Curtin School of Allied Health

Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia

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Author’s Declaration

To the best of my knowledge and belief, this thesis does not contain material previously published by any other person. This thesis does not contain material which has been accepted for the award of any other degree or diploma in any university. No other person’swork has been used without due acknowledgement.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. Human research ethics approval was received from the Curtin University Human Research Ethics Committee (EC00262), Approval Number: HREC2021–0274.

Signed

September 19, 2024

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Abstract

This thesis aims to develop quality and robust outcome measures that can be used to assess the impact of an interprofessional education program on the perceptions, attitudes, and collaborative behaviours of health students and practitioners in Australia and Indonesia. The thesis also aims to assess the impact on patients' health outcomes following the delivery of interprofessional Tuberculosis (TB) patient care in community settings in Indonesia.

TB remains a significant public health concern in Indonesia, with the country having one of the highest TB burdens in the world. Despite efforts to control the disease, Indonesia faces challenges in providing effective TB care, including 1) a high prevalence of drug-resistant TB, 2) limited access to quality healthcare, particularly in rural areas, 3) inadequate healthcare infrastructure and resources, 4) shortage of skilled healthcare workers, 5) low adherence to treatment regimens, and 6) stigma and social determinants hindering TB diagnosis and treatment.

One way to strengthen the health system is to narrow the gap between TB prevention, detection, and access to quality TB treatment. Increased collaboration between healthcare providers involved in TB management is essential for system-wide improvement. In 2010, the World Health Organization (WHO) highlighted the urgent need to integrate interprofessional education and collaborative practice into education and healthcare systems globally. The WHO emphasises the importance of interprofessional collaboration in achieving optimal healthcare outcomes, particularly for complex diseases like TB. However, the effectiveness of interprofessional TB care remains unclear due to the lack of validated measures to assess outcomes.

The development and/or validation of a measure to assess interprofessional TB outcomes is crucial for several reasons: 1) current TB outcome measures focus on individual healthcare provider performance, neglecting the collaborative aspects of care; 2) a validated measure will enable accountability among healthcare providers and teams,

promoting high-quality care; 3) the validated measure will facilitate the identification of areas for quality improvement, guiding targeted interventions; and 4) validated measures with robust psychometric properties will enable rigorous research and evaluation of interprofessional TB care, informing evidence-based practice.

Interprofessional education (IPE) and collaborative practice (IPCP) have been shown to positively impact patient satisfaction and reduce the duration of hospital stays, number of hospital visits, malpractice acts, and health-related costs. The global attention towards IPE and IPCP in recent decades and its potential to benefit patients worldwide make this program of validated outcome measures important. By developing measures to assess interprofessional TB outcomes, this research has the potential to transform TB care, ultimately improving the lives of individuals and communities affected by TB.

This program of research is organised into three phases: Phase1, which includes Chapters 3 and 4, involves the development of measures for the Australian setting; Phase2, which includes Chapters 5 and 6, consists of the development of measures for the Indonesian setting; and Phase 3, Chapter 7, involves the development of an interprofessional TB patient outcome measure.

The phases are organised around five studies, each representing a manuscript for publication in a journal: 1) validation of an interprofessional socialisation measure for health practitioners and students in Australia (Chapter 1); 2) validation of an interprofessional team collaboration measure for health practitioners and students in Australia (Chapter 2); 3) cultural adaptation and validation of an interprofessional socialisation measure for health practitioners and students in Indonesia (Chapter 3); 4) validation of an interprofessional team collaboration measure for health practitioners and students in Indonesia (Chapter 4); and 5) development and testing of a patient outcome measure for interprofessional TB care, an international and Indonesian Delphi study (Chapter 5).

Chapter 3 aimed to validate the Interprofessional Socialisation and Valuing Scale (ISVS), and Chapter 4 aimed to validate the Collaborative Practice Assessment Tool

(CPAT); both measures were validated in Australia. Both instruments demonstrated strong psychometric properties to measure interprofessional socialisation and collaborative practice outcomes for healthcare practitioners and students. The findings from the Australian studies were used to inform the development of the Indonesian versions of the instruments. Chapters 5 and 6, which were carried out in Indonesia, have objectives similar to those carried out in Australia, as explained in Chapters 3 and 4. The chapters validated a culturally appropriate and psychometrically robust measure for the ISVS and the CPAT, which can be used to assess interprofessional socialisation and collaborative practice for health practitioners and students in Indonesia following an interprofessional TB care delivery for patients. Chapter 7 aimed to develop and evaluate a patient outcome measure for interprofessional TB care — a patient self-perception measure that quantified the quality and functional impact of an interprofessional model of TB care on the patient.

The Australian Health Practitioner Regulation Agency (AHPRA) is a national agency that oversees health professional bodies and is responsible for accreditation and regulation. The agency has issued a statement of intent regarding IPE and IPCP, which have been incorporated into Australian higher education. This initiative requires support on validated measures to gauge the outcomes of IPE and IPCP in Australia effectively. Several assessment measures have been used in Australian universities; however, before this program research was conducted, there were no validated interprofessional-based outcome measures for either students or practitioners in Australia. Conversely, in Indonesian, some measures have been validated for practitioners or students, but none of the measures can be used equivalently as invariant measures for both cohorts.

Having an invariant measure between health practitioners and students means that even though the two groups may differ in their average levels of agreement with certain factors, the estimated loadings, mean scores, and intercepts of items within those factors differ only by chance. This allows for a comparison of the scale scores of both groups. Relevant interprofessional outcomes scores can be compared to identify weaknesses, improvements, and target attainment across the tested groups. Comparable scores enable the identification of the nature of practitioners' collaborative practice in the workplace and the level of interprofessional development of students in their training. The measure is expected to evaluate better integration between IPE and IPCP throughout the professional lifespan, from pre-qualifying students to experienced health practitioners.

To thoroughly evaluate the psychometric properties of the validated instrument, we used the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) taxonomy and standards of psychometric properties to guide the study procedures. This included the translation process, target population selection, sample size requirements, data collection, data analysis, and reporting. This program of research introduces new elements for a more comprehensive assessment of psychometric properties compared to previous studies, including a content validity evaluation to assess the relevance, comprehensibility, and comprehensiveness of the instrument's items for the targeted end users and its ability to measure the intended constructs. Evaluating the internal structure of the measure involves testing structural validity, internal consistency reliability, and measurement invariance. This was done through a three-layer factor analysis process involving Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and multi-group CFA, as well as an evaluation of measurement invariance. Hypothesis testing used published path models and was validated for construct validity. The study in Chapter 7 involved the following steps: 1) the development of a conceptual framework for the instrument and the creation of items; 2) the evaluation of the instrument through a Delphi study to obtain international participants' consensus regarding the components to be included in the measure; 3) back-to-back translation into Indonesian; and 4) the evaluation of the instrument using a second Delphi study to obtain consensus from Indonesian participants.

The research conducted in Chapters 3 to 6 has produced promising findings. The findings indicate that both the Australian and Indonesian versions of CPAT and ISVS demonstrate strong psychometric properties, including content validity, structural validity, internal consistency reliability, measurement invariance, and construct validity. These versions were reliable in assessing interprofessional socialisation and collaborative practice for health practitioners and students in their respective settings. In addition, the findings from Chapter 7 represent the initial stage of developing and testing patient outcome measures for interprofessional TB care delivery in Indonesia. These findings meet the COSMIN requirements for content validity, as all items are relevant to the construct being measured, understandable, and comprehensive. The next phase of the process will focus on instrument development, with a specific focus on validating the instrument in patients to enable a comprehensive evaluation of its psychometric properties.

This thesis significantly contributes to the evidence base on: 1) evaluating the implementation of IPE and IPCP in Australian and Indonesian health and education institutions; 2) assessing the impact of an interprofessional education program on practitioners and students from different health professional backgrounds; and 3) making possible the evaluation of the impact of interprofessional TB care on patients' healthcare.

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Dedication

To Ato Mine and Ato Aji.

Tatajengka, to sipulung maneng paimeng, Insyaa Allah. See you in jannah.

List of Publications

This doctoral thesis consists of the following publications:

1. Ardyansyah, B. D., Cordier, R., Brewer, M. L., & Parsons, D. (2024). Psychometric evaluation of the culturally adapted interprofessional socialisation and valuing scale (ISVS)-19 for health practitioners and students in Indonesia. *Journal of Interprofessional Care*, *38*(2), 283–293.
2. Ardyansyah, B. D., Cordier, R., Brewer, M., & Parsons, D. (2024). An evaluation of the psychometric properties of the Australian Collaborative Practice Assessment Tool. *Plos one*, *19*(5), e0302834.
3. Ardyansyah, B. D., Cordier, R., Brewer, M., & Parsons, D. (2024). Psychometric evaluation of the Australian Interprofessional Socialisation and Valuing Scale: An invariant measure for health practitioners and students. *Plos one*, *19(9), e0309697.*
4. Ardyansyah, B. D., Cordier, R., Brewer, M., & Parsons, D. (2024). A psychometric evaluation of the Indonesian version of the Collaborative Practice Assessment Tool (CPAT) for assessing interprofessional education and collaborative practice among health practitioners and students. *Narra J*, *4*(3), e1106-e1106.
5. Ardyansyah, B. D., Cordier, R., Brewer, M., & Parsons, D. (In Press). Development and Testing of a Patient Outcome Measure for Interprofessional Tuberculosis Care: A Delphi Study. *Emerging Science Journal.*

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Chapter 1 Introduction

1.1 Background to Research

Throughout my 16-year career as a medical practitioner, tuberculosis (TB) has been a significant concern in Indonesia (Noviyani et al., 2021; Zafar Ullah et al., 2004). As a primary care physician at a community health centre for several years during my early career, I encountered many challenging dilemmas related to TB. It was distressing to see new TB cases diagnosed every day, especially among people from impoverished communities. While we knew how to help patients recover, many factors were beyond our control. One of the most frustrating challenges was the loss of employment, leading to patient malnourishment and depression.

It is quite common to come across individuals with TB in public places in Indonesia, such as markets, schools, and shopping centres. This includes those who are already receiving treatment and those who have not yet received a formal diagnosis but display symptoms specific to TB. Suspected cases lack access to reliable screening, leading to delays in diagnosis and treatment (Ahmad et al., 2012; Irawati et al., 2007; Mustikawati et al., 2017). Additionally, there is no effective isolation system in place, allowing active cases to potentially spread the disease before receiving treatment. Furthermore, efforts in education for prevention and health promotion are inadequate (Directorate General of Prevention and Disease Control, 2022). Improved TB management is a high priority for health services in Indonesia (Mahendradhata et al., 2017; Mustikawati et al., 2017).

Chronic medical conditions such as TB can have a significant impact not only on the patient's life but also on their family and community, including the healthcare practitioners who care for them (World Health Organization [WHO], 2022). For example, a father of four school-age children and a wife who does not work diagnosed with TB who is dismissed from work because of the impact of illness and economic hardship will impact the entire family. Similarly, for a person of advanced age with TB who lives in a remote, economically deprived village far from the local community health centre and is dependent on public transportation that is not always available, there will be an additional burden placed on their family or friends. It is also complex for those with TB who have other co-morbid diseases such as Diabetes, HIV/AIDS, or malnutrition (WHO, 2022). The social stigma associated with TB adds further to the complexity of TB care (WHO, 2022).

For healthcare practitioners, treating TB can be overwhelming and both physically and emotionally challenging. Caring for patients with TB is like ‘running a marathon’. Endurance, persistence and constant motivation are critical for patients, their families, and the healthcare practitioners who care for them. One may think they have reached the finish line when the mandatory period of taking prescribed medication ends when, in fact, there is still a lot of work to be done to ensure this disease no longer affects patients and their families. For this very reason, TB care requires resilience and coordinated work (Aggarwal, 2019; Arsenault et al., 2019; Mustikawati et al., 2017; WHO, 2022). A team-based model that positions patients and their families not just as ‘objects of care’ but as part of the care team — a model aligned with an interprofessional-based approach (WHO, 2010), henceforth referred to as interprofessional care (IPE) or interprofessional collaborative practice (IPCP).

When I submitted the thesis proposal in early 2020, the overarching aim of the thesis was to improve TB services by providing an interprofessional care intervention in Indonesia and then assess the impact of the intervention on changes in the provision of care for TB patients both in hospitals and community clinics (i.e., within the Hasanuddin University [UNHAS] Health Community Service Program in hospital-based lung clinics and community clinics in Indonesia). This planned intervention consisted of an eight-week IPE program to enhance health professionals’ knowledge and capacity to deliver interprofessional care. However, when COVID-19 hit Indonesia between early 2020 and late 2021, the virus severely impacted the country. During this period, an intervention study that mobilised students, clinical supervisors, and TB patients was impossible. COVID-19 and TB have the same focus of infection - the lungs (Miggiano et al., 2020). Due to this pandemic, TB control programs throughout the world have experienced a setback to their targets equivalent to a decade of achievement (WHO, 2022). The proposed intervention study had to be discontinued, and significant changes were made to my research program to provide a solid foundation for future implementation. The changes made to this proposal focus on delivering quality outcome measures to evaluate the interventions' efficacy and quality improvements.

1.2 Problem Statements

A complex disease like TB requires the collaboration of several healthcare workers from various professions to ensure quality prevention, detection, and treatment (Aggarwal, 2019; Arsenault et al., 2019; Mustikawati et al., 2017; WHO, 2022). However, Indonesia faces a considerable gap between the pre-service/pre-qualification training provided to health professionals and the interprofessional competencies needed in real-life clinical settings (Djaharuddin et al., 2023). Today's pre-service training offers learning experiences with students from similar or the same professional backgrounds (Reeves & Freeth, 2002; Reeves et al., 2013). At the same time, the actual clinical practice settings require health practitioners with the competencies to collaborate with practitioners from different professional backgrounds once they enter the workplace.

The challenges associated with TB care in Indonesia's healthcare services are further compounded by the increasing complexity of various factors (Directorate General of Prevention and Disease Control, 2022), including 1) the shortage of healthcare workers, which makes it difficult to provide adequate care to patients; 2) the unequal distribution of healthcare workers across Indonesia’s more than 17 thousand islands; and 3) the limited diversification of healthcare professions, with doctors and general nurses dominating. Indonesia lacks other healthcare professions rooted in integrated health services, including specialised nurses, social workers, occupational therapists and physiotherapists who play a critical role in caring for patients with chronic diseases like TB. Although these professions are in demand, their availability is limited, and more need to be trained to ensure they are accessible to all who need them.

Indonesian national policy has begun to support the implementation of IPE and IPCP in healthcare education and clinical practice settings to advance the provision of integrated health services. IPE and IPCP have received strong support for implementation in hospitals and health educational institutions, playing a crucial role in the accreditation of these institutions in Indonesia (Indonesian Accreditation Agency for Higher Education in Health, 2023; Ministry of Health Indonesia, 2022). However, relevant institutions continue to question their ability to adopt these approaches. Some critical aspects concerning the implementation include 1) the lack of faculty support and training to gain the necessary skills and knowledge to teach IPE effectively, which can lead to ineffective and inconsistent delivery of IPE; 2) the lack of a standardised framework for IPE and IPCP implementation, both in the education and health systems leading to different institutions adopting varying approaches to IPE and IPCP, which can lead to inconsistencies in the delivery; 3) limited time and financial resources available for establishing and sustaining IPE and IPCP programs; and 4) the lack of quality measures to assess the intervention's performance indicators and outcomes (Djaharuddin et al., 2023; Findyartini et al., 2019; Prihatiningsih et al., 2017; Syahrizal et al., 2020).

Considering the global implementation of IPE and IPCP in patient care (WHO, 2010), these strategies hold the potential to substantially mitigate the challenges encountered in TB care programs in Indonesia. Through the adoption of IPE and IPCP, Indonesia has the opportunity to effectively narrow the gaps in TB services and enhance patient care. However, I contend that evidence-based measurement is essential for evidence-based practice. That is, access to valid and reliable measures to capture IPE and IPCP intervention outcomes is essential.

1.3 Research Framework

This program of research aims to develop reliable and valid measures that enable the assessment of outcomes for healthcare students and practitioners in Australia and Indonesia, as well as TB patients in Indonesia receiving interprofessional TB care. The framework of this program of research is provided in Figure 1.1. The framework will be discussed under the following headings: *IPE-IPCP Competencies, Outcomes Impact, Program of Research, and Studies.*

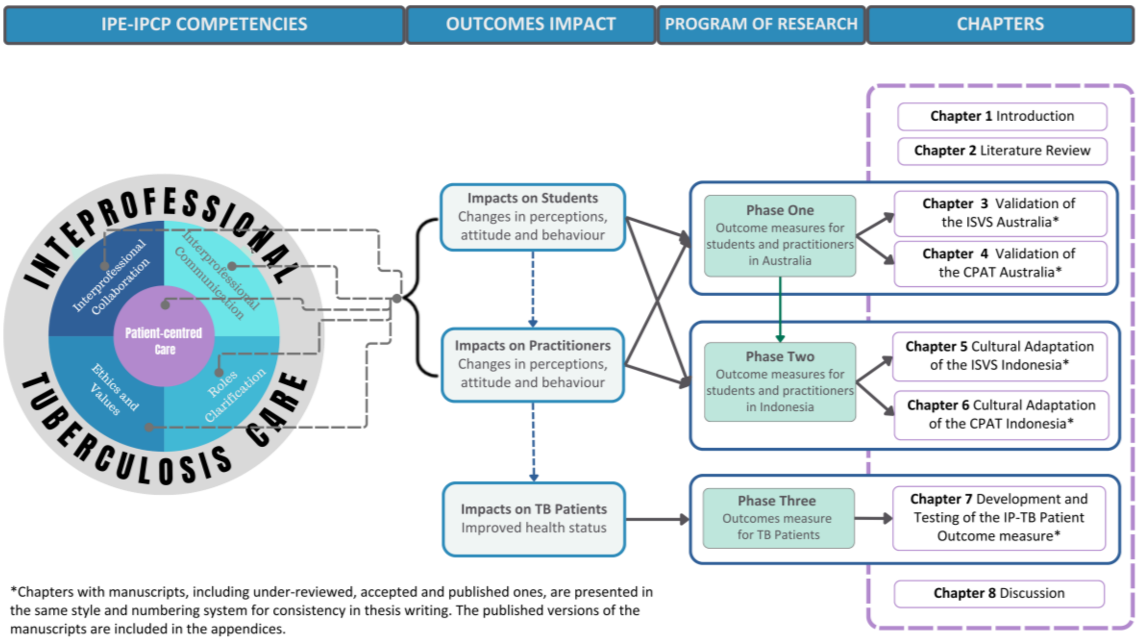

Figure 1.1 Study Framework

1.3.1 IPE-IPCP Competencies

The first component of the framework is a circular interprofessional TB care model. The model was developed by integrating the frameworks of Core Competencies for Interprofessional Collaborative Practice (Interprofessional Education Collaborative, 2016), the National Interprofessional Competency Framework (Canadian

Interprofessional Health Collaborative, 2010), and the Curtin University Interprofessional Capability Framework (Brewer, 2011). This model is underpinned by the essential pillars of interprofessional collaborative competencies, which include interprofessional collaboration, interprofessional communication, role clarification, ethics, and values. The core competency is patient-centred care.

The World Health Organization (WHO) states, "...interprofessional education occurs when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" (WHO, 2010, p. 3). The term 'professions' refers to occupational groups such as nurses, physicians, and pharmacists. Furthermore, the WHO states that collaborative practice occurs "...when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and community to deliver the highest quality of care across settings" (WHO, 2010, p. 3). One indicator that signifies interprofessional collaborative practice is if the participants engage in collective actions where they learn with, from, and about each other in pursuing collaborative goals (Barr & Coyle, 2013; Barr et al., 2016; Brewer & Flavell, 2018; Cox et al., 2016). The essence of interprofessional education and practice lies in the quality of collaboration among the participants. Furthermore, IPE and IPCP are ongoing and interrelated processes where providing quality IPE is essential for students and/or qualified healthcare workers to develop the competencies to implement IPCP in clinical practice settings. The specific practice context chosen for this study is interprofessional care related to TB management.

1.3.2 Outcomes Impact

To facilitate the transition between IPE and IPCP in practice settings, it is fundamental to ensure that measures are available to evaluate outcomes for health students, licensed practitioners and the patients to whom they provide care.

Very few measures are currently available worldwide to assess interprofessional outcomes in both educational and practice settings for healthcare students and practitioners. None of these measures has been validated for use in Australia. Furthermore, while some measures have been validated specifically for practitioners, others have only been validated for students in Indonesia. Validation of measures performed by only one cohort (either practitioners or students) or validation by both groups but under different circumstances (e.g., a measure validated separately with practitioners in Canada and students in Australia) does not meet the requirements for the generation of invariant measures for both cohorts in the given setting as the data may not be analysed simultaneously (Mokkink et al., 2018a; Mokkink et al., 2018b). An invariant measure is a measure that remains unchanged under a specific transformation or action. This means that the items' structure, meaning, and understanding are preserved or invariant under a particular group of transformations. For example, this could involve translating from the original language to another language. This concept holds true even when tested on different sets of populations, which, in this thesis case, involved health students and practitioners (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Before this program of research was conducted, only one invariant measure for use with healthcare students and practitioners could be found, the Interprofessional Socialisation and Valuing Scale (ISVS)-21 (King et al., 2016), which was validated in Canada.

Outcomes for IPE are often measured using Kirkpatrick's modified model (Oates & Davidson, 2015). This model measures program outcomes according to the following:

a) the learners' reaction (level 1),

b) changes in attitudes/perception (level 2a),

c) changes in knowledge and skills (level 2b),

d) changes in behaviours (level 3),

e) changes in organisational practice (level 4a), and

f) improvements in patient care (level 4b) (Barr et al., 2008; Reeves et al., 2015).

Most research on IPE and IPCP reports impacts on learning outcomes related to level 1 — learner reactions, level 2a — changes in knowledge and skills, and level 2b — attitudes and perceptions (Reeves et al., 2016). Fewer studies examine the achievement of level 3 outcomes. Additionally, published studies regarding the impact of interprofessional care on improving health services and patient care are minimal. While linking IPE involving undergraduate students to patient care outcomes is difficult (Barr et al., 2008; Morphet et al., 2014; Oandasan & Reeves, 2005), more evidence linking IPE for qualified health professionals to improve patient outcomes is needed.

The lack of reliable and valid tools to assess patient care outcomes presents a significant challenge in health professional education and practice (Canadian Interprofessional Health Collaborative, 2012; Kenaszchuk, 2013). This is further compounded by the lack of reliable and valid measures to assess IPE outcomes for students and practitioners (Oates & Davidson, 2015). To address these gaps, the focus for this program of research was the development of validated tools to measure the impact of IPE on practitioners' and students' perceptions, attitudes, and behaviour (Kirkpatrick's modified model of outcomes level 3) and the impact on interprofessional TB care on patient health (Kirkpatrick's modified model of outcomes level 4b).

1.3.3 Program of Research

Effective interprofessional collaboration hinges on developing and evaluating shared competencies across healthcare teams. Both Australia and Indonesia share a need for psychometrically robust, culturally adaptable instruments to measure interprofessional collaboration. However, their distinct healthcare system priorities shape the nature of these validation efforts. **Australia**, with its established emphasis on multicultural and team-based care, would benefit from ISVS and CPAT adaptation that bridges educational and professional domains. This approach could fill the existing gap in validated instruments for students and practitioners, fostering seamless transitions from IPE to workplace collaboration. **Indonesia** requires measures that can accommodate its healthcare system's structural and cultural heterogeneity, where collaborative practice is critical for addressing workforce and resource disparities (Directorate General of Prevention and Disease Control, 2022). Critically, both countries must prioritise longitudinal assessments that track the development of interprofessional identities from education to practice. By aligning validation efforts with these broader objectives, the measures could be pivotal in advancing collaborative care research and practice globally.

Several outcome measures have been validated with students in Indonesia, such as the Readiness for Interprofessional Learning Scale (RIPLS) and the Chiba Interprofessional Competency Scale (CICS29; Soemantri et al., 2020; Tyastuti et al., 2014), however not with practitioners. One measure has been validated with the practitioner (CPAT) but not with the students. On the other side of the spectrum, no published study was reported related to validating interprofessional outcome measures for either students or practitioners in Australia. Both Australia and Indonesia lack comparable measures that span the education-to-practice continuum. The extensive reliance on unvalidated/poorly validated measures in both countries' interprofessional studies reflects a broader issue within the field: the tendency to prioritise measure adoption over rigorous psychometric evaluation. This research program is expected to address these gaps, ensuring that these instruments are appropriately validated and contextualised for practitioners and students in Australia and Indonesia before being used.

Two instruments have become the focus of interest in this program of research. The Interprofessional Socialisation and Valuing Scale (ISVS)-21 and the Collaborative Practice Assessment Tool (CPAT). The CPAT is recognised for its potential to link IPE to collaborative practice outcomes, such as team performance and patient empowerment

(Schroder et al., 2011); thus, it has been widely used to measure team performance. The CPAT is recommended as the best instrument to assess interprofessional teamwork (Kang et al., 2022) and has been used in many countries, including Japan (Tomizawa et al., 2014), Taiwan (Ho et al., 2023), Indonesia (Yusra et al., 2019), Singapore (Quek et al., 2022), as well as multiple studies in the USA and Canada (Bookey-Bassett et al., 2016; Fisher et al., 2015; Khan et al., 2022; Nagelkerk et al., 2018; Paterson et al., 2013; Pfaff et al., 2014). In addition, the CPAT is acceptable for use in many different clinical contexts, such as primary and community care (Findyartini et al., 2019; Khan et al., 2022), mental health (Tomizawa et al., 2014), chronic disease management (Bookey-Bassett et al., 2016), postgraduate training of healthcare professionals (Ho et al., 2023), patient safety (Fisher et al., 2015; Paterson & Britten, 2005), and patient satisfaction (Fisher et al., 2015). However, its application has been primarily confined to healthcare practitioners, with no evidence of use among students.

The CPAT's initial validation in Canada laid the groundwork for its application by demonstrating acceptable internal consistency across its eight subscales, with Cronbach's α values ranging from 0.67 to 0.89. However, significant limitations in its psychometric rigour cast doubt on its reliability. Notably, the exploratory and confirmatory factor analyses conducted in the original studies were hindered by small sample sizes (first pilot, n = 42 and second pilot, n = 111), compromising the robustness of the structural validity of the measure. Furthermore, key subscales such as **Communication** and **Patient Involvement** failed to meet predefined model fit indices, suggesting potential flaws in the tool's structural design. These foundational limitations raise concerns about the CPAT's capacity to function as a universal instrument without extensive validation. Indonesia's efforts to adapt the CPAT reflect its growing recognition of the importance of interprofessional collaboration in addressing systemic healthcare challenges, such as workforce shortages and fragmented service delivery (Directorate General of Prevention and Disease Control, 2022). Yusra et al. (2019) adapted the CPAT to the Indonesian context, removing three items and retaining 53, which exhibited acceptable internal consistency during exploratory factor analysis. However, the model suggested by the original instrument (an 8-Factor, 56-Item solution) was not tested for model fit in that study. Moreover, the CPAT was validated specifically for use with Indonesian students; its validation with practitioners alone cannot justify its application to student populations.

The Interprofessional Socialisation and Valuing Scale (ISVS) is widely acknowledged as a key measure in this domain and is claimed to be the best measure to assess multiple levels of interprofessional outcomes based on the Kirkpatrick modified model (e.g., reaction, perception/attitudes, knowledge/skills and behaviour; Oates & Davidson, 2015). However, its development and use warrant closer scrutiny. The ISVS-24 (King et al., 2010) was designed to evaluate three distinct domains related to team interprofessional competencies: self-confidence (9 items), attitudes (9 items), and behaviour (6 items), with acceptable reliability (Cronbach's α: 0.79–0.89). The measure was later refined to ISVS-21 and is described as unidimensional and demonstrated strong psychometric properties compared to its earlier version (Cronbach’s α = 0.988; King et al., 2016). The ISVS-21 has been adopted internationally and cross-culturally (De Vries et al., 2016; Mahler et al., 2023), but its predominant use with students raises concerns about its applicability and generalisability to practitioners. Many Australian studies have used this measure, primarily focused on student participants (e.g., Bloomfield et al., 2021; Brewer & Stewart-Wynne, 2013; Cartwright et al., 2015), with one reported research involving practitioners (Shaw et al., 2023). Perhaps most critically, neither the ISVS-24 nor ISVS-21 has been validated for Australian students or practitioners.

Despite the progress elaborated above, significant gaps remain in the validation process for the two measures and highlight a broader issue: the lack of validated measures that connect pre-qualification education with workplace practice. The absence of multi-group confirmatory factor analysis, measurement invariance, and construct validity for hypothesis testing limits the measures’ ability to yield reliable invariant measures between practitioners and students or across diverse healthcare settings.

The overarching aim of this thesis, as outlined in the framework presented in Figure 1.1, p. 5, is to develop instruments for measuring IPE and IPCP outcomes for three key stakeholders: practitioners, students, and patients. The instruments for all three stakeholders are equally important and foundational to advancing interprofessional-based TB care. The phases of the thesis were structured to address different aspects of this overall aim, focusing on developing IPE and IPCP measures for each stakeholder group.

The initial phase (Phase 1) focused on validating two IPE and IPCP measures in Australia, where the PhD candidate studied. The subsequent phase (Phase 2) focused on developing two IPE measures in Indonesia, where the PhD candidate lives and works. Findings from Phase 1 were used to inform the validation of measures in Phase 2. The final phase (Phase 3) was specifically designed to develop a measure for assessing the quality and functional impact of an interprofessional model of TB care on the patient. The measures developed for healthcare practitioners and students (from Phase 1 and 2) can be applied across diverse education and practice contexts, and the outcome measure for patients (from Phase 3) is specifically tailored to address the unique challenges of TB care.

The order of the phases is not hierarchical. One may argue that Phase 3 is the most important phase of the study and, therefore, should come first. The reason Phase 3 was conducted last relates to the specific challenges encountered during the study. As detailed in the ***Introduction*** *s*ection ***1.4 Background to Research, p. 2***, the original study design was planned to involve patients earlier. However, the COVID-19 pandemic made it infeasible to mobilise TB patients, requiring a modification to the study design, ultimately precluding patient participation in this study.

Furthermore, although Phase 3 aimed to develop a patient-reported outcome measure for TB health outcomes, at this point in time, this research was focused on piloting and validation with TB care providers instead of patients (due to time and

COVID-19 constraints, patient involvement was designed as part of the future development of the instrument and not included in this thesis). **CO**nsensus-based Standards for the selection of health **M**easurement **IN**struments (COSMIN), the guidelines used throughout this program of research, emphasise the importance of involving care providers in the initial stages of the instrument development to ensure methodological rigour before direct patient involvement (Mokkink et al., 2018a; Mokkink et al., 2018b).

1.3.4 The Need for Research in Australia

Although the ultimate goal of this research program is to improve interprofessional TB care in Indonesia, including Australian populations was a necessary adaptation due to the logistical challenges posed by the COVID-19 pandemic, as explained in the background section. This adjustment ensured the continuity of research by shifting data collection to an online format, avoiding the need for physical interaction required in the original study design.

Beyond the need for a practical adjustment, including Australian populations was also an intentional scientific step to establish foundational validity for measures of IPE and IPCP outcomes. As a doctoral candidate studying in Australia while researching TB care challenges in Indonesia, I leveraged the opportunity to validate these measures in Australia for several reasons:

a) The ISVS and CPAT, initially developed in English, have not yet undergone comprehensive validation within an English-speaking cultural context, including evaluations of reliability, content validity, structural validity, and construct validity. Previous validation studies of the ISVS and CPAT instruments only addressed individual psychometric properties, and none included content validity within the context to which they were adapted. Additionally, because this research introduced a new psychometric evaluation, namely ensuring that these instruments are reliable, valid and invariant for two distinct cohorts — practitioners and students, performing the initial validation in an English-speaking context was essential. While cultural differences between Canada (where the instruments were developed) and Australia were acknowledged, Australia was considered a more suitable starting point than directly validating the instruments in Indonesian. This approach minimised the challenges associated with cultural and linguistic adaptations, allowing for a more rigorous assessment of the instrument's psychometric properties before tailoring them to the Indonesian context.

b) The measures developed during this thesis aim to be robust across different educational and practice contexts. Conducting the initial validation with Australian healthcare students and practitioners provided the opportunity to ensure psychometric robustness before adaptation to the Indonesian context. The Australian context allowed for testing and validating the measures under a better-established IPE and IPCP system, which Indonesian health systems aim to adopt.

c) The frameworks used in this thesis—such as the WHO's interprofessional care standards and other internationally recognised competency frameworks—are globally applicable. By comparing perceptions, attitudes and behaviour in a developed healthcare setting, like Australia, with those in a resource-constrained setting, like Indonesia, this program of research aimed to understand how interprofessional competencies translate across diverse contexts. This step was crucial for ensuring the scalability and relevance of the measures. Lessons learned from Australian cohorts informed how IPE and IPCP competencies could be adapted to address specific challenges in Indonesian healthcare, such as the need for collaboration among diverse healthcare providers in a TB care setting.

1.3.5 Studies on Interprofessional Outcomes

Healthcare practitioners and students are two distinct groups with different characteristics. Factors such as age, years of study and service, professional background, practice setting (e.g., classroom, hospital, or community), team environment, and leadership model can significantly influence how individuals respond to any particular item in a measure. For these reasons, an invariant measure representing both targeted cohorts is essential, as some items may be less critical for one cohort but very important for another cohort. During measurement invariance analysis, items with significant differences between the two cohorts are moderated or discarded.

