors have copyright but license exclusive rights in their article to the publisher**. In this case authors have the right to:</p> <ul style="list-style-type: none">• Share their article in the same ways permitted to third parties under the relevant user license (together with Personal Use rights) so long as it contains a CrossMark logo, the end user license, and a DOI link to the version of record on ScienceDirect.• Retain patent, trademark and other intellectual property rights (including research data).• Proper attribution and credit for the published work.
---------------------------------	--

Personal use includes:

Personal use

Authors can use their articles, in full or in part, for a wide range of scholarly, non-commercial purposes as outlined below:

- Use by an author in the author's classroom teaching (including distribution of copies, paper or electronic)
- Distribution of copies (including through e-mail) to known research colleagues for their personal use (but not for Commercial Use)
- Inclusion in a thesis or dissertation (provided that this is not to be published commercially)
- Use in a subsequent compilation of the author's works
- Extending the Article to book-length form
- Preparation of other derivative works (but not for Commercial Use)
- Otherwise using or re-using portions or excerpts in other works

These rights apply for all Elsevier authors who publish their article as either a subscription article or an open access article. In all cases we require that all Elsevier authors always include a full acknowledgement and, if appropriate, a link to the final published version hosted on Science Direct.

Kind regards,

Linsey Burbery
Journal Manager

Tel: +44 (0)1395 225045 (home worker)

Team Manager: Linda Gethin (L.gethin@elsevier.com) +44 (0)1392 285876

Appendix 7: Search strategy in MEDLINE

-
1. Patient* adj5 satisf*.mp
 2. Knee adj3 replac*.mp
 3. Knee adj2 arthroplasty.mp
 4. 2 or 3
 5. 1 and 4
-

mp denotes keyword

Appendix 8: Satisfaction with total knee replacement – risk of bias tool

This tool is designed to assess the risk of bias in studies of satisfaction after total knee replacement (TKR). Please read the additional notes for each item when initially using the tool. Note: If there is insufficient information in the article to permit a judgement for a particular item, please answer No (HIGH RISK) for that particular item.

Risk of bias item	Criteria for answers (please circle one option)	Additional notes and examples
<i>External validity</i>		
1. Was the study's target population representative of most TKR populations on relevant demographic and clinical variables, e.g. age, sex, pain severity, osteoarthritis grade?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The study's target population was a close representation of most TKR populations. • No (HIGH RISK): The study's target population was clearly NOT representative of most TKR populations. 	<p>The target population refers to the group of patients to which the results of the study will be generalised. Examples:</p> <ul style="list-style-type: none"> • The study was a survey of patients in a hospital department and the sample was drawn from a list that included all individuals operated on over a two-year period. The answer is: Yes (LOW RISK). • The study was conducted in one province only, and it is not clear if this was representative of the national population. The answer is: No (HIGH RISK). • The study was undertaken asking responses from people considering revision surgery and it is clear this was not representative of most TKR populations. The answer is: No (HIGH RISK).
2. Was the sampling frame a true or close representation of the TKR population?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The sampling frame was a true or close representation of the TKR population. • No (HIGH RISK): The sampling frame was NOT a true or close representation of the TKR population. 	<p>The sampling frame is a list of the sampling units in the target population and the study sample is drawn from this list. Examples:</p> <ul style="list-style-type: none"> • The sampling frame was a database of every individual who received a TKR within a hospital. The answer is: Yes (LOW RISK). • The study asked responses from anonymous people in an online chat group. The answer is: Yes (LOW RISK).
3. Was some form of consecutive or random selection used to select the sample?	<ul style="list-style-type: none"> • Yes (LOW RISK): Some form of consecutive or random selection was used to select the sample (e.g. simple random sampling, stratified random sampling, cluster sampling, systematic sampling). 	<p>In a survey, only part of the sampling frame is sampled. In these instances, consecutive or random selection of the sample helps minimise study bias. Examples:</p> <ul style="list-style-type: none"> • Every person in a consecutive sample was surveyed. The answer is: Yes (LOW RISK). • The sample was selected using simple random sampling. The answer is: Yes (LOW RISK).

	<ul style="list-style-type: none"> • No (HIGH RISK): Some form of consecutive or random selection was NOT used to select the sample. 	<ul style="list-style-type: none"> • A clinician asked a non-consecutive sample of his/her patients. The answer is: No (HIGH RISK).
4. Was the likelihood of non-response bias minimal?*	<p>Yes (LOW RISK): The response rate for the study was $\geq 75\%$, OR, an analysis was performed that showed no significant difference in relevant demographic and clinical characteristics between responders and non-responders</p> <ul style="list-style-type: none"> • No (HIGH RISK): The response rate was $< 75\%$, and if any analysis comparing responders and non-responders was done, it showed a significant difference in relevant demographic and clinical characteristics between responders and non-responders. 	<p>Examples:</p> <ul style="list-style-type: none"> • The response rate was 68%; however, the researchers did an analysis and found no significant difference between responders and non-responders in terms of age, sex and clinician status. The answer is: Yes (LOW RISK). • The response rate was 65% and the researchers did NOT carry out an analysis to compare relevant characteristics between responders and non-responders. The answer is: No (HIGH RISK). • The response rate was 69% and the researchers did an analysis and found a significant difference in age, sex and clinical status between responders and non-responders. The answer is: No (HIGH RISK).
<i>Internal validity</i>		
5. Were data collected* directly from the participants (as opposed to a proxy)?	<p>Yes (LOW RISK): All data were collected directly from the participants.</p> <ul style="list-style-type: none"> • No (HIGH RISK): In some instances, data were collected from a proxy. 	<p>A proxy is a representative of the subject.</p> <p>Examples:</p> <ul style="list-style-type: none"> • All eligible participants were surveyed directly. The answer is: Yes (LOW RISK). • A clinician, or series of clinicians, estimated how satisfied their patients were. The answer is: No (HIGH RISK).
6. Was an acceptable participant definition TKR used in the study?*	<ul style="list-style-type: none"> • Yes (LOW RISK): An acceptable participant definition was used. • No (HIGH RISK): An acceptable case participant definition was NOT used. 	<p>In a study, the following participant definition was used: 'All participants must have had a TKR, which is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability'. The answer is: Yes (LOW RISK).</p> <ul style="list-style-type: none"> • In a study, the following participant definition was used: 'Participants needed to have received some form of knee surgery'. The answer is: No (HIGH RISK).
7. Was the study instrument that measured satisfaction shown	<ul style="list-style-type: none"> • Yes (LOW RISK): The study instrument had been shown to have reliability and validity, e.g. test-retest, 	<ul style="list-style-type: none"> • The authors used a questionnaire, which had previously been validated. They also tested the inter-rater reliability of the questionnaire. The answer is: Yes (LOW RISK).

to have reliability and validity (if necessary)?	<p>piloting, validation in a previous study, etc.</p> <ul style="list-style-type: none"> • No (HIGH RISK): The study instrument had NOT been shown to have reliability or validity 	<ul style="list-style-type: none"> • The authors developed their own questionnaire and did not test this for validity or reliability. The answer is: No (HIGH RISK).
8. Was the same mode of data collection used for all participants?	<ul style="list-style-type: none"> • Yes (LOW RISK): The same mode of data collection was used for all subjects. • No (HIGH RISK): The same mode of data collection was NOT used for all subjects. 	<p>The mode of data collection is the method used for collecting information from the subjects. The most common modes are face-to-face interviews, telephone interviews and self-administered questionnaires. Examples:</p> <ul style="list-style-type: none"> • All eligible subjects had a face-to-face interview. The answer is: Yes (LOW RISK). • Some subjects were interviewed over the telephone and some filled in postal questionnaires. The answer is: No (HIGH RISK).
9. Was the length of the measurement period of satisfaction with TKR appropriate?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The shortest measurement period of satisfaction with TKR was appropriate. • No (HIGH RISK): The shortest measurement period was not appropriate 	<p>The measurement period is the length of time post-surgery. The shorter the measurement period, the greater the likelihood of the participant's satisfaction being about the operative and rehabilitation process rather than about the medium-term or longer-term residual pain and functional capacity. Examples:</p> <ul style="list-style-type: none"> • Participants were asked about satisfaction with TKR when they were 12-months post-surgery. The answer is: Yes (LOW RISK). • Participants were asked about satisfaction when they were 2-months post-surgery. The answer is: No (HIGH RISK). <p>Note: A follow-up of >6 months was part of the inclusion criteria for this review. Therefore all studies with <6 months were excluded from further consideration in the full text screening.</p>
10. Were the statistical measures of satisfaction appropriate?*	<ul style="list-style-type: none"> • Yes (LOW RISK): The paper presented adequate description of how the summary statistics were calculated, the statistics were appropriate and would be possible to be reproduced in a replication study. • No (HIGH RISK): The paper did present adequate description of the statistics or one or more of these were inappropriate. 	<ul style="list-style-type: none"> • The individual items in the satisfaction questionnaire were scored and summarised using the method the questionnaire developers validated, and a group mean score was reported with 95% confidence intervals). The answer is: Yes (LOW RISK). • It is not clear how the measure of satisfaction was scored and/or summarised. The answer is: No (HIGH RISK).

11. Summary item on the overall risk of study bias

- **LOW RISK OF BIAS:** Further research is very unlikely to change our confidence in the estimate.
- **MODERATE RISK OF BIAS:** Further research is likely to have an important impact on our confidence in the estimate and may change the estimate.
- **HIGH RISK OF BIAS:** Further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate.

Items with an asterisk will exclude a paper from further consideration (items 1, 2, 4, 5, 6, 9 and 10).

Appendix 9: Content validity search strategy example

E.g.: New Knee Society Knee Scoring System

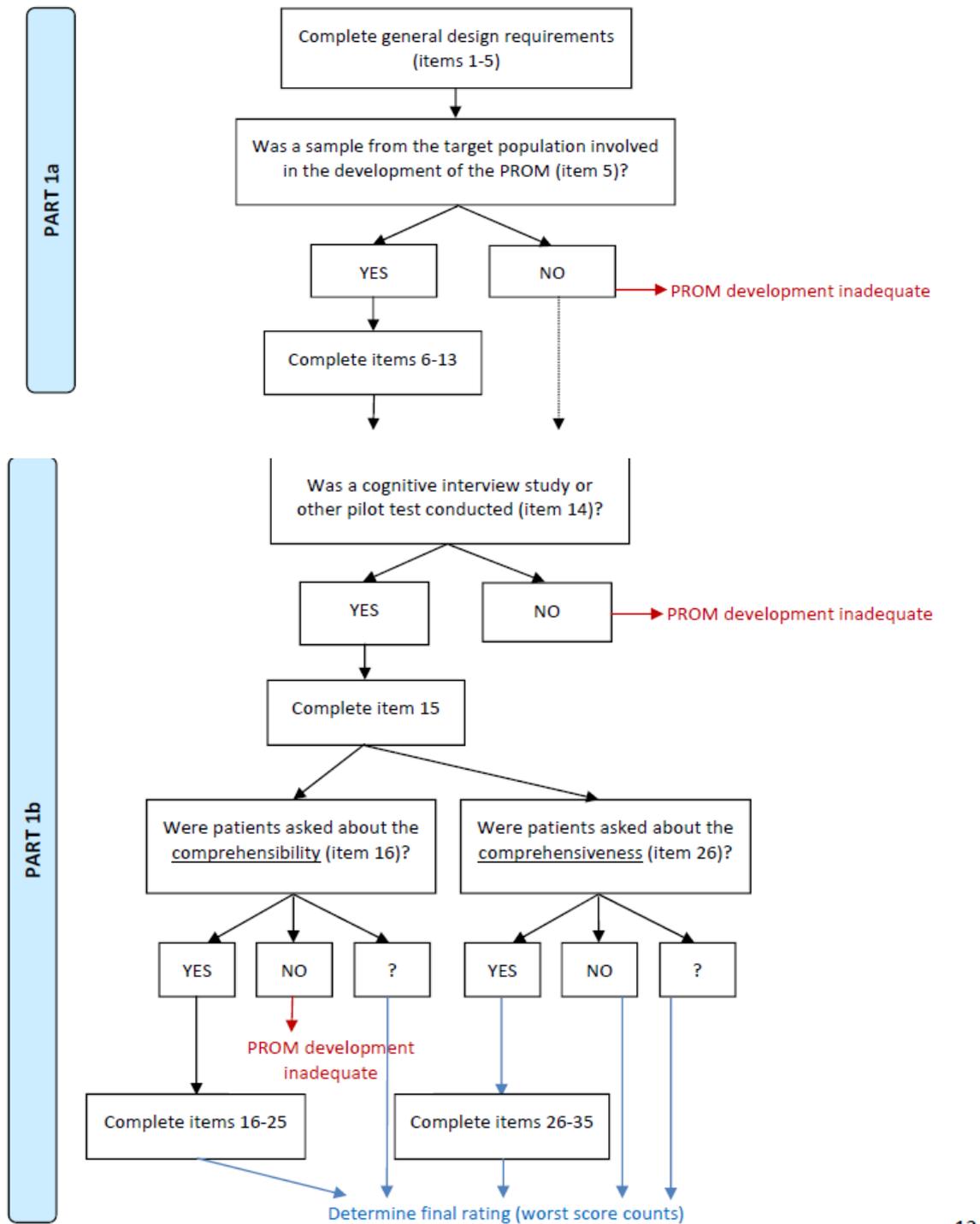
MEDLINE, SCOPUS, Embase

▼ Search History (3)