To generate invariant measures, they must be validated simultaneously on the targeted populations of interest (i.e., healthcare students and practitioners), and further psychometric analyses are needed to indicate that the tested measures are invariant for the populations tested. Invariant measures enable the independent measurement of outcomes from each cohort to predict the current status of the two levels of settings. Additionally, these measures allow for analysing the transition between the two levels. For example, students' development of interprofessional competencies can be identified and then adjusted with practitioners' outcomes serving as a reference point. Target competencies critical for interprofessional experiences (IPE or IPCP), such as interprofessional teamwork, interprofessional communication, clarity of team roles, leadership, ethical values, and respect, can be measured in and compared between both cohorts. As such, this thesis advances the interprofessional field in Australia and Indonesia, which lack valid and reliable invariant measures developed for use in their context.

The Collaborative Practice Assessment Tool (CPAT) (Schroder et al., 2011) and the Interprofessional Socialisation and Valuing Scale 21 (ISVS-21) (King et al., 2016) were the two measures selected for validation in Australia and Indonesia. The ISVS-21 is the only measure that comprehensively assesses multiple levels of interprofessional outcomes based on the Kirkpatrick-adapted model levels 1 to 3 (Oates & Davidson, 2015). At the same time, the CPAT was considered the best measure to assess IPCP because of its comprehensive construct (Kang et al., 2022).

1.4 Evaluation of Psychometric Properties

1.4.1 CQnsensus-based Standards for the selection of health Measurement INstruments

Researchers and clinicians often find it challenging to choose outcome measures due to the numerous measures available to assess the same construct for their study's target population (Paterson & Britten, 2005). New measures are constantly being developed and published, further compounding this challenge.

Considerations often raised in measurement selection include those related to the measure's conceptual constructs (content validity and comprehensiveness aspects), practical aspects pertaining to its administration (practicality, flexibility, feasibility, timeliness), and, most importantly, the measure's quality (validity, reliability and responsiveness) (Mokkink et al., 2018a; Mokkink et al., 2018b). Selecting measures with poor-quality psychometrics can cause bias and erroneous conclusions. This raises ethical concerns because research participants contribute little or nothing to the body of evidence but still bear the burden and risks of the research. Ensuring that the measures used in research are reliable, valid, and appropriate to meet the study's objectives is essential. If the available measures are of poor quality, it is important to design a new, high-quality measure.

Initially established in 2005 and later refined and equipped with a taxonomy of psychometric terms and a set of standards to determine bias in 2018, the **CO**nsensus-based **S**tandards for the selection of health **M**easurement **IN**struments (COSMIN) is instrumental in enabling the selection of the most appropriate research outcome measures. The COSMIN initiative was introduced to overcome the challenges regarding measurement selection and the inconsistent use of psychometric terminology. COSMIN provides clarity in the literature regarding terminology and definitions of measure properties and offers suggestions regarding the best and alternative methods that can be used to determine and evaluate measure psychometric properties. The COSMIN team consists of an international multidisciplinary team of researchers with backgrounds in epidemiology, psychometrics, medicine, qualitative research, and healthcare who have expertise in developing and evaluating outcome measures. COSMIN is recommended as a framework for measure developers and people identifying the most appropriate measure for their purposes. The COSMIN risk of bias checklist is the latest set of recommendations in the field. Other quality rating criteria for assessing psychometric properties are available. These criteria include the Andresen criteria (Andresen, 2000), Bombardier and Tugwell criteria (Bombardier & Tugwell, 1982), McDowell and Jenkinson criteria (McDowell & Jenkinson, 1996), the Terwee standard checklist (later re-developed into COSMIN by Terwee et al., 2007), and the Scientific Criteria Medical Advisory Committee (SAC) of the Medical Outcomes (Scientific Advisory Committee, 1995). However, these criteria do not offer the same comprehensive coverage of all psychometric properties as COSMIN. Furthermore, their development did not involve international consensus.

The COSMIN taxonomy and standards for measurement properties are divided into three broad groups of psychometric domains and include nine measurement properties considered relevant for health-related measurement (Mokkink et al., 2018a; Mokkink et al., 2018b). The domains and properties classifications are 1) *Reliability*, containing the measure properties of internal consistency reliability and measurement errors; 2) *Validity*, containing the measure properties of content validity, criterion validity, and construct validity, which is further divided into structural validity, cross-cultural validity (measurement invariance), and hypothesis testing; and 3) *Responsiveness*, containing the measure property of responsiveness. COSMIN also acknowledges interpretability as an essential aspect of a measure, but it is not considered a measure property per se.

COSMIN has a robust quality rating system to determine the risk of bias for testing psychometric properties. COSMIN assesses measures systematically against two important assessment domains: the quality of research methodology and the quality of measures' psychometric properties. Each psychometric property has independent measurement standards and criteria to rank the quality of each property investigated in a study on a 4-point rating scale of '*very good', 'adequate', 'doubtful', 'inadequate',* and *'not applicable'*. The method allows for assessing the measure's overall quality and quality at the subscale level, making COSMIN unique and advantageous over other tools. Having separate quality scores for each psychometric property in a measure provides a more comprehensive basis for assessment, so properties considered 'weak' cannot be masked by the overall rating. Another advantage of COSMIN is the detailed instruction manual. The COSMIN risk of bias checklist supports the quality grading process and ensures the tool is user-friendly (Mokkink et al., 2018a).

COSMIN also provides standards for study requirements and recommended statistical analyses for each measurement property (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). The COSMIN taxonomy of psychometric properties, standards, and quality criteria makes COSMIN a robust framework for assessing the quality of the psychometric properties of existing measures and a guide for developing new measures. Throughout this thesis, all procedures, including general requirements for measure development and testing, such as sample size and target population requirements, the translation process, data collection, data analysis, and reporting, followed the COSMIN taxonomy and standards of psychometric properties (Gagnier et al., 2021; Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018).

1.4.2 Classical Test Theory Versus Item Response Theory

As stated previously, identifying a measure's psychometric properties is essential. Psychometric properties can determine the quality of a measure used to analyse the intended construct. In psychometric studies, two approaches are used to analyse a measure: Classical Test Theory (CTT) and Item Response Theory (IRT). CTT is considered a conventional analytical technique compared to the more modern IRT.

Classical Test Theory (CTT) is a technique where the analysis is conducted at the level of the measure (Cappelleri et al., 2014). CTT assumes that each individual has a true score (T) that can be obtained if there is no error (E) in the measurement. The true score shows the value of the construct, trait or ability intended to be measured. A measure generally cannot directly produce the true score value but can produce an observation score (X), which is the sum of the true score (T) and the measurement error (E); $X = T + E$. The test score on CTT has a linear model, meaning that, typically, the higher the observation score obtained from a test, the more superior the individual item is in the intended construct to be measured. Statistical aspects tested in CTT include reliability, which typically uses Cronbach's α score (Terwee et al., 2018), item difficulty level, item discrimination, distractor effectiveness, and standard error measurement (SEM).

In contrast to CTT, IRT analysis is carried out at the item level (Bond & Fox, 2013). Using the Rasch approach, test items are more likely to be answered correctly by people with high ability on the measured construct. In IRT, the scores resulting from a test are not linear, and the difference between two consecutive test scores cannot be considered to represent the same interval. Rasch analysis will produce an estimate of the ability (Bond & Fox, 2013; Boone & Noltemeyer, 2017). The level of individual ability is referred to as theta (θ). It can be identified by looking at the individual's response to the item and its parameters (e.g., item difficulty level).

A measure with many items tends to have more reliable scores when evaluated with CTT, so the sample characteristics (i.e., sample size and number of variables) influence the measure's reliability. Using parameters at the item level (IRT), measures with fewer items can provide more reliable scores, so the sample size and number of variables in a measure do not affect its reliability (Cappelleri et al., 2014; Jabrayilov et al., 2016).

When evaluating a measure's quality, it is essential to recognise that both the CTT and Rasch approaches (IRT) have strengths and weaknesses. While some argue that one approach is better, both can provide sufficient evidence to assess a measure's quality. The critical factor is understanding the criteria to consider when using the CTT or Rasch approach.

1.4.2 Classical Test Theory: The Preferred Methodology

This research is based on the CTT approach. The choice to use CTT was first and foremost because the ISVS and CPAT measures, which are central to this research, were primarily developed and validated using CTT methodologies. Given this foundation, this study needed to align with the established methodology to maintain comparability with prior research and the existing evidence base.

Additionally, CTT's application was deemed suitable within the framework of the COSMIN standards, which provided an established and practical approach to evaluating the psychometric properties of health-related measures. CTT's focus on *measure-level* analysis made it particularly appropriate for the goals of this study, which sought to assess internal consistency reliability, content validity, and construct validity. COSMIN emphasises the importance of selecting the right psychometric methods. CTT was the most feasible option given this research's sample sizes and analytical techniques, which aligns well with the COSMIN statistical standards.

While Item Response Theory (IRT) offers advantages at the *item level,* the sample size in this study did not meet the requirements for IRT analysis. The sample requirements of all four validation studies (studies presented in Chapter 3 to Chapter 6) generally met the COSMIN standard requirements of *'very good', 'good'* and '*adequate*'; however, it was not possible to carry out IRT on the sample size for the Australian CPAT validation (Chapter 4) as the practitioner's sample size fell under COSMIN's '*doubtful*' category relative to the number of items tested (*n*=134). In contrast, CTT's flexibility allowed for comprehensive analysis despite these limitations. CTT is well-suited for the type of data available; as later confirmed, the CPAT dataset met the "*very good*" requirement for sample adequacy for factor analysis with Kaiser-Meyer-Olkin index (KMO) of 0.900 and the Bartlett test of sphericity with $p<0.05$. As a result, all analyses were conducted using CTT to keep the methodology consistent.

Specifically, CTT in this program of research was used to measure the psychometric properties of the measures' *content validity, internal structure* (including analysis of *structural validity*, *measurement invariance*, and *internal consistency reliability*), and *hypothesis testing* for *construct validity*. Structural validity analysis used multilevel factor analysis, including EFA (Exploratory Factor Analysis), CFA (Confirmatory Factor Analysis), and MG-CFA (Multi-group Confirmatory Factor Analysis). Measurement invariance analyses were also conducted in stages, including Configuration, Metric and Scalar invariance analyses. The relevant data analysis performed in each validation study differed depending on the needs. An infographic at the start of each chapter with a validation study provides an overview of the psychometric properties evaluated in each study.

1.5 Overall Aims

Overall, this program of research comprised three phases that aim to develop and validate quality measures with good psychometric properties regarding content validity, internal structure (i.e., structural validity, internal consistency reliability, and measurement invariance), and hypotheses testing to measure the interprofessional outcomes for cohorts: a) healthcare students in Australia and Indonesia; b) healthcare practitioners in Australia and Indonesia; and c) TB patients involved in interprofessional TB care in Indonesia. The availability of the quality, valid, and reliable measures developed will provide a robust scientific basis for evaluating, determining treatment progress, and assessing the efficacy of interprofessional approaches to TB intervention.

1.6 Significance of the Research

There has been no published research investigating the impact of IPE and/or IPCP outcomes on healthcare students, practitioners and patients in relation to improving TB care in Indonesia. One contributing factor is the absence of validated measures. This research makes a significant contribution to health professional education and healthcare in Indonesia by providing: 1) valid and reliable IPE outcome measures that can be used in institutions training students on TB care; 2) valid and reliable outcome measures that can be used for with healthcare practitioners involved in IPCP for TB care in the clinical work settings; and 3) a valid and reliable tool for measuring the impact of interprofessional care for TB patients.

This program of research will have a reciprocal impact, benefiting not only the Indonesian health system but also contributing significantly to the Australian healthcare landscape. The Australian-validated measures will substantially advance the evidence base for IPE and IPCP outcomes in Australia. The development of these measures for Australia was crucial to this program of research because their development informed the development of the Indonesian measures.

1.7 Thesis Structure

This thesis is structured following a hybrid thesis presentation, consisting of Chapter 1 Introduction; Chapter 2 Literature Review; Chapters 3 to 7 comprise the body of this thesis, each of which is a journal manuscript, either published in a peer-reviewed journal or a manuscript currently in press or under review; and concludes with Chapter 8 Discussion and Conclusion. References are provided for each chapter. A graphic is presented at the beginning of each chapter to guide the layout and presentation of the thesis. For example, Chapter 1, as highlighted in pink in Figure 1.2 below, indicates that this section is part of Chapter 1.

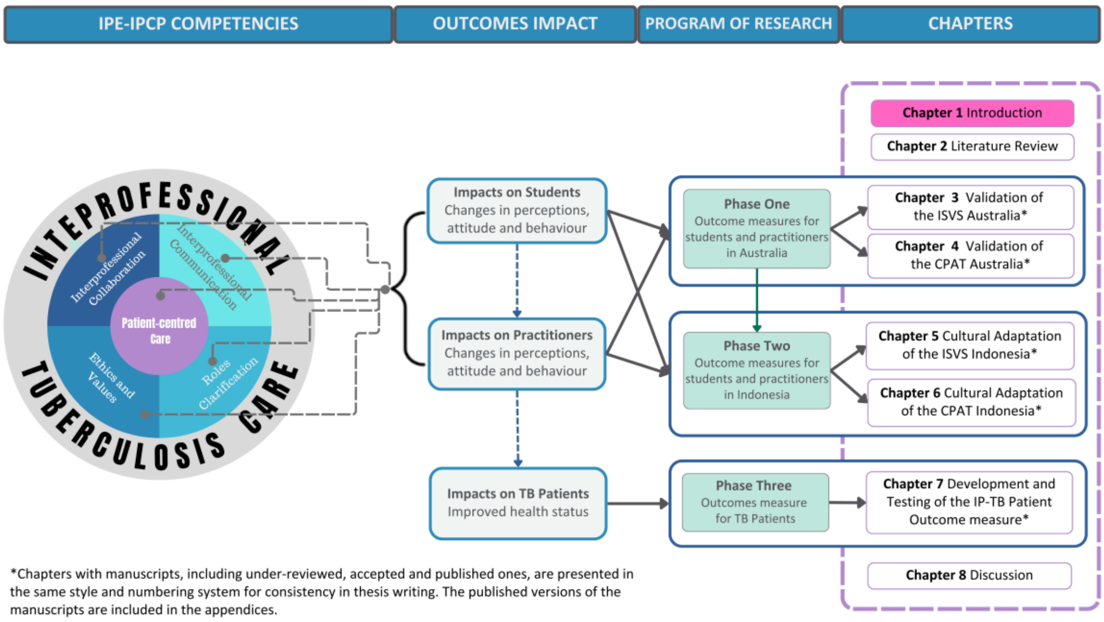

Figure 1.2 Chapter's Guide

Each chapter of this thesis is structured as an independent study, yet together, they contribute to a unified objective: the development and validation of reliable measures to evaluate interprofessional outcomes and their application within tuberculosis (TB) care. The framework presented in Figure 1.1 (p. 5) serves as the conceptual model, linking the development of interprofessional education (IPE) and interprofessional collaborative practice (IPCP) competencies to improve TB care outcomes. While each study validates a specific component of this model, their integration ultimately paves the way for the future implementation of interprofessional-TB care interventions in Indonesia.

The studies are synthesised in the following way:

- Chapters 1 and 2 lay the foundation by highlighting the critical need for IPE and IPCP frameworks in TB care, outlining both the background and the problem statements.
- Chapters 3 and 4 focus on validating measures in Australia, providing the groundwork for their potential application in Indonesia.
- Chapters 5, 6, and 7 address the unique challenges of interprofessional TB care in Indonesia, culminating in developing a tailored measure for IPE and IPCP outcomes specific to the Indonesian context.
- Finally, Chapter 8 synthesises and summarises the findings, offering an integrated discussion of the studies' implications for advancing interprofessional TB care.

This structure allows for a step-by-step approach, where each study not only stands alone but also contributes to a broader, cohesive narrative on the role of interprofessional collaboration in improving TB care outcomes, particularly in the Indonesian setting.

1.7.1 Chapter 1

Chapter 1 of the thesis serves as an introduction, offering a comprehensive overview of the background to the program of research and highlighting its significant scientific contribution to health professional education and healthcare services in both Australia and Indonesia. In this chapter, the framework of the program of research is outlined, with a particular focus on two main themes: interprofessional care and tuberculosis-based care. Emphasis is placed on the significance of the program of research in addressing these critical areas. Furthermore, the chapter details the standardised quality rating measures used to guide the study, showcasing the meticulous evaluation of the measure's psychometric properties. Additionally, the organisational structure of the thesis is laid out in this chapter.

1.7.2 Chapter 2

Chapter 2 delves into the underlying theories and concepts that form the basis of this research and provides a critique of the relevant literature. This chapter also examines the lessons learned from previous research related to this topic, thereby providing a perspective on the substance of the three phases with existing theories and concepts.

1.7.3 Phase One - Validation of Outcome Measures for Healthcare Practitioners and Students in Australia: Chapters 3 and 4

Phase One involved two studies (presented in Chapters 3 and 4), each representing the validation of a measure to analyse interprofessional outcomes in healthcare practitioners and students in Australia. Chapter 3 discusses the validation of the Australian Collaborative Practice Assessment Tool (CPAT), while Chapter 4 discusses the development of the Australian Interprofessional Socialisation and Valuing Scale-21 (ISVS-21). Although both measures were initially developed in English with Canadian populations, as per COSMIN recommendations, content validity checks are strongly recommended if intended to be used in Australia as part of the measure development requirements. Therefore, both measures underwent pilot testing for content validity assessment before being validated.

The pilot testing explicitly evaluated the measures' items based on *relevance* (the importance of inclusion), *comprehensibility* (clarity), and *comprehensiveness* in measuring the construct. The results were used as a basis for item revision or inclusion for validation. Following the validation of the items, the internal structure of the measures was evaluated based on three analytical steps: Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Multi-group Confirmatory Factor Analysis (MG-

CFA), followed by Measurement invariance analysis and hypothesis testings. Measurement invariance analyses were conducted to determine if the measures were equivalent for use in both target populations (healthcare practitioners and students).

The aims of the study presented in Chapter 3 were to:

a) validate the ISVS-21 in Australia;

b) evaluate the psychometric properties of the validated measure in terms of content validity and internal structure (i.e., structural validity, internal consistency reliability, and measurement invariances). In particular, an evaluation of the internal structure of the measure was carried out to determine the invariance of the measure across the groups tested (practitioners and students) to ensure the measure's reliability and validity for use in both cohorts, and

c) perform hypotheses testing for construct validity.

The aims of the study presented in Chapter 4 were to:

a) validate the CPAT in the Australian setting and provide a quality measure in terms of psychometric properties that can be used to measure interprofessional outcomes for both healthcare practitioners and students;

b) evaluate the internal structure of the measure (i.e., structural validity, internal consistency reliability, and measurement invariances); and

c) perform hypotheses testing for construct validity using previously validated path models.

Findings from Chapters 3 and 4 informed the development of the Indonesian measures outlined in Chapters 5 and 6.

1.7.4 Phase Two – Validation of Outcome Measures for Healthcare Practitioners and Students in Indonesia: Chapters 5 and 6

Phase Two replicated Phase One to provide a robust, quality measure representing Indonesian culture. Chapter 5 discusses the cross-cultural validation of the

ISVS-19 measure for Indonesia, while Chapter 6 discusses the cross-cultural validation of the CPAT measure for Indonesia. The Indonesian ISVS-19 and CPAT validation also used COSMIN guidelines and standards for measure development.

The key difference between the two Indonesian studies was that the ISVS-21 was translated back-to-back from English to Indonesian and back to the original language. Trial testing was then undertaken to ensure the ISVS-21 constructs included in the translated measure appropriately represented the constructs to be measured. The CPAT was not translated and piloted because this study used the previously translated Indonesian CPAT. The psychometric properties of the Indonesian version of the ISVS-21 and CPAT measures were then evaluated.

The aims of the study presented in Chapter 5 were to:

a) translate the ISVS-21 into Indonesian;
b) perform cross-cultural validation by evaluating content validity and internal structure of the translated measure (i.e., structural validity, internal consistency reliability, and measurement invariances); and
c) conduct hypotheses testing based on predetermined assumptions related to the construct of interprofessional socialisation (age, length of work, and professional or educational background).

The aims of the study presented in Chapter 6 were to:

a) perform cross-cultural validation of the CPAT;
b) evaluate the internal structure of the measure (i.e., structural validity, internal consistency and measurement invariances); and
c) test hypotheses for construct validity using a validated conceptual framework for interprofessional collaboration.

1.7.5 Phase Three - Development of a Patient Outcome Measure for Interprofessional Tuberculosis Care: Chapter 7

Phase Three (Chapter 7) outlines the development of a patient outcome measure for interprofessional Tuberculosis care (IP-TB care) in Indonesia. This final study's overall aim was to develop and evaluate a patient outcome measure for interprofessional TB care, a measure that can be used to quantify the quality and functional impact of an interprofessional model of TB care on the patient, as reported by the patient. The following four steps were followed:

a) developing a conceptual framework for the measure and the creation of items;
b) testing the measure through a Delphi study to obtain international participants' consensus regarding the components to be included in the measure;
c) performing a back-to-back translation into Indonesian; and
d) testing the measure with a second Delphi round to obtain consensus from Indonesian participants.

1.7.6 Discussion Chapter

The final chapter (Chapter 8) synthesises all of the research findings, contextualises the stated aims, and analyses the current program of research's strengths, limitations, and contributions to the world of knowledge. Opportunities and potential impacts on future practice are explored, and directions for future research are mapped.

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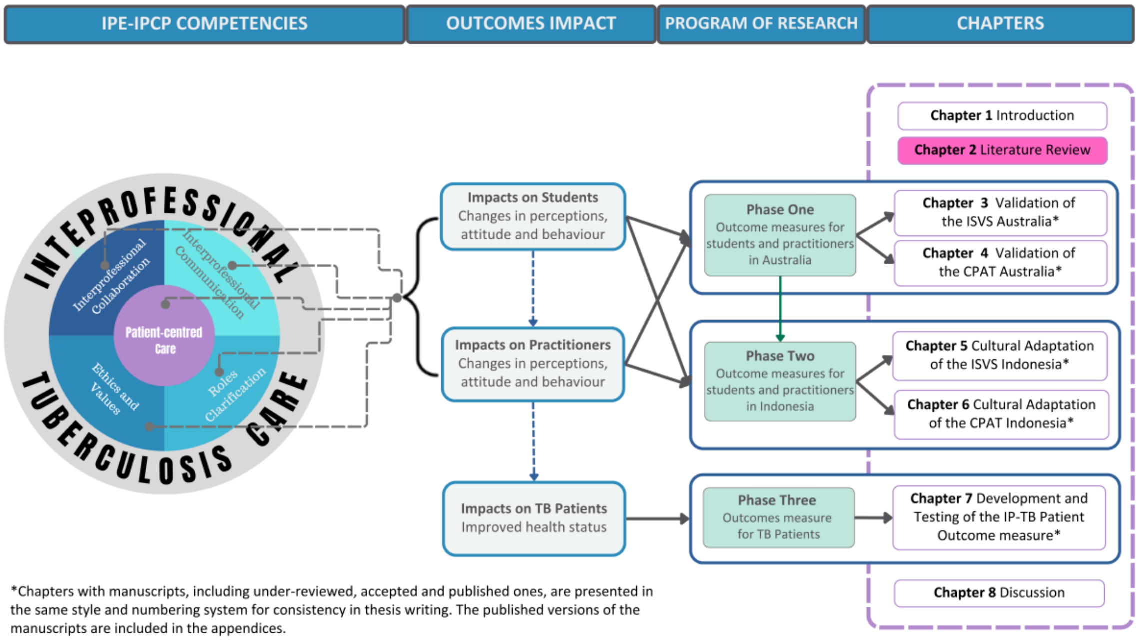
Chapter 2 Literature Review

This chapter explores the theories and concepts underpinning this thesis, critically analyses the relevant literature, and draws from previous research, providing valuable insights into the alignment of studies conducted with existing theories and concepts.



2.1 Interprofessional Collaboration in Health

The World Health Organization (WHO) published its first seminar report on interprofessional education (IPE), *Learning Together to Work Together,* in 1988 (WHO, 1988). This report called for health professionals to learn together so they could effectively work together to achieve improved health outcomes in communities across the globe. Limited change to health professional education was observed, so they made another call for change 18 years later in their report, *Working Together for Health* (WHO, 2006), encouraging health and social care professionals to work collaboratively with their colleagues from different professions and for educational institutions to prepare graduates for this interprofessional way of working. Their most recent report explicitly focused on IPE — *Framework for Action on Interprofessional Education and Collaborative Practice* (WHO, 2010) — resulting from two years of dedicated work by a team of international experts and gathering information from 42 countries. The framework (WHO, 2010) is a "call for action to policymakers, decision-makers, educators, health workers, community leaders and global health advocates to move towards embedding IPE and CP into all of the services they deliver" (p.13).

Coinciding with the release of this third WHO report, a study was published by the WHO expert group (described above), providing a baseline regarding the progress made in global IPE programs (Rodger et al., 2010). The study, involving students and educators from several health-science backgrounds across 42 countries, indicated that an interprofessional approach had been implemented in various healthcare service settings across many healthcare professions in both high- and low-income countries (Rodger et al., 2010). However, IPE was reported to often be voluntary (22%), without clear learning outcomes (34%), not aligned with other learning and assessment (63%), offered by untrained facilitators (69%), and not being formally evaluated (30%). Despite the complexities associated with implementation, IPE demonstrated measured and tangible benefits for education, policy-making, and healthcare services (Rodger et al., 2010; WHO, 2010). For example, interprofessional services positively impacted patient satisfaction, hospitalisation duration, hospital visits, malpractice acts, and health costs (WHO, 2010).

2.1.1 Global Status

A recent survey on the implementation status of IPE has not only shed light on the progress made in the last decade but also highlighted areas for improvement (Khalili et al., 2022). Based on a survey involving 152 institutions from six different regions worldwide, the study found that 51.9% of participating institutions had established IPE programs. The remaining institutions were either in the process of establishing an IPE program (28.3%) or did not have an existing program or curriculum in place (19.8%).

The review highlighted the lack of agreement regarding the best format for IPE implementation (Khalili et al., 2024; Khalili et al., 2022). While just over half of the institutions used an interprofessional competency framework to structure their IPE learning objectives, 47.6% did not use such a framework. Globally, the most utilised interprofessional competency frameworks included the Interprofessional Education Collaborative Competency (IPEC) Framework (*n*=35), the Canadian Interprofessional Health Collaborative (CIHC) Competency Framework (*n*=34), the Centre for the Advancement of Interprofessional Education (CAIPE)/UK IPE Framework (*n*=4), and the WHO Framework (*n*=3). Some institutions use a combination of two or more frameworks (*n*=3), and some developed their own framework (*n*=8) (Khalili et al., 2022).

The implementation of IPE varies significantly across regions. North America boasts the highest number of IPE programs, while Africa lags behind with the lowest (Khalili et al., 2022). Over 40% of North American institutions have successfully integrated IPE for over five years. However, in Africa, 71% are still in the early stages, with less than five years of implementation or an unknown starting point. Additionally, the report reveals that 37% of institutions lack a formalised IPE structure and urgently require a dedicated IPE coordinator or leadership role.

Specific to my own region, Southeast Asia, of the 152 institutions involved in this global survey, 23 were from Asia (15.1%), three of which were Southeast Asian countries (Khalili et al., 2022), with Indonesia contributing the most participants (*n*=8), followed by Malaysia (*n*=1) and Thailand (*n*=1). As mentioned in the report, one Indonesian institution uses the Indonesian IPE Framework (Khalili et al., 2022). This framework was only used by the institution that developed it. It is unclear whether the other seven institutions were aware of the proposed national Indonesian IPE framework. Further research is needed to gain insight into the dynamic profile of IPE in Indonesia, determine the level of commitment from Indonesian institutions to support IPE, and identify possible barriers to implementing the IPE and IPCP program as a national initiative.

Approximately 60% of academic institutions indicate that they assess interprofessional collaborative competencies and interprofessional learning outcomes. In Asia, 12 out of 19 institutions (70%) indicated they assess students' IPE achievements. Unfortunately, no information is available regarding the specific instruments used to evaluate these learning outcomes. However, the report indicated a need for a more unified assessment of educational outcomes.

Despite criticism that the survey was not comprehensive and not fully representative of global IPE practice (i.e., the survey was conducted exclusively in English as an online self-report), it does provide a useful perspective on the global status of IPE implementation. It is clear from the results that there is much progress still to be made for IPE to achieve universal recognition on a global scale. Furthermore, the complexities involved in implementing IPE and IPCP (Xyrichis et al., 2018) suggest that achieving consensus on a universally recognised framework may be a challenging endeavour. The survey adds value by identifying essential factors that significantly contribute to the successful implementation of IPE (i.e., supportive senior leadership, a culture of collaboration, strategic prioritisation of IPE activities, and centralised funding). Institutions can use these findings to improve their IPE programs.

2.1.2 Indonesian Status

Beyond the global survey results reported above, several universities in Indonesia have paved the way towards implementing IPE and IPCP. Published reports about IPE and IPCP activities in Indonesia are emerging. However, the numbers are still small relative to the population of Indonesia and the number of Indonesian higher education institutions. The universities that have published articles reporting on the implementation of IPE and/or IPCP are Gadjah Mada University (Prihatiningsih et al., 2017; Widyandana, 2018); University of Indonesia (Findyartini et al., 2019; Yusra et al., 2019); Syiah Kuala University (Syahrizal et al., 2020); Diponegoro University and Sultan Agung Islamic University (Pamungkasari et al., 2020); Sebelas Maret University (Ghurafa et al., 2022; Toman et al., 2016); Lambung Mangkurat (Arifin & Hafifah, 2020); and Hasanuddin University (Djaharuddin et al., 2023). Publications reporting healthcare practitioners' perceptions of IPCP in hospitals also exist, although to a lesser extent (Findyartini et al., 2019; Soemantri et al., 2020; Yulia et al., 2023; Yusra et al., 2019). Despite the low number of publications to date, it is encouraging to see that the academic institutions involved are not limited to universities but also include healthcare colleges and polytechnics (Fuadah & Taukhid, 2018).

Different settings and contexts have also been reported regarding the implementation of IPE in Indonesia. These contexts include an interprofessional simulation-based study in a community-based setting (Tyastuti et al., 2014), an IPCP intervention in a primary healthcare setting (Findyartini et al., 2019), a workshop-based interprofessional study with geriatric patients (Ernawati et al., 2020; Ernawati et al., 2015), a study on IPE for disaster management (Prihatiningsih et al., 2017), and a study on teachers' and students' attitudes toward IPE (Lestari et al., 2018).

Despite this progress, the implementation of IPE and IPCP in Indonesia is still in its infancy and faces several obstacles (Djaharuddin et al., 2023; Findyartini et al., 2019; Yusra et al., 2019). The primary challenges are the insufficient recognition of IPE as a strategic priority and the absence of leadership models to promote commitment to collaboration. This leads to restricted integration of IPE in the curricula of health professional education institutions and disjointed strategies in clinical practice settings. These challenges were highlighted in the global report on IPE (Khalili et al., 2022). The commitment to work interprofessionally is weakened due to barriers between the Indonesian healthcare professions. A major barrier is the medical profession's continued dominance in the healthcare services hierarchy in Indonesia (Djaharuddin et al., 2023; Findyartini et al., 2019; Yusra et al., 2019). As a consequence of these challenges, the implementation and practices of IPE and IPCP are inconsistent and sporadic, which is reflected in the limited quantity and quality of research published in the field.

Most of the publications of IPE or IPCP in Indonesia cited above focus on reporting outcomes at Level 2a of Kirkpatrick's modified model (change in attitudes/perceptions). While such changes are important, leading researchers have called for more studies that focus on changes in behaviour (level 3) and changes in organisational/patient outcomes (level 4) (Reeves et al., 2016). In terms of implementation quality, future studies need to accurately identify whether the approach taken is actually IPE (i.e., aligns with the common definitions of IPE) or is, in fact, multi-professional in nature due to limited interaction between the learners from different professions (Djaharuddin et al., 2023). Beyond the education context, the essential principles of IPCP, such as shared goals, clear roles and responsibilities, and shared leadership, must be put into practice in clinical settings, and the outcomes of these initiatives must be evaluated using quality measurement tools (Mokkink et al., 2018; Prinsen et al., 2018). Addressing these challenges is crucial to promoting IPE and IPCP in the country's healthcare system (Khalili et al., 2022). The upcoming discussion will address the challenges of managing TB disease in Indonesia and how interprofessional care is proposed to overcome these challenges.

2.2 Tuberculosis in Indonesia

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* (Miggiano et al., 2020). The disease manifests in two forms: Latent and Active TB. The latent infection usually has no symptoms, leading to late identification and progression to active disease. Active infections present with symptoms of chronic cough, thick mucus mixed with blood, sub-febrile, and night sweats. Severe weight loss is one of the more profound symptoms. TB bacteria become airborne and can be transferred from the person who is actively infected via droplets. TB is preventable and curable; however, untreated cases can be life-threatening (Dasti et al., 2015; Miggiano et al., 2020).

According to the WHO, TB is one of the top 10 causes of death worldwide, with 1.3 million TB deaths in 2017 (WHO, 2022). Over 95% of TB deaths and cases are found in 30 low-income countries, with Indonesia in third place, accounting for 87% of the world's cases. Ten countries accounted for 80% of the 10 million new cases reported in 2017, with Indonesia ranked second, representing 11% of the cases (WHO, 2022). Indonesia's incidence rate is 759 per 100,000 people (Noviyani et al., 2021), much higher than the 354 per 100,000 people estimated by WHO (WHO, 2022). The death rate in Indonesia has reached 150,000 cases (i.e., one person dies every 4 minutes).

TB is the third most prominent cause of death in Indonesia in all age groups after cardiovascular and respiratory tract diseases and is the number one cause of death among infectious diseases (Mahendradhata et al., 2017). New TB cases place an exceptionally high burden on the Indonesian economy, with new cases diagnosed in 2015 adding an estimated US$6.9 billion to the existing TB national cost (Collins et al., 2017). The situation is even more complicated by the failure of Indonesia's health insurance administration body, which announced a projected deficit of US$2 billion by the end of the 2019 financial year due to unpaid bills to hospitals, clinics and pharmaceutical companies (Gorbiano, 2019). Consequently, this insurance body has only limited its service to 'essential services'.

2.2.1 Challenges of Tuberculosis Care

To date, Indonesia's TB strategy has focused primarily on controlling the progression of latent TB cases to new active cases and preventing transmission of TB to healthy individuals (Uplekar et al., 2006). The WHO's *End TB Strategy* program, released in 1994, introduced the Public-Private Mix for Directly Observed Treatment Short-Course (PPM-DOTS) strategy to control the disease epidemic worldwide (Uplekar et al., 2006). The model covers four main strategies: 1) access to quality-assured TB sputum laboratories, 2) direct observation of standardised short-course treatment delivery, 3) uninterrupted access to quality medications, and 4) a systematic recording and reporting system. The PPM-DOTS model is designed to engage multisectoral participants from relevant public and private healthcare providers, such as medical practitioners, nurses, hospitals, clinics and laboratories, government staff, community healthcare workers, and military officers through a collaborative strategy network (Uplekar et al., 2006). Although successful results have not been achieved by all countries implementing the model, WHO claims the model increases new case detection by between 10% and 60%, improves patient outcomes by over 85%, and is cost-effective (WHO, 2008). The Indonesian national TB program has implemented the PPM-DOTS model since 1995 (Zafar Ullah et al., 2004). The model covered 95% of the Indonesian population in 2005 and successfully accomplished the Indonesian 2006 TB global target (WHO, 2008).

In recent years, the increasing number of newly diagnosed infections and multi-drug-resistant TB cases has raised concerns about the poor quality of implementing the PPM-DOTS model (Mustikawati et al., 2017). Among the concerns are the significant loss of new TB suspects due to the inadequate identification system, the unreliable diagnosis due to poor quality of sputum, delayed treatments due to substantial delays in patient diagnosis, and the substandard treatments for patients in hospitals that participated in the PPM-DOTS (Ahmad et al., 2012; Irawati et al., 2007; Mustikawati et al., 2017). The lack of healthcare facilities and patients' reluctance to seek treatment are also significant issues (Ahmad et al., 2012; Sakundarno et al., 2009). The program in Indonesia is further complicated by many healthcare practitioners lacking awareness of the program; most are not linked to the system (Irawati et al., 2007). Moreover, there is no definite patient referral system (Irawati et al., 2007). Together, these studies indicate the need for further strengthening the PPM-DOTS model, which will require support from multiple sectors, strong individual commitment, and collaboration among healthcare providers.

2.2.2 Interprofessional Tuberculosis (IP-TB) Care

As outlined previously, the WHO has introduced a framework for action on IPE and IPCP (WHO, 2010). This framework, depicted in Figure 2.1, outlines the necessary stages to collaborate among healthcare teams. The framework starts by focusing on health students (i.e., the future health workforce) being fully prepared to work collaboratively in real-life practice situations.

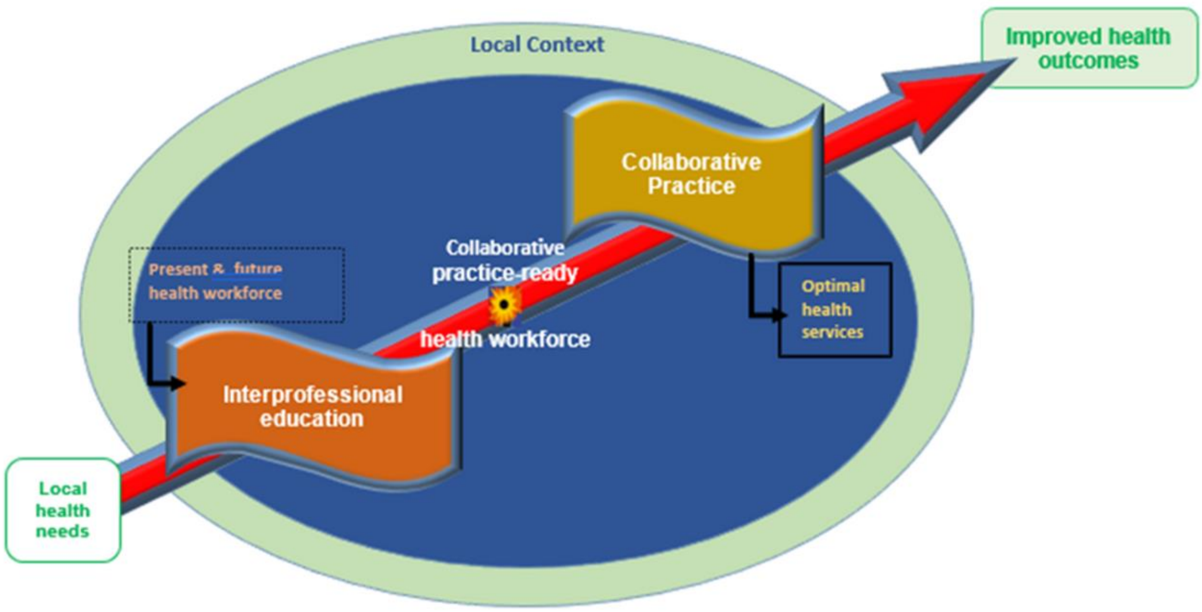
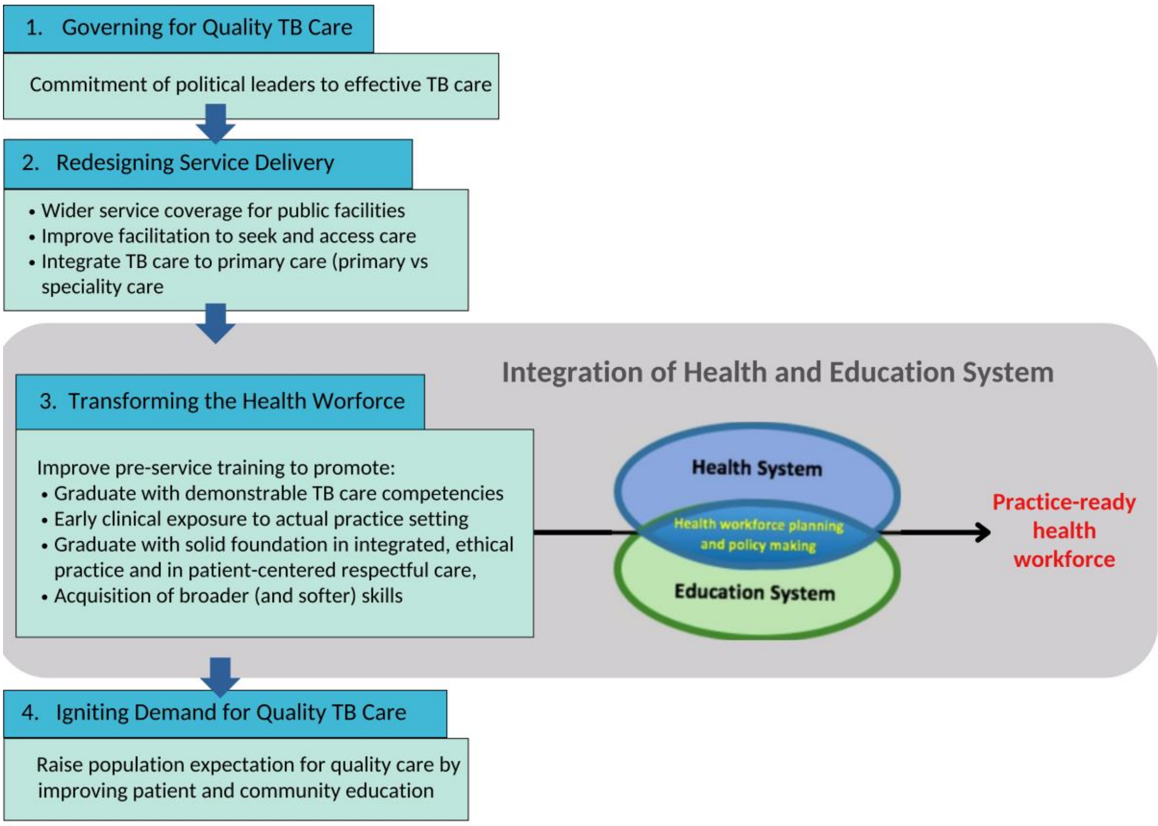


Figure 2.1 WHO Framework for Action

In line with the WHO (2010), the adapted framework provided in Figure 2.2 is designed to improve the quality of TB care service worldwide. Four universal actions are recommended to accelerate the achievement of TB care targets: *1) governing for quality, 2) redesigning service delivery, 3) transforming the healthcare workforce, and 4) igniting demand for quality TB services*. Collaboration between the health and education systems in coordinating healthcare workforce strategies is not only necessary but also an essential aspect of this framework. Integrating healthcare workforce planning, education, and policy-making can pave the way are needed to provide full support for IPE and IPCP (WHO, 2019; WHO, 2010).



Notes. Adapted from the WHO Framework for Action on Interprofessional Education and Collaborative Practices, 2010 and Arsenault, C., Roder-DeWan, S., & Kruk, M. E. (2019). Measuring and improving the quality of tuberculosis care: A framework and implications from the Lancet Global Health Commission. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, *16*, 100112.

Figure 2.2 Universal Action for Tuberculosis Care

The WHO's initiative to transform the healthcare workforce, resonates with this program of research, which focuses on implementing strategies to strengthen and improve team-based care for TB through an interprofessional approach. Implementing IPE and IPCP for TB care is of the utmost importance in Indonesia to address the failings of the PPM-DOTS model and the current escalation in new cases and deaths from TB.

That said, the first crucial step is establishing valid measures to evaluate outcomes and monitor the program's progress effectively.

2.3 Linking Evidence to Action

Developing valid, standardised quantitative measures typically involves pilot testing and validation in new environments and populations. The addition of the need to undertake cultural adaptation adds another layer of complexity to what, for many, is already a daunting task. Accurate measures validated for different study purposes are essential. Such measures should be validated for their specific target populations whenever possible (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018; Terwee et al., 2018). The population can, for instance, relate to age, gender, health condition, culture and/or geographic region, and pre-licensure (health students) or post-licensure (health practitioners). Unfortunately, some researchers neglect to invest in their methodology, including the psychometric quality of their measures.

2.3.1 Evidence-Based Measurements for Evidence-Based Research

The use of unvalidated measures in studies violates the principles of data reliability and validity. Measures that have not been validated can generate biased and inaccurate conclusions, the results of which cannot be generalised to represent the observed population. Some of the specific issues with unvalidated measures are that they limit the researcher's ability to reach definite conclusions (Chad-Friedman et al., 2017); are unlikely to capture the variables under investigation accurately (Course-Choi & Hammond, 2021); substantially limit the interpretation and comparison of data (Chad-Friedman et al., 2017; Course-Choi & Hammond, 2021); are not comprehensive (Marinho et al., 2024); can alter the relationship with outcome variables, leading to an inadequate adjustment of treatment (Halvorson et al., 2013); and generate inconclusive results, in which the causality of interventions and their impact on clinical therapy is complex to conclude with certainty (Yerrakalva et al., 2015; Zywiel et al., 2013). Unfortunately, many studies still use these unvalidated measures despite the well-established knowledge that they contravene evidence-based measurement (Chad-Friedman et al., 2017; Prinsen et al., 2018; Terwee et al., 2018).

Validated outcome measures offer a consistent and reliable way of measuring outcomes, thus allowing findings across different studies and methods to be compared (Laver-Fawcett & Cox, 2021; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018). These validated measures have undergone rigorous testing to ensure the accuracy and trustworthiness of the data generated. As a result, findings produced using validated outcome measures can be generalised and used to make informed decisions relevant to the population being tested. Additionally, due to their standardised nature, validated outcome measures can identify areas for improvement regarding interventions and/or programs and track progress over time. Overall, using validated outcome measures, researchers can significantly enhance the precision and credibility of their findings, verify the effectiveness and suitability of interventions or treatments, and make adjustments for their intended population (Laver-Fawcett & Cox, 2021; Mokkink et al., 2018; Prinsen et al., 2018).

2.3.2 Interprofessional Variables for Outcomes Measures

‘‘Collaborative practice is an inter-professional process for communication and decision-making that enables the separate and shared knowledge and skills of care providers to synergistically influence the client/patient care provided.’’ (Way et al., 2000, p. 3). Based on this definition, collaborative practice involves social phenomena, including interprofessional communication, shared knowledge, skills and decision-making. These social phenomena represent the *latent variables* of interprofessional outcomes measures (as domains or factors). These latent variables cannot be measured directly. Therefore, for practical purposes, identifying measurable, *observable variables* is used to measure the latent variables indirectly.

In the literature discussing instruments for measuring interprofessional outcomes, various latent variables have been identified in relation to measuring IPE and IPCP outcomes. Communication and collaboration are the two fundamental latent variables reported by outcome measures for optimising interprofessional care (Curran et al., 2011; Sigalet et al., 2012). The variation of *'communication*' includes *communication skills* (Stutsky & Spence Laschinger, 2014), *communication and information exchange* (Schroder et al., 2011), and *communication and teamwork* (Pollard & Miers, 2008). The variations of '*collaboration*' include *team functioning* (Curran et al., 2011), *effective team working* (Parsell & Bligh, 1999), *team working* (McFadyen et al., 2005), *interprofessional collaboration* (Almås & Ødegård, 2010), and *interprofessional interaction* (Pollard & Miers, 2008).

Although not used as frequently, some outcome measures include characteristics related to the role or scope of practice of professionals, such as *understanding the value and contribution of professionals/other professions* (Luetsch & Rowett, 2016), *professional roles* (Oates & Davidson, 2015), *roles and responsibilities* (Curran et al., 2011; Parsell & Bligh, 1999; Sigalet et al., 2012), *general role responsibilities and autonomy* (Schroder et al., 2011), and *role understanding* (Stutsky & Spence Laschinger, 2014). Resolving differences in opinions or perspectives is another common variable in IPE outcome measures. The relevant variables include *conflict management/resolution* (Curran et al., 2011) and *decision-making and conflict management* (Schroder et al., 2011).

In addition to the variables outlined above, a much smaller number of measures mention variables related to patient care. This variable is typically expressed as *a collaborative approach centred on the patient/client family* (Curran et al., 2011), *patient involvement* (Schroder et al., 2011), and *patient empowerment* (Stutsky & Spence Laschinger, 2014). Interprofessional collaboration in care is a complex intervention that focuses on patient-related outcomes and should, therefore, be considered the most essential component of treatment (Brewer, 2011; Interprofessional Education Collaborative, 2016; WHO, 2016). However, given that very few outcome measures include patient-related variables, achieving outcomes related to improvements in organisational practice (level 4a) or patient care (level 4b) is difficult (Reeves et al., 2016).

The potential advantages of IPE and IPCP on patient outcomes—such as decreasing medical errors and enhancing patient satisfaction—are well documented (WHO, 2010; Cadet et al., 2024). Nonetheless, significant gaps exist in the current research (Cadet et al., 2024). These include an overemphasis on North American studies, insufficient representation of various healthcare professions, and a reliance on pre-post-study designs rather than more rigorous randomised trials. While the evidence suggesting a link between IPE and IPCP and improved health outcomes is encouraging, the variability in interventions and results restricts the generalisability of these findings. Additionally, there is a pressing need for longitudinal studies to evaluate the enduring effects of IPE and IPCP, thereby strengthening its actionable implications. Addressing these limitations in future research is crucial to fully validate the essential role of IPE and IPCP in enhancing patient care and outcomes.

Unfortunately, existing measures related to patient outcomes are limited (Cadet et al., 2024). Consequently, limited measures are available for comparison. In addition, it is essential to note that most studies were conducted on patients, not with patients, highlighting the need for more inclusive instruments that engage patients as end users and involve them in the development process.

2.3.3 The Collaborative Practice Assessment Tool

The Collaborative Practice Assessment Tool (CPAT) is a self-assessment measure of interprofessional collaborative practice among healthcare practitioners developed in English (Schroder et al., 2011). Developed in Canada, the CPAT is considered a valuable instrument for the Australian and Indonesian context because it covers essential aspects of interprofessional collaboration, such as team leadership, shared goals, role clarification, teamwork, and team communication. Furthermore, it contains variables that indicate patient and community empowerment in care (Schroder et al., 2011). The CPAT can provide evidence linking IPE to IPCP including patient involvement and outcomes. The CPAT is widely used to measure team performance and is recommended as the best instrument to assess interprofessional teamwork (Kang et al., 2022) and has been used in many countries, including Japan (Tomizawa et al., 2014), Taiwan (Ho et al., 2023), Indonesia (Yusra et al., 2019), Singapore (Quek et al., 2022), as well as multiple studies in the USA and Canada (Bookey-Bassett et al., 2016; Fisher et al., 2015; Khan et al., 2022; Nagelkerk et al., 2018; Paterson et al., 2013; Pfaff et al., 2014).

In addition, the CPAT is acceptable for use in many different clinical contexts, such as primary and community care (Findyartini et al., 2019; Khan et al., 2022), mental health (Tomizawa et al., 2014), chronic disease management (Bookey-Bassett et al., 2016), postgraduate training of healthcare professionals (Ho et al., 2023), patient safety (Fisher et al., 2015; Paterson & Britten, 2005), and patient satisfaction (Fisher et al., 2015). All of these studies included healthcare professionals as participants and validated the tool with healthcare practitioners (i.e., students were not included in the validation studies).

The eight subscales of the original CPAT (Schroder et al., 2011). are: *Mission, meaningful purpose, goals* (Cronbach's α = .88); *General relationships* (Cronbach's α = .89); *Team leadership* (Cronbach's α = .80); *General roles responsibilities*, autonomy (Cronbach's α = .81); *Communication and information exchange* (Cronbach's α = .84);

Community linkages and coordination of care (Cronbach's α = .76); *Decision-making and conflict management* (Cronbach's α = .67); and *Patient involvement* (Cronbach's α = .87). Responses are based on a 7-point Likert scale (1 = *Strongly disagree*, 2 = *Mostly disagree*, 3 = *Somewhat disagree*, 4 = *Neither agree nor disagree,* 5 = *Somewhat agree*, 6 = *Mostly agree*, and 7 = *Strongly Agree*). Six of the items are negatively worded, so they need reverse coding (Schroder et al., 2011).

The original CPAT development included two pilot studies involving Canadian healthcare practitioners only. Exploratory factor analysis (EFA) was used in the first anaysis (*N*=42) to confirm the factorial number, item positioning, and item deletion. Confirmatory factor analysis (CFA) was used in the second analysis (*N*=111). Based on subscale analysis, CFA confirmed that six of the eight subscales met the predefined standards of a 'good' fit model based on the normed fit index (NFI), comparative fit index (CFI), Tucker-Lewis's index (TLI) and root mean square error of approximation (RMSEA). Two subscales, *Communication and information exchange* and *Patient Involvement*, did not meet these model fit indices. The sample sizes were too small for both factor analyses conducted in the study. The psychometric properties of the CPAT were later explored in cross-cultural studies with practitioners only, including in Taiwan (*N*=43) (Ho et al., 2023), Indonesia (*N*=304) (Yusra et al., 2019), and Singapore (*N*=148) (Quek et al., 2022). CPAT subscale analysis was carried out using exploratory factor analysis in the Indonesian study (Yusra et al., 2019) and item-level analysis in the Taiwanese version (Ho et al., 2023). The model suggested by the original instrument (8-Factor 56-Item solution) was not tested for model fit in these three studies.

In conclusion, the CPAT's validation, which has been carried out in multiple countries, featured under-sampling and was mainly related to content validity and internal consistency reliability with Cronbach's α. The CPAT's validation can be improved by adhering to the evaluation procedures recommended by COSMIN. Conducting a measurement invariance test during validation, as undertaken in this program of research, will determine if the instrument can be used equally across these two cohorts.

2.3.4 The Interprofessional Socialisation and Valuing Scale-21

Several instruments have been used at Australian universities to measure the outcomes of IPE and IPCP, including the Interprofessional Socialisation and Valuing Scale (ISVS), the Readiness for Interprofessional Learning Scale (RIPLS), the University of West England (UWE) instruments, and Curtin University's Interprofessional Capability Assessment Tool (Nicol, 2013). In particular, the ISVS-24 (King et al., 2010) and its refined version, the ISVS-21 (King et al., 2016), are among the measures most widely used in Australia. The ISVS-24 is considered the only measure to comprehensively assess multiple levels of interprofessional outcomes based on the Kirkpatrick adapted model as it covers Level 2a (attitudes/perceptions), Level 2b (knowledge/skills), and Level 3 (behaviours) (Oates & Davidson, 2015).

The original ISVS-21 consisted of 21 positively written items. Overall, the ISVS-21 is unidimensional and was found to have better psychometric properties than the previous ISVS-24 version, with Cronbach's $\alpha = 0.99$ (95% confidence interval of 0.96–0.99) (King et al., 2016). The ISVS-21 is considered a reliable measure of interprofessional socialisation in both practitioners and students; the agreement factor scores between the practitioner and the student datasets, $r = 0.99$, 95% CI 0.99–0.99. Both the ISVS-24 and ISVS-21 have been used in many countries, including with practitioners in the US and Germany (De Vries et al., 2016; Mahler et al., 2023) and student participants in the US, Australia, and Spain (Aul & Long, 2020; Bloomfield et al., 2021; Brewer & Flavell, 2018; Brewer et al., 2014; Brewer & Stewart-Wynne, 2013; Gierach et al., 2020; González-Pascual et al., 2022; Graves et al., 2020; Hoti et al., 2014; Spence Laschinger et al., 2010; Vari et al., 2021). To date, the ISVS-21 and ISVS-24 have not been validated for students or practitioners in Australia. There are also no validation studies related to the ISVS-21 in Indonesia. Validation of the ISVS-21, using both practitioners and students, is crucial to ensuring a quality measure of interprofessional competencies across the domains of attitudes, knowledge, skills, and behaviours for the Australian and Indonesian contexts.

A valid and reliable measure of interprofessional socialisation is needed to measure outcomes in research. Psychometric evaluation is required to ensure the adopted items adequately reflect the measure intended in the original version. In addition, as outlined previously, validation with the two different cohorts in the health system (students and practitioners) is essential as students may disagree about the importance of some items highly endorsed by practitioners and vice versa (De Vries et al., 2016; Vari et al., 2021). The forthcoming chapters will delve into the extensive validation procedures carried out on CPAT and ISVS-21 in both Australia and Indonesia. This includes a detailed account of the validation process based on the COSMIN recommendation. Chapters 3, 4, 5, 6 and 7 comprise published papers or manuscripts currently undergoing review for journal publications.

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Chapter 3 Validation of the Interprofessional Socialisation and Valuing Scale (ISVS)-21 in Australia

Chapter 3 details the results of the cultural validation of the Interprofessional Socialisation and Valuing Scale (ISVS)-21 in Australia. This chapter contains an accepted manuscript of an article published in the journal PLOS ONE, which is available online: https://doi.org/10.1371/journal.pone.0309697. The spelling and wording contained within this chapter are that of the published manuscript.

Journal Manuscript 1

Title

Psychometric evaluation of the Australian Interprofessional Socialisation and Valuing Scale: An invariant measure for health practitioners and students

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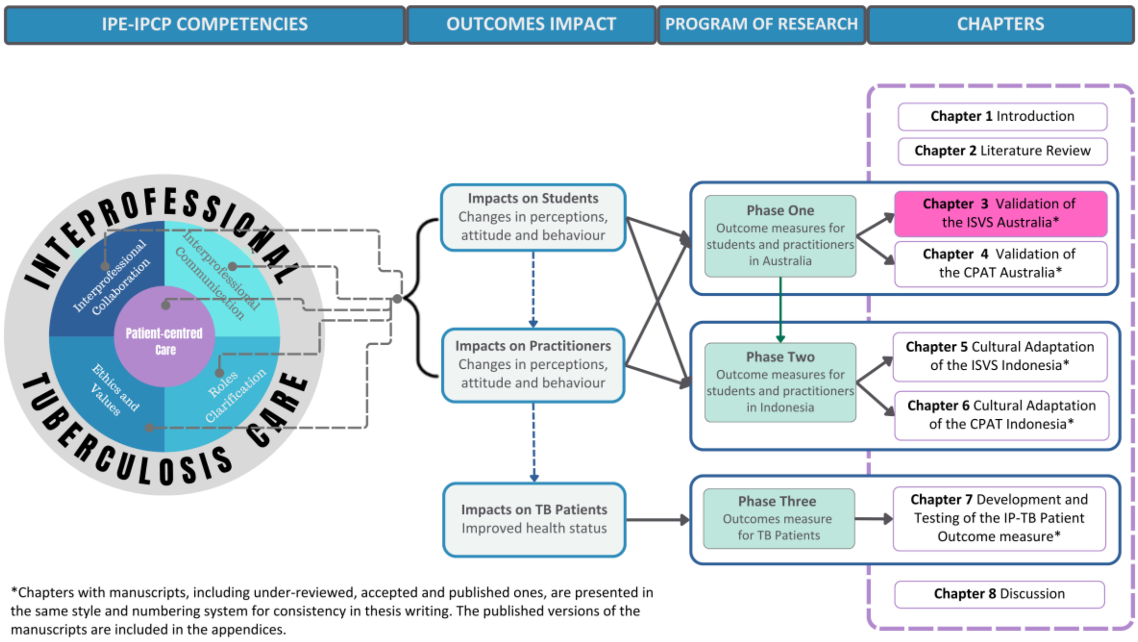


3.1 Abstract

Objectives: This study aimed to evaluate the psychometric properties of the Australian Interprofessional Socialisation and Valuing Scale (ISVS)-21 and provide an invariant measure for health practitioners and students to assess interprofessional socialisation.

Methods: The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) were used as guidelines. This research began with a key step: conducting a pilot study to assess content validity, a requirement of COSMIN for item development. The ISVS-21 has not yet been validated in Australia. Content validity checks ensure the developed items accurately represent the measured construct in the intended cultural context. In addition to conducting more comprehensive tests of psychometric properties compared to previous studies on ISVS-21, this paper introduces something new by evaluating the internal structure of the instrument involving measurement invariance and hypothesis testing for construct validity based on several assumptions related to interprofessional socialisation and values. An invariant measure

validates the use of the Australian ISVS-21 on practitioner and student equivalently, allowing the comparison of outcomes at both levels.

Results: The evaluation of content validity indicated that the items were relevant, comprehensible (practitioners and students had an agreement score of $>$70% for all 21 items), and comprehensive to the concepts intended to be measured. Structural validity confirms ISVS-21 Australia as unidimensional, with good internal consistency reliabilities, Cronbach's α scores=0.96 (practitioner) and 0.96 (student). Measurement invariance tests confirm ISVS-21 Australia is configural, metric and scalar invariance (ΔCFI $\leq$ 0.01) across the tested groups of practitioner and student, and therefore suitable for use by both cohorts in Australia. Age and length of work/study were discriminant factors for interprofessional socialisation in both cohorts; the professional background was a differentiating factor for practitioners but not for students. Hypotheses testing results support the COSMIN construct validity requirement for the measure, with 83.3% of assumptions tested accepted.

Conclusion: The Australian ISVS has good psychometric properties based on evaluating the content validity, internal structure, and hypotheses testing for construct validity. In addition, Australian ISVS is an invariant measure for use by health practitioners and students and, therefore, confirmed as a quality measure to assess interprofessional socialisation for both cohorts in Australia.

3.2 Introduction

The World Health Organization (WHO) calls for education and health systems to embed interprofessional education (IPE) in tertiary curricula for the future workforce and in continuing professional development for the current workforce to ensure health professionals have the competencies to be effective interprofessional collaborative practitioners (World Health Organization, 2010). In response to this call to action, Australia made some early progress on embedding IPE in health professional education at the tertiary level (Dunston et al., 2014), progress that continues today (Khalili et al., 2022).

Most IPE to date results from the leadership of local champions within universities (Dunston et al., 2014; Nicol, 2013) and health service organisations (Dunston et al., 2014; Gum et al., 2020; Nisbet et al., 2008) rather than national leadership. Australia is moving towards national leadership with the Australian Health Practitioner Regulation Agency (AHPRA), the national regulation agency covering 28 professions, having recently released a statement of intent on interprofessional collaborative practice (IPCP) (AHPRA, 2023). AHPRA is committed to advancing interprofessional collaborative practice in education, training, clinical governance, and healthcare delivery. Through this initiative, the vision is to provide more effective, efficient, culturally sensitive, and patient-centered care while actively working to eliminate racism in healthcare. The ultimate goal is to enhance collaboration within the healthcare workforce, which leads to improved experiences and better health outcomes for individuals and other healthcare consumers. To achieve AHPRA's vision for IPCP, they need high-quality IPE in health professional education that results in the development of core IPCP competencies. To measure the achievement of these competencies, valid and reliable instruments that can be used across the professional lifespan are needed (from pre-qualifying students to experienced health practitioners).

Several instruments have been used in Australian universities to measure the outcomes of interprofessional education, including the Interprofessional Socialization and Valuing Scale (ISVS), the Readiness for Interprofessional Learning Scale (RIPLS), the University of West England (UWE) instruments, and Curtin University's Interprofessional Capability Assessment Tool (ICAT) (Nicol, 2013). Australia needs more instruments for measuring interprofessional-related outcomes that have been validated with an

Australian population. Until recently, the only instrument validated in the country was the Collaborative Practice Assessment Tool (CPAT) (Ardyansyah et al., 2024a). Having Australian-validated measures will significantly benefit the advancement of interprofessional education and collaborative practice in the country.

3.2.1 The Interprofessional Socialisation and Valuing Scale (ISVS)-21

Interprofessional socialisation is critical in shaping a profession's values and beliefs [9]. Historically, healthcare professionals were educated and socialised separately, leading to professional isolation. Successful interprofessional collaboration hinges on critical values such as shared goals, responsibility, leadership, teamwork, and respect for other professions, underscoring the vital role of interprofessional socialisation (Brewer & Stewart-Wynne, 2013; King et al., 2016; Stutsky & Spence Laschinger, 2014). A tool to measure interprofessional socialisation and its associated values is indispensable. In particular, the ISVS-24 (King et al., 2010) and its refined version, the ISVS-21 (King et al., 2016), are among the instruments widely used in Australia. The ISVS-24 consists of three domains: Self-Perceived Ability to Work with Others (*Self-Confidence*; 9 items), Values in Working with Others (*Attitude*; 9 items), and Comfort in Working with Others (*Behavior*; 6 items). The Cronbach α scores for these domains range from 0.79 and 0.89. The refinement of ISVS-24 into ISVS-21 involved more than just removing three items. To develop the ISVS and its instrument variations (including the ISVS-9A and ISVS-9B), the author created an item pool consisting of 34 items. Several items were added and removed from the item pool during the refinement process. The ISVS-21 contained 11 items that were different from the ISVS-24 (these items were added during the refinement process, and eight new items from the ISVS pool). The ISVS-24 is considered the only measure to comprehensively assess multiple levels of interprofessional outcomes based on the Kirkpatrick adapted model (covers outcomes evaluation for Level 2a, attitudes/perceptions; Level 2b, knowledge/skills; and Level 3, behaviours (Oates & Davidson, 2015).

Different to ISVS-24, the ISVS-21 is unidimensional and was found to have better psychometric properties than the previous ISVS-24 version, with a Cronbach's α=0.988 (95% confidence interval of 0.985–0.991) (King et al., 2016). The ISVS-21 is considered a reliable measure of interprofessional socialisation in both practitioners and students (the agreement factor score between the practitioner and the student datasets, r=0.9986, 95% CI 0.9983–0.9988) (King et al., 2016). The original ISVS-21 consisted of 21 positively written items.

Both the ISVS-24 and ISVS-21, have been used and adapted cross-culturally in many countries with practitioners (De Vries et al., 2016; Mahler et al., 2023) and student participants (Aul & Long, 2020; Bloomfield et al., 2021; Brewer et al., 2014; Brewer et al., 2016; Brewer & Stewart-Wynne, 2013; Gierach et al., 2020; González-Pascual et al., 2022; Graves et al., 2020; Hoti et al., 2014; Karnish et al., 2019; MacDonald et al., 2010; Mitchell et al., 2011; Spence Laschinger et al., 2010; Timm & Schnepper, 2021; Vari et al., 2021). These interprofessional scales have been used in several Australian studies (Nicol, 2013); however, they have been mainly used with student participants (Bloomfield et al., 2021; Brewer & Stewart-Wynne, 2013; Cartwright et al., 2015; Hoti et al., 2014; Vari et al., 2021; Venville & Andrews, 2020) , with limited practitioner involvement (Shaw et al., 2023). To date, these instruments have not been validated for either students or practitioners in Australia.