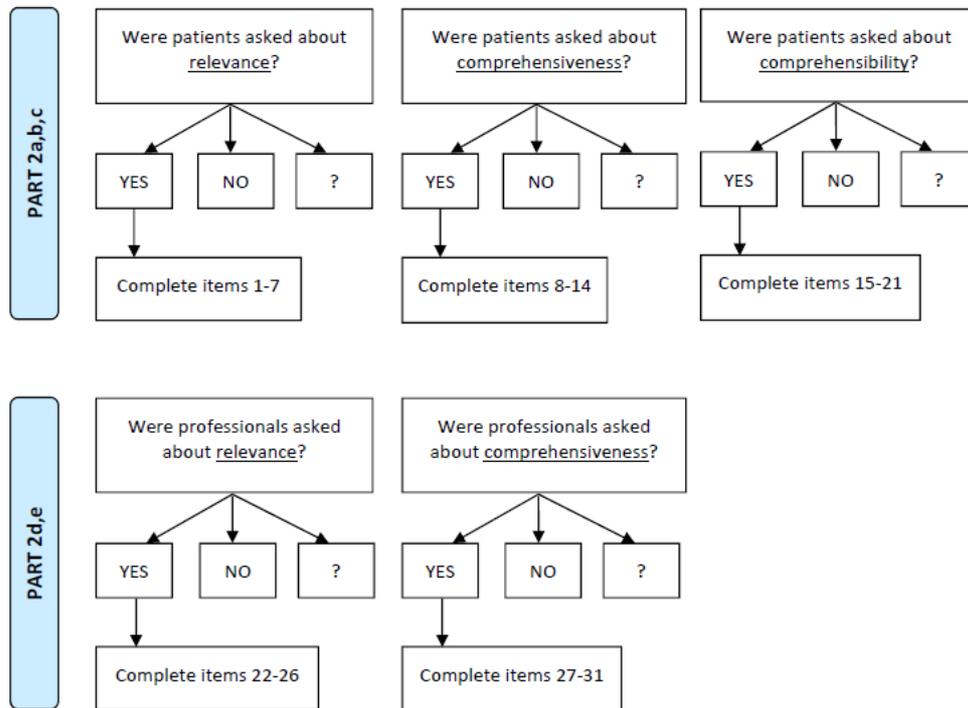
<input type="checkbox"/>	# ▲	Searches
<input type="checkbox"/>	1	(psychometr* or "validity stud*" or "content validity" or validity or validation).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, unique identifier, synonyms]
<input type="checkbox"/>	2	New Knee Society Knee Scoring System.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease unique identifier, synonyms]
<input checked="" type="checkbox"/>	3	1 and 2

Combine with:

Appendix 10: COSMIN assessment of PROM development studies



Appendix 11: COSMIN assessment of PROM content validity studies



Determine the final rating (worst score counts) for each part separately (page 15)

Appendix 12: Risk of bias results of all included studies

	Study target population representative of TKR populations*	Sampling frame a true or close representation of TKR populations*	Consecutive or random sample used	Likelihood of non-response bias minimal*	Data collected directly from participants*	Acceptable participant definition TKR used*	Study instrument that measured satisfaction shown to have reliability and validity	Same mode of data collection used for all participants	Appropriate length of measurement period of satisfaction with TKR*	Appropriate statistical measures of satisfaction*	
Ali et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Ali et al. (2017)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Aunan & Röhrli (2018)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Baker et al. (2007)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Blyth et al. (2015)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Boese et al. (2011)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Chinnappa et al. (2017)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Clement et al. (2013)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Collados Maestre et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Collins et al. (2017)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Culliton et al. (2018)	+	+	+	+	+	+	+	+	+	+	Low risk
Dailiana et al. (2015)	+	+	+	+	+	+	+	+	+	+	Low risk
Escobar et al. (2013)	+	+	+	+	+	+	+	+	+	+	Low risk
Gaillard et al. (2017)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Gandhi et al. (2007)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Genet et al. (2008)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Gildone et al. (2005)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Giurea et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Healy et al. (2002)	+	+	+	+	+	+	-	+	+	+	Moderate risk

Hinarejos et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Kawakami et al. (2015)	+	+	+	+	+	+	+	+	+	+	Low risk
Khuangsiriku et al. (2016)	+	+	+	+	+	+	+	-	+	+	Moderate risk
Kim, Choy et al. (2009)	+	+	+	+	+	+	+	+	+	+	Low risk
Lange et al. (2018)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Li et al. (2012)	+	+	+	+	+	+	+	+	+	+	Low risk
Liebs et al. (2010)	+	+	+	+	+	+	+	+	+	+	Low risk
Liebs et al. (2012)	+	+	+	+	+	+	+	+	+	+	Low risk
Lizaur Utrilla et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Mannion et al. (2009)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Matthews et al. (2013)	+	+	-	+	+	+	-	+	+	+	Moderate risk
Mooney et al. (2016)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Murphy et al. (2014)	+	+	-	+	+	+	-	+	+	+	Moderate risk
Nilsson et al. (2009)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Petersen et al. (2015)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Pulavarti et al. (2014)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Ranawat et al. (2017)	+	+	+	+	+	+	-	-	+	+	Moderate risk
Robertsson et al. (2000)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Stickles et al. (2001)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Sun et al. (2012)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Von Keudell et al. (2014)	+	+	-	+	+	+	-	-	+	+	Moderate risk
Walker et al. (2018)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Warner et al. (2017)	+	+	+	+	+	+	-	+	+	+	Moderate risk
Williams, O'Brien et al. (2013)	+	+	+	+	+	+	-	+	+	+	Moderate risk

Clinical Research

What Influences Patient Satisfaction after TKA? A Qualitative Investigation

Nardia-Rose Klem BSc (Physio) (Hons), Anne Smith Postgrad Dip Sports Physio, BAppSci(Physio), MBIostats, PhD, Peter O'Sullivan Dip Physio, Grad Dip Manip Ther, PhD, FACP, Michelle M. Dowsey BHealthSci, MEpi, PhD, Robert Schütze MPsych(Clin), PhD, Peter Kent BAppSc(Chiro), BAppSc(Physio), Grad Dip Manip Ther, PhD, Peter F. Choong MBBS, MD, FRACS, FAOrthA, FAAHMS, Samantha Bunzli BPhy (Hons), GradCert Res Methodology, PhD

Received: 3 December 2019 / Accepted: 14 April 2020 / Published online: 12 May 2020
Copyright © 2020 by the Association of Bone and Joint Surgeons

Abstract

Background Patient satisfaction is a common measure of the success of an orthopaedic intervention. However, there is poor understanding of what satisfaction means to patients or what influences it.

Questions/purposes Using qualitative study methodology in patients undergoing TKA, we asked: (1) What does it mean to be satisfied after TKA? (2) What factors influence satisfaction levels after TKA?

Methods People in a hospital registry who had completed 12-month follow-up questionnaires and were not more than 18 months post-TKA at the time of sampling were eligible

(n = 121). To recruit a sample that provided insight into a range of TKA experiences, we divided eligible candidates on the registry into quadrants based on their responder status and satisfaction level. A responder was an individual who experienced a clinically meaningful change in pain and/or function on the WOMAC according to the Outcome Measures in Rheumatology-Osteoarthritis Research Society International (OMERACT-OARSI) responder criteria. Individuals were considered satisfied unless they indicated somewhat dissatisfied or very dissatisfied for one or more of the four items on the Self-Administered Patient

The institution of one or more of the authors (PFC, AS, PO, MMD) has received, during the study period, funding from the Australian National Health and Medical Research Council Centre of Research Excellence in Joint Replacement Surgery (APP1116325).

Each author certifies that neither he or she, nor any member of his or her immediate family, has funding or commercial associations (consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research*® editors and board members are on file with the publication and can be viewed on request.

Each author certifies that his or her institution approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research.

This work was conducted in both St Vincent's Hospital (Melbourne), Australia, and Curtin University, Perth, Australia.

N.-R. Klem, A. Smith, P. O'Sullivan, R. Schütze, P. Kent, Curtin University, Bentley, Western Australia, Australia

M. M. Dowsey, P. F. Choong, S. Bunzli, The University of Melbourne, Department of Surgery, St Vincent's Hospital Melbourne, Victoria, Australia

P. Kent, University of Southern Denmark, Odense, Denmark

N.-R. Klem (✉), Curtin University, Building 408, Brand Drive, Bentley, Western Australia 6102, Australia, Email: n.klem@postgrad.curtin.edu.au

Satisfaction Scale. From the resulting quadrants: responder satisfied, nonresponder satisfied, nonresponder dissatisfied, responder dissatisfied, we identified men and women with a range of ages and invited them to participate ($n = 85$). The final sample ($n = 40$), consisted of 10 responder satisfied, nine nonresponder satisfied, eight nonresponder dissatisfied, and 13 responder dissatisfied; 71% were women, with a mean age of 71 ± 7 years and a mean time since TKA surgery of 17 ± 2 months (range 13 to 25 months). Interview transcripts were analyzed by looking for factors in the participants' narrative that appeared to underscore their level of satisfaction and attaching inductive (data-derived, rather than a priori derived) codes to relevant sections of text. Coded data from participants who reported high and low levels of satisfaction were compared/contrasted and emerging patterns were mapped into a conceptual model. Recruitment continued until no new information was uncovered in data analysis of subsequent interviews, signalling to the researchers that further interviews would not change the key themes identified and data collection could cease.

Results In those with high satisfaction levels, satisfaction was conceptualized as an improvement in pain and function. In those with low satisfaction levels, rather than an improvement, satisfaction was conceptualized as completely resolving all symptoms and functional limitations. In addition, we identified three pathways through which participants reached different levels of low and high satisfaction: (1) The full-glass pathway, characterized by no or minimal ongoing symptoms and functional deficits, which consistently led to high levels of satisfaction; (2) the glass-half-full pathway, characterized by ongoing symptoms and functional limitations, which led to high satisfaction; and (3) the glass-half-empty pathway, also characterized by ongoing symptoms and functional limitations, which led to low satisfaction levels. The latter two pathways were mediated by three core mechanisms (recalibration, reframing valued activities, and reconceptualization) influenced either positively or negatively by (1) a persons' thoughts and feelings such as optimism, self-efficacy, pain catastrophizing, external locus of control; and (2) social and contextual factors such as fulfilment of social roles, therapeutic alliance, lack of family/social support.

Conclusions This qualitative study suggests that for preoperative patients in whom unrealistically high hopes for complete symptom resolution and restoration of functional capacity persists, it may be appropriate to direct them away from TKA due to the risk of low satisfaction. For postoperative patients troubled by ongoing symptoms or functional limitations, clinicians may improve levels of satisfaction by targeting the three core mechanisms (recalibration, reframing valued activities, and reconceptualization) through addressing modifiable negative thoughts

and feelings in interventions such as psychology or psychotherapy; and negative social and contextual factors by promoting a strong therapeutic alliance and engagement in community activities. Given that these factors may be identifiable preoperatively, future research is needed to explore if and how addressing them preoperatively may improve satisfaction post-TKA.

Level of Evidence Level IV, therapeutic study.

Introduction

The effect of TKA is best measured from the patient's perspective. Alongside other patient-reported outcome measures, such as pain and disability, satisfaction is commonly used to evaluate patients' perceptions of surgical success [8, 9]. Reflecting the growing usage of measuring patient satisfaction, it has been included as a core outcome post-TKA according to a Delphi study by the Outcome Measures in Rheumatology initiative [34]. However, concerns have been raised regarding the meaningfulness of this measurement [33]. Satisfaction is likely to be influenced by various factors, such as patient expectations for TKA and how well they are addressed [4, 5, 22], levels of distress (symptoms of anxiety and depression) [5, 22, 25], and the hospital experience and interactions with the surgeon [4, 5]. Each factor may vary from patient to patient, such that the same surgical outcome may result in discrepant satisfaction levels [33]. As a result, current attempts to measure patient satisfaction are limited in their ability to be meaningfully interpreted because the available measures lack the ability to capture the depth or nuance associated with a patient appraisal of surgical outcome [33], and suffer strong ceiling effects. Driving these validity issues is a lack of important theoretical grounding, specifically the patient's perspective of satisfaction after TKA, to inform questionnaire development [24]. Thus, research approaches such as qualitative inquiries that elicit the patient's perspective on their satisfaction after TKA are needed to improve understanding of how to measure this construct.