A valid and reliable measure of interprofessional socialisation is needed to measure outcomes in research, and a psychometric evaluation is required to ensure the adopted items adequately reflect the measure intended in the original version (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). As students may dislike some items highly endorsed by practitioners, and vice versa (Ardyansyah et al., 2024a; Ardyansyah et al., 2024b; De Vries et al., 2016; Vari et al., 2021). Following the

COnsensus-based Standards for selecting health Measurement Instruments (COSMIN) requirements, validation was conducted simultaneously with practitioner and student cohorts as the intended users of the instrument (Mokkink et al., 2018a; Mokkink et al., 2018).

Initially established in 2015, COSMIN is a psychometric framework with a robust quality rating system for determining the risk of bias in testing psychometric properties (Mokkink et al., 2018a; Mokkink et al., 2018). COSMIN consists of an international multidisciplinary team of researchers with backgrounds in epidemiology, psychometrics, medicine, qualitative research, and healthcare who are experts in developing and evaluating outcome measures. COSMIN introduced a psychometric framework and taxonomy designed to tackle the inconsistent and conflicting use of psychometric terms in research. COSMIN allows for the systematic assessment of measures in two critical areas: the methodological quality of research and the quality of psychometric properties of measurements. COSMIN provides each psychometric property with independent measurement standards and criteria for ranking its quality. This method allows for subscale and overall measurement quality assessment, making COSMIN unique and, arguably, more advanced than other psychometric frameworks. Having separate quality scores for each psychometric property in a measure provides a more comprehensive basis for assessment. COSMIN is recommended as a framework for instrument developers and people identifying the most appropriate measure for their purposes.

3.2.2 Interprofessional Socialisation and Values for Construct Validity

Age and length of practice. The collaboration and practice of interprofessional skills are influenced by age and length of experience (Anderson & Thorpe, 2008; Van et al., 2007). Graduate students generally exhibit stronger interprofessional skills than undergraduates, possibly due to their age and maturity (Stubbs et al., 2017). Furthermore, a study found that a one-year fellowship significantly improved interprofessional skills compared to a one-semester IPE course, highlighting the importance of course duration in shaping comfort, value, and ability to collaborate with other professions (Acquavita et al., 2020). Practitioners' willingness and ability to collaborate with other team members are affected by their understanding of age and experience in teamwork (De Vries et al., 2016).

The findings indicate that experience accumulates over time, reinforcing practitioners' ability to understand the scope of practice (Fletcher et al., 2007; Horrocks et al., 2002; Legault et al., 2012). Forming a professional identity and establishing moderate collaborative relationships typically takes at least six months, with initial exposure being a significant point (Bradby, 1990; Legault et al., 2012). However, it is essential to note that practitioners' abilities to collaborate cannot be generalised based solely on the length of their work period. Even a senior medical practitioner with extensive practice experience may show reluctance to share information and collaborate interprofessionally (Lalonde et al., 2011; Van et al., 2007).

Professional backgrounds. Studies have highlighted a gap in how the healthcare profession perceives the concepts and values of interprofessional collaboration. The medical profession has historically dominated healthcare systems (Bollen et al., 2019; Clarin, 2007; Mian et al., 2012). Physicians' relationships with other professions are characterised by a lack of trust in different professions, reluctance to delegate work, and reluctance to collaborate (Bollen et al., 2019; Clarin, 2007; Legault et al., 2012; Mian et al., 2012). In a study by Taylor et al., 2016, physician residents, particularly in internal medicine, displayed the lowest index scores for interprofessional collaboration (Taylor et al., 2016). Conversely, social workers tend to have the most positive perception of interprofessional collaboration compared to almost all other health professions, positioning them at the opposite end of the spectrum. Nurses fall in the middle, scoring higher than physicians but lower than other non-physician professions. This difference is attributed to social work education, which has long emphasised interprofessional collaboration skills within its curriculum (Rubin et al., 2018). Differences in perceptions regarding interprofessional collaboration are also significant at the student level, for example, between medical and nursing students and medical and pharmacy students (Bloomfield et al., 2021).

Taking an interprofessional approach to patient care is a significant advance in healthcare. In the past, medical and dental training focused on independent practice, causing older generations of practitioners from these professional backgrounds to overlook the importance of working with other healthcare professionals in patient care (Oandasan & Reeves, 2005; Thannhauser et al., 2010). However, a study has also found that a person’s professional background does not necessarily determine their ability to work collaboratively with other professionals different to their own (De Vries et al., 2016). In fact, there is growing enthusiasm for creating more equitable positions in health services. A study in Australia revealed disagreements between healthcare practitioners and students regarding the dominant role of medical practitioners in decision-making, and patient care (Ardyansyah et al., 2024a). Participants voiced a strong desire for change and rejected two items related to the perception of physicians having an overly dominant role in interprofessional teams.

3.2.3 Objectives

Validation of the new version of the ISVS-21 using both practitioners and students is crucial to ensuring a quality measure of interprofessional competencies across the domains of attitudes, knowledge, skills, and behaviours for the Australian context (Oates & Davidson, 2015). This study aimed to: 1) validate the ISVS-21 in Australia and 2) evaluate the psychometric properties of the validated instrument in terms of content validity, internal structure (i.e., structural validity, internal consistency reliability, and measurement invariances), and hypotheses testing for construct validity. In particular, an evaluation of the internal structure of the instrument was carried out to determine the invariance of the instrument across the groups tested (practitioners and students) to ensure the instrument's reliability for use in both cohorts.

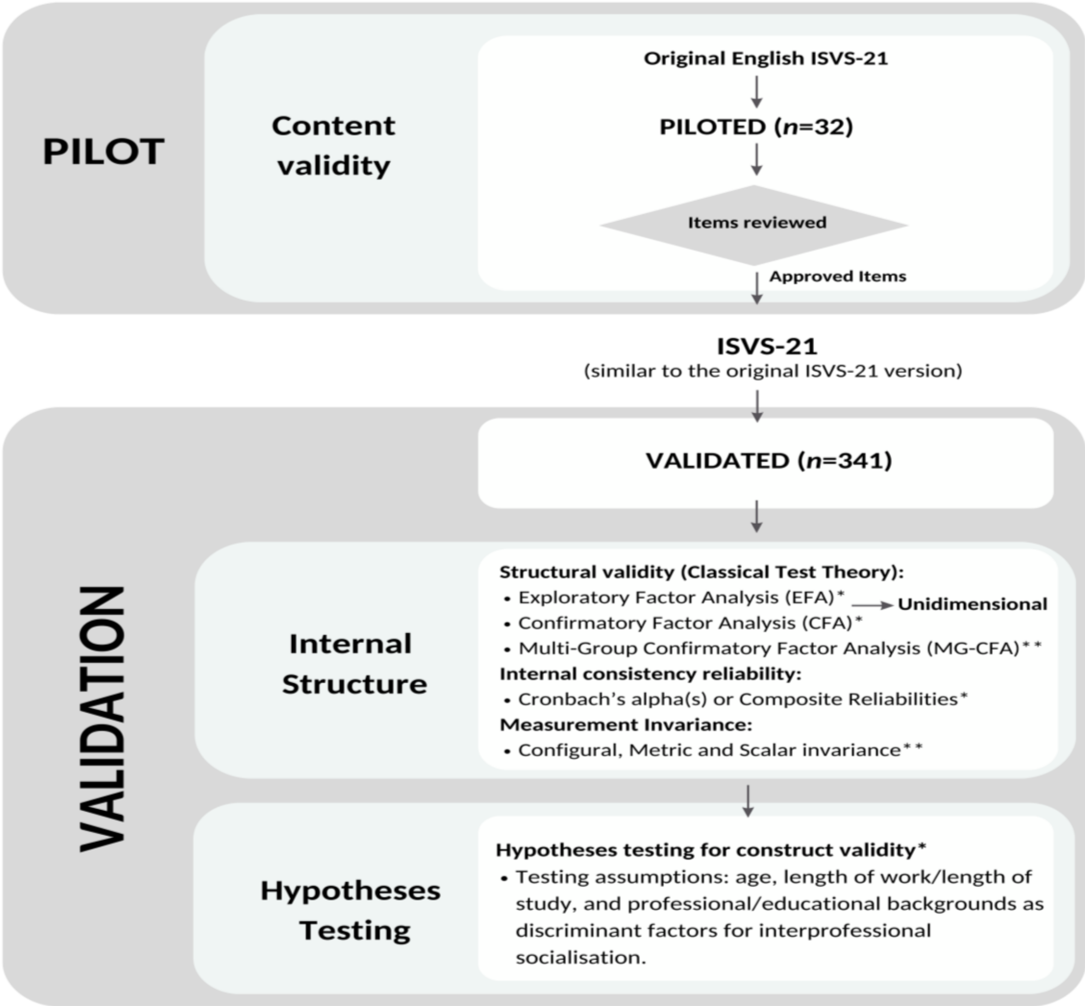
3.3 Materials and Methods

3.3.1 Procedures

We contacted the original authors of the instrument to advise them of our study validating the Interprofessional Socialisation and Valuing Scale (ISVS)-21 instrument for the Australian context. This study's procedures, including instrument development requirements for data collection, analysis, and reporting, were based on the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) taxonomy and standards of psychometric properties (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018; Yoon et al., 2021). The procedures for this study included pilot and validation studies. The phases are shown in more detail in Figure 3.1 below.

3.3.2 Ethics Statement

Ethics approval for this study was obtained from Curtin University Human Research Ethics Committee (HREC approval number: HRE2021–0274). The survey was distributed between 6 August 2021 and 15 May 2022. The invitation to participate included information about the survey and provided a Qualtrics (Qualtrics, 2023) link that anyone interested could access. Participation in this research was voluntary, and all responses were anonymous.



Notes. *The practitioners and students data were analysed separately

**The practitioners and students data were analysed simultaneously

Figure 3.1 Study procedure

3.3.3 Sample Population and Size

The participants were purposively recruited to ensure optimal size and representation of the intended target population (Mokkink et al., 2018a; Mokkink et al., 2018b). The inclusion criteria were as follows: 1) Australian practitioners and students from any health professional or educational background, and 2) practitioners should have at least one year of experience collaborating within a healthcare team with other practitioners from different professional backgrounds, while students should have at least one year of experience working within a healthcare team with other students from different educational backgrounds. The minimum requirement for collaborative experience is one year, as the professional identity of health workers is estimated to be formed at least six months after the beginning of clinical exposure (Bradby, 1990).

Potential participants for the pilot study were purposefully selected from the research team's network, targeting individuals with expertise in interprofessional education and team collaboration. Participants' agreement to participate was sought through invitations sent via email. The pilot study's sample size was aimed at COSMIN's 'adequate' requirements (i.e., 30-50 participants) for quantitative research and for a 'very good' sample size for the validation, with a 7 to 1 ratio of respondents to the number of items in each questionnaire and a minimum of 100 per sample (i.e., a minimum of 21*7=147 participants for each cohort of practitioner and student) (Prinsen et al., 2018).

An invitation for practitioners to participate in the validation study was sent to the relevant health professional peak bodies and associations in Australia. In addition, invitations were extended to health practitioners within the researchers' network and snowballed to reach out to more participants. Invitations for student participation were sent through the university's official communication platforms. Each participant was asked to provide their written consent before participating in the study. In addition, because providing consent was mandatory prior to initiating the survey, their consent was assumed based on the completion of the survey. The same participant inclusion criteria were used for the study's instrument pilot and validation phase. Data collection for the pilot survey was completed four weeks prior to validation.

3.3.4 Phase 1: Pilot Study

The pilot study phases are described in alignment with COSMIN requirements to ensure that the instrument's content validity adequately represents the underlying construct. Three aspects were evaluated in the pilot study (Mokkink et al., 2018a;

Mokkink et al., 2018b); the items' *relevance* and *comprehensibility*, and the *comprehensiveness* of the instrument.

3.3.4.1 Content Validity

The ISVS-21 was piloted on Australian practitioners and students using a 5-point Likert scale (1=*strongly disagree* to 5=*strongly agree*). Participants were asked to rate whether each item was relevant to their experience (to assess item relevance) and whether each item was easy to understand (to assess item comprehensibility). Each participant who answered *disagree* or *strongly disagree* to the question regarding item comprehensibility was invited to explain their answer or suggest alternative phrasing to improve the clarity of the item. COSMIN recommendations were followed to assess the comprehensiveness of the instrument, an open-ended question was provided to identify whether participants felt any topics or items were missing from the instrument. Quantitative descriptive statistics were conducted using Statistical Package for the Social Sciences (SPSS) v26 (SPSS, 2023); while qualitative data were analysed using content analyses (Vaismoradi et al., 2013).

3.3.5 Phase 2: Validation Study

To analyse the instrument's internal structure, the ISVS-21 was validated on the same target population as the pilot study (Mokkink et al., 2018a; Mokkink et al., 2018b). In the validation study, participants were asked to rate each item using the Likert scale used in the original instrument descriptors (0=*not at all*, 1=*strongly disagree*, 6=*strongly agree*) (King et al., 2016).

Quantitative descriptive statistics were applied to investigate the internal structure of psychometric properties of the Australian ISVS-21, including Exploratory Factor Analysis (EFA), using SPSS v26; Confirmatory Factor Analysis (CFA) and Multi-group Confirmatory Factor Analysis (MG-CFA), and measurement invariances were estimated using Analysis Movement of Structure (AMOS) v24 (Gaskin & Lim, 2018). The analysis only includes data with a response rate of >75%, and missing data was replaced with the mean value. First, we tested to determine whether the data was suitable for factor analysis. Once we have qualified results, we can proceed with EFA and CFA. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were used to determine the suitability of datasets for factor analysis (Williams et al., 2010). To assess model fit, the following COSMIN criteria for good model fit indices were used to report on model fit throughout this study: a comparative fit index (CFI), Tucker-Lewis index (TLI) or equivalent measure >0.95, OR root mean square error of approximation (RMSEA) <0.06, OR standard root mean square of residual (SRMR) <0.08 (Prinsen et al., 2018). The chi-square minimum difference function (CMIN/df) is expected to be between 1 and 3, with a score <5 regarded as acceptable.

3.3.5.1 Structural Validity

The factor structure of the Australian ISVS was carried out in stages through Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Multi-group Confirmatory Factor Analysis (MG-CFA). Each stage is described in detail below. Exploratory factor analysis was conducted to explore the constructs underlying the Australian ISVS before performing a confirmatory factor analysis (Byrne, 2013). The practitioner dataset was analysed separately from the student dataset. As stated earlier, the ISVS-21 was confirmed to be unidimensional from studies in several other countries (De Vries et al., 2016; King et al., 2016; Mahler et al., 2023). To confirm unidimensionality, three decision rules were applied. Firstly, exploratory factor analysis dimension reduction with Kaiser's criteria with eigenvalues greater than 1 (Williams et al., 2010) was used to determine the number of factors and the percentage of cumulative variance. If the first factor explains >40% of the variance of the population tested (Reckase, 1979) or when the eigenvalue of the first factor is at least five times higher than that of the second factor (Rubio et al., 2007), unidimensionality is confirmed. Secondly, a scree test (Williams et al., 2010) was conducted, which analyses the factorial structure following an eigenvalues plotline. The number of potential factors for a given data set can be determined by calculating the number of factors above the breakpoint in the plotline. Thirdly, based on correlation reliability checks with Cronbach's α and average inter-item correlation scores (Hayes & Coutts, 2020; Prinsen et al., 2018). The higher the correlation between items, the higher the Cronbach's α score; where a value of 0.70 is acceptable, a value $>$0.80 is considered high; a value $>$0.95 is undesirable as it may suggest item redundancy rather than homogeneity (Hair et al., 2020; Mokkink et al., 2018; Prinsen et al., 2018). The average inter-item correlation was expected to be between 0.30 to 0.50.

Confirmatory factor analysis was performed to confirm the exploratory factor analysis results (Byrne, 2013; Williams et al., 2010). CFA began by confirming the one-factor model for all 21 items. This confirmatory analysis was performed separately for each dataset, starting with the practitioner dataset, the results of which were used as a calibrator to inform the structure of the student model. The model's goodness-of-fit indices (the CMIN/df, CFI, SRMR, RMSEA, *p*-value), composite reliability (CR), and average variance extracted (AVE) were analysed to assess the model fitness. These data profiles were used to determine whether the tested one-factor model was acceptable, needed improvement, or should be rejected. If required, problematic items were carefully removed one at a time during the CFA refinement process. Additionally, error terms covariance with a Modification Index (MI) $>$20 were identified (Lei & Wu, 2007). Following the removal of each item and/or the application of one or more MI correlations, the fitness indices, CR, and AVE were recalculated each time. Confirmatory factor analysis was expected to confirm a good final model for both datasets to pass the multi-group factor analysis. This final factorial analysis was undertaken with both datasets simultaneously. The factor structures set as equal across tested datasets during MG-CFA to enable the rating of the quality of the summary score (Prinsen et al., 2018). If MG-CFA shows a good model fit, measurement invariance can be conducted.

3.3.5.2 Internal Consistency Reliability

Internal consistency refers to the relationship between variables in measuring a similar construct that underlies the development of a domain, with distinctive domains indicated with good internal consistency and average variance extracted (Hair et al., 2020; Prinsen et al., 2018). At this stage, because the composite reliability value also considers the variable loading factor, the composite reliability score was used as a reference to measure the consistency of internal reliability. Similar cut-off values apply to composite reliability and Cronbach's α scores (Hair et al., 2020; Prinsen et al., 2018). The average variance extracted was also calculated to estimate the discriminant validity of the domain; an average variance extracted >0.5 was expected (Hair et al., 2020).

3.3.5.3 Measurement Invariances

Further analysis was conducted to ensure the equivalence of the two cohorts with invariant measurements (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Both datasets were analysed simultaneously with configural, metric, and scalar invariant tests. Invariant measurement is a tiered test, where the next stage cannot be carried out if the proposed structural model does not provide a good model fit at the previous stage (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). As previously stated, the standard for good model fit follows the COSMIN guidelines (Prinsen et al., 2018). During the invariant tests, the comparative fit index value was anticipated to decrease due to the imposition of some constraints on the model, but the decrease was expected to be $\leq$ 0.01 to confirm an invariance (Cheung & Rensvold, 2002). Invariance is confirmed when the difference in the comparative fit index (ΔCFI) $\leq$ 0.01 between the two tested measures (Cheung & Rensvold, 2002).

3.3.5.4 Hypotheses Testing

Several elements are believed to influence the construct of interprofessional socialisation, including gender, age, length of service, and professional/educational backgrounds (Anderson & Thorpe, 2008; Horrocks et al., 2002; Van et al., 2007).

Therefore, COSMIN's requirement for hypotheses testing was based on validating the assumptions associated with these elements. The hypotheses proposed were as follows:

H1.A. Age is a discriminant factor for interprofessional socialisation for health practitioners. Five age groups were created: 21-30 years, 31-40 years, 41-50 years, 51-60 years, and 61-70 years.

H2.A. Length of work is a discriminant factor for interprofessional socialisation for health practitioners. Seven groups of service length were created: 1-2 years, 3-5 years, 6-10 years, 11-15 years, 16-20 years, 21-30 years, and 31-40 years.

H3.A. Professional background is not a discriminant factor for interprofessional socialisation for health practitioners. There were 15 groups of professionals: dentist, nutritionist, medical practitioner, midwife, nurse, occupational therapist, optometrist, pharmacist, physiotherapist, podiatrist, psychologist, public health, radiographer, social worker, speech pathologist.

H1.B. Age is a discriminant factor for interprofessional socialisation for health students. Four age groups were created: 18-24 years, 25-29 years, 30-34 years, and 35-40 years.

H2.B. Length of study is a discriminant factor for interprofessional socialisation for health student length of study for health students. Four groups of length of study were created: 1-2 years, 3-4 years, 5-6 years, and 7-8 years.

H3.B. Discipline background is not a discriminant factor for interprofessional socialisation for health students. There were 13 student courses: dentistry, exercise and sports science, exercise physiology, health promotion and sexology, medicine, nursing, nutrition and dietetics, occupational therapy, pharmacy, physiotherapy, psychology, social work, and speech pathology.

3.4 Results

3.4.1 Phase 1: Pilot Study

A total of 32 health practitioners (*n*=23) and students (*n*=9) completed the pilot study. Practitioners were aged between 21 and 60 years (*M*=39.3; *SD*=8.7); most were female (*n*=18, 78.3%) from eight different health professional backgrounds, with nurses being the largest group (*n*=11; 47.8%). Practitioners' length of service in interprofessional collaborative practice settings varied from 1 to 30 years (*M*=9.2; *SD*=8.5). Students were aged 18 to 40 years (*M*=28.1; *SD*=7.3). All were female (*n*=9) and from five different educational backgrounds, with occupational therapy being the largest group (*n*=5; 55.6%). Students' length of study varied from 1 to 4 years (*M*=3.0; *SD*=0.9). All students had experience working in teams in an actual healthcare industry, such as aged care, disability care, private clinics or hospitals. Detailed information regarding the pilot participants is provided as a supplementary (S1 Table).

3.4.1.1 Content Validity

When asked about the *relevance* of the items, practitioners and students had an agreement score of >70% for all 21 items, indicating all items were considered relevant by health practitioners and students. Therefore, all 21 items were included in the validation (practitioners, *Md*=97.0, *n*=23; students, *Md*=93.0, *n*=9). Three items were rated *disagree* by practitioners (8.6%) and students (22.4%), which were ISVS6 (comfortable being the leader), ISVS7 (comfortable in speaking out), and ISVS1 (aware of preconceived ideas). The lowest minimum agreement score was for ISVS6 (comfortable being the leader)=78.3%.

When asked about the *comprehensibility* of the items, practitioners and students had an agreement score of >70% for all 21 items, indicating both cohorts understood the instructions, items, and response options as intended (practitioners, *Md*=97.0, *n*=23; students, *Md*=97.0, *n*=9). Nevertheless, the comprehensibility of four items, ISVS2 (better appreciation for using a common language), ISVS4 (able to share and exchange ideas), ISVS5 (enhanced perception of engaging in interprofessional practice), and ISVS15 (comfortable clarifying misconceptions) were each rated as *disagree* by practitioners (8.7%) and students (22.2%). The alternative wording suggested by the participants for the four items was brought to the research team's panel meeting for further review. As the original instrument words and phrases were deemed more appropriate and better representing the items' context than the suggested phrasing, no changes were made; the original version of all items was retained. No comments were provided when participants asked about missing concepts in the instrument, indicating practitioners and students considered the *comprehensiveness* of the instrument to be high (i.e., all key concepts were included). Due to the minimum concern raised by the participants during the pilot, one trial was deemed sufficient.

3.4.2 Phase 2: Validation Study

The practitioner cohort comprised 134 participants who were mainly females (*n*=107, 79.9%). Practitioners' ages ranged from 21 to 70 years (*Md*=104.0; *n*=134), with the most common age group being 31-40 years (*n*=56, 41.8%). Practitioners' length of service ranged between 1 and 40 years (*Md*=104.0; *n*=134), with 6-10 years of service being the most common range (*n*=31, 23.1%). The three most common professional groups were occupational therapy (*n*=30, 22.4%), speech pathology (*n*=23, 17.2%), and nursing (*n*=18, 13.4%).

The student cohort comprised 207 participants who were mainly females (*n*=160, 77.3%). The students' ages ranged between 18 and 44 years (*Md*=100.0; *n*=207), and the most common age range was 18-24 years (*n*=150, 72.5%). Students' length of study within an interprofessional education and collaborative practice environment varied from 1 to 8 years (*Md*=100.0; *n*=207), with 1-2 years of studying within that context being the highest range (*n*=132, 63.8%). The three most common study courses were medicine (*n*=31, 15%), nursing (*n*=30, 14.5%), and speech pathology (*n*=23, 11.1%). All students involved had experience working in teams in actual healthcare industries, such as aged care, disability care, private clinics, or hospitals; length of working experience from 1 to 4 years (*Md*=100.0, *n*=207). More detailed information regarding participant characteristics is presented in Table 3.1.

With a total of 134 health practitioners and 207 students participating in the validation study, the study's intended target population was fulfilled. COSMIN's 'adequate' sample size (at least 5 times the number of items and a minimum of 100) was met for the practitioners, and 'very good' sample size (7 times the number of items and a minimum of 100) for students [34, 35]. The two datasets were confirmed suitable for factor analysis with Kaiser-Meyer-Olkin (KMO) 0.93 (practitioners) and 0.95 (students), respectively. Bartlett's Test of Sphericity for both datasets had values of $p < 0.001$, indicating suitability for factor reduction analysis. Results from the Kolmogorov-Smirnov normality test indicated evidence of non-normality ($p < 0.05$ in both datasets). No significant outliers and no missing data were identified in both datasets.

Table 3.1 Participants Characteristics

Practitioners			**Students**		
Number of participants (n = 134)			**Number of participants (n = 207)**		
Demographics	**Frequency (%)**	**Median**	**Demographics**	**Frequency (%)**	**Median**
Gender					
Male	(19.4%)	96.5	Male	42 (20.3%)	101.0
Female	107 (79.9%)	104.0	Female	160 (77.3%)	100.0
Other	1 (0.7%)	106.0	Other	5 (2.4%)	104.0
Age					
21-30 years	31 (23.1%)	93.0	18-24 years	150 (72.5%)	100.5
31-40 years	56 (41.8%)	104.5	25-29 years	31 (15.0%)	103.0
41-50 years	26 (19.4%)	102.5	30-34 years	15 (7.2%)	107.0

Practitioners			Students		
Number of participants (n = 134)			Number of participants (n = 207)		
Demographics	**Frequency (%)**	**Median**	**Demographics**	**Frequency (%)**	**Median**
51-60 years	15 (11.2%)	112.0	35-40 years	11 (5.3%)	83.0
61-70 years	6 (4.5%)	110.0			
Length of work/Length of study					
1-2 years	22 (16.4%)	93.0	1-2 years	132 (63.8%)	100.0
3-5 years	18 (13.4%)	94.0	3-4 years	63 (30.4%)	102.0
6-10 years	31 (23.1%)	102.0	5-6 years	10 (4.8%)	91.5
11-15 years	19 (14.2%)	105.0	7-8 years	2 (1.0%)	117.5
16-20 years	12 (9.0%)	113.5			
21-30 years	21 (15.7%)	105.0			
31-40 years	11 (8.2%)	109.0			
Professional\Educational Backgrounds					
Dentist	2 (1.5%)	72.5	Dentistry	11 (5.3%)	103.0
Nutritionist	3 (2.2%)	104.0	Exercise and sports science	3 (1.4%)	89.0
Medical practitioner	10 (7.5%)	110.5			
Midwife	3 (2.2%)	88.0	Exercise physiology	1 (0.5%)	63.0
Nurse	18 (13.4%)	106.0	Health promotion and sexology	11 (5.3%)	109.0
Occupational therapist	30 (22.4%)	102.5	Medicine	31 (15.0%)	100.0
Optometrist	6 (4.5%)	90.0	Nursing	30 (14.5%)	103.0
Pharmacist	15 (11.2%)	98.0	Nutrition and dietetics	10 (4.8%)	92.0
Physiotherapist	7 (5.2%)	123.5	Occupational therapy	20 (9.7%)	104.0
Podiatrist	2 (1.5%)	77.0	Pharmacy	22 (10.6%)	97.5
Psychologist	4 (3.0%)	100.0	Physiotherapy	12 (5.8%)	96.5
Public health	4 (3.0%)	105.0	Psychology	21 (10.1%)	104.0
Radiographer	3 (2.2%)	113.0	Social work	12 (5.8%)	102.5
Social worker	4 (3.0%)	117.5	Speech pathology	23 (11.1%)	102.0
Speech pathologist	23 (17.2%)	86.0			

3.4.2.1 Exploratory Factor Analysis

EFA was initiated with dimension reduction analysis set to maximum likelihood extraction based on eigenvalues greater than 1 and varimax rotation. Four potential factors were identified in the practitioner dataset and three in the student dataset, with a total variance explained in the first component being 53.8% and 59.4%, respectively. The assumption of factorial numbers based on Kaiser's criteria with eigenvalues greater than one is presented in Table 3.2.

As presented in Table 3.2, the unidimensionality of the Australian ISVS is confirmed based on: 1) the first factor explaining >40% of the variance of the population tested in both datasets (practitioner=53.8%; student=59.4%) (Reckase, 1979) and the total eigenvalue of the first factor being at least five times higher than that of the second factor in both datasets (practitioner 11.30/1.48=7.6 times higher; student 12.48/1.34=9.3 times higher) (Rubio et al., 2007); 2) the scree plots generated for both datasets indicated that the (imaginary) red line that separates the breakpoints in the two plots leaves only one dot above the line; and 3) all 21 items demonstrated strong internal consistency reliability with Cronbach's α scores of 0.96 and 0.96 and average inter-item correlations between items of 0.51 and 0.57 for the practitioner and student datasets, respectively. These findings strongly supported the Australian ISVS factorial structure as unidimensional, resembling the original instrument factorial structure (King et al., 2016).

3.4.1.2 Confirmatory Factor Analysis

CFA was conducted to further confirm a 1-factor 21-item solution for the Australian ISVS for both datasets. All 21 items for both cohorts showed good loading estimates >0.50 (ranging from 0.53 - 0.82 for practitioners and 0.64 - 0.85 for students), with a critical ratio (CR) >1.96 at p <0.001. These results indicated that each item met the validity requirements and reflected the unidimensional construct of the instrument. Sorted sequentially, ISVS1 (aware of preconceived ideas), ISVS2 (better appreciation for using a common language), and ISVS3 (enhanced awareness of own role) had the lowest estimated loading on practitioners. For students, ISVS2 (better appreciation for using a common language), ISVS6 (comfortable being the leader), and ISVS1 (aware of preconceived ideas) had the lowest estimated loading. The initial model tested with confirmatory factor analysis is shown in Figure 3.2A. Using this model, the two datasets were tested separately, using the practitioners as the calibrator. The results indicated a 'good' fit to the COSMIN model by the SRMR (practitioner SRMR=0.076; student SRMR=0.062) and acceptable CMIN/df with $\chi^2(189)=650.36$, CMIN/df=3.44 for practitioners, and $\chi^2(189)=795.15$, CMIN/df=4.21 for students. The CFI and RMSEA were poor in both datasets, with $p<0.001$, indicating a discrepancy between the data and the proposed models.

Table 3.2 Numbers of Factorial Structure

Total Variance Explained							
Practitioner dataset				Student dataset			
Factor	Initial Eigenvalues			Factor	Initial Eigenvalues		
	Total	% of variance	Cumulative %		Total	% of variance	Cumulative %
1	11.30	53.8	53.8	1	12.48	59.4	59.4
2	1.48	7.1	60.8	2	1.34	6.4	65.8
3	1.28	6.1	67.0	3	1.07	5.1	70.9
4	1.00	4.8	71.7				

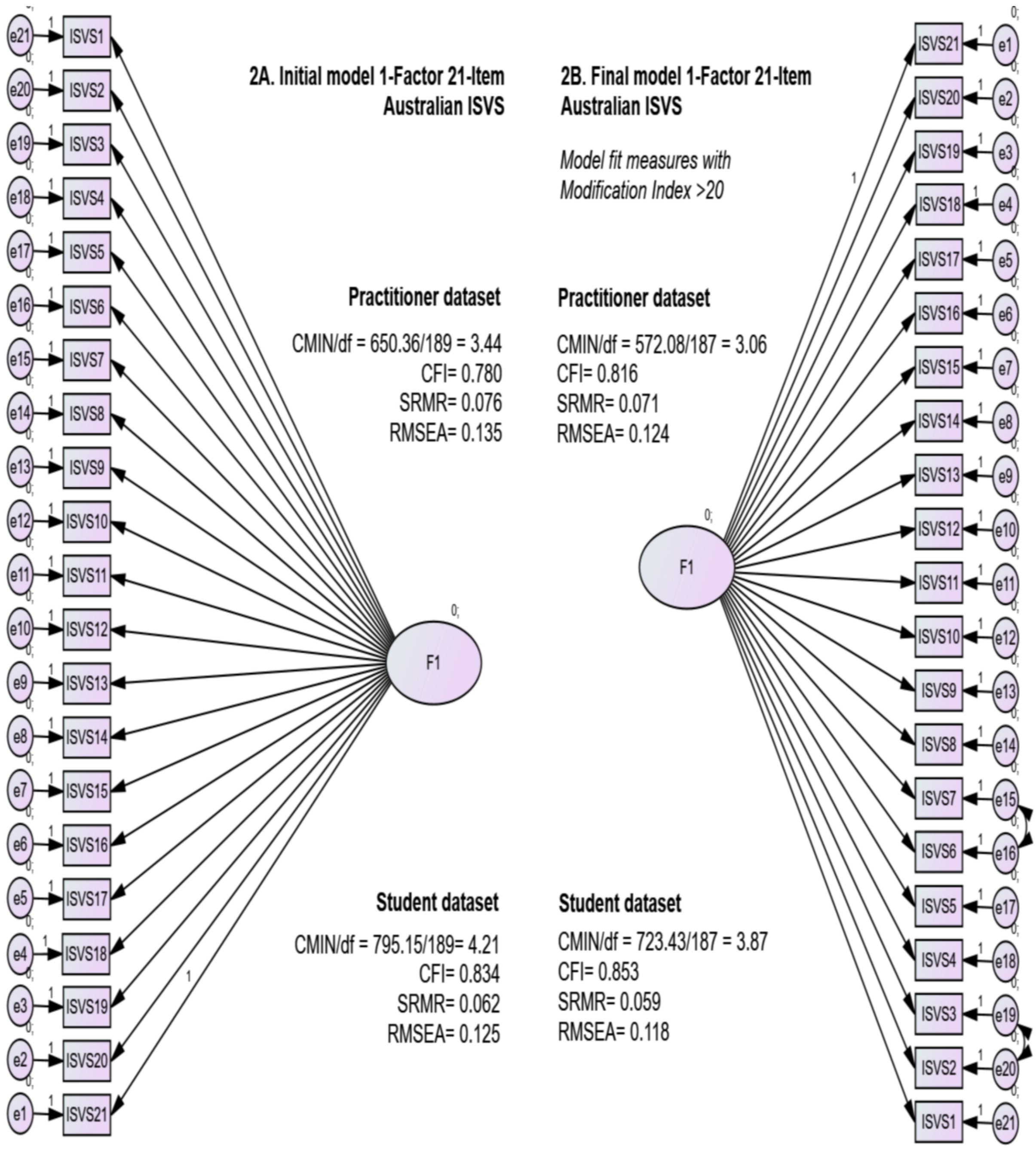
Several covariances were identified with the Modification Index (MI)>20, indicating the possibility of items overlapping. Seven significant cases were identified with MI>20 for practitioners. Notably, two of these cases related to error terms for ISVS1, ISVS2, ISVS3, and ISVS6, with the error terms covariance between ISVS2 and ISVS3 showing the highest MI (45.14 with a parameter change of 0.40). For students, ten cases were found with MI>20. Three cases involved error terms for ISVS3 and ISVS2, while two involved ISVS7. The highest MI (43.18 with a parameter change of 0.62) was observed in the covariance between the error terms for ISVS6 and ISVS7. Correlating the error terms of interest (ISVS2 and ISVS3, as well as ISVS6 and ISVS7) highlights areas for focused attention and potential enhancements of the model without the need to remove any item.

Alternative iterations were performed to improve the model fit by applying one or more covariances representing the MI findings [64]. As predicted, the most improved model fit was obtained by generating covariances with the most significant chi-square improvement and involved error terms of the same items in both cohorts, which were error terms between ISVS2 (better appreciation for using a common language) and ISVS3 (enhanced awareness of own role); and correlating between error terms for ISVS6 (comfortable being the leader) and ISVS7 (comfortable in speaking out). By correlating the error terms involving ISVS2 and ISVS3, as well as ISVS6 and ISVS7, the model fit indices for both data sets significantly improved. Figure 3.2 shows changes in fit indices of both datasets' initial and final models.

As part of the iteration process, we conducted tests to analyse whether removing ISVS1 or ISVS6, or both ISVS1 and ISVS2, along with applying one or more correlations to error terms with MI>20 in both data sets, would significantly improve the model. Our goal throughout this iterative process is to retain as many items as possible. After excluding ISVS1 from the practitioner dataset, the CFI increased by 0.025 (from 0.780 to 0.805), and the SRMR decreased by 0.004 (from 0.076 to 0.072). Conversely, excluding ISVS6 resulted in a CFI increase of 0.015 (from 0.780 to 0.795) and an SRMR decrease of 0.020 (from 0.076 to 0.074). The exclusion of ISVS1 from the student dataset resulted in a 0.007 increase in CFI (from 0.834 to 0.841) and a 0.001 decrease in SRMR (from 0.062 to 0.061). Conversely, excluding ISVS6 led to CFI increasing by 0.012 points (from 0.834 to 0.846) and SRMR decreasing by 0.018 points (from 0.062 to 0.058). Other indices (i.e., CMIN/df and RMSEA) did not show improvement in both datasets. Similarly, excluding ISVS1 and ISVS6 in both datasets only introduced a minimal improvement in the fit indices.

For all of these trial results, the CMIN/df remained acceptable (between 3 and 5, excellent if <3), the CFI remained within the acceptable category (CFI not increased to >0.9), and the SRMR was already at an excellent level, as indicated by its initial value of <0.08. As such, the small improvement did not lead to better indices group classification compared to the initial model. Having an excellent SRMR (<0.08), acceptable CFI (>0.80), and acceptable CMIN/df (between 3 - 5) in both datasets already meets the COSMIN good model fit requirements. The slight improvement in the indices was deemed insignificant compared to the potential compromise of the instrument's construct validity (i.e., if ISVS1, ISVS6, or both items were removed). Figure 3.2 shows changes in fit indices of the initial and final models for both datasets. Additional information regarding the CFA results is provided as a supplementary (S2 File).

As reflected in Figure 3.2 the model fit indices of the two cohorts improved significantly in the final model. Practitioner, χ^2(187)=572.08, CMIN/df=3.06, SRMR=0.071, CFI=0.834; and student, χ^2(187)=723.43, CMIN/df=3.87, SRMR=0.059, CFI=0.853. Both models met the COSMIN requirements for a good model fit. For a detailed comparison of the initial and final model fit indices, see also supplementary document for CFA results (S2 File). With a good model fit achieved, the MG-CFA for both datasets was confirmed to be appropriate for testing. Using the final model solutions, the standardised estimates, critical ratios and probability (*p*) for items in the two cohorts were calculated and presented in Table 3.3.



Notes. CMIN/df = Chi-square Minimum Discrepancy Function, df = Degree of Freedom, CFI = Comparative index, SRMR = Standard Root Mean Square of the Residual, RMSEA = Root Mean Square Error of Approximation

Figure 3.2. The Initial (2A) And Final (2B) Structural Models for the Australian ISVS

Table 3.3 Item Estimates, Critical Ratios and Probability (*p*)

Items	Practitioner				Student			
	Estimate[1]	S.E[2]	C.R[3]	*p*	Estimate[1]	S.E[2]	C.R[3]	*p*
ISVS1	0.53	0.13	6.24	<0.001	0.67	0.11	9.25	<0.001
ISVS2	0.58	0.13	7.00	<0.001	0.63	0.10	8.68	<0.001
ISVS3	0.62	0.11	7.33	<0.001	0.71	0.10	9.82	<0.001
ISVS4	0.80	0.13	9.44	<0.001	0.75	0.12	10.37	<0.001
ISVS5	0.76	0.13	8.90	<0.001	0.78	0.12	10.66	<0.001
ISVS6	0.72	0.17	8.56	<0.001	0.64	0.16	8.79	<0.001
ISVS7	0.72	0.15	8.58	<0.001	0.72	0.13	9.94	<0.001
ISVS8	0.76	0.14	8.97	<0.001	0.78	0.12	10.72	<0.001
ISVS9	0.68	0.12	7.90	<0.001	0.74	0.12	10.23	<0.001
ISVS10	0.78	0.14	9.33	<0.001	0.83	0.13	11.32	<0.001
ISVS11	0.64	0.12	7.37	<0.001	0.77	0.11	10.62	<0.001
ISVS12	0.81	0.12	9.59	<0.001	0.82	0.13	11.15	<0.001
ISVS13	0.70	0.10	8.03	<0.001	0.80	0.11	11.00	<0.001
ISVS14	0.62	0.13	7.16	<0.001	0.74	0.11	10.17	<0.001
ISVS15	0.82	0.13	9.61	<0.001	0.85	0.12	11.55	<0.001
ISVS16	0.67	0.10	7.68	<0.001	0.73	0.12	10.09	<0.001
ISVS17	0.71	0.13	8.38	<0.001	0.83	0.12	11.39	<0.001
ISVS18	0.80	0.14	9.41	<0.001	0.82	0.13	11.17	<0.001
ISVS19	0.73	0.11	8.50	<0.001	0.80	0.11	11.02	<0.001
ISVS20	0.76	0.13	8.77	<0.001	0.74	0.11	10.16	<0.001
ISVS21	0.75				0.69			

Note. [1]Standardised estimates, [2]Standard error, [3]Critical ratio.

3.4.1.3 Measurement Invariances

A 3-staged invariant measurement of configural, metric and scalar tests was carried out using the model presented in Figure 2B. Both datasets were analysed simultaneously. Thus, the reported fit indices refer to groups, not individual datasets. The configural invariance was achieved with the unconstrained model indicated SRMR=0.059, RMSEA=0.085, $\chi^2(374)=1295.69$, CMIN/df=3.47, fulfilling the COSMIN criteria for a 'good model fit [33]. The metric test indicated a good fit with SRMR=0.061, RMSEA=0.084, $\chi^2(394)=1327.18$, CMIN/df=3.37, fulfilling the COSMIN criteria for a 'good' model fit (Prinsen et al., 2018). Metric invariance was confirmed by the difference in CFI between configural and metrics models <0.01 (ΔCFI=0.002). The scalar test indicated a good fit with SRMR=0.061, RMSEA=0.082, $\chi^2(415)=1375.74$, CMIN/df=3.32, fulfilling the COSMIN criteria for a 'good' model fit (Prinsen et al., 2018). Scalar invariance was confirmed by the difference in CFI between metrics and scalar models <0.01 (ΔCFI=0.005). A comparison of fit indices for the three models is presented in Table 3.4.

Table 3.4 Full Model Comparison of the Invariances

Full Model Comparison	CMIN/df	CFI	ΔCFI	SRMR	RMSEA	Invariance
Configural Invariance	1295.69 (374) = 3.47	0.840	-	0.059	0.085	Yes
Metric Invariance (Measurement weights)	1327.18 (394) = 3.37	0.838	0.002	0.061	0.084	Yes
Scalar Invariance (Measurement intercepts)	1375.74 (415) = 3.32	0.833	0.005	0.061	0.082	Yes

Notes. CMIN/df = Chi-square Minimum Discrepancy Function, df = Degree of Freedom, CFI = Comparative index, ΔCFI = Differences in CFI, SRMR = Standard Root Mean Square of the Residual, RMSEA = Root Mean Square Error of Approximation

3.4.1.4 Internal Consistency Reliability

The internal consistency reliabilities of the Australian ISVS-21 for practitioners and students indicated composite reliability of 0.96 and 0.96, respectively. The average variance extracted was within the expected range of greater than 0.5 (practitioner, AVE=0.51; student, AVE=0.57).

3.4.1.5 Hypotheses Testing

As neither dataset was normally distributed, non-parametric statistics of the Kruskal-Wallis H test were performed with the Mann-Whitney U posthoc test for comparisons to identify exact group differences. All responses (practitioners, n=134, students, n=207) were included for hypotheses testing.

H1.A was accepted.

Practitioners' age was a discriminant factor for interprofessional socialisation ($H(4)=10.37$, $p=0.04$). Practitioners aged 51–60 years were significantly different from those aged 21-30 years, 31-40 years, and 41-50 years.

H2.A was accepted.

Practitioners' length of service was a discriminant factor for interprofessional socialisation ($H(6)=13.01$, $p=0.04$). Practitioners with 1–2 years of work experience were significantly different from those with 11-15 years and 16-20 years; and those with 3-5 years of work experience were significantly different from those with 16-20 years, 21-30 years, and 30-40 years.

H3.A was rejected.

Practitioners' professional background was a discriminant factor for interprofessional socialisation for health practitioners ($H(14)=28.20$, $p=0.01$). Optometrists were significantly different from speech pathologists and social workers; psychologists were significantly different from podiatrists, social workers, speech pathologists, nurses, occupational therapists, pharmacists, nutritionists, medical practitioners, and physiotherapists; and dentists were significantly different from nurses and speech pathologists.

H1.B was accepted.

Students' age was a discriminant factor for interprofessional socialisation ($H(2)=8.85$, $p=0.01$). Students aged 35-40 were significantly different from those aged 18-24 and 25-34.

H2.B was accepted.

Students' length of study was a discriminant factor for interprofessional socialisation ($H(3)=8.22$, $p=0.04$). Students with 5-6 years of study were significantly different from those with 3-4 years and 7-8 years of study.

H3.B was accepted.

Students' discipline background was a discriminant factor for interprofessional socialisation ($H(12)=11.98$, $p=0.45$).

The post hoc tests with Mann-Whitney U identified significant differences related to exact age groups for each hypothesis (please refer to supplementary S3 Table). Five of the six (83.3%) assumptions proposed were accepted; therefore, COSMIN's requirements for hypotheses testing were met (Prinsen et al., 2018).

3.5 Discussion

This study aimed to assess the psychometric properties of the Australian ISVS. A series of psychometric evaluations were carried out according to COSMIN guidelines, which included content validity testing, internal structure testing (structural validity, internal consistency reliability, and measurement invariance), and hypotheses testing. In particular, measurement invariance was assessed to ascertain instrument invariance across tested groups and suitability for use by health practitioners and students in Australia.

3.5.1 The Australian ISVS-21 Psychometric Properties

The Australian ISVS was confirmed to be unidimensional, suggesting that all 21 items that comprise the instrument measure a similar construct of interprofessional socialisation as proposed by the original instrument (King et al., 2016). Several studies in various countries have also confirmed the unidimensional structure of ISVS-21 (Ardyansyah et al., 2024b; González-Pascual et al., 2022; Mahler et al., 2023). Based on content validity analysis for COSMIN requirements on *relevance*, *comprehensibility* and *comprehensiveness*, no changes were made, and all 21 items were used as presented in the original version (King et al., 2016). However, it should be noted that four items were closely examined in the pilot study in terms of how easily they could be understood (comprehensibility): ISVS2 (better appreciation for using a common language), ISVS4 (able to share and exchange ideas), ISVS5 (enhanced perception of engaging in interprofessional practice), and ISVS15 (comfortable clarifying misconceptions). Although participants suggested alternative wording for these items, the research panel ultimately retained the original language as the original items aligned better with the intended constructs. ISVS2 and ISVS5 were also recommended to be rewritten in other validation studies (Ardyansyah et al., 2024b; González-Pascual et al., 2022) whereas ISVS15 was removed from the other two studies to improve the instrument's properties (Ardyansyah et al., 2024b; De Vries et al., 2016).

In addition, three items received the least endorsement in terms of *relevance* from both cohorts in the pilot study: ISVS1 (aware of preconceived ideas), ISVS6 (comfortable being the leader), and ISVS7 (comfortable in speaking out). The ISVS1 and ISVS6 are of concern because subsequent confirmatory factor analysis also confirmed ISVS1 (aware of preconceived ideas) as the item with the lowest estimate in the practitioner cohort and ISVS6 (comfortable being the leader) as the second lowest in the student cohort. This finding is consistent with results demonstrated during the development of ISVS-21 (King et al., 2016), whereby ISVS6 (comfortable being the leader) and ISVS1 (aware of preconceived ideas) were the two items with the lowest means. Similar findings related to difficulties with ISVS1 (aware of preconceived ideas) were corroborated by other ISVS-21 studies using student participants in Germany (Mahler et al., 2023), Spain (González-Pascual et al., 2022), Australia (Vari et al., 2021), and Indonesia (Ardyansyah et al., 2024b); and ISVS6 (comfortable being the leader) was dropped from the instrument in the study in Australia (Vari et al., 2021). A low loading estimate on an item indicates a weak contribution of the item to the overall construct (Williams et al., 2010). Collectively, these results reinforce the weaknesses of the two items for inclusion in the measure.

The internal consistency reliability scores of the Australian ISVS-21 are relatively high, with Cronbach's α scores and composite reliability exceeding 0.95 for both datasets. This suggests that there may be item redundancy. The interitem correlation scores in both datasets also exceed 0.5, indicating further redundancy. These reliability scores demonstrate how well the items are related to each other and their suitability for measuring a single construct. While high reliability is essential, excessively high scores may compromise the instrument's ability to measure diverse constructs accurately, thus impacting its overall validity (Hair et al., 2020; Prinsen et al., 2018).

Cronbach's α scores of well above 0.90 have been reported in several ISVS-21 studies (Cartwright et al., 2015; González-Pascual et al., 2022; Mahler et al., 2023) and some with very high scores of $>$0.95 (Karnish et al., 2019; Timm & Schnepper, 2021), including the original ISVS-21 with Cronbach's α=0.988 (King et al., 2016). Item reduction is recommended for a scale or subscale with very high Cronbach's α scores (Prinsen et al., 2018). While our psychometric evaluation of the Australian ISVS-21 indicates that attention needs to be paid to their relevance for inclusion in the instrument to ISVS1 (aware of preconceived ideas) and ISVS6 (comfortable being the leader), relying on Cronbach's α or composite reliability, and interitem correlation scores alone as a basis for item deletion is not recommended at this stage. Instead, all 21 items were seen to have relevance, were well-understood, and were comprehensive for measuring interprofessional socialisation in Australia. As good psychometric properties of the instrument can still be maintained by retaining these items, retaining ISVS1 (aware of preconceived ideas) and ISVS6 (comfortable being the leader) is highly recommended to allow measuring themes that are challenging, yet highly relevant, to interprofessional education and collaborative practice.

The three-stage invariance tests of configural, metric and scalar performed on the Australian ISVS confirmed the proposed model is invariant across groups tested and can be used to measure interprofessional socialisation in Australian health practitioners and students. By achieving configuration, metric, and scalar invariants, practitioners and students are in agreement with the Australian ISVS factorial structure regarding its unidimensionality and inclusion of all 21 items (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). The practitioners and students in the study shared the same understanding of the constructs that underlie the Australian ISVS, and the mean scores of the two cohorts are expected to be comparable when assessed using the suggested factorial solutions (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016).

To date, the only studies we found to have evaluated the equivalence of the ISVS-21 for use in practitioners and students was the original Canadian version (King et al., 2016). The study used Item Response Theory modelling and reported an agreement score between the practitioner and student datasets (r=0.9986, 95% CI 0.9983–0.9988), indicating invariance of the two tested cohorts. However, because this original study used a different invariant measurement method to the ones performed in this study, it should be interpreted with caution.

3.5.2 'Preconceived Ideas' and 'Leadership' in Interprofessional Socialisation

Participant disagreement over including two items, ISVS1 (aware of preconceived ideas) and ISVS6 (comfortable being the leader), reflects a challenge to the concepts implied by the items, which are *preconceived ideas* and *leadership* in interprofessional socialisation. Both practitioners and students involved in this research have experience working in interprofessional teams. This experience developed their perceptions, attitudes, and beliefs about interprofessional teamwork and shaped their preconceived ideas. Stereotypes about one's role, the roles of other team members, and the dominance of certain professions are among the frequently expressed prejudices (Nicol, 2013; Will et al., 2019; Xyrichis et al., 2018), which were evident in these studies.

Leadership is an important element of effective interprofessional teamwork (Stutsky & Spence Laschinger, 2014; WHO, 2010) Leadership is regarded as an antecedent factor that can directly or indirectly affect consequence variables (Stutsky & Spence Laschinger, 2014), such as conflict resolution (Gergerich et al., 2019; Snyder & Engström, 2016), team effectiveness (MacDonald et al., 2010; Mitchell et al., 2011), the team's drive for patient involvement (Snyder & Engström, 2016; Spence Laschinger et al., 2010), and patient satisfaction (Gergerich et al., 2019; Lawrence et al., 2015). The fact that ISVS6 (comfortable being the leader) is not fully supported in many ISVS studies suggests challenges for leadership skills in interprofessional teams, which aligns with previous research on the complexity of interprofessional practice (Xyrichis et al., 2018).

It is worth noting that women were the dominant participants in both the pilot and validation studies. According to the World Health Organization (2019), women comprise almost 70% of global health workers, with 89% being nurses. This trend is also reflected in Australia, where women comprise 74.2% of the healthcare workforce (Australian Institute of Health and Welfare, 2023). Nurses and midwives constitute Australia's largest group of registered health professionals, representing about 54% of the total health professionals. Through a purposive sampling method, we distributed the instrument online to health professional bodies and other official platforms freely accessible to healthcare practitioners and students in Australia. As a result, the overrepresentation of women in the Australian healthcare workforce naturally led to recruiting more female than male participants.

The significant number of women in this study could potentially result in implicit bias. Participants' experiences may have influenced their preconceived ideas about prevalent issues impacting women as healthcare professionals, ranging from a simple stereotypical based on gender characteristics, as to how male and female will act in the group, to more complex issues, including gender disparities, work-life balance and family responsibilities, unfavourable work environments, and discrimination (e.g., limited job recruitment opportunities and career advancement for women) (ALobaid et al., 2020; Price & Clearihan, 2015). These experiences may have shaped the participants' views on interprofessional socialisation and values.

Despite the high percentage of women in clinical and frontline healthcare roles in Australia, their presence in leadership positions does not reflect this. Only 12.5% of hospital chief executive officers, 22% of Australian Medical Association presidents, 28% of medical school deans, and 33% of chief medical officers at state/territory and federal levels are women (Bismark et al., 2015). Barriers such as self-doubt, lack of self-confidence, underestimating personal capabilities, parenthood or family responsibilities, and the perception that being too feminine means being an incompetent leader prevent women from taking up leadership roles (Bismark et al., 2015; McGowan & Stokes, 2019; Mousa et al., 2021; Perry et al., 2017; Price & Clearihan, 2015). More female representation in leadership roles is urgently needed to ensure inclusive decision-making for women in Australia's health sector.

3.5.3 Determining Factors for Interprofessional Socialisation

In relation to construct validity, this study confirms that age and length of service or length of study were determining factors for interprofessional socialisation for both health practitioners and students. Age and years of service have been acknowledged as influential factors for interprofessional practice (Anderson & Thorpe, 2008; Van et al., 2007). The two are related because older practitioners with more extensive work experience will likely understand their scope of practice better (Bradby, 1990; Horrocks et al., 2002; Legault et al., 2012). However, previous research found that more experienced practitioners are less likely to collaborate and share information (Lalonde et al., 2011; Van et al., 2007). Furthermore, given that professional role identity occurs at least six months after the start of clinical exposure (Bradby, 1990), it was not surprising that students' discipline-specific skills begin to shape during their clinical placement time and, subsequently, their professional identity in general. The students who participated in this study had a minimum of one year of clinical experience.

Students' course of study was not a discriminant factor for interprofessional socialisation, which is consistent with other previous ISVS studies identifying no significant differences between students regarding study courses (Aul & Long, 2020; Bloomfield et al., 2021; De Vries et al., 2016; Gierach et al., 2020; Graves et al., 2020; Karnish et al., 2019). Studies using the ISVS with practitioners are limited. However, many studies have reported that professional background is a differentiating factor, and professional hierarchies are evident in healthcare (Clarin, 2007; Lalonde et al., 2011; Mian et al., 2012).

Interestingly, professional backgrounds were evident for practitioners but not for students. One possible explanation is that the Australian students involved have been trained in IPE during their training and thus were more accepting of interprofessional socialisation (Nicol, 2013). In contrast, the practitioners in this study, 33% of whom have been in service for over 15 years, are likely to have been trained in uniprofessional culture and practice (Oandasan & Reeves, 2005; Thannhauser et al., 2010) as IPE is a relatively new addition to health professional education. As such, they may be less inclined to collaborate with other practitioners in patient care (Legault et al., 2012; Nicol, 2013).

This study has limitations. The samples were dominated by certain professions or courses, which may have influenced participants' overall responses. For future action, research utilising item response theory (Rasch analysis) is needed to determine if the problematic items (i.e., ISVS1 and ISVS6) need to be removed.

3.6 Conclusion

The Australian ISVS has good psychometric properties based on evaluating the content validity, internal structure, and hypotheses testing for construct validity. In addition, Australian ISVS is an invariant measure for use by health practitioners and students and, therefore, is confirmed as a quality measure to assess interprofessional socialisation for both cohorts in Australia.

3.7 Acknowledgments

We are thankful to the Australian health practitioners and students who participated in this study.

3.8 Supporting Information

S1 Table. Pilot Participants Characteristics
S2 File. Detailed CFA results
S3 Table. Mann-Whitney U Post-Hoc Analysis of Significant Hypotheses Testing

3.9 References

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Chapter 4 Validation of the Collaborative Practice Assessment Tool (CPAT) Australia

Chapter 4 details the results of the cultural validation of the Collaborative Practice Assessment Tool (CPAT) in Australia. This chapter contains an accepted manuscript of an article published in the journal PlOS ONE, which is available online: https://doi.org/10.1371/journal.pone.0302834. The spelling and wording contained within this chapter are that of the published manuscript.

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Title

An evaluation of the psychometric propertiesof the Australian Collaborative Practice Assessment Tool

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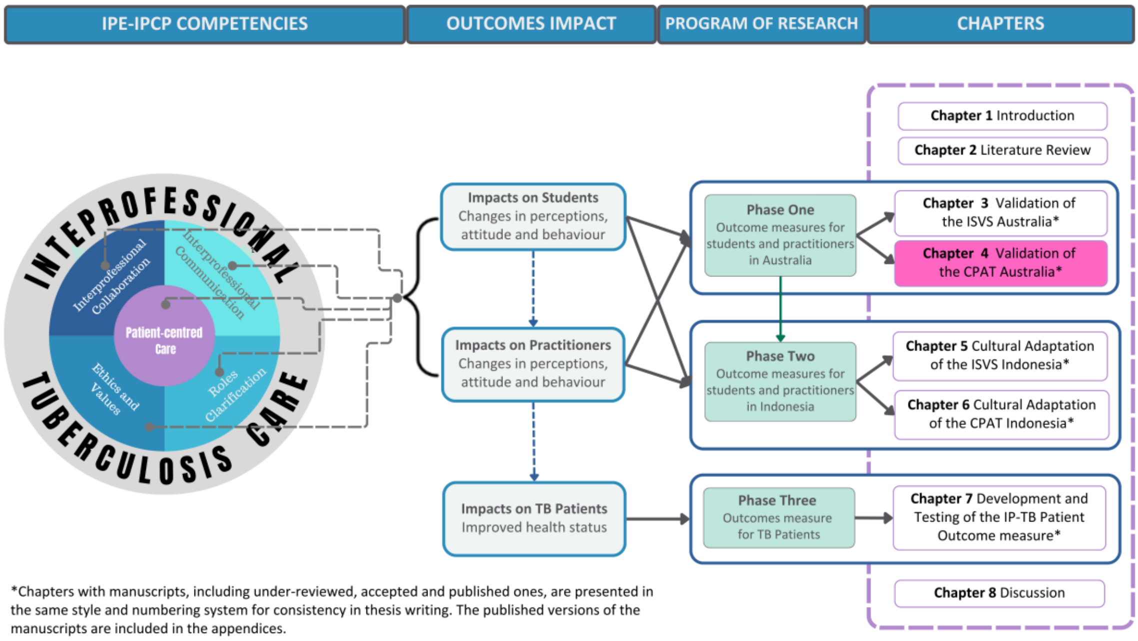

4.1 Abstract

Objectives: This study aimed to validate the Collaborative Practice Assessment Tool (CPAT) in the Australian setting and provide a quality instrument in terms of psychometric properties that can be used to measure interprofessional outcomes for both healthcare practitioners and students. The outcomes evaluated include the capacity to work in an interprofessional team, good interprofessional communication skills, leadership skills, ensuring clear division of tasks and roles in a team, effective conflict management, and being actively involved with patients and their families/communities in care.

Methods: The COSMIN (**CO**nsensus-based **S**tandards for the selection of health **M**easurement **IN**struments) taxonomy and standards were used as guides for evaluating the psychometric properties of the Australian CPAT, which include evaluations regarding instrument development requirements of sample target and size, content validity, internal structure (structural validity, internal consistency reliability and measurement invariance), and hypotheses testing. CPAT Australia was developed through two stages involving pilot studies and a validation study, both of which included healthcare practitioners and students as participants. A pilot study examined content validity regarding item relevance, item comprehensibility, and instrument comprehensiveness. The validation study was carried out to assess the internal structure of CPAT Australia for aspects of structural validity, internal consistency reliabilities, and configural, metric and scalar measurement invariance. The structural validity was explored using the following three steps: exploratory, confirmatory, and multi-group factor analysis. Construct validity was evaluated to confirm direct and indirect paths of assumptions based on a previously validated model. Data collected between August 2021 and May 2022.

Results: The content validity evaluation confirmed that all items were relevant, understandable and comprehensive for measuring interprofessional collaborative care in Australia. Three hundred ninety-nine participants contributed to the validation study (*n*=152 practitioners; *n*=247 students). The original instrument model of 8-Factor 56-Item was improved in the Australian CPAT. Two items, Item 27 (Physicians assume the ultimate responsibility) and Item 49 (Final decision rest with the physician), were consistently rejected and therefore discarded. The internal structure of the 7-Factor 54-Item solution was confirmed as a suitable model with fit indices meeting COSMIN standards for a good model in practitioner and student cohorts. Configural, metric and scalar invariances were confirmed, indicating the invariance of the instruments when used for the practitioner and student cohorts. The construct validity evaluation indicated that 81.3% of direct and indirect assumptions were accepted, fulfilling the COSMIN requirement of >75% of proposed assumptions being accepted.

Conclusion: The Australian CPAT with a 7-factor 54-item solution was confirmed as a quality measure for assessing interprofessional education and collaborative practice for

both healthcare practitioners and students in Australia with robust psychometric properties.

4.2 Introduction

Working in the same healthcare context, such as the same ward in a hospital, does not constitute an interprofessional education and collaborative practice activity as this group of health professionals may operate within a multiprofessional team framework. The terms multiprofessional and interprofessional practice are sometimes incorrectly used as though they are synonymous. Within a multiprofessional context, health professionals learn alongside each other and do not necessarily learn and work collaboratively or pursue common goals (Freeth, 2013). Conversely, interprofessional education or collaborative practice offers more than parallel learning within an interprofessional context. The nature of interprofessional activities requires health professionals to engage in collective actions to learn with, from, and about each other to pursue collaborative goals. The World Health Organisation (WHO) defines Interprofessional education as occurring when, "...two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" [WHO, p. 13], and collaborative practice as occurring when, "...multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across settings" [WHO, p. 13].

Interprofessional education and collaborative practice have been reported to positively impact patient satisfaction and reduce the duration of hospitalisation, the number of hospital visits, malpractice acts, and health-related costs (WHO, 2010). However, their implementation in educational settings is considerably challenged by leadership support, timetable restrictions, limited opportunity for collaborative interaction between the students, their mentors and patients, and a lack of resources for appropriate interprofessional learning (Brewer & Flavell, 2018; Brewer & Barr, 2016; Brewer et al., 2017; Nisbet et al., 2008; Reeves & Freeth, 2002; Slater et al., 2012). Australian health education institutions and practice settings are not new to interprofessional education and collaborative practice. The Australian Health Practitioner Regulation Agency (AHPRA), a national agency for accreditation and regulation overseeing 28 health professional bodies, has released a statement of intent regarding interprofessional collaborative practice (IPCP), and interprofessional education has become embedded at the Australian higher education level (Australian Health Practitioner Regulation Agency (AHPRA), 2023; Dunston et al., 2014; Khalili et al., 2022). Several instruments have been used in Australian universities to measure interprofessional related outcomes: the Interprofessional Socialization and Valuing Scale (ISVS), the Readiness for Interprofessional Learning Scale (RIPLS), the University of West England (UWE) instruments, and Curtin University's Interprofessional Capability Assessment Tool (ICAT) (Nicol, 2013). However, to date, no interprofessional outcomes measure has been validated for either students or practitioners in Australia. Instrument validation is critical to instrument quality control, which, in turn, determines data reproducibility, accuracy of findings, and generalisability (Mokkink et al., 2018a; Mokkink et al., 2018b)

In cross-population studies involving healthcare practitioners and students, as in this current study, it is likely that the instrument will not produce equivalent responses due to differences in factors such as age, length of service or experience, professional backgrounds and practice settings. However, outcome measures for practitioners and students are needed to support greater integration between interprofessional education (at the students' level) and collaborative practice in the workplaces (at the practitioners' level). Therefore, it is crucial to investigate the equivalence of statistical models to determine whether the responses of these two populations differ by more than chance. This is an essential process because instrument validation must be conducted in the intended context and with the user population to ensure the adopted items adequately reflect the measure as intended in the original version (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). Instruments validated for health practitioners are not recommended for use by health students, as practitioners may respond differently to items compared to students, and vice versa (De Vries et al., 2016). Unfortunately, few instruments are available to assess outcomes at both levels. Outcomes evaluated in the instrument should apply to both cohorts, for example, the capacity to work in an interprofessional team, good interprofessional communication skills, leadership skills, ensuring clear division of tasks and roles in a team, effective conflict management, and being actively involved with patients and their families/communities in care. The Interprofessional Socialization and Valuing Scale (ISVS)-21 is among the few invariant measures for this purpose (Ardyansyah et al., 2024; King et al., 2016). However, as opposed to the ISVS-21, the CPAT was chosen in the current study because it is more comprehensive. It contains domains related to patient engagement and community empowerment, constructs not covered in the ISVS-21.

Having an invariant measure between healthcare practitioners and students means that although the two groups may differ in their average levels of agreement with certain factors, the estimated loadings, mean scores and intercepts of items within those factors differ only by chance, thus allowing comparison of the scale scores of both groups (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Scores associated with relevant interprofessional outcomes can be compared to identify weaknesses, improvements, and target attainment across the tested groups. The comparable scores enable the identification of the nature of practitioners’ collaborative practice in the workplace and the level of interprofessional development of students in their training.

4.2.1 The Collaborative Practice Assessment Tool (CPAT)

The Collaborative Practice Assessment Tool (CPAT) is considered a valuable instrument for the Australian context because it covers essential aspects related to interprofessional collaboration, such as team leadership, shared goals, roles clarification, teamwork, and team communication, and contains variables that can be used as patient and community indicators of empowerment in care (Schroder et al., 2011). The lack of tools to assess organisational or patient care outcomes is an issue related to interprofessional education and collaborative care (Reeves et al., 2016). The CPAT can provide evidence linking interprofessional education to collaborative practice, including patient involvement and outcomes.