Creating meaning from satisfaction scores is further clouded by a lack of consensus regarding question design. Tools purporting to measure satisfaction have used single items with various foci (such as satisfaction with pain, overall satisfaction, function, surgery); some have used amalgamated scales of different components of satisfaction, while others have attributed satisfaction to other constructs such as fulfilment of expectations [22]. Given that the design of the question influences satisfaction scores [12], certainty of what is being captured from one type of question to the next remains unclear.

These issues are not surprising given how rarely the patient's perspective has been explored during the development of tools to measure satisfaction after TKA. As

the meaning of satisfaction or dissatisfaction after TKA is unclear, efforts to interpret quantified satisfaction outcomes to this point have been speculative at best. To address these deficiencies in our understanding of patient satisfaction after TKA, and to identify potential targets for improving satisfaction, we undertook a qualitative study. Through interviews with patients who experienced a range of outcomes from TKA, the aim of this qualitative study was to shed light on how people arrive at different levels of satisfaction.

The specific questions governing this study were: (1) What does it mean to be satisfied after TKA? (2) What factors influence satisfaction levels after TKA?

Patients and Methods

Study Design and Setting

We conducted a cross-sectional qualitative study in the orthopaedic clinic of a large tertiary hospital in metropolitan Australia. This clinic receives state-wide referrals, performs a large volume of TKAs, and routinely collects 12-month registry data on all patients who undergo a lower limb joint replacement and records patients' outcomes longitudinally.

This study was conducted in accordance with the ethical standards in the 1964 Declaration of Helsinki. Ethics approval was granted by St Vincent's Hospital (Melbourne) Human Research Ethics Committee (HREC/17/SVHM/251).

Participants

Patients who were 12 to 25 months post-TKA for knee osteoarthritis with completed 12-month registry data were eligible. The time frame of 12 to 25 months post-TKA was considered an appropriate follow-up as this study was concerned with identifying the factors and processes that shape satisfaction, which might then be targeted to improve satisfaction at later time points. Patients more than 18 months post-TKA at the time of sampling were included in this study as data collection spanned over 6 months. Patients who spoke a language other than English were eligible to participate through a qualified interpreter. Patients were ineligible if they had a cognitive impairment that prevented them from providing meaningful responses to interview questions. We sought to include people with a range of TKA outcomes and experiences in our study. To do this, we divided eligible patients into quadrants based on their Osteoarthritis Research Society International responder status and satisfaction levels: responder satisfied, responder dissatisfied, nonresponder satisfied, and nonresponder dissatisfied [6, 13, 17, 30]. A responder was defined as someone who had experienced a clinically meaningful change in pain and/or function after TKA [6, 13, 17] (Table 1). We emphasize that grouping people this way was simply a tool to assist purposive sampling, which enabled us to identify individuals with a range of experiences. The grouping of patients this way held no weight on the analytic process, nor was there any intention to suggest who should be satisfied or dissatisfied based on these metrics. Within each quadrant, we identified men and women with a range of ages to

Table 1. Criteria for the four sampling quadrants

Sampling criteria	Description
Clinical response to TKA	Pre to 12-month post-TKA WOMAC^a change scores, normalized to a scale of 100
Responder ^b	Achieved either: - Relative change of 50%, or an absolute change of ≥ 20 in one of pain or function scores, or - Relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score ^a
Nonresponder ^b	Did not achieve either: - Relative change of 50%, or an absolute change of ≥ 20 in one of pain or function scores, or - Relative change of 20% or an absolute change of ≥ 10 in two of pain, function, or global score ^a
Satisfaction	12-month post-TKA Self-Administered Patient Satisfaction scores ^c Domains ^c - Overall satisfaction, - Satisfaction with pain, - Satisfaction with home and yard work - Satisfaction with recreation
Satisfied	Somewhat satisfied or very satisfied in all four domains
Dissatisfied	Somewhat dissatisfied or very dissatisfied in one or more of the four domains

^aThe Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [6, 13].

^bThe Osteoarthritis Research Society International (OMERACT OARSI) criteria [17].

^cThe Self-Administered Patient Satisfaction scale (SAPS) [30].

ensure a variety of voices were represented in our final sample.

Consistent with the qualitative framework, data collection and analysis were conducted concurrently. This enabled emerging patterns in the data to be tested in subsequent interviews. We continued to recruit individuals from each sampling quadrant until there was consensus agreement among authors that the data collected could answer our research question and that the themes identified were unlikely to change through interviews with additional participants. This consensus process took place over multiple meetings in which raw data and emerging themes were presented to the authorship team and these emerging themes were discussed, refined and challenged in the context of existing theory and clinical practice (see data analysis below).

Of the 121 people from the hospital registry who were eligible, 85 were invited to participate as a result of this purposive sampling strategy, and 41 consented and were interviewed. One interview was lost due to equipment malfunction. The proportions of each sampling quadrant from the 40 interviews were: 10 responder satisfied, nine nonresponder satisfied, eight nonresponder dissatisfied, and 13 responder dissatisfied. Of the remaining 44 people, 28 declined, 12 did not respond to letter or phone contact, and four were identified as inappropriate (two cognitive impairment, one undergoing treatment for surgical complication and one declined use of professional interpreter) (Table 2).

During the interviews, 29 participants reported high satisfaction levels during their interviews. Of these, 11 had no or minimal symptoms or functional limitations, while 18 had some degree of ongoing symptoms or functional limitations. Eleven participants reported low satisfaction levels during their interviews, and all had ongoing symptoms or functional limitation. Our sample did not include anyone who experienced a major surgical complication.

Data Collection

Both face-to-face (n = 12) and phone interviews (n = 28) were conducted in a private room in the hospital's orthopaedic research department. There were no differences in the length, quality, or content between the two modes of interview. Interviews were conducted by a woman physiotherapist and PhD student (NRK) who received training from an experienced qualitative researcher (SB) and had no pre-existing relationship with any of the participants. In the interviews, participants were asked how satisfied they were with their TKA outcome and why. In addition, those reporting low levels of satisfaction were asked what it would take to be more satisfied. Participants were also encouraged to reflect on their TKA journey, including their expectations for surgery and postoperative experiences, and how they conceptualized (understood) the current

Table 2. Participant characteristics

Characteristic	Percentage of participants (n) n = 40
Age (years)	
50-59	5 (2)
60-69	40 (16)
70-79	45 (18)
80 +	10 (4)
Women	71 (28)
Time since TKA (months)	
12-15	35 (14)
16-19	50 (20)
20-23	10 (4)
24-25	5 (2)
BMI (kg/m ²)	
< 19	0 (0)
19-24	10 (4)
25-29	15 (6)
30-35	33 (13)
36-40	23 (9)
> 40	20 (8)
Contralateral TKA	
Yes, before index TKA	45 (18)
Yes, after index TKA	18 (7)
No	38 (15)
Sampled as	
Responder satisfied	25 (10)
Responder dissatisfied	33 (13)
Nonresponder satisfied	23 (9)
Nonresponder dissatisfied	20 (8)

symptoms they were experiencing. Interview questions remained flexible to explore/test new concepts as they arose (Table 3). Interviews lasted 50 minutes on average, were audio recorded, and transcribed before analysis.

Data Analysis

The present study followed a constructivist grounded theory methodology [10]. This methodology is an inductive (data derived, rather than a priori derived) approach to analyzing primary qualitative data that facilitates the development of theory grounded in participants' voices [11]. Constructivist grounded theory acknowledges the researchers' prior knowledge and experience in the data analysis and aims to understand the processes and patterns of a given phenomenon, rather than offer descriptions or narrative accounts [11]. The development of theory in this way can offer useful clinical information, which can later

Table 3. The example interview schedule

Construct	Example question
Level of satisfaction	How satisfied are you with the overall results of your TKA? <i>Probe:</i> Can you explain to me why you feel that way?
Conceptualization of a high level of satisfaction	Can you help me understand what it would take to make you satisfied/increase your satisfaction?
Expectations	Can you cast your mind back and tell me about what your expectations of surgery were?
Current symptoms	Can you tell me about any symptoms you are currently experiencing?
Level of satisfaction with symptoms	How satisfied are you with your symptom outcomes? <i>Probe:</i> Can you explain to me why you feel that way?
Conceptualization of symptoms	[If still experiencing symptoms] can you tell me about what you believe is causing your symptoms? <i>Probe:</i> Why do you believe this?
Level of satisfaction with recreational activities	Are you satisfied with your ability to do the activities you enjoy? <i>Probe:</i> Can you explain to me why you feel that way?
Conceptualization of ideal functional outcome	Can you tell me about the activities you are currently doing? <i>Probe:</i> Is there anything you'd like to do that you can't do?
Social and contextual factors	Can you tell me about any role your family and friends have played in your TKA journey? How do you think your outcome compares to that of other people who have had a TKA?
Thoughts and feelings	How are you feeling overall about your TKA outcomes?

be tested using quantitative research approaches in larger, generalizable samples. This method has successfully been applied to develop theory and guide clinical practice in the broader health literature. For example, Law et al. [26] used constructivist grounded theory to understand how patient-practitioner mistrust hinders effective tuberculosis management and developed a clinically useful model to address mistrust and encourage treatment adherence [26].

Data analysis in this study involved the full research team, which consisted of clinical and research physiotherapists (AS, PO, PK, NRK), an orthopaedic research nurse (MMD), an orthopaedic surgeon and researcher (PFC), a clinical and research psychologist (RS), and a qualitative expert (SB). The team had common research interests in improving treatment outcomes for people with chronic musculoskeletal pain.

Data analysis involved the following stages: (1) Reading and re-reading the transcripts for familiarization by two authors (NRK, SB). (2) Coding of transcripts by two authors independently (NRK, SB). In this process, relevant sections of text related to the questions, "What does being satisfied mean to this person?" and "What influences the level of satisfaction in this person?" were given a code. For example, when a person described support they received from their family or friends the text fragment was coded family or social support. Although the authors were aware of pre-existing variables known to

affect satisfaction levels, such as narcotic use, workplace compensation or litigation, anxiety, and depression, the purpose of this analysis was to reflect the participants' perspectives on satisfaction after TKA rather than to validate existing knowledge. Therefore, we did not decide on any codes a priori; coding was an inductive (data-derived) process based on what we identified in the participants narratives. (3) Codes from each author were merged into a comprehensive coding framework (Table 4, left hand column), which consisted of clearly defined codes that covered all relevant raw data so that it could be consistently applied to all transcripts. (4) Coded data from participants who reported high and low levels of satisfaction were compared/contrasted. (5) Emerging patterns were mapped into a conceptual model through round table discussion involving the multidisciplinary authorship team. To test aspects of the model, additional participants were recruited. For example, to test the emerging theory that social support was important in the pathway to satisfaction, we recruited additional participants from the dissatisfied quadrants and asked them about the involvement of friends and family along their TKA journey. (6) We continued to refine the model until the research team perceived that it captured the experiences of all the participants in the study and provided a robust description of satisfaction, and the processes resulting in satisfaction. At this point, we considered that we had reached data saturation (no new information

Table 4. The coding framework and process of data reduction

Coding framework	Categories	Themes
High satisfaction - Due to reduction in symptoms/improvement in function - Due to improvement from previous state - Due to absence of symptoms/functional limitations	Satisfaction due to improvement in symptoms or functional impairments	Conceptualization of satisfaction
Low satisfaction - Due to lack of improvement in symptoms/function - Due to continued symptoms/dysfunction - Due to not enough improvement in symptoms or function -Satisfied if no symptoms or dysfunction	Satisfied if resolution of symptoms or functional impairments	
Acceptance Adaptation Self-responsibility Seeking knowledge Equity Self-efficacy Internal locus of control Belief of good outcome Positivity Good attitude Happiness Positive mind-set/attitude Optimism Compliance Gratitude Content Resilient	Positive thoughts and feelings	Factors influencing mechanisms of change
Low motivation Dependency Care seeking Pain avoidant Low self-efficacy External locus of control Equity Expectations Pessimism Hopelessness Lack of hopefulness Catastrophizing Depression/ crankiness Anxiety High emotional investment Lack of embodiment Social calibration Shared experience Fulfilment of social roles	Negative thoughts and feelings	
	Social and contextual factors	

Table 4. continued

Coding framework	Categories	Themes
Fulfilment of identity		
Therapeutic alliance		
Process of care		
Social and contextual beliefs about TKA		
Ability to do important activities		
The aging process		
Comparison with others	Change internal standards	Mechanisms of change
Comparison with previous state	(recalibration)	
Adaptations to activities	Reframing priorities and activities	
Finding new activities		
Accepting reduced functional abilities		
Pain/symptoms as non-bothersome	Change conceptualization of	
Attributing symptoms to comorbidities	symptoms	
Helpful biomedical understanding of symptoms		

was discovered in data analysis, signalling to the researchers that data collection may cease).