In addition, the CPAT has also been translated and used in many settings worldwide to measure team performance and cross-cultural validation of the instrument has been conducted in Japan (Tomizawa et al., 2014), Taiwan (Ho et al., 2023), Indonesia (Yusra et al., 2019), and Singapore (Quek et al., 2022) and used in many studies in the USA and Canada (Bookey-Bassett et al., 2016; Fisher et al., 2015; Khan et al., 2022; Nagelkerk et al., 2018; Paterson et al., 2013; Pfaff et al., 2014). CPAT is acceptable for use in many different clinical settings, such as primary and community care (Findyartini et al., 2019; Khan et al., 2022), mental health (Tomizawa et al., 2014), chronic disease management (Bookey-Bassett et al., 2016), health professionals postgraduate training (Ho et al., 2023), patient safety (Paterson et al., 2013), and patient satisfaction (Fisher et al., 2015). Despite its lengthy scale consisting of 56 items, the CPAT is recommended as the best instrument for measuring interprofessional collaboration for teamwork (Kang et al., 2022). All of these studies included health professionals as participants. An American study used CPAT to measure improvements in the health of diabetes patients following an interprofessional collaborative practice program; this research involved both practitioner staff and students as participants (Nagelkerk et al., 2018). To the best of our knowledge, no study has validated the CPAT for health students.

The original version of the CPAT was designed in Canada in English as a self-assessment measure and consists of 56 items, eight subscales, and three open-ended questions [21]. The subscales are 1) Mission, meaningful purpose, goals (8 items, Cronbach's α=0.88); 2) General relationships (8 items, Cronbach's α=0.89); 3) Team leadership (8 items, Cronbach's α=0.80); 4) General roles responsibilities, autonomy (10 items, Cronbach's α=0.81); 5) Communication and information exchange (6 items, Cronbach's α=0.84); 6) Community linkages and coordination of care (4 items, Cronbach's α=0.76); 7) Decision-making and conflict management (6 items, Cronbach's α=0.67); and 8) Patient involvement (5 items, Cronbach's α=0.87). Six of the items are negatively worded. The scale descriptor was based on a 1 to 7-point Likert scale (1 = Strongly disagree, 2 = Mostly disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Mostly agree, and 7 = Strongly Agree).

The original CPAT development included two pilot studies involving Canadian healthcare practitioners. Exploratory factor analysis (EFA) was used in the first pilot (*n*=42) to confirm the factorial number, item positioning, and item deletion and Confirmatory factor analysis (CFA) was used in the second pilot analysis (*n*=111). Based on subscale analysis, CFA confirmed that six of the eight subscales met the predefined standards of a 'good' fit model based on the normed fit index (NFI), comparative fit index (CFI), Tucker-Lewis index (TLI) and root mean square error of approximation (RMSEA). Two domains, *Communication* and *Patient Involvement*, did not meet these model fit indices. The sample sizes were too small for both factor analysis conducted in the study. The psychometric properties of the CPAT were explored in cross-cultural studies including in Taiwan (*n*=43)[24], Indonesia (*n*=304) (Yusra et al., 2019), and Singapore (*n*=148) (Quek et al., 2022). The psychometric properties assessed were mainly related to content validity and internal consistency reliability with Cronbach's α. CPAT subscale analysis was carried out using exploratory factor analysis in the Indonesian study [25] and item-level analysis in the Taiwanese version (Ho et al., 2023). The model suggested by the original instrument (8-Factor 56-Item solution) was not tested for a model fit in the three studies.

4.2.2 Interprofessional Practice Framework For Construct Validity

Following COSMIN requirements for construct validity, this study used a causal model for the interprofessional collaboration conceptual framework to estimate the covariance matrix of the population tested (Stutsky & Spence Laschinger, 2014). This theoretical framework was chosen because it comprehensively covers relevant aspects of interprofessional collaborative practice and is conceptualised based on validated processes. The causal model for hypotheses testing is presented in the supplementary S1 Figure. Based on this model, there are three levels of constructs: antecedent, mediators, and consequences. The antecedent factors influence interprofessional collaborative practice. Interprofessional collaborative practice mediates the antecedent causal factors and is conceptualised to positively affect the achievement of results, which are the consequences.

Referring to the original CPAT domains, *Communication and information exchange* and *Team leadership* are independent factors that are antecedents in the framework. *Mission, meaning, purpose and goals* and *General roles responsibilities, and autonomy* are mediators. *General relationships*, *Decision-making and conflict management*, *Community linkages and coordination of care*, and *Patient involvement* are independent factors that are consequences of interprofessional collaborative practice. The assumptions tested involved direct and indirect paths, as suggested in this model.

4.2.3 Objectives

We aimed to provide quality interprofessional education and collaborative practice outcomes measure for Australian healthcare practitioners and students by validating the CPAT with its intended users (healthcare practitioners and students). The COSMIN (**CO**nsensus-based **S**tandards for the selection of health **M**easurement **IN**struments) taxonomy and standards of psychometric properties (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018) were used to evaluate the psychometric properties of the validated instrument in terms of content validity, internal structure (structural validity, internal consistency reliability, and measurement invariance), and construct validity. This study started with the important step of conducting a pilot study to evaluate content validity, one of COSMIN's main requirements for item development (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). Content validity checks ensure that the items developed represent the construct being measured in the desired cultural setting. The CPAT has yet to be validated in Australia, so it is important to conduct content validity checks before validating the instrument. In addition to conducting more comprehensive tests of psychometric properties compared to previously reported studies, this paper proposes something new by conducting, 1) an evaluation of the internal structure of the instrument involving measurement invariance, and 2) hypotheses testing for construct validity using previously validated path models [35]. An invariant measure validates the use of the Australian CPAT in practitioner and student equivalently, thus enabling the measurement of outcomes at both levels. The measure is expected to evaluate better integration between interprofessional education and collaborative practice throughout the professional lifespan from pre-qualifying students to experienced health practitioners.

4.3 Materials and Methods

4.3.1 Instrument

The Collaborative Practice Assessment tool (CPAT) is a measure of interprofessional collaborative practice among health practitioners (Schroder et al., 2011). The original version of the CPAT was designed in English as a self-assessment measure and consists of 56 items, eight subscales, and three open-ended questions (Schroder et al., 2011). The lead author contacted the developers of the original CPAT to obtain their consent to utilise the instrument in this study.

4.3.2 Ethics Statement

This study gained ethical approval from Curtin University Human Research Ethics Committee (approval number: HRE2021-0274). The survey was circulated between 6 August 2021 and 15 May 2022. Prospective participants were sent an invitation to participate via an online Qualtrics survey (Qualtrics, 2023). Invitations to practitioners and students were advertised on the official websites and social media accounts of health professional bodies and associations in Australia and via official staff and student communication platforms at university, faculty and study program levels at the researchers' university. The invitation was provided with information sheets completed with the study details and the consent process. Participation was voluntary, and the responses were anonymous. Each participant was asked to provide their written consent before participating in the study. In addition, as the participants were required to have consented before starting the survey, their consent was assumed based on the survey completion.

4.3.3 Study Procedure

To evaluate the psychometric properties of the Australian CPAT, we used the COSMIN taxonomy and standards to guide the study procedure. The COSMIN framework for psychometric analysis has been simplified to include only the steps relevant to this study and is presented in Figure 4.1.

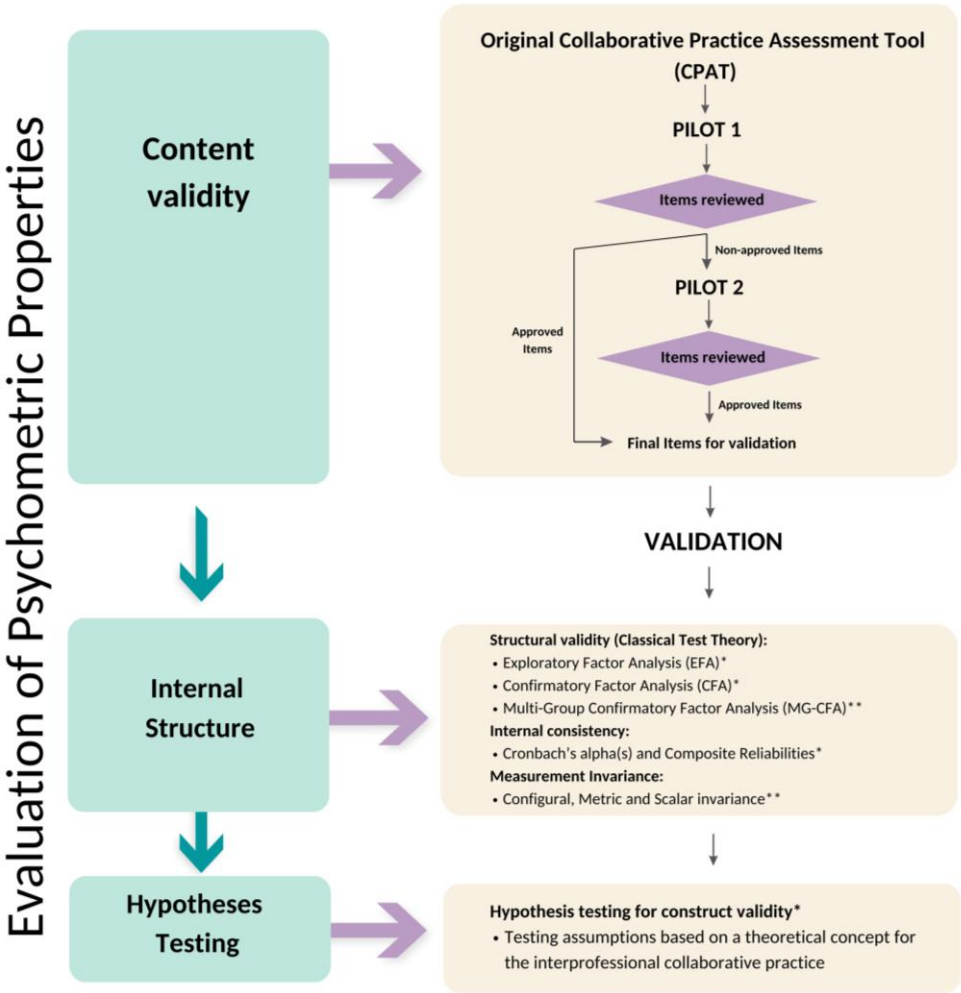

Figure 4.1 Study Procedure

Following COSMIN guidelines, the evaluations carried out and the types of psychometric parameters analysed are arranged sequentially. There are three major evaluation themes regarding content validity, internal structure, and hypothesis testing for construct validity.

4.3.4 Participants

The participants of this study were Australian healthcare practitioners and students selected through purposive sampling to ensure the intended users of the instruments were adequately represented (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). The eligibility criteria for study participation were: 1) Participants needed to be Australian healthcare practitioners and students from any health professional background, and 2) have experience in collaborating within a healthcare team(s) comprised of practitioners or students from different health professions (i.e., an interprofessional team). Because professional role identity occurs at least six months after the start of clinical exposure (Bradby, 1990), recruited students and practitioners needed to have at least one year of experience studying or working in an interprofessional team.

4.3.5 Pilot Study

A total of 31 health practitioners (*n*=22) and students (*n*=9) completed Pilot Study 1. Practitioners were aged between 20 and 59 years (*M*=38.6; *SD*=8.8), most participants were female (*n*=18, 81.8%) and from eight different health professional backgrounds, with nurses being the largest participant group (*n*=10; 45.5%). Practitioners' length of work within an interprofessional collaborative practice environment varied from 1 to 30 years (*M*=9.1, *SD*=8.6). Students were aged 18 to 40 years (*M*=27.8; *SD*=7.4), all female (*n*=8), and from five different educational backgrounds, with occupational therapy being the largest participant group (*n*=3; 37.5%). Students' length of study within an interprofessional education and collaborative practice environment varied from 1 to 4 years (*M*=3.0; *SD*=0.9). All students had previous experience working collaboratively in a clinical setting such as in a hospital, aged care or other health centres

4.3.6 Validation Study

For factor analysis of validating study data, the adequacy of sample size was determined using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity to evaluate structural validity [38]. In addition, The COSMIN criteria for adequate sample size were followed, which stipulated a sample size >100 and five times the number of items (i.e., 56*5=280 participants for each cohort of practitioners and students) (Prinsen et al., 2018).

The Australian CPAT was validated by involving healthcare practitioners and students who met the inclusion criteria. The practitioner cohort comprised 152 participants, mainly females (*n*=123, 80.9%). Practitioners' ages ranged from 20 to 64 years (*M*=37.9; *SD*=10.6). The most common age group was 35-39 years (*n*=39, 25.7%); 58 practitioners were aged under 35 years (38.2%), while 55 practitioners were aged over 39 years (36.2%). Practitioners' length of service ranged between 1 and 40 years (*M*=13.0; *SD*=10.1), with 6-10 years of service being the highest number of respondents (*n*=34, 22.4%); 48 practitioners with less than six years of service (31.6%); 70 practitioners with more than ten years of service (46.1%). The five most common professional groups were occupational therapists (*n*=33, 21.7%), nurses (*n*=25, 16.4%), speech pathologists (*n*=23, 15.1%), pharmacists (*n*=15, 9.9%) and medicine practitioners (*n*=10, 6.6%). Other professions were dentists, nutritionists, midwives, physiotherapists, podiatrists, psychologists, social workers, ophthalmologists, and public health experts (*n*=46, 30.3%).

The student cohort comprised 247 participants, mainly females (*n*=192, 77.7%). The students' ages ranged between 18 and 39 years (*M*=24.0; *SD*=5.2). The most common age group was 18-24 years (*n*=174, 70.4%); 73 students were aged over 24 years (29.6%). Students' length of study within an interprofessional education and collaborative practice environment varied from 1 to 8 years (*M*=2.4; *SD*=1.3), with working experience in health industry such as age and disability care varied from 1 to 4 years (*M*=2.6; *SD*=1.0). The six most common health professional groups were medicine (*n*=37, 15%), nursing (*n*=37, 15%), speech pathology (*n*=28, 11.3%), psychology (*n*=26, 10.5%), occupational therapy (*n*=24, 9.7%), and pharmacy (*n*=24, 9.7%). Other educational backgrounds were dentistry, exercise and sports science, health promotion and sexology, nutrition and dietetics, physiotherapy, and social work (*n*=71, 28.7%).

The total sample size for multi-group analysis met COSMIN very good criteria with a sample $>$100 in size (total *n*=399) and seven times the number of items (7*56=392) [20].

The sample sizes for the individual cohort analyses were in the doubtful range, with sample sizes in both cohorts >100 (Practitioners, n=152; Students, n=247), but less than five times the number of items tested. However, both datasets qualified for factor analysis, as confirmed by the Kaiser-Meyer-Olkin index (KMO) of 0.900 (practitioners) and 0.962 (students) and the Bartlett test o sphericity with $p<0.001$ (for both datasets).

4.3.7 Content Validity

Content validity reflects the extent to which an instrument's contents adequately represent the measured construct in the desired cultural setting (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). Content validity can be assessed by asking patients and professionals as the intended users of the instruments being developed (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). Using the COSMIN guide, the first pilot aimed to identify components requiring improvement, whereby participants were presented with the original CPAT and asked to rate each item on the level of *importance (relevance)* and *clarity (comprehensibility)* using a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, to 5 = Strongly Agree). To explore participants' opinions further, those who chose *disagree* or *strongly disagree* were directed to open-ended questions that invited them to provide their reasoning and suggest alternative words. Additionally, to assess the *comprehensiveness* of the instrument, participants were asked to share any topics they felt were missing from the instrument. The results of Pilot 1 were then used as the basis for item revisions. To this end, seven items were rewritten to improve clarity. The second pilot was conducted to verify the changes made to the instrument. Agreement scores of >70% for relevance were expected for each item for inclusion.

Qualitative data from the open-ended questions related to participants' responses to the items' *clarity (comprehensibility)* and *comprehensiveness* in the pilot studies were analysed using content analysis (Braun & Clarke, 2014). The instrument resulting from this two-phased pilot study is hereinafter referred to as the Australian CPAT.

4.3.8 Internal structure

The Australian CPAT was presented to participants in the validation study. The participants were asked to rate each item on a 1 to 7-point Likert scale (1 = Strongly Disagree, 2 = Mostly disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Mostly agree, and 7 = Strongly Agree), following the original instrument scale descriptors (Schroder et al., 2011). Data from validation were used to evaluate COSMIN criteria for instrument general development requirements (e.g., the sample size and target), internal structure (structural validity, internal consistency reliability, measurement invariance) and hypotheses testing.

4.3.8.1 Structural Validity

Structural validity measures the level of representativeness of the instrument's constructs (Prinsen et al., 2018). Three chronological steps of factorial analysis were performed in this study: Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Multi-Group Confirmatory Factor Analysis (MG-CFA). First, EFA was conducted separately for each group to explore the factorial structure of each group to determine whether or not to maintain the 8-factor 56-item model for the Australian CPAT [21]. The exploratory factor analysis solution may be weak because items can load on any factor (Williams et al., 2010). For this reason, the original 8-Factor 56-Item solution was to be maintained whenever possible to the exact factorial numbers and item positioning unless there were strong EFA indications to do otherwise. A structural model informed by the exploratory factor analysis was used as the initial model for CFA. Second, confirmatory factor analysis was carried out separately for each cohort based on the CFA initial model. Relevant CFA results from each cohort (e.g., item estimates, convergent validity, composite reliability, average variance extracted, and model fit indices) were used to determine whether certain factors should be combined or if items should be removed to inform the development of the CFA final model for the Australian CPAT. For invariant measurement, we need to confirm that the two cohorts agreed when jointly analysed using the CFA final model. Therefore, the two cohorts were jointly analysed in the third step of MG-CFA. If MG-CFA shows a good model fit, measurement invariance can be carried out. Measurement invariance involved the analyses of both datasets simultaneously (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016).

Data with less than 75% response rate were discarded; missing data at response rates $>$75% were replaced with mean average values. Data analysis was performed with the Statistical Package for the Social Sciences (SPSS) 26 and Analysis Movement of Structure (AMOS) 24 (SPSS, 2023). This study used COSMIN criteria for good fit indices based on either comparative fit index (CFI), Tucker-Lewis index (TLI) or comparable measure $>$0.95, **OR** root mean square error of approximation (RMSEA) $<$0.06, **OR** standard root mean square of the residual (SRMR) $<$0.08 (Prinsen et al., 2018). This study used these COSMIN indices cut-offs to assess a model fit throughout.

4.3.8.2 Internal Consistency Reliability

Internal consistency refers to the relatedness of the observed constructs and how these constructs are correlated in measuring the same general concept (Prinsen et al., 2018). Depending on the stage of factor analysis, Cronbach α and Composite reliability scores were calculated in this study for each subscale to confirm their unidimensionality (Hair et al., 2020; Prinsen et al., 2018; Yoon et al., 2021). A score of 0.7 is acceptable, with a score greater than 0.80 considered high. Scores greater than 0.95 are undesirable, as such high scores suggest item redundancy rather than homogeneity (Prinsen et al., 2018). To measure the convergent validity shared between the construct and its individual indicators, the average variances extracted (AVE) for each factor were also calculated (Hair et al., 2020). The AVE is expected to be a minimum of 0.5 or higher (Hair et al., 2020). However, if the composite reliability is $>$ 0.6, then an AVE of 0.4 is considered acceptable.

4.3.8.3 Measurement Invariances

Assuming that the conformation of the model produced by the multi-group confirmatory factor analysis gave good fit indices, the psychometric evaluation was continued with invariance tests to assess the equivalence of the models when used for cross-group measurement (Putnick & Bornstein, 2016). Invariance tests included configural, metrics and scalars tests. Each level of invariance testing applied constraints that were predicted to cause a decrease in the fit indices (Putnick & Bornstein, 2016). To confirm invariance, differences in comparative fit index (ΔCFI) values were expected to $\leq$ 0.01 (Cheung & Rensvold, 2002). COSMIN's criteria for good fit indices were used as cut-offs (Prinsen et al., 2018).

Configural invariance tested the model by comparing the structure of the tested groups based on the independently estimated number of latent and observable variables (i.e., testing the model without constraints) (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). A good model fit indicates that the data passes configural invariance across groups and serves as confirmation to continue testing metrics invariance . Metric invariance was set with each item factor loading constrained equally across groups (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). The differences in the comparative fit index and fit indices of the metric and configural models were then compared (an index of $\leq$ 0.01 confirmed metric invariance) (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). A good model fit indicates that the data passes metric invariance across groups and serves as confirmation to continue testing scalar invariance (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Scalar invariance imposes additional constraints to the item factor loading, where the item intercept was equalised between groups (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). The differences in the comparative fit index of $\leq$ 0.01 between the metric and scalar models confirmed scalar invariance.

4.3.9 Hypotheses testing

The nature of the assumptions was identified using the referred model of path analysis (Stutsky & Spence Laschinger, 2014), whether it is a full or partial mediation. Full mediation is when the assumption results in a significant indirect (mediated) relationship, with a non-significant direct relationship from the antecedent to a consequence factor; whereas partial mediation is when the assumption results in significant effects for both indirect (mediated) and direct (without mediation) relationships (Collier, 2020). The direct hypotheses (HDir.1 to 8) and indirect hypotheses (HInd.1 to 8) tested for each dataset were as follows:

Direct paths:

HDir.1. *Team leadership* has significant direct effects on *General relationship*

HDir.2. *Team leadership* has significant direct effects on *Decision-making and conflict management*.

HDir.3. *Team leadership* has significant direct effects on *Community linkages and coordination of care*.

HDir.4. *Team leadership* has significant direct effects on *Patient involvement*.

HDir.5. *Communication and information exchange* has significant direct effects on *General relationship*.

HDir.6. *Communication and information exchange* has significant direct effects on *Decision-making and conflict management*.

HDir.7. *Communication and information exchange* has significant direct effects on *Community linkages and coordination of care*.

HDir.8. *Communication and information exchange* has significant direct effects on *Patient involvement*.

Indirect paths:

HInd.1. The mediators (*Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Team leadership* on *General relationships*.

HInd.2. The mediators (*Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Team leadership* on *Decision-making and conflict management*.

HInd.3. The mediators (*Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Team leadership* on *Community linkages and Coordination of care*.

HInd.4. The mediators (*Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Team leadership* on *Patient involvement*.

HInd.5. The mediators (*Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Communication and information exchange* on *General relationships*.

HInd.6. The mediators *(Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Communication and information exchange* on *Decision-making and conflict management*.

HInd.7. The mediators *(Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Communication and information exchange* on *Community linkages and coordination of care*.

HInd.8. The mediators *(Mission, meaning, purpose and goals* and *General roles responsibilities, autonomy*) mediated a significant indirect effect for *Communication and information exchange* on *Patient involvement*.

The direct path hypotheses testing were carried out using AMOS (Version 24). Additional estimand [44] was incorporated into AMOS-24 to enable individual indirect path calculations.

4.4 Results

In line with the research objective to provide a quality and psychometrically sound instrument to measure interprofessional education and collaborative practice for both healthcare practitioners and students in Australia, the findings are presented following the COSMIN guidelines for content validity, internal structure (structural validity, internal consistency reliability, and measurement invariance), and hypothesis testing. The procedures are depicted in Figure 4.1.

4.4.1 Content Validity

All 56 items had agreement scores greater than 70% for *importance (relevance)* of items for inclusion. Concerning *clarity (comprehensibility)*, all items reached >70% agreement. However, seven items had low mean scores and high standard deviation ($M \leq 3.5$; $SD > 1$). Detailed information regarding all item means and standard deviations for the pilot study is presented in the supplementary S2 Table. No participants raised issues regarding the *comprehensiveness* of the instrument.

Participants provided alternative wording for some items, which were then reviewed by the research panel. As a result, seven items were reworded. The comparison of original and modified statements of these items is provided in the supplementary S2 Table. All seven items were retested in the second pilot with similar participants four weeks after the previous pilot. All items tested reached >70% agreement for importance (relevance) and clarity (comprehensibility). Therefore, no further pilot testing was needed. All 56 items were included for validation.

4.4.2 Structural Validity

4.4.2.1 Exploratory Factor Analysis (EFA)

EFA was performed with dimensional reduction set to maximum likelihood extraction and varimax rotation. Eigenvalues >1 resulted in no items with extraction communalities of < 0.300. The results indicated 12 potential factors in the practitioner cohort and 8 in the student cohort (with a cumulative percentage explaining 73.2% and 71.6% of the variance, respectively).

In both cohorts, five distinct factors were identified with items' positioning to relevant factors closely matching the original CPAT 8-Factor 56-Item configuration. The stability of these five factors was further confirmed when the number of factors was sequentially reduced. In addition, items that were not correlated with these five factors were also explored separately for the best positioning. The variation of the steps carried out corroborates the possibility of the 8-Factor 56-Item structure as the most suitable model for both cohorts. Furthermore, the internal consistency reliability for each subscale and total instrument exceeded Cronbach's α score of 0.70, and the inter-item correlations were mainly within the expected range of 0.3 – 0.5. Therefore, the 8-Factor 56-Item solution suggested by the original instrument [21] was used as the initial model for CFA. EFA results regarding items factor loadings and scree plot for each dataset are provided in the S3 File.

4.4.2.2 Confirmatory Factor Analysis (CFA)

CFA started by analysing the initial model as suggested by the original CPAT. CFA results in the initial model showed 54 items with adequate factor loadings (estimates$>$0.500), good critical ratio (CR$>$1.96), and making a significant contribution to its corresponding factor ($p<0.001$ at 95% Confidence interval). Two items, Item 27 (*Physicians assume the ultimate responsibility*) and Item 49 (*Final decision rest with the* *physician*), were with the lowest factor loadings in both cohorts, with CR<1.96 and p>0.05. Detailed information on each item's regression weights (estimates), critical ratio (CR), and probability as an item that contributes to the relevant factor is provided in Table 4.1.

Model fit indices for the initial 8-Factor 56-items conformation met the COSMIN requirement for a good model fit in both datasets with SRMR values in both cohorts < 0.08 (practitioner dataset: SRMR = 0.074; student dataset: SRMR = 0.058); and CMIN/df were fulfilled with χ^2 (2.113) = 3076.09, CMIN/df = 2.113 for practitioners (cut-off ≤3), and χ^2 (1456) = 3562.50, CMIN/df = 2.447 (cut-off $\leq$ 3) for students. CFI and RMSEA in both datasets were poor.

Four correlations with estimates $>$ 0.80 in both data sets were identified, which indicated that the corresponding factors were highly correlated. Three correlations were ignored due to conceptual concerns (the corresponding items were not conceptually related), and correlated paired factors were derived from different levels of the construct (see S1 Figure on referenced conceptual framework). Multicollinearity involving F1 *(Mission, meaningful, purpose, and goals)* and F4 *(General roles responsibilities, and autonomy)* was solved by combining the two factors to develop a new domain: *Collective goals and understanding of roles*. Both factors were composed of items with conceptual similarity and framed at the same construct level; both were considered mediators.

Table 4.1 Item Estimates, Standard Error, Critical Ratio and *p*-Value

Factors	**Items**	**Practitioner**				**Student**			
		Estimate [1]	**S.E.** [2]	**C.R.** [3]	***p***	**Estimate** [1]	**S.E.** [2]	**C.R.** [3]	***p***
F1	C1	0.573	0.106	7.153	<0.001	0.734	0.065	12.823	<0.001
	C2	0.465	0.083	5.685	<0.001	0.692	0.068	11.900	<0.001
	C3	0.785	0.090	10.324	<0.001	0.797	0.058	14.340	<0.001
	C4	0.655	0.140	8.313	<0.001	0.668	0.071	11.391	<0.001

Factors	Items	Practitioner				Student			
		Estimate [1]	S.E. [2]	C.R. [3]	*p*	Estimate [1]	S.E. [2]	C.R. [3]	*p*
	C5	0.834	0.116	11.125	<0.001	0.822	0.066	14.968	<0.001
	C6	0.792	0.079	10.439	<0.001	0.844	0.060	15.543	<0.001
	C7	0.628	0.108	7.932	<0.001	0.764	0.062	13.530	<0.001
	C8	0.778	-	-	-	0.804	-	-	-
	C9	0.594	0.127	6.968	<0.001	0.791	0.054	15.510	<0.001
	C10	0.733	0.185	8.549	<0.001	0.849	0.067	17.513	<0.001
	C11	0.408	0.180	4.818	<0.001	0.735	0.067	13.809	<0.001
F2	C12	0.733	0.147	8.555	<0.001	0.823	0.063	16.572	<0.001
	C13	0.889	0.170	10.268	<0.001	0.840	0.058	17.166	<0.001
	C14	0.709	0.166	8.287	<0.001	0.835	0.062	16.981	<0.001
	C15	0.852	0.164	9.871	<0.001	0.822	0.058	16.523	<0.001
	C16	0.700	-	-	-	0.855	-	-	-
	C17	0.771	0.154	7.240	<0.001	0.644	0.127	7.937	<0.001
	C18	0.842	0.141	7.628	<0.001	0.841	0.124	9.273	<0.001
F3	C19	0.870	0.143	7.768	<0.001	0.869	0.128	9.425	<0.001
	C20	0.875	0.141	7.795	<0.001	0.860	0.128	9.381	<0.001
	C21	0.712	0.144	6.883	<0.001	0.787	0.132	8.952	<0.001
	C22	0.787	0.130	7.334	<0.001	0.857	0.127	9.364	<0.001
	C23	0.831	0.148	7.570	<0.001	0.826	0.138	9.188	<0.001
	C24	0.769	0.132	7.229	<0.001	0.854	0.132	9.345	<0.001
	C25	0.574	-	-	-	0.549	-	-	-
	C26	0.627	0.149	6.635	<0.001	0.766	0.080	13.189	<0.001
F4	C27	**-0.002**	**0.220**	**-0.022**	**0.983**	**0.451**	**0.114**	**7.171**	**<0.001**
	C28	0.588	0.171	6.300	<0.001	0.778	0.079	13.451	<0.001

Factors	**Items**	**Practitioner**				**Student**			
		Estimate [1]	**S.E.** [2]	**C.R.** [3]	***p***	**Estimate** [1]	**S.E.** [2]	**C.R.** [3]	***p***
	C29	0.689	0.150	7.132	<0.001	0.731	0.085	12.447	<0.001
	C30	0.798	0.157	7.936	<0.001	0.801	0.078	13.951	<0.001
	C31	0.374	0.208	4.249	<0.001	0.670	0.091	11.196	<0.001
	C32	0.678	0.130	7.044	<0.001	0.769	0.075	13.245	<0.001
	C33	0.840	0.170	8.219	<0.001	0.793	0.085	13.782	<0.001
	C34	0.675	0.140	7.024	<0.001	0.827	0.074	14.545	<0.001
	C35	0.614	-	-	-	0.782	-	-	-
	C36	0.734	0.178	7.673	<0.001	0.756	0.077	12.709	<0.001
	C37	0.899	0.166	8.885	<0.001	0.872	0.072	15.211	<0.001
F5	C38	0.724	0.146	7.593	<0.001	0.830	0.069	14.281	<0.001
	C39	0.727	0.142	7.611	<0.001	0.820	0.069	14.060	<0.001
	C40	0.842	0.169	8.496	<0.001	0.800	0.079	13.634	<0.001
	C41	0.629	-	-	-	0.773	-	-	-
	C42	0.778	0.263	5.603	<0.001	0.799	0.130	10.207	<0.001
F6	C43	0.794	0.260	5.643	<0.001	0.867	0.127	10.784	<0.001
	C44	0.822	0.263	5.708	<0.001	0.874	0.128	10.838	<0.001
	C45	0.475	-	-	-	0.627	-	-	
	C46	0.694	0.089	8.257	<0.001	0.792	0.066	13.368	<0.001
	C47	0.839	0.102	10.003	<0.001	0.829	0.066	14.149	<0.001
	C48	0.828	0.097	9.865	<0.001	0.850	0.066	14.597	<0.001
F7	C49	**0.080**	**0.137**	**0.947**	**0.344**	**0.525**	**0.079**	**8.296**	**<0.001**
	C50	0.537	0.094	6.373	<0.001	0.720	0.066	11.894	<0.001
	C51	0.717	-	-	-	0.778	-	-	-
F8	C52	0.837	0.148	8.794	<0.001	0.847	0.057	16.794	<0.001

Factors	Items	Practitioner				Student			
		Estimate [1]	S.E. [2]	C.R. [3]	*p*	Estimate [1]	S.E. [2]	C.R. [3]	*p*
	C53	0.612	0.126	6.751	<0.001	0.778	0.064	14.661	<0.001
	C54	0.838	0.116	8.809	<0.001	0.873	0.053	17.667	<0.001
	C55	0.772	0.149	8.25	<0.001	0.828	0.059	16.179	<0.001
	C56	0.665	-	-	-	0.848	-	-	-

Note. [1]Standardised estimates, [2]Standar Error, [3]Critical ratio;
F1 = Mission, Meaning, Purpose, Goals;
F2 = General Relationships;
F3 = Team Leadership;
F4 = General Roles Responsibilities, and Autonomy;
F5 = Communication and Information Exchange;
F6 = Community Linkages and Coordination of Care;
F7 = Decision-Making and Conflict Management;
F8 = Patient Involvement.