Study Outcomes

Our primary study outcome was to understand what it meant to be satisfied after TKA from the patient's perspective. Through our process of data analysis, we specifically coded for the participant's reasoning of why they had either high or lower levels of satisfaction. These codes were collated within participants, then between participants to identify patterns and common stories driving the conceptualization of satisfaction. After this back and forth process of testing patterns and themes, two key concepts were identified: In those with high satisfaction levels, satisfaction was conceptualized as an improvement in pain and function; whereas, in patients with low satisfaction levels, rather than an improvement, satisfaction was conceptualized as completely resolving all symptoms and functional limitations.

Our secondary study outcome was to identify what factors influenced patient satisfaction after TKA. Like our primary outcome, codes were given to fragments of the raw interview data that appeared influential in levels of satisfaction. Themes for those with reports of high satisfaction levels were compared with those with low satisfaction levels. Patterns and discrepancies were discussed within the authorship team until consensus was reached. We identified two key concepts: For patients with minimal or no ongoing symptoms or functional limitations, they experienced a direct pathway to high satisfaction levels; in those with ongoing symptoms or functional limitations, their satisfaction level was a result of three core

mechanisms (recalibration, reframing valued activities, and reconceptualization), affected by either positive or negative thoughts and feelings, and social and contextual factors.

Study outcomes 1 and 2 are described in more detail below. Each key theme is supported with a quote from a participant indexed by the participants' identification number, their gender, age, and time since their TKA, for example: (Participant 1, Man, 65, 15 months).

Results

What Does it Mean to be Satisfied After TKA?

Among the participants who reported high satisfaction levels, being satisfied meant being better off than before the operation, that is, improvement in symptoms or functional limitations (not suggesting the need to be completely pain free, or free of functional limitations). For example, Participant 01 reported being very satisfied with his TKA outcome because he had experienced an improvement in his pain, rather than a complete resolution in pain: "[I'm satisfied] because I've got more movement and less pain ... I can do all the activities without as much pain as I used to have." (Participant 01, Man, 73 years, 24 months).

In contrast to those with high satisfaction levels, for participants who reported low satisfaction levels, it was not enough to be better off than before the operation; for them, to be satisfied would require a complete resolution of symptoms and functional limitations. For example, Participant 34 explained that she would have been satisfied if she did not have any pain or functional problems engaging in the

activities she enjoyed: “[I’d be satisfied if] I could ride a bike without pain. I could camp without any problems. I could get in and out my four-wheel drive without pain. I could get down on the floor with my granddaughter.” (Participant 34, Woman, 60 years, 19 months).

Participant 20, who experienced persistent pain and required a walking aid, said that to be satisfied she would like her pain to have gone and her functional abilities restored: “Well I expected the pain to go away and you know just being able to walk, you know without hanging onto – or even with a walker would be alright but just to walk would be a good idea.” (Participant 20, Woman, 77 years, 16 months).

What Factors Influence Satisfaction After TKA?

We identified three pathways to satisfaction outcomes (Fig. 1). The first pathway (full glass), which involved no or minimal ongoing symptoms or functional limitations, consistently led to reports of high satisfaction levels. The other two pathways (glass half full and glass half empty),

which involved the presence of ongoing symptoms and functional limitations, consistently led to differing levels of low and high satisfaction, depending on the participants’ understanding of any ongoing symptoms and their perception of symptom severity; their level of participation in daily/social life; and their thoughts, feelings, social support and interactions with their surgeon. Each pathway is described in detail below and illustrated with a case study (Table 5).

Full Glass

The full glass pathway (n = 11) was characterized by minimal or no ongoing symptoms or functional limitations, resulting in an increased capacity to participate in a range of activities and a direct pathway to high satisfaction (Fig. 1). The following quote is an example of a participant who expressed a lack of functional limitations and very minimal pain. He experienced a direct pathway to satisfaction: “I’m running around the ring showing me dogs again now I’ve got mobility; it’s fantastic it really, really, brings you right

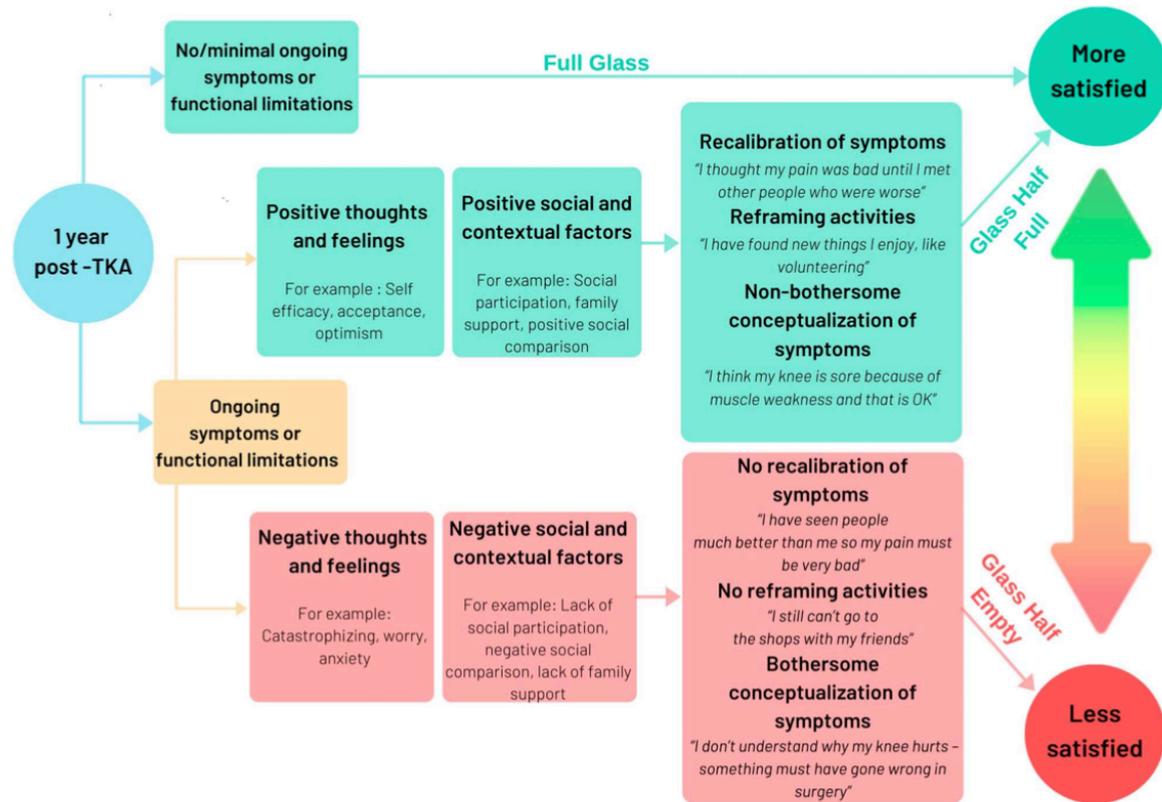


Fig. 1 Framework of patient satisfaction post-TKA is shown here.

Table 5. Case studies

Pathway and participant	Case study
Full glass	<p>Participant 14 (Woman, 68 years, 19 months) described being very restricted physically and experiencing high levels of pain before her TKA. <i>"Out of 10, 10 being the most pain, I would say that before it was about 9. I could not walk far whatsoever it absolutely restricted me on walking it restricted me on any – any social things at all. I mean, we used to go to the city, my daughter and I, to theater and things, and we were doing it, but we were having to get a taxi from hotel to theater and things. I could not walk far at all and I was using a stick."</i></p> <p>Since undergoing both TKAs she reports being 100% satisfied and feeling unlimited in activities: <i>"Really the only thing I can't do is I can't kneel down, other than that I can do everything, I swim, that's alright now, I can walk, I can play with the grandkids 'cause we do a lot of outside activities."</i></p> <p>She reported an absence of symptoms and exceeded expectations: <i>"I am very satisfied ... as I say, I don't get any pain at all. I really didn't think I was going to get as much gain from it as I did get."</i></p> <p>Overall, Participant 14 indicated an absence of any bothersome symptoms post-TKA and interpreted her outcomes as a significant improvement from her previous state, resulting in a high level of satisfaction.</p>
Glass half full	<p>Participant 29 (Woman, 61 years, 20 months) described continued symptoms and functional impairments: <i>"I can't go to the gym anymore and I can't jog and I get a bit frustrated because I'm single and I've got a dog and he's my whole life and we used to go for really, really long walks and I used to be able to play with him and now I have – I just can't, I just can't do it, it's very frustrating!"</i></p> <p>Despite this, Participant 29 reported being satisfied with the outcome from her TKA: <i>"I'm very satisfied because I was in so much pain and I was unable to do almost anything, and I was almost bed ridden because of the pain that I was experiencing."</i></p> <p>To arrive at this level of satisfaction, Participant 29 appeared to have changed her priorities to align with her outcomes: <i>"Of course, I'm frustrated I can't do the thing I just spoke to you about but, you know, I mean at least now I'm not suffering 24/7, I'm not having pain 24/7. So I can do a little bit and I just have to say ok that's how I am now so I can go out and I can do a little bit of gardening, I can walk the dog down the beach for a little bit, I can play with him for a little bit but – it's improved from how I was greatly in everyday just walking around and you know just doing general stuff but as far as the things that I really love to do I still can't really do them – or I can do them but to a lesser degree."</i></p> <p>Participant 29 displayed acceptance and adaptation to match her current abilities, in addition to positive thoughts and feelings. Furthermore, from a social context perspective, her dog facilitated continued physical activity, even in a limited capacity. These influencing factors interacted positively with individual factors of level of pain, level of function, and expectations; allowing her to flexibly integrate these outcomes into her lifestyle, and resulting in a high level of satisfaction.</p>
Glass half empty	<p>Participant 20 (Woman, 77 years, 16 months) described significant pain and disability, and emotional distress, leading her to report a low level of satisfaction: <i>"The pain is unbelievable. If I don't hang onto things, I'll fall ... It's almost to the stage where I scream because it's so painful and [when] I finally get up and then, you know, sort of walking – It's only very slow and I've got my walker with me and it's a high one that I lean right over ... I try to take one step at a time, and I've got to be very, very careful because I will fall over if I'm not careful, so you know, very difficult getting around."</i></p> <p>Participant 20 believed there was a surgical error during her TKA, resulting in one leg longer than the other, causing her ongoing pain and functional limitation: <i>"I'm not sure but I think they put another metal bone in it or something to make it – to straighten it or to do something with it and whatever they've done they made it longer, you know, they haven't measured it properly to the other leg."</i></p> <p>Due to this, Participant 20 was unable to arrive at a nonbothersome understanding of her symptoms. Participant 20 went on to explain that she did not feel considered by her surgeon during her review, nor did she receive a solution or explanation for her ongoing symptoms: <i>"Well you know we were only there a few minutes and you know he's carrying on saying it was the hips, coming from the hips, not the knees and um, you know when he sent me for an x-ray I thought well we'll go back and talk about it and see what's going on with it and um, no he'd gone, he'd gone home or whatever, he'd left, didn't wait for us to come back when he told us to come back."</i></p> <p>The negative thoughts and feelings, in the form of emotional distress and helplessness, along with the impact of the social and contextual factor of poor therapeutic alliance acted as a barriers to arriving at a nonbothersome understanding of symptoms, thus arriving at a lower level of satisfaction.</p>

out you know, compared to what it was before. Me grand kids had to show me dogs before, so now I can show them me self.” (Participant 16, Man, 67 years, 20 months).

Glass Half Full

The glass half full pathway (n = 18) was characterized by high satisfaction levels despite ongoing symptoms and functional limitations. These participants arrived at a high satisfaction level through one or more of three mechanisms of change: recalibration, reframing valued activities, or reconceptualization.

The first mechanism of change involved recalibrating how severely they perceived their ongoing symptoms or function limitations. Participants did this by comparing themselves with others their age, or others who had undergone a TKA, with similar or worse outcomes. For example, after being exposed to others with a broad range of TKA outcomes through an online forum, Participant 34 recalibrated her symptoms to a lower severity: “I’ve spoken to numerous different people who have had the same surgery prior to me having it, in fact, prior to even me making the decision to have it. Some have said they’ve never looked back. Since then, I’m on different forums and there’s a lot of people that are a lot, lot worse off than me, yet again, that are still having substantial pain 12 months down the track and don’t have the mobility or range of movement.” (Participant 34, Woman, 60 years, 19 months).

Another mechanism of change was reframing valued activities, where participants shifted their priorities in life to align with their TKA outcomes. This could take the form of letting go of or adjusting enjoyable activities or finding new activities. For example, Participant 28 was no longer able to do the things she really enjoyed but had reframed her valued activities to a modified version of what she could previously achieve and thereby reported high satisfaction: “I mean at least now I’m not suffering 24/7, I’m not having pain 24/7. It’s improved from how I was greatly in everyday, just walking around and you know just doing general stuff but as far as the things that I really love to do I still can’t really do them. Or I can do them but to a lesser degree.” (Participant 29, Woman, 61 years, 20 months).

A third mechanism of change was reconceptualization; participants attributed their ongoing symptoms to their age and/or the aging process, a continued healing process, or other comorbidities, rather than a threatening defect with their joint replacement. For example, Participant 30 attributed the ongoing pain she experienced in her knee to her long-standing back pain. As a result of this reconceptualization, the pain in her knee was not threatening, and she was satisfied with her TKA outcome: “There’s still pain, it’s more like pins and needles or a little twinge now and

again, like if I move it sudden, or some sort of exercise. The back of the leg up here, into the buttocks area. Don’t know if it’s [the] leg causing it or my spine. But I would say it’s my spine, ‘cause I’ve got my discs L3 and all that are out. And they’ve prolapsed.” (Participant 30, Woman, 63 years, 20 months).

Each of these change mechanisms were facilitated by positive thoughts and feelings, such as self-efficacy, optimism, and compliance. Participant 14 demonstrates how she took an active, self-efficacious approach to receiving a TKA, and how she was going to be as compliant as possible with rehabilitation: “Well, the mind tells me that you’re having it done and there’s no point having it, going through all this for you; and you’ve got to make the most of it. And try do exactly what you’re told to do with the physiotherapy.” (Participant 14, Woman, 68 years, 19 months).

Positive social and contextual factors, including family support, social participation, and positive therapeutic encounters, particularly with their surgeon, were also facilitators. For example, Participant 27 had much support from his family, including his grandson who encouraged him to keep active: “I didn’t try the dancing yet, but I try to walk as much as possible with our grandson and with my doggy. Yeah but I can feel, I can see is a much better than before, when I walk and yeah is much better.” (Participant 27, Man, 60 years, 15 months).

Participant 34 experienced a strong therapeutic alliance with a clinician who she perceived was supportive and reassuring along her TKA journey: “Same surgeon for both, but he was awesome. He was really good. Open, encouraged questions, showed me the x-rays up on the screen, didn’t hurry me through a consultation. Some just push, push, push and then get you out. He said on a number of occasions, ‘Anymore questions?’ Yeah, I found him very efficient but, yet, he had a really good bedside manner.” (Participant 34, Woman, 60 years, 19 months).

Glass Half Empty

The glass half empty pathway (n = 11) was characterized by low satisfaction levels in the presence of ongoing symptoms and functional limitations. Unlike participants in the glass half full pathway, these participants did not experience any of the change mechanisms described above. In approaching the analysis for this group of participants, the authors wish to emphasize the key themes identified were grounded in the participant’s stories. Due to this, some factors known to affect satisfaction levels from quantitative research, such as narcotic use, did not emerge as an important factor affecting satisfaction levels from the perspectives of the participants in this sample. Further, due to the public hospital setting of our study, workers compensation or litigation cases were not relevant to our study

population and, therefore, would not be expected to emerge as a key theme.

Participants did not appear to recalibrate internal standards of symptoms or function due to either a lack of exposure to others with poorer outcomes or exposure to others with better outcomes. For example, compared with her husband's outcome from TKA, Participant 40 believed her outcomes should have been better and therefore reported being dissatisfied: "Compared to my husband, I'm dissatisfied. My husband had two knee replacements, and he is walking normally, jumping up and down in bed, completely mobile, and I'm completely dependent on him. And I thought I would've been able to dress myself and just be completely mobile, just in the normal things." (Participant 40, Woman, 71 years, 15 months).

A reframing of valued activities was not apparent from interviews with participants in this pathway. Some participants in this pathway reported being unable to engage in their valued activities due to either a lack of social participation and/or emotional distress due to continued symptoms and impairments. For example, Participant 20, was unable to adjust or reframe her valued activities and, as a result, felt dissatisfied that she could not participate in social activities: "[If I was confident] I'd be going on the trips and you know sort of when they have concerts and things here down in the main lounge room, you know singers come and things like that I can't go and sit there for a couple of hours. You know half an hour would be the longest I could sit and trying to get up the pain is so bad you know I can't do anything like that now." (Participant 20, Woman, 77 years, 16 months).

The process of reconceptualization also appeared to be absent for participants in this pathway. Some participants in this pathway attributed their ongoing symptoms to a problem with the joint replacement, often blaming this on surgical incompetence. For example, Participant 39 was troubled by a lack of explanation for her persistent symptoms. As a result, she felt something was not done correctly in the surgery: "To me I still feel there's something they didn't do properly, or (the surgeon) hasn't done it properly or there's something wrong with the actual knee. The kneecap gets really sore. I shouldn't be getting sore, and I am still getting the pain that I used to get before I had the operation." (Participant 39, Woman, 74 years, 13 months).

This perception appeared to be reinforced by negative encounters with their surgeon. Participant 34 felt dismissed by her surgeon, who did not assist in her understanding of her persistent symptoms or functional limitations: "I saw a particular doctor who, after a 4-and-a-half-hour trip down there, said, 'Let me look at the scar. It's healed nicely. Thank you very much. Goodbye.' You know? So, I was most dissatisfied with that after an 11-hour trip by the time

that we got home that day." (Participant 36, Woman, 70 years, 16 months).

Other negative social and contextual factors, such as an inability to fulfil social roles and a lack of family support, as well as negative thoughts and feelings such as emotional distress, catastrophic thoughts, and anxiety all appeared to play a role in this glass half empty pathway, which led to low levels of satisfaction. Participant 20 displayed thoughts and feelings consistent with pain catastrophizing and high levels of distress: "Well, the pain and the whole thing I just wish I was dead, that's how I'm feeling, you know I'd just rather not be here. [I'm] quite distressed about it because I can't go anywhere you know. Here they have bus trips and things like that, and I can't go on them because I can't walk." (Participant 20, Woman, 77 years, 16 months).

Discussion

Patient satisfaction is important when assessing the success of orthopaedic interventions. However, a lack of understanding of what satisfaction means to patients makes it difficult to interpret satisfaction scores [32]. Through qualitative interviews with patients post-TKA, we found that satisfaction after TKA was a function of the presence or absence of ongoing symptoms and/or functional limitations. In the absence of ongoing symptoms or functional limitations, patients reported high satisfaction levels. In the presence of ongoing symptoms or functional limitations, a range of factors, some modifiable (such as, pain catastrophizing, low self-efficacy, poor therapeutic alliance, and social isolation), appeared to influence a patient's pathway to higher or lower satisfaction levels.

Limitations

Consistent with our qualitative approach, we sought to capture a wide range of experiences and perspectives in our sample, so we purposely recruited people with a range of TKA outcomes. This enabled us to capture the voices of people with not only high, but also low levels of satisfaction who are often difficult to engage in research. However, readers should be cognizant that our sample is not representative of the TKA population and does not provide an estimate of the proportion dissatisfied after TKA. Unlike quantitative studies, qualitative studies are not seeking to estimate the likely range of a parameter (such as, prevalence, odds ratio, risk ratio) from their sample that can be extrapolated to the population of interest. Instead, qualitative research seeks to gain rich descriptions from a small sample of people who have experienced the phenomenon of interest. In doing this, qualitative research is interested in diversity and understanding a range of experiences. It is

important to note that qualitative research is hypothesis-generating and does not seek to definitively produce generalizable results [27]. Thus, the issue of selection bias is not a consideration for qualitative research; however, each reader should carefully consider our sample to see if our findings are applicable to his or her setting or context, as the participants in this study may differ from the wider population in important ways. For example, it is possible that the participants here had higher health literacy than the wider population, as patients with lower health literacy may have been less likely to accept our invitation to participate. We recruited from a single site, and thus the experiences of the participants in this study will reflect aspects of the pre- and post-TKA care that is typical to this service. Additionally, this study was set in an Australian public hospital where TKAs are government-funded procedures. Incurring a financial cost may influence expectations of care, particularly given the role that process variables, such as surgeon interactions, played in reports of satisfaction among our sample. Future studies are needed to explore if and how our model captures the experiences of patients in other settings [4].

Although our model describes a process that unfolds over time, data were collected retrospectively at one time point and thus relied on the participants' recall of the TKA journey. Additionally, the scope of this study was to explore patients' conceptualization of, and pathways to, satisfaction 12 to 25 months after TKA. Although exploration of these factors before surgery would have been an interesting and potentially useful addition to this study, it does not detract from the utility of the results to assist clinicians in improving satisfaction levels in patients who are troubled by ongoing symptoms or functional limitations. Coding was conducted by two authors (NRK, SB) and, in accordance with the qualitative approach, was not tested for intra- or interobserver reliability. By providing an audit trail that describes the logical process of arriving at codes, themes, and theory through our own world view, we are confident that someone independent of the authorship team would be able to read the transcripts and identify similar codes in relation to our research question. Although other interpretations of our data are possible, for example, a thematic description of the lived experience after TKA, our aim was to develop a clinically useful framework to assist clinicians to improve patient satisfaction with TKA. Insights into the lived experience after TKA have been reported elsewhere [3, 19, 21].

Although previous research has identified depression, anxiety, antecedent narcotic use, or workers compensation as predictors of patient satisfaction [14, 18, 25], we did not have access to this information in our registry data to describe our sample. We emphasize that the aim of the study was to elicit the participant's perception of what contributed to their level of satisfaction, and our identification of depression, anxiety and self-efficacy in the participants'

narratives lends support to previous quantitative findings. Although we endeavored to create a comfortable judgement-free environment for each interview, social desirability forces may have prevented participants from describing their experiences with narcotic use or workers compensation. Our results further suggest that this ability to adapt is influenced by a myriad of factors, including mental health and issues relating to social support or the therapeutic process. However, understanding whether satisfaction is a standalone construct, or merely a proxy for assessing the adaptability of patients (or other factors like anxiety and depression), requires further quantitative investigation. Future research should consider empirically testing the assumptions of our theoretical model and exploring its intersection with the previously known factors associated with patient satisfaction to advance orthopaedic knowledge of the utility in measuring this construct.

What Does it Mean to be Satisfied After TKA?

Participants in this study who reported high satisfaction levels, regardless of the presence of any ongoing symptoms or functional limitation, considered satisfaction to mean some improvement in symptoms and/or functional limitations. This finding is supported by two systematic reviews, which have documented the influence of improvements in pain and function outcomes in reports of satisfaction [20, 22]. A novel finding from our study was that all those who reported low satisfaction levels felt that to be satisfied would have called for a complete resolution of symptoms and/or functional limitations, rather than only an improvement. Our findings illustrate the need for surgeons to be more specific in their preoperative patient education pertaining to the likelihood of persistent symptoms and functional limitation after TKA. For example, surgeons can explain that a resolution of symptoms and restoration in function is unrealistic for most patients and they should reconsider the procedure if these are their expectations.

What Factors Influence Satisfaction After TKA?