CFA was rerun with seven factors specifying 54 items (two items were removed, and the factorial structure was reduced as a result of combining two highly related factors). Model fit indices for the final 7-Factor 54-items configuration met the COSMIN requirement for a good model fit in both datasets with SRMR values in both cohorts < 0.08 (practitioner dataset: SRMR = 0.069; student dataset: SRMR = 0.057); and CMIN/df were fulfilled with χ^2 (1.356) = 2768.35, CMIN/df = 2.042 for practitioners (cut-off $\leq$ 3), and χ^2 (1356) = 3428.00, CMIN/df = 2.528 (cut-off ≤ 3) for students. RMSEA in both datasets improved to be within the acceptable range (practitioner, RMSEA = 0.083; student, RMSEA = 0.078; see Figure 2 for structure comparison). The 7-Factor 54-Items configuration (Figure 2B) was confirmed as the final model for the Australian CPAT and used for further analysis.

4.4.2.3 Multi-Group Confirmatory Factor Analysis

MG-CFA was performed simultaneously on two datasets using the 7-Factor 54-Item structure to confirm the model's fit across two tested groups. The results indicated the achievement of a good model fit with SRMR = 0.058, RMSEA = 0.057, CFI = 0.811, and

χ^2 (2.712) = 6197.41, CMIN/df = 2.285. COSMIN's requirements for good model fit were met and provided justification for invariance testing.

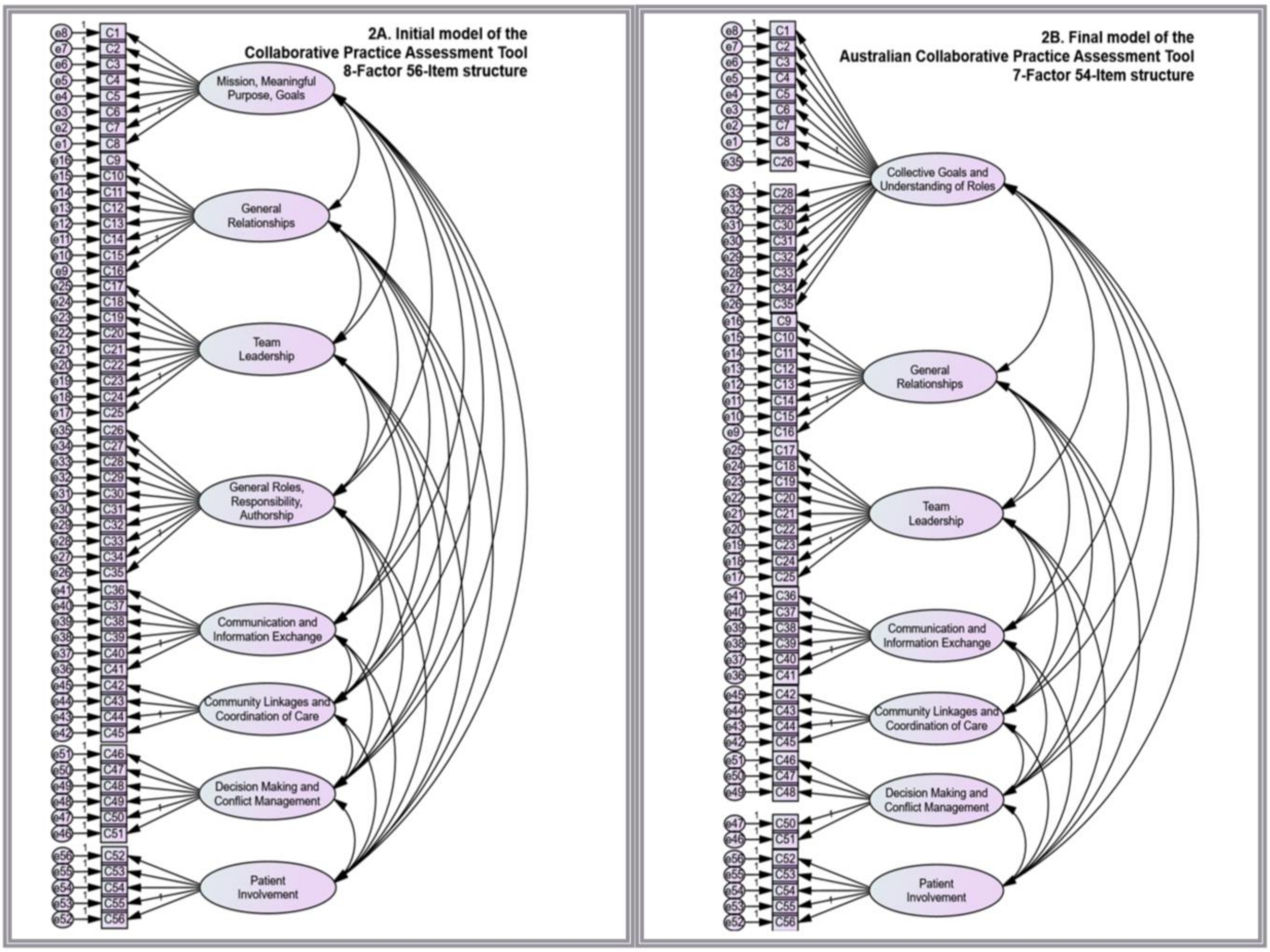

Figure 4.2 Construct models. A: Initial model of the Collaborative Practice Assessment Tool (8-factor 56-item model). B: Final model of the Australian Collaborative Practice Assessment Tool (7-factor 54-item model).

4.4.3 Internal Consistency Reliability

The Australian CPAT demonstrated good internal consistency with high composite reliability (CR) and extracted mean variance (AVE) for all subscales (see Table 4.2).

Table 4.2 Internal Consistency Reliability

Factors	Domains	Practitioner		Student	
		Composite reliability	Average variance extracted	Composite reliability	Average variance extracted
F1	Collective Goals and Understanding of Roles	0.924	0.425	0.953	0.542
F2	General Relationships	0.890	0.513	0.942	0.672
F3	Team Leadership	0.935	0.618	0.938	0.632
F4	Communication and Information Exchange	0.889	0.576	0.918	0.652
F5	Community Linkages and Coordination of Care	0.815	0.534	0.873	0.636
F6	Decision-Making and Conflict Management	0.849	0.534	0.897	0.636
F7	Patient Involvement	0.864	0.564	0.920	0.698

4.4.4 Measurement Invariance

The invariance tests were carried out on the 7-Factor 54-Item model in the configural, metric and scalar sequence. In the first stage, configural invariance applied no constraints to the model, resulting in a good fit, with SRMR = 0.058, RMSEA = 0.057, CFI = 0.811, and χ^2 (2.712) = 6197.41, CMIN/df = 2.285. These results confirmed configural invariance [19, 20]. The 7-Factor 54-Item solution of the model in terms of the number of factors and the positioning of items on related factors was used for both cohorts.

A good model fit was maintained in the second stage when items' factor loading was constrained to be equal across groups (SRMR = 0.059, RMSEA = 0.057, CFI = 0.807, and χ^2 (2.759) = 6311.44, CMIN/df = 2.288). The metric variance was confirmed with a CFI difference $\leq$ 0.01 (a decrease from 0.811 to 0.807) (Cheung & Rensvold, 2002; Putnick &

Bornstein, 2016). A good fit was again maintained for the third stage of scalar invariance, in which the loading factor and intercept were constrained to be equal across the groups tested, with SRMR = 0.060, RMSEA = 0.058, CFI = 0.807, and χ^2 (2329) = 6550.58, CMIN/df = 2.329. Scalar variance was confirmed with a CFI difference ≤ 0.01 (a decrease from 0.807 to 0.797) (Collier, 2020). A summary of the invariance test results is presented in Table 4.3.

Table 4.3 Full Model Comparison

Full Model Comparison	CMIN/df = X^2	CFI	ΔCFI	SRMR	RMSEA	Invariance
Unconstrained	6197.40/2712 = 2.285	0.811	-	0.058	0.057	Yes
Metric Invariance (Measurement weights)	6311.44/2759 = 2.288	0.807	0.004	0.059	0.057	Yes
Scalar Variance (Measurement intercepts)	6550.58/2813 = 2.329	0.797	0.010	0.060	0.058	Yes

Note. CMIN/df = Chi-Square Minimum Discrepancy Function, df = Degree of Freedom; CFI = Comparative Fit Index, ΔCFI = Differences in CFI, SRMR = Standard Root Mean Square Of The Residual, RMSEA = Root Mean Square Error Of Approximation.

4.4.5 Hypotheses testing

The path analysis model used as a reference (Stutsky & Spence Laschinger, 2014) was adapted to the final factorial solutions obtained from the final CFA to test the hypotheses. Domains *Mission, meaningful, purpose and goals* and *Understanding of roles, responsibilities and autonomy* were combined into a single factor, becoming a unified mediator construct, *Collective goals and understanding of roles*. The proposed path analysis models for the practitioner and student cohorts are shown in Figure 4.3, respectively.

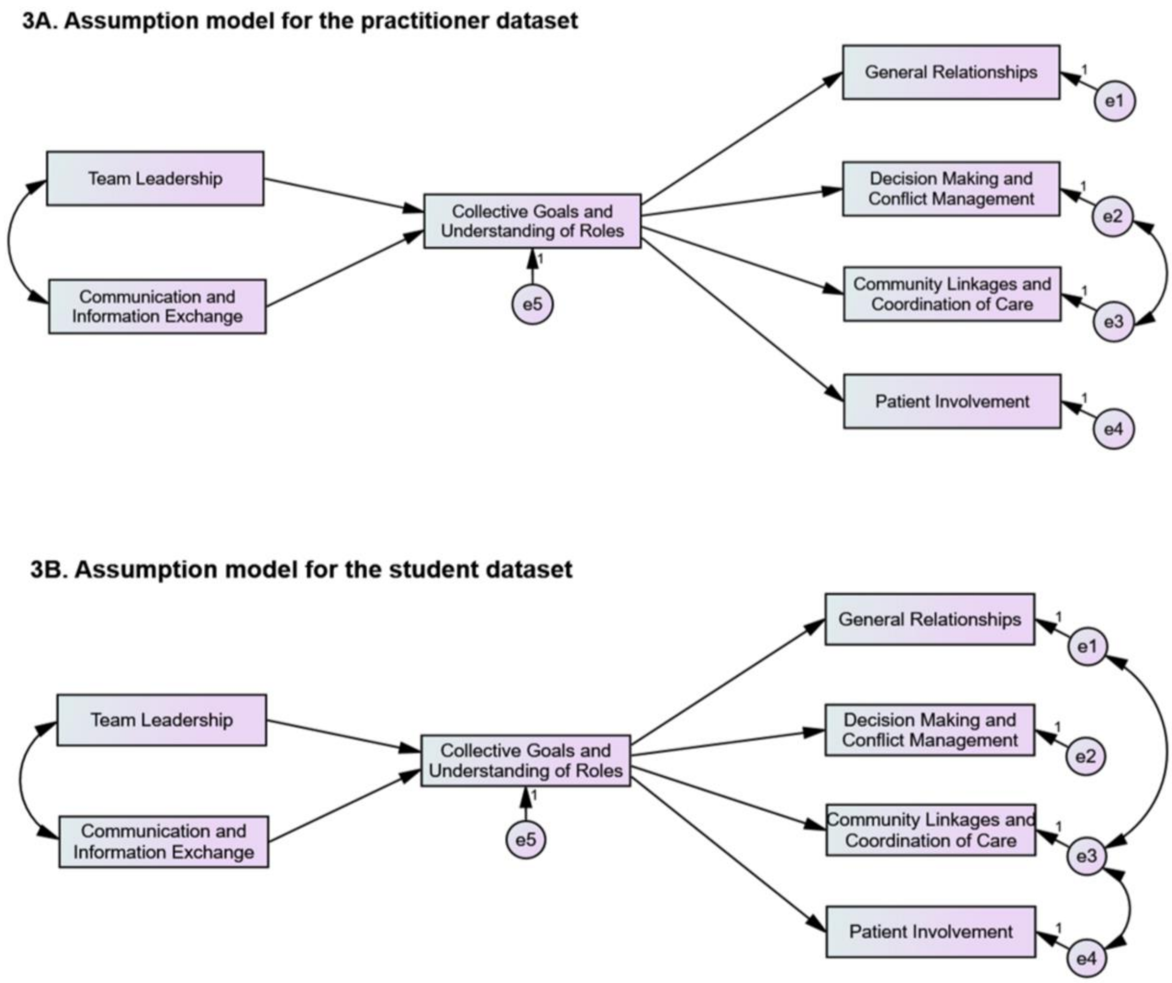

Figure 4.3 Path Analysis of Assumptions

Some covariance between error terms was generated to improve the fit of the two models. Covariance between error terms in the practitioner dataset significantly improved the SRMR from 0.086 to 0.078 (cut-off < 0.08), and CFI from 0.885 to a more acceptable value of 0.917 with χ^2 (13) = 72.02, CMIN/df = 5.539. The covariances between error terms in the student dataset significantly improved the χ^2 from χ^2 (14) = 114.84, CMIN/df = 8.20 to χ^2 (12) = 82.41, CMIN/df = 6.368 with SRMR = 0.043, and CFI = 0.958. The model fit in both datasets met the requirements for hypotheses testing.

As shown in Figure 4.3, the indirect effects through the mediation of *Collective goals and understanding of roles* from the antecedent factors of *Team leadership* and *Communication and information exchange* on all consequence factors were all significant in both datasets (HInd.1 to HInd.8 were all accepted). In relation to direct assumptions, the two cohorts have similar rejection related to *Team leadership* to *General relationships* (HDir.1) and *Team leadership* to *Patient involvement* (HDir.4). See Tables 4.4 and 4.5 for detailed information on assumption results for both datasets. Accepted assumptions reaching 13 out of 16 proposed in both datasets (81.3%), thereby fulfilling the COSMIN requirement of $>$ 75% of the assumptions proposed being accepted [15].

4.5 Discussion

This study aimed to provide a quality and psychometrically sound instrument to measure interprofessional education and collaborative practice outcomes for both healthcare practitioners and students in the Australian setting. The outcomes targeted were related to interprofessional teamwork, communication skills, leadership skills, task and role delineation, conflict management, and involvement with patients and families/communities. The COSMIN (COnsensus-based Standards for the selection of health Measurement INstruments) taxonomy and standards (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018; Yoon et al., 2021) were used to guide evaluations of the instrument development requirements of sample target and size, content validity, internal structure (structural validity, internal consistency reliability and measurement invariance), and hypotheses testing.

Table 4.4 Direct and Indirect Assumptions for Practitioner

Relationship					Direct Effect			Indirect Effect			Confidence Interval		Conclusion
					β[1]	*p*-value	Hypothesis	β[1]	*p*-value	Hypothesis	Low	High	
Team Leadership	→	Collective Goals and Understanding of Roles	→	General relationships	0.016	0.733	HDir.1 **Rejected**	0.148	< 0.001	HInd.1 **Accepted**	0.076	0.253	Full Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Decision-Making and Conflict Resolution	0.048	0.147	HDir.2 **Rejected**	0.139	< 0.001	HInd.2 **Accepted**	0.076	0.222	Full Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Community Linkages and Coordination of Care	0.085	0.019	HDir3 **Accepted**	0.064	< 0.001	HInd.3 **Accepted**	0.036	0.112	Partial Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Patient Involvement	0.066	0.095	HDir.4 **Rejected**	0.085	< 0.001	HInd.4 **Accepted**	0.046	0.144	Full Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	General relationships	0.298	< 0.001	HDir.5 **Accepted**	0.271	< 0.001	HInd.5 **Accepted**	0.175	0.406	Partial Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	Decision-Making and Conflict Resolution	0.245	< 0.001	HDir.6 **Accepted**	0.289	< 0.001	HInd.6 **Accepted**	0.192	0.419	Partial Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	Community Linkages and Coordination of Care	0.208	0.002	HDir7 **Accepted**	0.132	< 0.001	HInd.7 **Accepted**	0.056	0.243	Partial Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	Patient Involvement	0.157	0.029	HDir.8 **Accepted**	0.196	< 0.001	HInd.8 **Accepted**	0.104	0.330	Partial Mediation

Note. [1]**Unstandardised estimates; Bootstrap analysis sample = 5000 with a 95% Confidence Interval**

Table 4.5 Direct and Indirect Assumptions for Student

Relationship					Direct Effect			Indirect Effect			Confidence Interval		Conclusion
					β[1]	*p*-value	Hypothesis	β[1]	*p*-value	Hypothesis	Low	High	
Team Leadership	→	Collective Goals and Understanding of Roles	→	General relationships	0.096	0.097	HDir.1 **Rejected**	0.148	< 0.001	HInd.1 **Accepted**	0.076	0.253	Full Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Decision-Making and Conflict Resolution	0.142	0.002	HDir.2 **Accepted**	0.139	< 0.001	HInd.2 **Accepted**	0.076	0.222	Partial Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Community Linkages and Coordination of Care	0.116	0.002	HDir3 **Accepted**	0.064	< 0.001	HInd.3 **Accepted**	0.036	0.112	Partial Mediation
Team Leadership	→	Collective Goals and Understanding of Roles	→	Patient Involvement	-0.024	0.606	HDir.4 **Rejected**	0.085	< 0.001	HInd.4 **Accepted**	0.046	0.144	Full Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	General relationships	0.114	0.163	HDir.5 **Rejected**	0.271	< 0.001	HInd.5 **Accepted**	0.175	0.406	Full Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	Decision-Making and Conflict Resolution	0.384	< 0.001	HDir.6 **Accepted**	0.289	< 0.001	HInd.6 **Accepted**	0.192	0.419	Partial Mediation
Communication and Information Exchange	→	Collective Goals and Understanding of Roles	→	Community Linkages and Coordination of Care	0.165	0.002	HDir7 **Accepted**	0.132	< 0.001	HInd.7 **Accepted**	0.056	0.243	Partial Mediation
Communication and Information Exchange	→	ollective Goals and Understanding of Roles	→	Patient Involvement	0.232	< 0.001	HDir.8 **Accepted**	0.196	< 0.001	HInd.8 **Accepted**	0.104	0.330	Partial Mediation

Note. [1]Unstandardised estimates; Bootstrap analysis sample = 5000 with a 95% Confidence Interval

The 8-Factor 56-Item structure of the original instrument (Schroder et al., 2011), was improved in the Australian CPAT. Based on tiered psychometric evaluation, 7-Factor 54-Item was considered the best factor solution for the Australian CPAT.

Three fundamental changes were made. First, seven items were rewritten, six of which were negatively phrased items (see S2 Table). Negatively worded items were traditionally used to keep participants cognitively alert, to prevent careless answers and serve as correction for agreement bias (Baumgartner & Steenkamp, 2001). However, this finding indicated that negatively worded items introduce unnecessary difficulty for the participants, leading to confusion; similar findings were reported in other psychometric studies (Chyung et al., 2018; Johnson et al., 2004; Kamoen et al., 2011). The ineffectiveness of items with negative wording to prevent response agreement bias has also been reported, and it can significantly alter the psychometric features of an instrument (Kamoen et al., 2011; Sonderen et al., 2013). The COSMIN content validity check for *comprehensibility (clarity)* was fulfilled after all seven items were positively reworded in the second pilot.

Second, two items were discarded. Item 27 (*Physicians assume the ultimate responsibility*) and Item 49 (*Final decision rest with the physician*) were consistently rejected in the pilot and validation studies, reaffirming participants' disagreement to include these items. These items did not meet the validity requirements and failed to reflect constructability to the relevant factors (Putnick & Bornstein, 2016; Williams et al., 2010). Discarding these items was unavoidable. Notably, these two items were related to physicians' perceived roles in an interprofessional team. Medical dominance has been widely acknowledged as a barrier to interprofessional collaborative practice (Bollen et al., 2019; Clarin, 2007; Fejzic et al., 2010; Mian et al., 2012). This study's findings substantiate Australian health practitioners' and students' disagreement with the concept of medical practitioners as having the highest hierarchical position in decision-making and general patient care.

Third, Factor 1 (*Mission, Meaningful, Purpose, and Goals*) and Factor 4 (*General Roles Responsibilities, and Autonomy*) were combined into one dependent factor, *Collective Goals and Understanding of Roles* (see Figure 2), which reduced the factorial number of Australian CPAT to seven. Statistically, the high estimated correlation between the two factors supported merging the factors. Conceptually, merging was also possible, with both factors being at the same construct level as the referenced model suggests (see S1 Figure) (Stutsky & Spence Laschinger, 2014). The seven Australian CPAT subscales each presented as a solid unidimensional domain with good internal consistency reliability and high inter-item correlations, including domain Decision-making and conflict management, which was reported as a weak domain (Cronbach's score < 0.7) in the original study (Schroder et al., 2011), in the Indonesian (Yusra et al., 2019), and Singaporean validated versions (Quek et al., 2022). The fact that the domain of *Decision-making and Conflict Management* is not fully supported in many CPAT studies suggests challenges for decision-making skills in interprofessional teams, which aligns with previous research on the complexity of interprofessional practice (Xyrichis et al., 2018). The CPAT validation study in Singapore recommends modification of items related to this domain for use in Asian countries (Quek et al., 2022). The Australian CPAT included only five of the six items derived from this domain in the original instrument (item 49 was rejected). Removing this item significantly improved the subscale and total psychometric properties of the Australian CPAT instrument.

However, the composite reliability for Factor 1, *Collective goals and understanding of roles*, exceeded the expected score (Composite reliability = 0.953) in the student dataset. This high score indicated the possibility of redundancy (Hair et al., 2020; Prinsen et al., 2018). Two items, Items 5 and 8, identified in both datasets, were associated with a modification index > 20, and were suspected as the source of the redundancy. However, the removal of either or both items was disregarded because the AVE in the student dataset was in the ideal range (Hair et al., 2020). Findings from the practitioner dataset supported keeping both items by having composite reliability and AVE values in the acceptable range (Hair et al., 2020) for the corresponding factor (Factor 1, *Collective goals and understanding of roles*). In addition, removing either item 8 or 5 (or both) or generating a covariance between the two items' error terms made no significant difference compared to the 7-Factor 54-Item for the MG-CFA model; the RMSEA and SRMS only improved by a maximum of 0.002 points. Convergent validity is met for this measurement model (Hair et al., 2020).

In line with the targeted objectives, CPAT Australia was configural, metric and scalar invariant in both cohorts. These invariances allow for the use of the instrument in both cohorts as the practitioners and students perceive the meaning of the constructs underlying Australian CPAT in similar ways, and the mean scores of the two cohorts were expected to be comparable when assessed using the suggested model.

The mediation analysis results in this study indicated that practitioners and students perceived *Collective goals and understanding of roles* as an essential mediating variable influencing several antecedents on consequences factors. The findings on the fully mediated assumptions indicated that practitioners and students assumed *Team leadership* can influence a team's perceptions of their relationships and a team's encouragement to involve patients in their care, but only if the team was committed to their shared goals and in recognition of their own and others' roles.

Conversely, as suggested by relationships that were partially mediated (see Tables 4.4 and 4.5), practitioners and students were of the view that team leadership and effective communication can directly influence the team's general relationships, decision-making and conflict management, and community and family empowerment, with or without the need to have collective goals and understanding of roles between team members. The *Collective* *goals and understanding of roles* were recognised as essential variables in these relationships, however, not as the sole determinant.

All of these results are in accordance with the mediating pattern provided by the suggested model (Stutsky & Spence Laschinger, 2014). The results also confirm the notion that practitioners with a greater understanding of their roles and the roles of others are more open to interdependence and working collaboratively to pursue common goals related to patient care (Atwal & Caldwell, 2002; Clark, 2011; MacDonald et al., 2010). The results support findings from previous studies where sharing collective goals and roles understanding are suggested to have a positive influence on dependent variables such as patient satisfaction (Lawrence et al., 2015; San Martin-Rodriguez et al., 2008; Will et al., 2019) patient involvement (Snyder & Engström, 2016; Spence Laschinger et al., 2010) team effectiveness (MacDonald et al., 2010; Mitchell et al., 2011), and team conflict (Brown et al., 2011; Gergerich et al., 2019).

The original CPAT was developed in English in Canada. However, cultural differences between Australia and Canada resulted in pilot participants strongly suggesting the rephrasing of seven CPAT items. Two of these were later rejected at the validation stage due to participants' disagreement with the context being described by the items. Therefore, in alignment with the COSMIN guidelines, cross-cultural validation of an instrument is recommended before using it in different settings or populations.

This study has limitations. Although the number of participants satisfies the COSMIN criteria for very good requirements for multi-group analysis, individual cohort analyses can be improved. The small number of practitioners involved in the study limited the type of analysis that could be conducted (e.g., item response theory cannot be performed). Furthermore, some of the students involved in this study already had experience working in healthcare teams. The students were still in tertiary education and not formally certified health practitioners; however, they had work experience in health centres or clinics such as aged care or disability care. The experiences of students working in healthcare teams provide two sides of a coin for this research. The students' experience can lead to biased results compared to certified practitioners. However, the experience provides better insight into some aspects of the instrument items, which they would not have been able to respond to had they not experienced contextual interprofessional healthcare teamwork.

4.6 Conclusion

This study presented findings regarding the psychometric evaluation of the Australian CPAT, the procedures and standards of which are based on COSMIN guidelines. Achieving the COSMIN standards confirmed that the evaluation of the psychometric properties of the Australian CPAT informed the quality measure in terms of content validity, structural validity, internal consistency reliability, measurement invariance, and hypotheses testing. Results related to interprofessional teamwork and communication, leadership, task allocation, conflict management, and involving patients and their families/community in care showed the Australian CPAT is invariant for both students and practitioners. The Australian CPAT is, therefore, a quality outcome measure for assessing interprofessional collaborative practice, which can be used for both healthcare practitioners and students in Australia.

4.7 Acknowledgments

We are thankful to the Australian health practitioners and students who participated in this study.

4.8 Supporting information

S1 Figure. Reference Model For Hypotheses Testing.
S2 Table. Items Modification.

S3 File. Additional EFA Results.
S4 File. The Australian Collaborative Practice Assessment Tool.

4.9 References

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Chapter 5 Validation of the Interprofessional Socialisation and Valuing Scale (ISVS)-21 Indonesia

Chapter 5 details the results of the cultural validation of the Interprofessional Socialisation and Valuing Scale (ISVS)-21 in Indonesia. This chapter contains an accepted manuscript of an article published in the Journal of Interprofessional Care, which is available online: https://doi.org/10.1080/13561820.2023.2285020. The spelling and wording contained within this chapter are that of the published manuscript.

Journal Manuscript 3

Title

Psychometric evaluation of the culturally adapted interprofessional socialisation and valuing scale (ISVS)-19 for health practitioners and students in Indonesia

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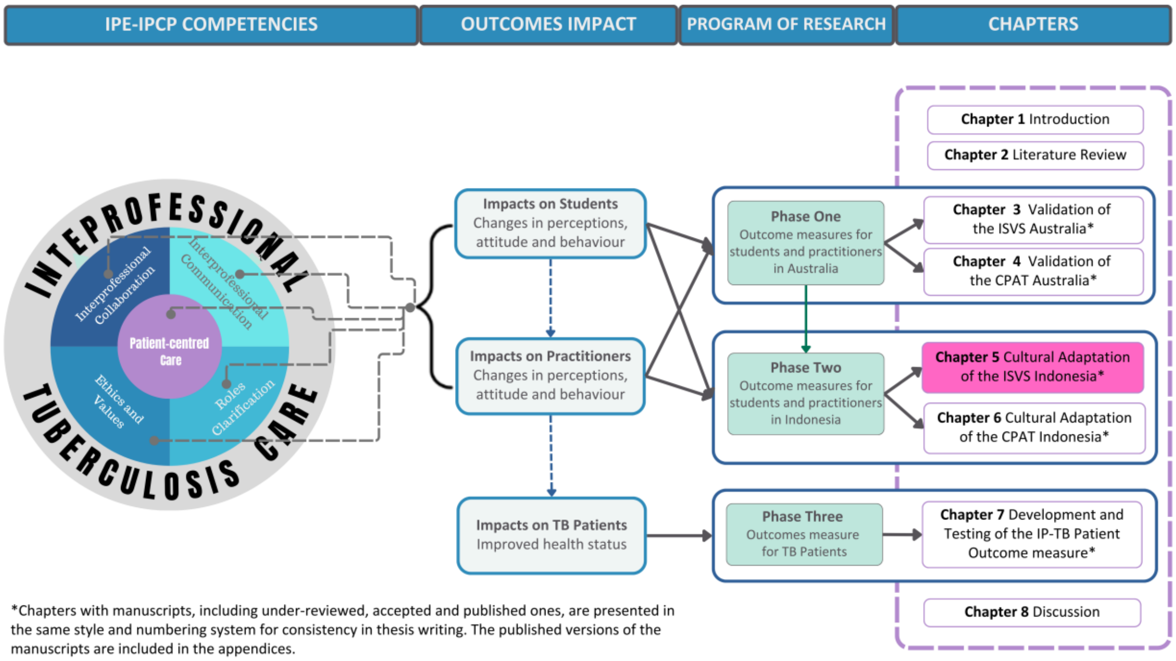


5.1 Abstract

We aimed to develop a culturally appropriate psychometrically robust measure for assessing interprofessional socialisation for health practitioners and students in Indonesia. The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) were used as guidelines. Our study was organised in three phases 1) translation, 2) cross-cultural validation by evaluating the content validity and internal structure of the translated instrument (i.e. structural validity, internal consistency reliability, and measurement invariances), and 3) hypotheses testing for construct validity. A total of 266 health practitioners and 206 students from various professional backgrounds participated. The Indonesian ISVS-19 was confirmed unidimensional. Content validity evaluation confirmed the inclusion of relevant, understandable items and was comprehensive. Factor analysis supported removal of two items. Configural, metric, and scalar tests confirmed the invariance of the 1-Factor 19-Items model in practitioner and

student cohorts. Age was a differentiating factor in both cohorts; length of work was only significant for practitioners, and educational background was significant for students (80% of assumptions were accepted, fulfilling COSMIN requirement for construct validity). The Indonesian ISVS-19 has good psychometric properties regarding content validity, internal structure, and construct validity and, therefore, is a psychometrically robust measure for assessing interprofessional socialisation for health practitioners and students in Indonesia.

5.2 Introduction

A gap exists between health professionals' education at the pre-qualification stage of training and the practice demands placed on healthcare practitioners when they enter the workplace. Contemporary pre-qualification training focuses on uniprofessional learning experiences for students from the same professional background (Lapkin et al., 2013; Tong et al., 2016; Zwarenstein et al., 2001). In contrast, practice settings require practitioners to be able to work collaboratively with colleagues from a range of different professional backgrounds (Barr & Coyle, 2013; Barr et al., 2000). Thus, to strengthen the global healthcare system, there is an urgent need to promote interprofessional education that prepares the current and future health workforce for interprofessional collaborative practice (World Health Organization, 2010).

To prepare the future healthcare workforce, pre-qualifying students in health professional programs must develop collaborative competencies early in their training (Barr & Coyle, 2013). Providing opportunities for students from different health backgrounds to work collaboratively during their education can promote future collaboration in the clinical phase (during clinical placements) and the workplace (Brewer & Flavell, 2018; Mink et al., 2019; Reeves & Freeth, 2002). To be proactive, interprofessional research has shifted from focusing on qualified health practitioners to studies targeting pre-qualifying students

(Findyartini et al., 2019; Soemantri et al., 2020; Tyastuti et al., 2014). Hence, to support greater integration between interprofessional education (IPE) and interprofessional collaborative practice (IPCP), it is important to have an outcome measure that can be used for both practitioners and students.

5.2.1 Background

Three outcome measures have been validated in Bahasa Indonesia: the Collaborative Practice Assessment Tool (CPAT), validated for practitioners (Findyartini et al., 2019); and the Readiness for Interprofessional Learning Scale (RIPLS) and Chiba Interprofessional Competency Scale (CICS29), validated for students (Soemantri et al., 2020; Tyastuti et al., 2014). However, to our knowledge, few equivalent interprofessional outcome measures validated for use by both practitioners and students exist. Moreover, no such instruments are available in Indonesian. The Interprofessional Socialisation and Valuing Scale (ISVS)-21 (King et al., 2016), a revised version of the ISVS- 24 (King et al., 2010), is considered a potentially valuable measure for Indonesia due to its reliability in measuring interprofessional socialisation in practitioners and students. In a detailed analysis of IPE measures, the ISVS-24 was the only measure that met the standardized criteria to measure IPE outcomes at three levels of Kirkpatrick’s adapted model (Barr et al., 2000): Level 2a *attitudes/perceptions*, Level 2b *knowledge/skills*, and Level 3 *behaviour* (Oates & Davidson, 2015).

The original ISVS-21, a self-rated measure that includes 21 positively worded items in English, was developed in Canada. The ISVS-21 is unidimensional with a Cronbach’s α of .99 (95% CI). The unidimensionality of ISVS-21 was confirmed with the first principal factor eigenvalue containing 57% of the variance (King et al., 2016). ISVS-21 showed a factoring agreement for the practitioner and student data with intraclass correlation coefficient = .99, 95% CI (King et al., 2016).