The pathways to high or low satisfaction levels in the presence of ongoing symptoms or functional limitations were influenced by a range of modifiable factors such as lack of social exposure to others with TKA, lack of participation in social activities, low self-efficacy, pain catastrophizing, and poor understanding of persistent symptoms. However, those without ongoing symptoms or functional limitations experienced a direct pathway to high satisfaction levels. Contrary to what surgeons may believe [10], our findings demonstrate how satisfaction may have

Table 6. Helpful communication

Patient experience	Unhelpful communication	Helpful communication
1. <i>"My knee feels really unstable; it keeps popping out sideways when I'm walking. I can't do the things I want to do."</i>	<p><i>"The only way to fix your unstable knee is to do another TKA."</i></p> <p>Telling the patient that the only option to improve their continued symptoms or functional limitations is to have another surgery leaves them dependent and with the perception they have no ability to control their symptoms, lowering self-efficacy (negative thoughts and feelings).</p>	<p>Targeting reframing of valued activities</p> <p><i>"That sounds like it is a real concern for you. Can you tell me how it is affecting you?"</i></p> <p>Validating the patients experience and gaining an insight into their illness perceptions can have positive effects on patient's (positive thoughts and feelings).</p> <p><i>"The good thing is that from the x-ray and my examination, I can assure you that your new knee is very stable."</i></p> <p>Providing reassurance is important to reduce worry (positive thoughts and feelings).</p> <p><i>"That means we need to explore other factors like muscle strength, balance, and the way you walk—things we know can influence your knee and how it behaves when you use it. That way we can help build your confidence to get back to those things that you like to do"</i></p>
2. <i>"I don't know what's wrong with my knee and my surgeon can't tell me either. I've done everything I can and it's not very good at all. When I went to the surgeon they said 'No, there's nothing wrong with it. The operation went well.' I said 'Well, why is it still no good?' They said they don't know."</i>	<p><i>"The surgery was a success. You can see here on the x-ray that everything is perfectly in place, which means that there is nothing wrong with your new knee. I don't know why your knee is still bothering you"</i></p> <p>Telling the patient that there is nothing wrong with their knee and the operation went well without exploration of the patient's concerns, invalidates the patient and potentially stigmatizes them (negative thoughts and feelings)</p>	<p>Placing a focus on modifiable factors to build the patient's confidence (positive thoughts and feelings) to engage in valued activities, puts the patient in charge of their health and builds self-efficacy (positive thoughts and feelings). This process will facilitate finding activities that are important to the patient, or directing attention toward new/modified activities, which the patient can find enjoyment in, resulting in reframing valued activities.</p> <p>Targeting reconceptualization</p> <p><i>"I am hearing that your knee is really troubling you. Please can you tell me more about exactly what you are feeling and how this is affecting you?"</i></p>

Table 6. continued

Patient experience	Unhelpful communication	Helpful communication
"		<p>Validating the patient’s experience, showing empathy and exploring their concerns helps reduce emotional distress (positive thoughts and feelings).</p> <p><i>“While it may seem hard to believe with these symptoms, it’s really important for you to know that your new knee is strong and can be trusted. There are several other factors from your story and examination that we know can cause ongoing pain and restriction in your knee. The key thing is to work out a plan together to address these factors to get you back to living again. What do you think about that?”</i></p>
		<p>Reassuring patients while explaining that there are multiple reasons why a person may experience ongoing symptoms that do not involve the surgical procedure helps facilitate reconceptualization. By using the conceptual model, the surgeon may then explore some of the other contributing factors to the patient’s difficulties, including the contribution of thoughts, feelings, social and contextual factors. After identifying possible influences, these factors can be addressed by the surgeon or result in referral on to trusted allied health (positive social and contextual factors).</p>
<p>3. <i>“It’s 12 months and I am still in pain. I know people who had surgery at the same time who are a lot better than me and this worries me.”</i></p>	<p><i>“There are a lot of people in a lot more pain than you at the 12-month mark; I think you are doing well.”</i></p> <p>Attempting to minimize what the patient is experiencing by using examples of people who are much worse off is not reassuring or validating and can result in increased emotional distress (negative thoughts and feelings).</p>	<p>Targeting recalibration</p> <p><i>“I am hearing that the pain is really troubling you. Can you tell me more about how this is for you?”</i></p> <p><i>“I understand this is really frustrating for you, but unfortunately there are a wide variety of outcomes after a knee replacement. Although some people at 12 months report little pain or functional limitation, others still require walking aids and regularly experience pain. Everyone is on their own journey. We know symptoms continue to improve up to 2 years later, so while this is tough for you, it’s important to know that we will continue to support you to get the best outcome.”</i></p>

Table 6. continued

Patient experience	Unhelpful communication	Helpful communication
		Validation, active listening, ongoing support and normalizing experiences are powerful tools to reduce worry and catastrophizing (positive thoughts and feelings) for patients. This can be achieved by explaining that people experience a broad range of outcomes after TKA. To support this process, the surgeon could refer the patient to allied health where the patient can experience a social environment with others that have undergone TKA, and receive rehabilitation, emotional support and education (positive social and contextual factors). This process will facilitate recalibration.

little to do with more tangible outcomes, such as complications or biomechanical factors. Instead, satisfaction likely has more to do with the patient's world view and individual traits. Previous evidence has identified the association of negative thoughts and feelings (such as anxiety and depression) [1, 22], and low levels of social support [22, 23] with lower satisfaction levels. Our study demonstrates how thoughts, feelings, social and contextual factors interact with ongoing symptoms or functional limitations on the pathways to different satisfaction levels. For example, people with lower levels of satisfaction may present with negative thoughts and feelings, such as hopelessness or pain catastrophizing, in combination with negative social and contextual factors including the inability to do socially enjoyable activities and poor therapeutic alliance. These factors can affect how they understand or manage their symptoms or functional limitations, thus affecting their satisfaction level. Our findings are consistent with the response shift observed in the quality-of-life evidence. Response shift describes how quality-of-life assessments can change despite no alteration in objective circumstances, as a result of recalibrating (for example, comparing one's situation to that of others who are less well off), reprioritizing (such as, finding new activities to enjoy), or reconceptualizing (including no longer considering health symptoms to be a threat) [2, 7]. Despite many studies attributing patient satisfaction to fulfilment of expectations [29, 32], the findings of this study suggest that expectations are only one part of the satisfaction puzzle; the other parts include the presence or absence of ongoing symptoms or function limitations, and in the presence of them, how the individual adapts and accepts them. Our findings agree with research suggesting patients calibrate their expectations to pain and function outcomes [28], and that expectations alone cannot predict satisfaction [31].

The results of this work illustrate how patients can arrive at high satisfaction levels through the three core mechanisms (recalibration, reframing valued activities, and reconceptualization), often without therapeutic intervention. However, with knowledge of these mechanisms, our findings suggest that clinicians can play an important role in facilitating higher levels of satisfaction when patients are troubled by ongoing symptoms and functional limitations. This could occur through: (1) Asking patients about any ongoing symptoms/functional limitations, what they believe is causing them, the effect they are having on their lives, and how severe they believe they are; and (2) identifying and targeting modifiable barriers to satisfaction (understanding of ongoing symptoms, social participation, confidence, self-efficacy, pain catastrophizing, depression) in the context of the individual patient. Based on our conceptual model and supported by subjective reports of therapeutic encounters from the participants in our sample, we have provided example strategies to facilitate the three mechanisms of change and address negative thoughts, feelings, social and contextual factors (Table 6). Other key areas the surgeon can target include positive communication techniques, active listening, and being available for patient follow-up appointments, rather than leaving patient follow-up in the hands of junior doctors or other allied health professionals. Clinicians may also consider applying pre-TKA screening tools that can identify patients with negative thoughts and feelings, which may predict low satisfaction levels [16]. We emphasize that patients are likely to present with more than one modifiable barrier to satisfaction and it is unlikely that these can all be addressed in a single consultation. For patients presenting with multiple barriers, such as negative thoughts, feelings, social and contextual factors, we recommend focusing on communication strategies that are validating, reassuring,

patient-centered and that build confidence, acceptance, and self-efficacy. It may be that these factors are best targeted pre-TKA to improve patient outcomes, however, further research is needed to test the efficacy of this. Following this, and a review of whether rehabilitation has been adequate, it may be appropriate to refer the patient to allied health for further support to improve the patient's satisfaction levels. Consulting services such as psychiatry and colleagues in the allied health professions like physiotherapy, occupational therapy, social work, psychology provide patients with access to a range of evidence-based interventions may be able to target the modifiable factors identified in this study, including mindfulness, which has shown to be effective in the TKA population [15].

Conclusions

This qualitative study has demonstrated the importance of educating patients about the likely outcomes after TKA, especially the possibility of continued symptoms and functional limitations. In patients who continue to believe that their symptoms will be resolved, and their functional capacity completely restored, it may be appropriate to advise them away from TKA due to the risk of being dissatisfied postoperatively. In patients who are troubled by ongoing symptoms or functional limitations after TKA, the results of this study have described three core mechanisms (recalibration, reframing valued activities, and reconceptualization), which clinicians may use as a road map to improve patient satisfaction. In patients with low satisfaction, it is important to consider the influence of negative thoughts and feelings, such as symptoms of depression, feelings of hopelessness, and poor self-efficacy, and address them through interventions such as psychology and psychiatry. Additionally, negative social and contextual factors, such as poor social support or inability to fulfil social roles, should be considered and addressed through focusing on a strong therapeutic alliance, social work referral, and seeking ways to engage patients in meaningful activities in their communities. It may be feasible to target the modifiable thoughts and feelings, as well as social and contextual factors pre-TKA, to reduce the likelihood of a patient becoming dissatisfied postoperatively. However, future empirical research is required to test the efficacy of intervening on these factors before surgery.

References

1. Ali A, Lindstrand A, Sundberg M, Flivik G. Preoperative Anxiety and Depression Correlate With Dissatisfaction After Total Knee Arthroplasty: A Prospective Longitudinal Cohort Study of 186 Patients, With 4-Year Follow-Up. *J Arthroplasty*. 2017;32:767-770.
2. Barclay-Goddard R, Epstein JD, Mayo NE. Response shift: a brief overview and proposed research priorities. *Qual Life Res*. 2009;18:335-346.
3. Bardgett M, Lally J, Malviya A, Deehan D. Return to work after knee replacement: a qualitative study of patient experiences. *BMJ Open*. 2016;6:e007912.
4. Batbaatar E, Dorjdagva J, Luvsannyam A, Amenta P. Conceptualisation of patient satisfaction: a systematic narrative literature review. *Perspect Public Health*. 2015;135:243-250.
5. Batbaatar E, Dorjdagva J, Luvsannyam A, Savino MM, Amenta P. Determinants of patient satisfaction: a systematic review. *Perspect Public Health*. 2017;137:89-101.
6. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to anti-rheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol*. 1988;15:1833-1840.
7. Blome C, Augustin M. Measuring change in quality of life: bias in prospective and retrospective evaluation. *Value Health*. 2015; 18:110-115.
8. Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KD. Patient satisfaction after total knee arthroplasty: who is satisfied and who is not? *Clin Orthop Relat Res*. 2010;468:57-63.
9. Bullens PH, van Loon CJ, de Waal Malefijt MC, Laan RF, Veth RP. Patient satisfaction after total knee arthroplasty: a comparison between subjective and objective outcome assessments. *J Arthroplasty*. 2001;16:740-747.
10. Bunzli S, Nelson E, Scott A, French S, Choong P, Dowsey M. Barriers and facilitators to orthopaedic surgeons' uptake of decision aids for total knee arthroplasty: a qualitative study. *BMJ Open*. 2017;7:e018614.
11. Charmaz K. Grounded Theory: Methodology and Theory Construction. In: Wright JD, ed. *International Encyclopedia of the Social & Behavioral Sciences* 2nd ed. Oxford: Elsevier; 2015: 402-407.
12. Clement ND, Bardgett M, Weir D, Holland J, Gerrard C, Deehan DJ. The rate and predictors of patient satisfaction after total knee arthroplasty are influenced by the focus of the question. *Bone Joint J*. 2018;100:740-748.
13. Collins NJ, Misra D, Felson DT, Crossley KM, Roos EM. Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Outcome Survey Activities of Daily Living Scale (KOS-ADL), Lysholm Knee Scoring Scale, Oxford Knee Score (OKS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Activity Rating Scale (ARS), and Tegner Activity Score (TAS). *Arthritis Care Res (Hoboken)*. 2011;63(Suppl 11):S208-28.
14. de Beer J, Petruccioli D, Gandhi R, Winemaker M. Primary total knee arthroplasty in patients receiving workers' compensation benefits. *Can J Surg*. 2005;48:100-105.
15. Dowsey M, Castle D, Knowles S, Monshat K, Salzberg M, Nelson E, Dunin A, Dunin J, Spelman T, Choong P. The effect of mindfulness training prior to total joint arthroplasty on post-operative pain and physical function: A randomised controlled trial. *Complement Ther Med*. 2019;46:195-201.
16. Dowsey MM, Spelman T, Choong PF. Development of a Prognostic Nomogram for Predicting the Probability of Nonresponse to Total Knee Arthroplasty 1 Year After Surgery. *J Arthroplasty*. 2016;31:1654-1660.
17. Escobar A, Gonzalez M, Quintana JM, Vrotsou K, Bilbao A, Herrera-Espineira C, Garcia-Perez L, Aizpuru F, Sarasqueta C.

- Patient acceptable symptom state and OMERACT-OARSI set of responder criteria in joint replacement. Identification of cut-off values. *Osteoarthritis Cartilage*. 2012;20:87-92.
18. Franklin PD, Karbassi JA, Li W, Yang W, Ayers DC. Reduction in narcotic use after primary total knee arthroplasty and association with patient pain relief and satisfaction. *J Arthroplasty*. 2010;25(6 Suppl):12-16.
 19. Goldsmith LJ, Suryaprakash N, Randall E, Shum J, MacDonald V, Sawatzky R, Hejazi S, Davis JC, McAllister P, Bryan S. The importance of informational, clinical and personal support in patient experience with total knee replacement: a qualitative investigation. *BMC Musculoskelet Disord* [Research Support, Non-U.S. Gov't]. 2017;18:127.
 20. Gunaratne R, Pratt DN, Banda J, Fick DP, Khan RJK, Robertson BW. Patient Dissatisfaction Following Total Knee Arthroplasty: A Systematic Review of the Literature. *J Arthroplasty*. 2017;32:3854-3860.
 21. Jeffery AE, Wylde V, Blom AW, Horwood JP. "It's there and I'm stuck with it": patients' experiences of chronic pain following total knee replacement surgery. *Arthritis Care Res (Hoboken)*. 2011;63:286-292.
 22. Kahlenberg CA, Nwachukwu BU, McLawhorn AS, Cross MB, Cornell CN, Padgett DE. Patient Satisfaction After Total Knee Replacement: A Systematic Review. *HSS J* [Review]. 2018;14:192-201.
 23. Kim TK, Chang CB, Kang YG, Kim SJ, Seong SC. Causes and predictors of patient's dissatisfaction after uncomplicated total knee arthroplasty. *J Arthroplasty*. 2009;24:263-271.
 24. Klem N-R, Kent P, Smith A, Dowsey M, Fary R, Schütze R, O'Sullivan P, Choong P, Bunzli S. Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review. *Osteoarthritis and Cartilage Open*. 2020:100032.
 25. Lavernia CJ, Villa JM, Iacobelli DA. What is the role of mental health in primary total knee arthroplasty? *Clin Orthop Relat Res*. 2015;473:159-163.
 26. Law S, Daftary A, Mitnick CD, Dheda K, Menzies D. Disrupting a cycle of mistrust: A constructivist grounded theory study on patient-provider trust in TB care. *Soc Sci Med*. 2019;240:112578.
 27. Leopold SS. *Editor's Spotlight/Take 5: Misconceptions and the Acceptance of Evidence-based Nonsurgical Interventions for Knee Osteoarthritis. A Qualitative Study*. *Clin Orthop Relat Res*. 2019;477:1970-1974.
 28. Levinger P, Bartlett JR, Bergman NR, McMahon S, Menz HB, Hill KD. The discrepancy between patient expectations and actual outcome reduces at the first 6 months following total knee replacement surgery. *Knee Surg Sports Traumatol Arthrosc*. 2019;27:2042-2050.
 29. Linder-Pelz S. Social psychological determinants of patient satisfaction: a test of five hypothesis. *Soc Sci Med*. 1982;16:583-589.
 30. Mahomed N, Gandhi R, Daltroy L, Katz JN. The self-administered patient satisfaction scale for primary hip and knee arthroplasty. *Arthritis*. 2011;2011:591253.
 31. Mannion AF, Kampfen S, Munzinger U, Kramers-de Quervain I. The role of patient expectations in predicting outcome after total knee arthroplasty. *Arthritis Res Ther*. 2009;11:R139.
 32. Noble PC, Condit MA, Cook KF, Mathis KB. The John Insall Award: Patient expectations affect satisfaction with total knee arthroplasty. *Clin Orthop Relat Res*. 2006;452:35-43.
 33. Ring D, Leopold SS. Editorial-Measuring Satisfaction: Can It Be Done? *Clin Orthop Relat Res*. 2015;473:3071-3703.
 34. Singh J, Dowsey M, Choong P. Patient Endorsement of the Outcome Measures in Rheumatology (OMERACT) Total Joint Replacement (TJR) clinical trial draft core domain set. *BMC Musculoskeleta Disord*. 2017;18:111.

CORR permission statement

Rightslink® by Copyright Clearance Center - Google Chrome
s100.copyright.com/AppDispatchServlet#formTop

 **RightsLink®** Home Help Email Support Sign in Create Account

What Influences Patient Satisfaction after TKA? A Qualitative Investigation

Author: Nardia-Rose Klem, Anne Smith, Peter O'Sullivan, et al
Publication: Clinical Orthopaedics and Related Research
Publisher: Wolters Kluwer Health, Inc.
Date: May 12, 2020

Copyright © 2020, © 2020 by the Association of Bone and Joint Surgeons

License Not Required

Wolters Kluwer policy permits only the final peer-reviewed manuscript of the article to be reused in a thesis. You are free to use the final peer-reviewed manuscript in your print thesis at this time, and in your electronic thesis 12 months after the article's publication date. The manuscript may only appear in your electronic thesis if it will be password protected. Please see our Author Guidelines here: https://cdn-tp2.mozu.com/16833-m1/cms/files/Author-Document.pdf?_mzts=636410951730000000.

[BACK](#) [CLOSE WINDOW](#)

© 2020 Copyright - All Rights Reserved | [Copyright Clearance Center, Inc.](#) | [Privacy statement](#) | [Terms and Conditions](#)
https://cdn-tp2.mozu.com/16833-m1/cms/files/Author-Document.pdf?_mzts=636410951730000000 /right.com

Appendix 14: Reviewer feedback and author responses

Reviewer feedback	Author response
<p>40/121 failed to respond or declined invitation to participate. What limitations of the data/conclusions can be inferred from this very high level of fallout from the originally eligible number of patients? (AU: This is really important. You need to characterise the differences between responders and non-responders in terms of age, gender, as many other relevant factors as you can and have available to you. This helps the reader to know to whom the work applies. Imagine a situation where the age of the responders/non-responders varies widely, or the gender balance, or the % who were employed, or the % who aspired to competitive sports ... all these things would change how we could/couldn't apply your study in practice. You MUST help the reader to understand this both in the Methods section of the Abstract and main text, and the 'limitations' paragraph of Discussion. ED)</p>	<p>In accordance with the qualitative approach, we did not set out to randomly sample an adequately representative sample of the population. Unlike quantitative studies, qualitative studies are not seeking to estimate the likely range of a particular parameter (e.g. prevalence, odds ratio, risk ratio etc.) from their sample that can be extrapolated to the population of interest. Instead, qualitative research seeks to gain rich descriptions from a small sample of people who have experienced the phenomenon of interest. In doing this, qualitative research is interested in diversity, and understanding a range of experiences. It is important to note that qualitative research is hypothesis generating, and does not seek to definitively produce generalisable results (Leopold, 2019). Thus, the issue of selection bias is not a consideration for qualitative research.</p> <p>A commonly employed sampling technique to achieve diverse, rich description in qualitative studies is purposive sampling. This method of participant recruitment involves the deliberate selection of participants who are especially knowledgeable about a phenomenon of interest, with the aim to achieve a diverse and information-rich sample. This method also includes concurrent data collection and analysis, whereby participants are selected based on the emerging theories in the data to be tested. Thus, the terms responder/non-responder are not appropriate in this context, as purposive sampling seeks to look for, and fill gaps in representation of themes underlying constructs being investigated, by seeking interviews with particular people that can test and challenge emerging themes. For the present study, we employed a purposive sampling strategy. This entailed identifying 121 people from the hospital registry who were eligible to be considered for inclusion in the study as they had completed 12 month registry data (WOMAC and satisfaction questionnaires) and were no more than 18 months post-surgery. Of these, 85 were invited to participate as a result of our purposive sampling strategy. Invitees were selected with the aim to gather a broad range of age, gender, pain and function outcomes, and levels of satisfaction (as directed by the four sampling quadrants and hospital registry demographic data). Consistent with our qualitative approach, we conducted data analysis and recruitment concurrently in order to test emerging patterns in the data. Of the 85 invited over the course of this process, 41 consented and were subsequently interviewed. One interview was lost</p>

	<p>due to equipment malfunction. Of the remaining 43 people, 28 declined, 12 did not respond to letter or phone contact, and 4 were identified as inappropriate (2 cognitive impairment, 1 undergoing treatment for surgical complication and 1 declined use of professional interpreter). We have amended this section in text.</p>
<p>Is it simply assumed that multidisciplinary round table discussions of emerging responses and refining research questions mid-project occurs without introducing bias?</p>	<p>As with any study, a particular ‘world view’ is applied to the data, so that the results may be useful to a specific context. For this particular study, the ‘world view’ was that of a clinical orientation; our authorship team drew on both clinical and theoretical expertise to inform an analysis that would assist clinicians in improving satisfaction levels in their patients. This ‘world view’ was drawn on frequently throughout the acquisition of data, to reflect on whether further avenues could be explored to gain a richer understanding of our research questions for the desired clinical context. This concurrent data collection and analysis is a key feature of qualitative design, and is supported by the Constructivist Grounded Theory methodology (Charmaz, 2015).</p> <p>An example of where this was important in our analysis was the identification of social factors in our data; after interviewing half of our sample, it was noted that the participant’s social context, particularly their exposure to others who had undergone a TKR, appeared important in reports of satisfaction. After discussion with the authorship team, it was decided to include more detailed questions about social factors, such as ‘can you tell me about your experiences with other people who have had a total knee replacement?’ This enabled us to explore this concept in more depth, and understand how, or if, it affected levels of satisfaction. After the acquisition of more interview data, it was found that a participant’s ability to calibrate their outcomes to others around them was an important component in arriving at a high or low level of satisfaction. If this concept was not discussed in detail with the authorship team, a key component of our conceptual model, and a previously unknown phenomena, would not have been identified. By only using an interview schedule decided a priori based on what the authorship team thought was going to be important in understanding patient satisfaction, key concepts would have been missed.</p> <p>Although the authorship team’s ‘world view’ is important to the analysis of the qualitative data, we emphasise that our findings are grounded in the participant’s voices, as evident by supporting quotes in the manuscript. We refer the reviewer to Leopold, 2019 for further discussion around researcher bias in qualitative research: ‘Qualitative researchers need to be cognizant that theirs is only one approach to the</p>

	<p>problem. The researchers' world-view, their lens, will (necessarily) influence the design of a qualitative study and the processes of data collection, analysis, and interpretation (this also goes for quantitative research). Therefore, it is important that the researchers describe who they are (Social scientists? Psychologists? Surgeons?), what biases they bring to the study, and how these influenced decisions made throughout the research process. This enables readers to understand how the researchers arrived at their results, through the lens they adopted' (Leopold, 2019).</p>
<p>Interesting to see that, in this population where complications from TKR were excluded, roughly one-third of patients had significant dissatisfiers. Higher than the oft-quoted 15–20%! (AU: This is a great point to emphasize in the Discussion. ED)</p>	<p>The reviewer has identified an interesting characteristic of our study population. However, it is important to remember we employed a purposive sampling strategy; with the use of the four sampling quadrants (responder satisfied, responder dissatisfied, non-responder satisfied, and non-responder dissatisfied), we deliberately sought out the voice of dissatisfied individuals to gain their perspectives and experiences. Due to this, for the purpose of estimating prevalence of satisfaction, our sample is not representative of the broader population, nor is it generalisable. As it is important for readers to acknowledge that our sample does not provide an estimate of the percentage dissatisfied after TKR, we have included a section in the discussion to emphasise this.</p>
<p>Can the various patient comments be consolidated without losing the message?</p>	<p>The authorship team believes the various patient comments are needed in the manuscript. We believe showing a variety of patient voices is important, and renders our interpretations of the data transparent (Leopold, 2019).</p>

Appendix 15: Glossary of qualitative terms

The following table provides simplified explanation of otherwise very complex terminology. Please use the following explanations as a starting guide. For further, more nuanced, descriptions of the following terms, please refer to the SAGE Handbook of Qualitative Research, third edition (Denzin & Lincoln, 2005), the SAGE Handbook of Grounded Theory (Bryant & Charmaz, 2010), Naturalistic Inquiry (Lincoln & Guba, 1985), Qualitative Inquiry and Research Design: Choosing Among Five Traditions (Creswell, 1998), The Foundations of Social Research (Crotty, 1998), and The SAGE Handbook of Qualitative Methods in Health Research (Bourgeault, Dingwall, & de Vries, 2010).

Authenticity	Whether the authors sought a range of different perspectives. Qualitative researchers must provide evidence of seeking diverse, appropriate people to answer their research question. Seeking diversity ensures the phenomenon of interest has been investigated from different angles and perspectives. Researchers should describe sampling techniques that sought breadth and were conducted iteratively with the analysis. This allows the researchers to follow different avenues and themes in their data to gain a complex understanding of the phenomenon being explored. Researchers should describe 'divergent cases' where they exist; some participants may have experiences and perspectives that were different to the other participants in the study. Divergent cases can be important for exploring different interpretations and providing direction for future research.
Category	A collection of similar data grouped or 'bucketed' together, which will allow the researcher to describe the key features of this cluster of data. Categories are often the step before arriving at the key themes of the data.
Coding	The initial phase of data analysis during which 'codes' (the smallest unit of data analysis) are used to capture features of the data that are of interest to the research question.
Confirmability	Ensuring researchers' interpretations are derived from the participants' voices. A reader should be able to look at the data, and the findings should make sense in the context of the researcher's lens, the theoretical perspective, and research design used. To achieve confirmability, researchers must maintain a well-documented and logical audit trail recording how analytical decisions were made, and how the researcher prioritised participants' voices over the researchers' knowledge and background. This is usually achieved through reflexive memos. A second 'coder' may analyse some of the raw data and consider alternative interpretations. Participants may provide feedback on whether the researcher correctly interpreted their experiences.
Constant comparison	Comparing the data between participants, between codes, between themes, and between different stages of the analysis. It is important for

	researchers to ensure that as they move further along in their analysis, they continue to capture the key features of the participants' stories.
Constructionism	An epistemology that assumes each individual's truth is wholly socially constructed through interacting with the world. As a result each person has their own unique meaning of truth depending on their social interactions, so many 'truths' exist.
Constructivism	An epistemology that assumes knowledge is constructed by the individual, which may be partly socially influenced. Each individual has their own unique construction of 'truth', so many 'truths' exist.
Credibility	The reader's confidence in the truth of the study. When looking for credibility, the reader should look for whether the research design and methods used were aligned with standard qualitative approaches. For example, if researchers claim to have used a grounded theory research design, then the methods should be consistent with what grounded theory involves. This will involve citing, and being faithful to, key publications to support the use of methods. The reader must understand the steps taken in the qualitative analysis.
Critical inquiry	Critical inquiry is most commonly considered a theoretical perspective. Studies of critical inquiry address power dynamics, injustices and inequalities.
Critical realism	Critical realism is commonly considered a theoretical perspective or an ontology. Critical realism assumes that there is a measurable reality but it is overlaid with an individual's construction of reality.
Dependability	Dependability ensures that the processes completed by the researchers are repeatable, despite many different perspectives and experiences of the study population. In qualitative research, it is acknowledged that the experience of a particular phenomenon for one participant will be different for another participant in a different context or setting. Researchers must keep a detailed log of all the activities undertaken and decisions made during data collection and analysis, also known as an 'audit trail'.
Epistemology	The study of knowledge. <i>How do we know knowledge? What is knowledge?</i>
Ethnography	An in-depth study of a particular cultural group. Ethnography is considered closer to a research design and typically involves the researcher observing and being immersed in a cultural group to provide rich description of that cultural group.
Focus groups	A structured discussion between a researcher and a small group of people, typically 6 to 8 people. Useful to gain the opinions of a group of people and allow participants to bounce ideas and experiences off one another.
Grounded theory	Grounded theory is considered a research design with the end goal being the production a theory or model developed from an in-depth analysis. Grounded theory research designs develop initial ideas 'grounded' in the data and then test these through further sampling to end up at a robust model. There are a few different types of grounded theory and each type has a specific theoretical framework.
Interpretive description	Interpretive description is an example of where theoretical framework and research design can overlap. The primary purpose of interpretive description is to design a study to address gaps in clinical knowledge. Researchers who use interpretive description are applying a theoretical

	framework that advances clinical knowledge. The findings from the research may build on or challenge the researcher's existing clinical knowledge and experience.
Interpretivism	A theoretical perspective that rejects an objective (measurable) approach to understanding knowledge. Interpretivism looks for the individual differences between people, with the perspective that they all have their own version of reality, and looks to understand meaning.
Mapping techniques	Mapping techniques can be used to visually represent the findings of the study; codes and themes can be drawn out in a mind map.
Memos	Notes researchers make while conducting the analysis. These are usually their emerging ideas about what is happening in the data, and the key ideas they are seeing.
Methodology	Can refer to one or both of theoretical perspective and research design in qualitative research.
Narrative accounts	Participants write an account of their experiences. This can be a useful tool over a longitudinal qualitative study, where the feasibility of recurrent interviews is not possible.
Objectivism	An epistemological position that assumes knowledge has a singular 'truth' that can be attained through measurement and observation.
Observation	The researcher observes and takes note of the behaviours of a specific group of people, often in a specific setting. This can be in person or through video recording.
One-to-one interview	An interview between a researcher and one participant. Using one-to-one interviews is most useful when researchers employ a theoretical perspective where it is important to gain a rich understanding of individual experiences and beliefs.
Ontology	Assumptions about the nature of reality; <i>'what is reality?'</i>
Paradigm	A set of beliefs that guide the research. These are usually a combination of the assumptions about ontology and epistemology, as well as the researcher's 'lens'.
Participatory action research	A research design that focuses on reflection, data collection and action. Participatory action research is commonly engaged to reduce inequalities by engaging the people who are oppressed. However, it can also be used where the goal is to simply engage a group of people to put forward their ideas for action and change related to a phenomenon. A key element of participatory action research is the participants drive the research process and create targets for action.
Phenomenology	Phenomenology is an example of where theoretical framework and research design can overlap. However, often researchers will just present phenomenology as the theoretical framework and then describe their research design. Phenomenology has the theoretical framework of seeking to understand the lived experience of individuals related to a specific phenomenon. Studies tend to provide very detailed descriptions of participant experiences, and present key themes of the data. They often have small sample sizes due to the depth of the analysis.
Positivism	Considered either a theoretical perspective or an epistemological assumption. According to positivism, there is a singular 'truth' that can be attained through measurement and observation, and a single reality that every person experiences in the same way.
Post-positivism	Considered either a theoretical perspective or epistemological assumption. Post-positivism pursues an objective approach to

	knowledge (having a single 'truth') but acknowledges that human influences mean that researcher may never fully attain that single truth.
Pragmatism	A theoretical perspective that asks ' <i>what is useful?</i> ' Pragmatism pursues knowledge that has an impact after the research is conducted. Pragmatic research may use both qualitative and quantitative approaches.
Purposive sampling	To ensure diversity, qualitative researchers often use <i>purposive sampling</i> . Purposive means an intentional selection of informants based on their ability to elucidate a specific theme, concept, or phenomenon.
Realism	An ontological assumption that a single reality (or world) exists that is experienced in the same way by all individuals.
Reflexive memos	Reflexive practice is important for researchers to reflect on how their 'lens' (experiences, beliefs and knowledge) is influencing their analysis. These are usually documented as memos and help researchers ensure the perspectives of the participants are prioritised.
Reflexive thematic analysis	Thematic analysis refers to a cluster of different research designs that share an interest in capturing patterns in data. Reflexive thematic analysis is a popular type of thematic analysis and is characterised by the subjectivity of the researchers as an important analytic tool, and the importance of the researchers reflexively engaging in theory, data, and interpretation (Braun & Clarke, 2020). All forms of thematic analysis have a place in qualitative research; for discussion of the other forms see Braun and Clarke (2020).
Relativism	An ontological assumption that multiple realities exist; reality (or the world) is experienced in a different way by each individual.
Research design	The 'plan' for the research. The research design complements the theoretical perspective and guides the use of methods.
Saturation	Sampling ends at <i>saturation</i> , the point at which the researchers believe that recruiting more participants will not change the existing key findings. There is some debate as to what constitutes saturation, however, it is most commonly used to indicate that no new ideas were found in the final interviews. Qualitative researchers seek to identify common processes underlying the experiences of a diverse sample and often these common processes can be observed among a relatively small sample. You do not see qualitative studies with hundreds of people as the aim of qualitative research is to describe the underlying processes rather than document their prevalence or frequency.
Semi-structured interviews	An interview schedule is used to assist researchers through the interview process. Semi-structured interviews are like a guided conversation but allow a researcher to probe other ideas and topics as they emerge in the interview.
Structured interviews	Strictly adhere to the use of an interview schedule and is a more rigid style of interviewing. Typically, only questions on the interview schedule are asked and the research does not explore further topics.
Subjectivism	An epistemological position that assumes meaning is created within the individual or subject. This epistemology assumes that knowledge is always filtered through the lens of the subject, which will necessarily include the influence of that person's race, gender, socio-economic status, age and so on.
Symbolic interactionism	A theoretical perspective that looks for the meaning or symbolism individuals bring to words or objects.

Themes	After the researcher has identified codes (and perhaps grouped these into categories), these can be collapsed into larger patterns in the data called 'themes'. These can represent the key concepts in the participants' stories, and tie together the underlying patterns in the data. Themes in this context are not to be confused with thematic analysis as a research design. Themes on their own are step in the analytic process and represent a meaningful essence that runs through the data. Research designs may describe their findings in terms of the main themes of their data but have not aligned themselves with a specific thematic analysis.
Theoretical framework	The 'concept' that guides the qualitative research. The theoretical framework guides the research design and subsequent choice of methods, including how the analysis is conducted. For example, a theoretical framework of 'the lived experienced of low back pain' will guide the methods to include in-depth one-to-one interviews, and analytic techniques of identifying the experience of the phenomenon of interest and grouping these into discrete themes.
Theoretical sampling	Theoretical sampling looks to recruit people to 'test' emerging ideas in the data. For example, to better understand an emerging theme about the meaning of pain, the researchers might recruit additional participants to specifically question about this. These additional people may have specific characteristics such as being female or younger to help the researchers understand how meanings differ among a diverse sample. Theoretical sampling is different from purposive sampling; theoretical sampling is concerned with testing the emerging theories in the data, whereas purposive sampling is a tool to achieve a diverse sample related to the phenomenon of interest.
Transferability	The extent to which the findings are useful in other, similar settings. To achieve this, researchers need to provide a rich, detailed description of the context, location and people studied. While similar to generalisability, transferability is concerned with findings that will apply to patients with similar characteristics from a similar setting to the current study, rather than a whole clinical population. Qualitative researchers must provide a comprehensive picture of the study sample and setting, which will help readers decide whether the findings are useful to clinical practice. For example, a study of knee osteoarthritis including patients of private hospitals in Australia may have limited transferability to patients of a public hospital in Bangladesh.
Unstructured interviews	Interviews that take place with minimal pre-specified interview questions from the interviewer. They progress in a similar way to a conversation but remain relevant to the phenomenon of interest. e.g. 'Tell me your story'; the participant is in the driving seat to lead in the direction they feel most important.

Appendix 16: Example process of data analysis

Data excerpt(s)	Code	Category	Theme
<i>It's good for the families to be involved and it's good for the patient 'cause they're always asking when do I have physio, when do I have physio? And this, yeah, having the family and being allowed, you know, to let them walk is great (F6)</i>	→ Opportunity to walk or exercise more	→ Benefits - physical	→ Physical and psychosocial benefits
<i>So being part of the program we kind of had your permission so then... we were allowed to do a lot more walking and just be active (F10b)</i>	→ Doing things that help strength and walking		
<i>She just sort of wanted to do things that were positive for getting her, you know, legs stronger and that so she could walk around (F11)</i>	→ Togetherness	→ Supporting relationships	
<i>Oh yes, because they... you get visits from your family and you're doing something together (P15)</i>	→ Hope	→ Benefits - psychological	
<i>Having someone to support them and making them feel more hope was probably a fairly big thing (F14)</i>	→ Feeling supported		
<i>I know he'll get hold of me and not let me fall (P1)</i>	→ Confidence	→ Benefits - social	
<i>It is good. I like walking. I've always walked (P5)</i>	→ Enjoyment	→ Benefits – physical and psychological	
<i>Oh, it's much more pleasant working with [family member], yes (P6)</i>	→ Confident		
<i>I guess our whole goal through this process is about getting him confident and active and independent (F3)</i>	→ Active	→ Benefits - psychosocial	
<i>It gives you something extra to do rather than sitting in the... especially in a shared ward, it's nice to get out and have a chat without three other ears listening to you [laughs] (F6)</i>	→ Independent		
<i>It was nice to actually have something extra and something that felt like, you know, it's helping too, it's enriching his abilities perhaps or keeping his muscles working (F15b)</i>	→ Something to do at visits		
<i>It's been a positive something else, where a lot of things have been frustrations, just being given the wrong information and things like that. So, no, it hasn't really been a stress (F9)</i>	→ Feeling good about being able to help		
<i>I think it would've been worse if we hadn't had it (F2)</i>	→ Positive experience		
	→ Caregiver stress		