5.2.2 Assumptions Related to Interprofessional Socialisation

5.2.2.1 Age and Length of Experience

Age and length of experience are relatively complex to discuss as two separate issues, as they are highly correlated. Nevertheless, the two aspects are acknowledged as differing for interprofessional collaboration and practice (Anderson & Thorpe, 2008; Van et al., 2007). For instance, researchers have suggested that older generations of physicians were less engaged in collaborative practice due to their lack of exposure to adopting an interprofessional approach during training (Van et al., 2007). The current older generation of practitioners was generally trained in a uniprofessional manner and has a propensity to ignore the importance of interprofessional collaboration in patient care (Oandasan & Reeves, 2005; Thannhauser et al., 2010). In addition, several programs, such as medicine and dentistry, traditionally trained their students to be self-reliant in delivering care (Oandasan & Reeves, 2005).

Length of work experience affects interprofessional capacity more at initial exposure to practice (Legault et al., 2012). As experience accumulates over time, it reinforces the ability to understand the scope of practice (Fletcher et al., 2007; Horrocks et al., 2002; Legault et al., 2012). A period of 6 months is claimed to be adequate to develop a moderate collaborative relationship (Bradby, 1990). However, increased length of work experience displays two different possibilities. Researchers have found that physicians with extended experience were less likely to share information, expressed limited interaction, and were less willing to collaborate (Lalonde et al., 2011; Van et al., 2007).

5.2.2.2 Medical dominance

The medical profession has long been perceived as having the highest position in the health system hierarchy, denying the legitimacy of other professions' evaluations, and having the privilege of controlling their work and managing the work of other professionals (Bollen et al., 2019; Clarin, 2007; Mian et al., 2012). Collaboration between medicine and other professions has been reported as having issues related to lacking trust, perceiving hierarchy when delivering care, delegating responsibilities to those perceived as being at the lower end of the hierarchy, and not adopting ideal collaborative practices in many different settings due to an unwillingness to collaborate (Bollen et al., 2019; Clarin, 2007; Legault et al., 2012; Mian et al., 2012).

To address the gap in IPE-IPCP outcome measurement in Indonesia, we aimed to a) translate the ISVS-21 into Indonesian, b) perform cross-cultural validation by evaluating content validity and internal structure of the translated instrument (i.e., structural validity, internal consistency reliability, and measurement invariances), and c) conduct hypotheses testing based on predetermined assumptions related to the construct of interprofessional socialisation (age, length of work, and professional or educational background).

5.3 Methods

5.3.1 Procedures

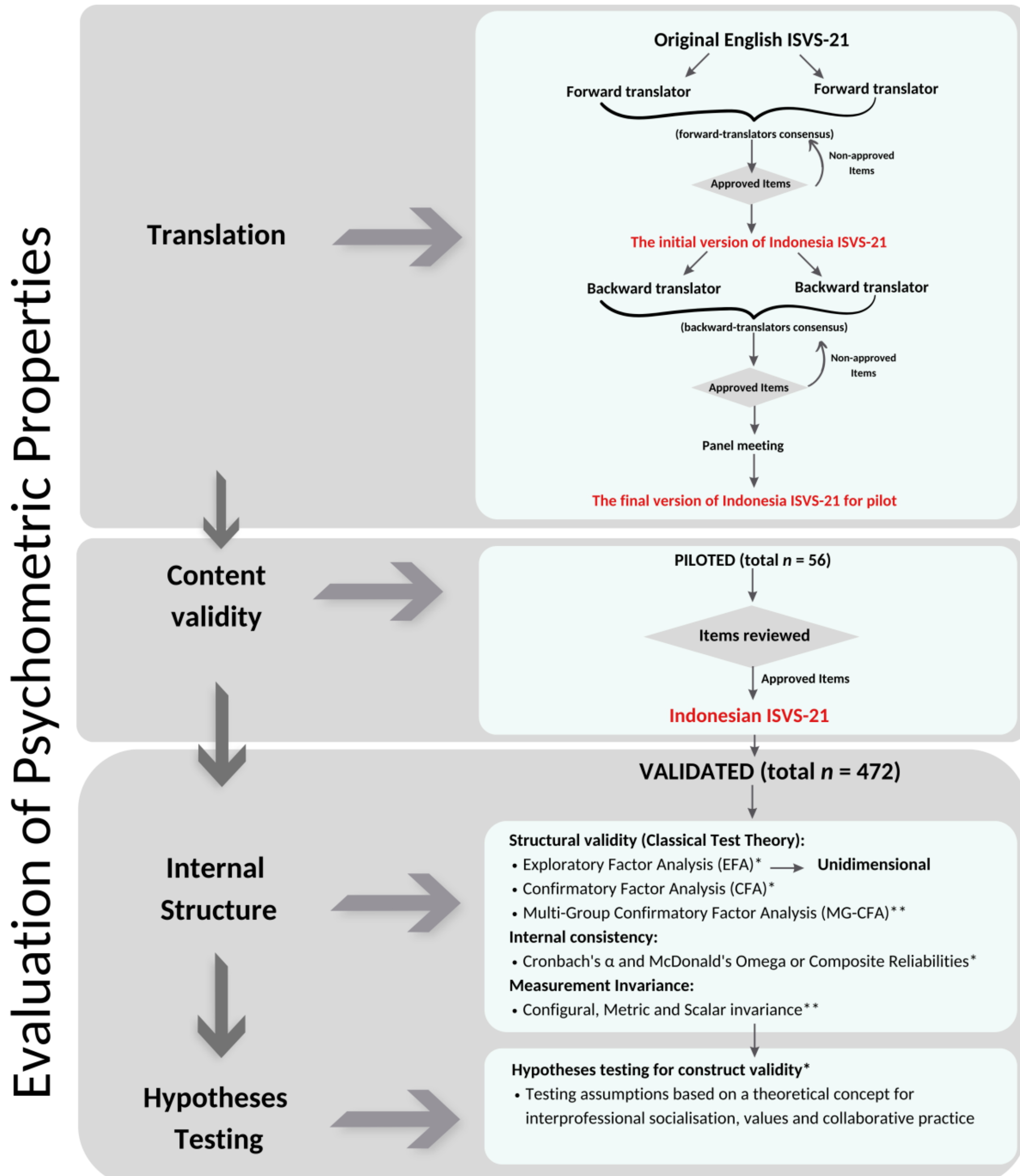
Permission to translate and use the instrument was obtained from the original ISVS-21 developer (King et al., 2016). Following translation, data were collected to evaluate the following psychometric properties: content validity, internal structure (structural validity, internal consistency reliability, and measurement invariances), and hypothesis testing. The **CO**nsensus- based **S**tandards for the selection of health **M**easurement **IN**struments (COSMIN) taxonomy and standards of psychometric properties were used to guide this study (Mokkink, De Vet et al., 2018; Mokkink, Prinsen et al., 2018; Prinsen et al., 2018; Yoon et al., 2021). COSMIN requires instrument validation in the intended users' context or population to ensure the instrument remains invariant across tested groups. The requirements indicate that if a translation instrument is to be used for practitioners or students, it must be validated on a cohort of practitioners and students (in the new setting). Developing such a measure requires careful consideration as some items may be less relevant for health practitioners yet highly suitable for students (De Vries et al., 2016). Figure 5.1 provides an overview of the processes adopted in this study.

5.3.2 Participants

Participants were purposively sampled, with the inclusion criteria of Indonesian practitioners and students from any health professional/educational background, with experience in health-team collaboration with another practitioner/student of different professional/academic backgrounds from their own. The same inclusion criteria were used for the pilot and validation studies. Participants self-identified whether they had previous experience in healthcare-team collaboration.

Participation in the pilot and validation studies was voluntary; all responses were anonymous. Potential participants were identified through online advertisements to health professional/student associations social media (e.g., professional, or discipline-based Facebook groups), and through direct invitations via e-mail to health practitioners and students who were currently in the clinical phase of their study. The survey link was provided online using Qualtrics (Qualtrics, 2022). As the participants were required to have consented before completing the survey, their consent was assumed based on the survey completion. This study's ethical approval was gained from the Curtin University Australia Human Research Ethics Committee (HREC2021–0274) and Faculty Medicine of

Hasanuddin University Ethics Board (170/UN4.6.4.5.31/ PP36/2023).



Notes. *The practitioners and students data were analysed separately

**The practitioners and students data were analysed simultaneously

Figure 5.1 Study Procedures

5.3.3 Samples

The suitability of the dataset for factor analysis was assessed according to the Kaiser–Meyer–Olkin (KMO) and Bartlett's Test of Sphericity (Williams et al., 2010). For the pilot study, COSMIN adequate size was expected with a minimum of 30 participants for each cohort, while for the validation study, COSMIN very good criteria was expected with a minimum of 7 × 21 items = 147 participants, and n ≥ 100 for each cohort (Mokkink et al., 2018).

5.3.4 Translations

Four translators were involved in the translation process; two forward translators who translated the instrument from English to Indonesian and two backward translators who translated the instrument from Indonesian back to English. COSMIN and World Health Organization standards were followed in the translation procedure (Mokkink et al., 2018; World Health Organization, 2012). Both forward translators were native Indonesian speakers who were fluent in English. One was a health professional (who holds a postgraduate degree from an English-speaking country) and was familiar with the questionnaire's content and terminology. The other was a naive Indonesian-speaking translator who did not have a health professional background. The second translator was unaware of the instrument's objective, holds a postgraduate degree in English literature from an English-speaking country, is a nationally certified translator, and is a member of the Fédération Internationale des Traducteurs. The two backward translators were native English speakers, fluent in Indonesian, and naïve to the construct to be measured. Both backward translators had doctoral degrees from an Indonesian higher educational institution, one of which was in English Education. The translators were encouraged to emphasise conceptual equivalence rather than a literal verbatim translation of each item.

The translation process began with the forward translators working independently, and then the results of the two translations were compared for agreement. The agreed Indonesian translation was sent to the backward translators, who worked independently, and then the results were compared for agreement. A review of the back-translation involving the researcher and the four translators identified several items requiring revisions to better represent the Indonesian culture without changing the context of the original construct. Eight items: ISVS1, ISVS2, ISVS3, ISVS5, ISVS8, ISVS9, ISVS10, and ISVS19 were returned to the forward translators, and the translation process continued as before for these items. For final verification, an online meeting was held involving the researcher, translators, and six Indonesian health practitioners from five different health professional backgrounds. Several items (ISVS1, ISVS5, and ISVS19) received special attention in this panel meeting, but no wording was changed.

5.3.5 Pilot: Content Validity Evaluation

Content validity reflects the extent to which the instrument's contents adequately represent the measured construct (Mokkink et al., 2018). In particular, COSMIN guidelines were used in the pilot testing to assess relevance of each item to the purpose of the measurement, comprehensibility of each item, and comprehensiveness of the items in representing the overarching construct (Mokkink et al., 2018; Prinsen et al., 2018). Participants were presented with the Indonesian ISVS and requested to rate each item on relevance and comprehen- sibility using a 5-point Likert-type scale (5 = strongly agree, 1 = strongly disagree). To further explore the participants' opinions, those selecting disagree or strongly disagree for comprehensibility were directed to an open-ended question to provide their reasoning for the rating and requested to suggest alternative wording. Comprehensibility was assessed quantitatively with descriptive statistics, and qualitatively using content analysis (Vaismoradi et al., 2013). The results were used as the basis for item revision. To assess comprehensiveness of the measure, participants were asked to propose any topics/items they felt were missing in the instrument.

5.3.6 Validation: Internal Structure Evaluation

In the validation study, participants were presented with the Indonesian ISVS and asked to rate each item using the original instrument's 7-point Likert-type scale descriptors (6 = to a very great extent, 0 = not at all). The Internal structure evaluation included the following three analytical steps a) structural validity, analysed using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Multi-group Confirmatory Factor Analysis (MG-CFA); b) Internal consistency reliability, calculated using Cronbach's α and McDonald`s Omega, and inter-item correlation; and c) measurement invariance, analysed for configural, metric, and scalar invariances. Data analysis was estimated using SPSS v26.0, and AMOS v24.0 was used to conduct confirmatory factor analysis and measurement invariance (SPSS, 2019). The Mahalanobis distance was used to identify outliers (Zijlstra et al., 2011). Missing data were treated with listwise deletion, in which the analysis was run only on observations with complete datasets.

We performed EFA using principal component analysis with varimax rotation (Williams et al., 2010), and to the maximum extent possible, equated the extraction method in the original measure factorial analysis. To perform a systematic procedure and minimise subjectivity in interpreting the results, we applied multiple-decision rules, including Kaiser's criteria and Scree test (Williams et al., 2010). Kaiser's criteria define factorial numbers based on the cumulative percentage of variance, represented by components with an eigenvalue >1; the scree test analyses a plot developed from a plotline of eigenvalues. Unidimensionality is further confirmed when the first factor's loading explains >40% of the variance (Reckase, 1979) or when the eigenvalue in the first factor is five times as high as that in the second factor (Rubio et al., 2007).

The CFA was started by independently testing the initial model (EFA results) against the practitioner and student datasets, which were then verified through MG-CFA. To obtain the optimal model fit, the error-term covariance was created based on the modification index (MI) >20, and, if required, the item with the lowest factor loading was removed with due consideration. There is no definitive cut-off to the application of model fit indices; for our study, COSMIN good fit criteria were used, i.e., the standard root mean square of the residual (SRMR) <.08, and as a complement, the root mean square error of approximation, RMSEA, cut-off <.06, was also reported (Prinsen et al., 2018). The chi-square minimum difference function (CMIN/df) is expected to be between 1 and 3, with a score <5 regarded as acceptable.

Internal consistency reliability refers to the interrelationship of the observed variables and how well these variables are correlated in measuring the same general concept (Prinsen et al., 2018). The common measurements of correlation reliability are represented with a Cronbach's α and McDonalds's Omega to confirm unidimensionality and further confirmed with the inter-item correlations (Hayes & Coutts, 2020; Prinsen et al., 2018). The higher the correlation between items, the higher Cronbach's α and McDonald's Omega scores. A value of .7 is acceptable, with a value ≥ .80 considered high; a value ≥ .95 is undesirable, as a very high value may suggest item redundancy rather than homogeneity (Hayes & Coutts, 2020; Prinsen et al., 2018; Yoon et al., 2021). Inter-item correlation examines the degree to which the score on one item relates to the scores on all other items on a respective scale (Mokkink et al., 2018). The inter-item correlation of a scale is expected to be between .30 and .50.

The final Indonesian ISVS model was tested in stages for configural, metric, and scalar invariances to assess model equivalence for the practitioner and student cohorts. Configural invariance tests a model without constraints, metric invariance applied constraint to observable variables' factor loadings to be equal across the groups, and scalar invariance applied additional constraint to the metric model with the intercepts set to be equal across the groups (Putnick & Bornstein, 2016). A good model fit is required from each test as confirmation to proceed to the next invariance test. Differences in comparative fit index (∆CFI) of the respective configural, metric, or scalar models were compared to confirmed invariances (Cheung & Rensvold, 2002). The application of restraints to the model is expected to cause a decrease in the fit indices. Thus, a reduction in the value of the comparative fit index (CFI) can be expected, but this decrease should be ≤ .01 to confirm invariances (Cheung & Rensvold, 2002).

5.3.7 Hypotheses testing: Construct Validity Evaluation

Based on the theoretical conceptualisation of interprofessional socialisation, several elements are believed to influence the construct, such as age, length of work, and medical dominance in patient care (Anderson & Thorpe, 2008; Bollen et al., 2019; Van et al., 2007). Therefore, these influential elements were used as the underlying theoretical concept for the construct validation of this study. Hypotheses were tested using analysis of variance with post-hoc multiple comparisons to identify individual differences between groups on significant results.

H1a. There is a significant difference in interprofessional socialisation for health practitioners across different age ranges (21–30 years; 31–40 years; 41–50 years; 51–60 years; 61–70 years).

H1b. There is a significant difference in interprofessional socialisation for health practitioners across different length of work ranges (1–2 years; 3–5 years; 6–10 years; 11–20 years; 20–30 years).

H1c. There is a significant difference in interprofessional socialisation for health practitioners across different professional backgrounds (dentist, nurse, pharmacist, physician, physiotherapist, public health expert, radiographer).

H2a. There is a significant difference in interprofessional socialisation for health students across different age ranges (16–20 years; 21–25 years; 26–30 years; 30–40 years).

H2b. There is a significant difference in interprofessional socialisation for health students across different educational backgrounds (dentistry, dietetics, health promotion, medicine, nursing, pharmacy).

5.4 Results

5.4.1 Pilot: Content Validity

Thirty-four health practitioners and 22 students from various health backgrounds completed the pilot study, fulfilling the COSMIN *adequate* requirement for instrument pilot testing for the practitioners, however not for the students (Mokkink et al., 2018; Prinsen et al., 2018). The practitioners and students scored significantly different on *relevance* of items (*mean* practitioner = 92.4, *SD* = 7.6; *mean* student = 85.1, *SD* = 7.8; *t*= 3.5; *df* = 54; *p* ≤.001). No participants responded *disagree* or *strongly disagree*, suggesting all items should be retained in the questionnaire. *Comprehensibility* of items was perceived as equally clear by both practitioners and students (*mean* practitioner = 88.9, *SD*= 9.3; *mean* student = 84.5, *SD* = 7.8; *t* = 1.8; *df* = 54; *p* = .073). ISVS1 *(aware of preconceived ideas)* received negative ratings (*disagree* or *strongly disagree*) from 14 practitioners and 11 students, and ISVS9 *(sharing research evidence)* and ISVS15 *(comfortable clarifying misconception)* from 6 practitioners.

These three items were submitted to a translation panel meeting for review, where a consensus was reached to reword the items. The terms “misconception,” “profession,” and “professional,” were words of English origin and should be replaced with the words “miskonsepsi,” “profesi,” and “professional,” and defined according to *The Great Dictionary of Bahasa Indonesia* (Ministry of Education and Culture Indonesia, 2016). No equivalent word for “interprofessional” was found in the dictionary, so the panel agreed to use the word “interprofesi” as the equivalent in Bahasa Indonesia. No responses were given related to the comprehensiveness of the instrument. However, one pilot test was considered adequate due to the minimum concern identified by participants in the pilot study.

5.4.2 Validation: Internal Structure

A total of 266 health practitioners and 206 students participated in the validation study. The sample was above the 10 to 1 ratio of respondents to the number of tested items, fulfilling COSMIN *very good* criteria, with the number of respondents exceeding 147 for each cohort (Mokkink et al., 2018). Practitioners’ ages ranged between 21 and 70 years (*Mean*= 45.9, *SD* = 8.6) and having worked professionally between 1 and 30 years (*Mean* = 10.3, *SD* = 6.6). Most participants were female. The largest group of practitioners was physicians. Students’ ages ranged between 16 and 40 years (*Mean* = 22.6, *SD* = 4.0) and a range in length of study between 3 and 10 years (*Mean* = 4.2, *SD* = 1.4). Again, most participants were female, with nursing students comprising the largest cohort (see Table 1). The suitability of the two datasets for factor analysis was confirmed with Kaiser–Meyer–Olkin (KMO) indices of .90 (practitioners) and .91 (students), respectively, and Bartlett’s Test of Sphericity for both datasets indicated values of $p \leq .01$. No missing data was identified in both datasets.

Table 5.1 Validation Study Participant Characteristic

Practitioner (*n* = 266)				Student (*n* = 206)			
Characteristics	***n* (%)**	***Mean***	***SD***	**Characteristics**	***n* (%)**	***Mean***	***SD***
Gender				Gender			
Female	187 (70.3%)	97.2	7.5	Female	153 (74.3%)	93.0	10.1
Male	79 (29.7%)	97.8	7.7	Male	53 (25.7%)	91.7	10.4
Age				Age			
21–30 years	6 (2.3%)	100.5	7.8	16–20 years	55 (26.7%)	97.6	9.8
31–40 years	63 (23.7%)	95.8	7.5	21–25 years	127 (61.7%)	90.8	9.5
41–50 years	123 (46.2%)	97.1	7.2	26–30 years	13 (6.3%)	92.4	10.1
51–60 years	62 (23.3%)	98.2	7.8	30–40 years	11 (5.3%)	89.6	12.3
61–70 years	12 (4.5%)	102.3	8.6				
Length of work experience				Length of Study			
1–2 years	37 (13.9%)	93.5	6.7	3–4 years	151 (73.3%)	93.8	9.7
3–5 years	41 (15.4%)	97.5	7.8	5–6 years	39 (18.9%)	88.0	11.2
6–10 years	79 (29.7%)	97.0	6.9	7–8 years	8 (3.9%)	90.9	10.7
11–20 years	89 (33.5%)	98.5	7.8	9–10 years	8 (3.9%)	95.8	7.6
20–30 years	20 (7.5%)	100.5	7.6				
Professional backgrounds				Educational backgrounds			
Dentist	9 (3.4%)	97.2	8.0	Dentistry	16 (7.8%)	92.6	5.3
Nurse	39 (14.7%)	99.2	6.3	Dietetics	30 (14.6%)	88.5	11.7
Pharmacist	14 (5.3%)	100.7	8.3	Health promotion	25 (12.1%)	95.8	6.3
Physician	172 (64.7%)	96.9	7.5	Medicine	50 (24.3%)	89.1	9.5
Physiotherapist	19 (7.1%)	97.6	10.5	Nursing	67 (32.5%)	96.4	10.8
Public health expert	7 (2.6%)	93.9	4.3	Pharmacy	18 (8.7%)	91.0	8.9
Radiographer	6 (2.3%)	95.2	5.3				

EFA provided 4-factor results for the practitioners' and students' datasets. The total variance explained was 54% and 60.7%, respectively. A scree plot generated for each dataset demonstrated one point above the break for both datasets, thus confirming the unidimensionality in both datasets. Unidimensionality was further confirmed in the student dataset, with the first-factor eigenvalues explaining 42.1% of the variance (Reckase, 1979). Although the first-factor eigenvalues of the practitioner dataset explained 35.1% of the variance, both cohorts met the unidimensionality requirement, with the eigenvalue of the first factor being about five times higher than that of the second factor (Rubio et al., 2007). Detailed results on the variance distribution are presented in Table 5.2.

Table 5.2 Variance Distribution of Initial Eigenvalues

Practitioner				Student			
Component #	Total	% variance	Cumulative %	Component #	Total	% variance	Cumulative %
1	7.36	35.0	35.0	1	8.84	42.1	42.1
2	1.53	7.3	42.3	2	1.54	7.3	49.4
3	1.44	6.8	49.2	3	1.29	6.2	55.6
4	1.01	4.8	54.0	4	1.08	5.2	60.7

Initial CFA modelling showed that no items were deemed necessary to be deleted for either cohort; all 21 items demonstrated critical ratio (CR) >1.96 at $p < .05$, indicating that each item met the validity requirements and reflected the construct. However, some items appeared to have low regression weights; sequentially, the three items with the lowest factor loading in the practitioner dataset were ISVS6, ISVS1, and ISVS7. In the student dataset, they were ISVS7, ISVS1, and ISVS2. Two items, ISVS1 (*aware of preconceived ideas*) and ISVS7 (*comfortable in speaking out*), were among the three items least endorsed by both cohorts (see detailed CFA results in Table 5.3).

Table 5.3 Confirmatory Analysis Results

Item#	Practitioner			Student		
	Estimate*	CR**	*p*	Estimate*	CR**	*p*
ISVS1	.32	4.76	<.001	.41	5.47	<.001
ISVS2	.54	7.51	<.001	.46	6.09	<.001
ISVS3	.62	8.37	<.001	.71	9.05	<.001
ISVS4	.58	7.96	<.001	.69	8.77	<.001
ISVS5	.45	6.44	<.001	.62	8.07	<.001
ISVS6	.31	4.59	<.001	.51	6.71	<.001
ISVS7	.32	4.78	<.001	.40	5.39	<.001
ISVS8	.37	5.39	<.001	.59	7.65	<.001
ISVS9	.60	8.13	<.001	.73	9.24	<.001
ISVS10	.54	7.52	<.001	.68	8.66	<.001
ISVS11	.68	8.95	<.001	.60	7.85	<.001
ISVS12	.65	8.66	<.001	.68	8.68	<.001
ISVS13	.56	7.77	<.001	.64	8.20	<.001
ISVS14	.70	9.14	<.001	.65	8.32	<.001
ISVS15	.52	7.26	<.001	.56	7.31	<.001
ISVS16	.65	8.63	<.001	.60	7.77	<.001
ISVS17	.70	9.09	<.001	.72	9.16	<.001
ISVS18	.63	8.46	<.001	.70	8.95	<.001
ISVS19	.69	8.98	<.001	.76	9.53	<.001
ISVS20	.57	7.82	<.001	.65	8.37	<.001
ISVS21	.59	-	-	.65	-	-

*Standardised estimates; **CR = Critical ratio.

The initial 1-Factor 21-items solution met the COSMIN requirement for a *good model fit* with SRMR in practitioner and student cohorts < .08 (SRMR = .069 and SRMR = .072, respectively); and acceptable CMIN/df in both datasets ($\chi 2$ (189) = 592.66, CMIN/df =

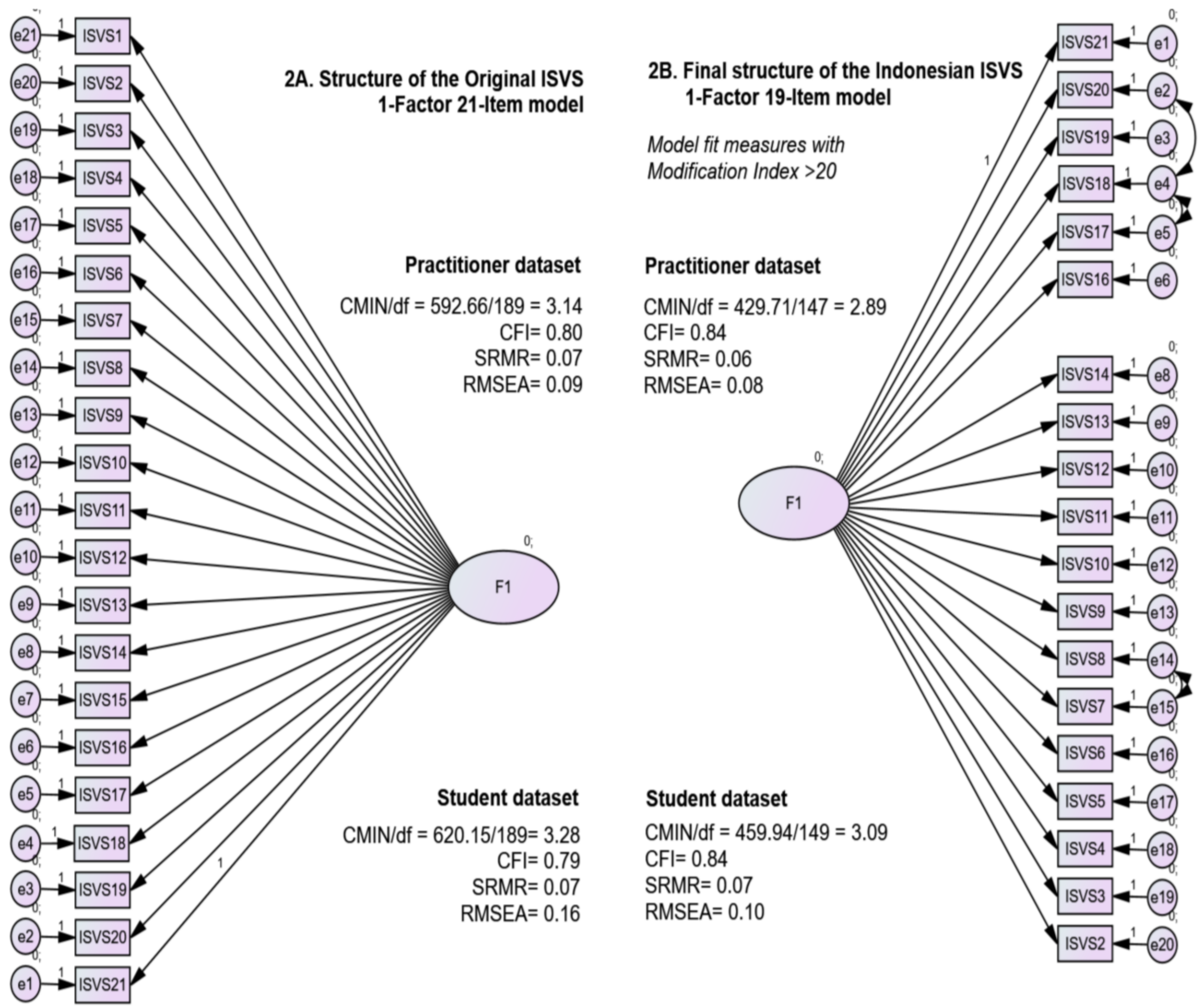
3.14 for practitioners, and χ2 (189) = 620.15, CMIN/df = 3.28 for students; see Figure 2A). Because it is predicted that the measurement invariance tests will erode the model fit indices at each stage due to the applied constraints (Putnick & Bornstein, 2016), improvements on the other indices were deemed necessary to optimise both datasets for invariance tests. There were five covariances with MI > 20, three associated with ISVS18 (*comfortable initiating discussion*), and two associated with ISVS15 (*comfortable clarifying misconception*).

Based on these findings, several iterations of applying covariates and removing items were conducted to obtain the best-fit indices while retaining as many items as possible. This was done by performing alternative modelling of all or some of the five covariances between error terms, combined with deleting *some* or *all* of the four items: ISVS1 and ISVS7 (which had the lowest factor loadings), and ISVS15 and ISVS18 (which had the most error terms of correlations). The most improved model fit was obtained by removing ISVS1 and ISVS15 (retaining 19 items) and generating covariances between three correlated error terms (see Figure 5.2b). Improvements in the fit index profiles for both datasets are provided in Figure 5.2.

The final 1-Factor 19-items model was confirmed as the best factorial solution of Indonesian ISVS-19 and used for further analysis. CFA for the 1-Factor 19-items model in the practitioner dataset indicated a *good model fit* with SRMR = .061, $\chi^2(149) = 429.73$, and CMIN/df = 2.88. A similar model was then applied to the student dataset and provided a *good model fit* with SRMR = .067, χ^2 (149) = 459.94, and acceptable CMIN/df = 3.09. These good fit indices confirmed that conducting an MG-CFA is appropriate (Putnick & Bornstein, 2016).

Using the final model, MG-CFA was performed to confirm the model's fit across the two groups. The model fit was good with SRMR = .061, RMSEA = .065, χ^2 (298) = 889.74, CMIN/df = 2.99. These good fit indices confirmed that evaluating measurement invariance is appropriate (Putnick & Bornstein, 2016). The Cronbach's α for practitioners was .89 and .92

for students (95% CI), whilst the McDonald's Omega was .88 and .92, respectively. The inter-item correlation was within the expected range (practitioner, r = .32; student, r = .40).



Notes. CMIN/df = Chi-square Minimum Discrepancy Function, df = Degree of Freedom; CFI = Comparative Fit Index, CFI = Differences of CFI, SRMR = Standard Root Mean Square Of The Residual, RMSEA = Root Mean Square Error Of Approximation.

Figure 5.2 Initial and Final Models Comparison

Measurement invariances were tested for the practitioner and student groups simultaneously, and therefore, the resulting fit indices referred to the group data/not individual datasets and will be reported accordingly. Configural model showed a *good model fit* with SRMR = .061, RMSEA = .065, χ^2 (298) = 889.74, CMIN/df = 2.99. The results indicated that the items tested do not differ across groups in terms of the structural modelling of 1-Factor 19-items. As configural invariance was achieved, the requirement for testing metric invariance was met (Cheung & Rensvold, 2002). Metric model demonstrated a *good model fit*, with SRMR= .067, RMSEA = .065, χ^2 (316) = 936.95 (CMIN/df = 2.97). The ΔCFI between the configural and metric models = .008, confirming metric invariance (Cheung & Rensvold, 2002). The results indicated that the items tested do not differ across groups in terms of factor loadings and supported the testing of scalar invariance. Scalar model showed a *good model fit* with SRMR = .069, RMSEA = .065 and χ^2 (335) = 992.67 (CMIN/df = 2.96). The ΔCFI between the metric and scalar models = .010, indicating no significant differences in the item factor loadings and intercepts across groups; scalar invariance was achieved (Cheung & Rensvold, 2002). As predicted, imposing constraints on factor loadings and intercepts can cause a decrease in the fit indices, which was demonstrated by SRMR slightly increasing from .061 to .069. The measurement invariance indices are presented in Table 5.4.

Table 5.4 Measurement Invariance Results

Full Model Comparison	CMIN/df	CFI	ΔCFI	SRMR	RMSEA	Invariance
Unconstrained	889.74(298) = 2.99	.841	-	.061	.065	Yes
Metric Invariance (Measurement Weight)	936.95(316) = 2.97	.833	.008	.067	.065	Yes
Scalar Invariance (Measurement Intercept)	992.67(335) = 2.96	.823	.010	.069	.065	Yes

Notes. CMIN/df = Chi-square Minimum Discrepancy Function, df = Degree of Freedom; CFI = Comparative Fit Index, ΔCFI = Differences of CFI, SRMR = Standard Root Mean Square Of The Residual, RMSEA = Root Mean Square Error Of Approximation.

5.4.3 Hypotheses Testing: Construct Validity

No outliers were identified in the practitioner data set; two significant outliers were removed from the student dataset and not included for hypotheses testing (practitioner, n = 266; student, n = 204). As both practitioner and student datasets were normally distributed, a parametric analysis of variance test was performed for construct validity. The mean differences were set to be significant at .05 level.

Significant differences were found in the practitioner dataset for age-related variables, $F(4, 261) = 2.53$, $p = .04$ (**H1a accepted**), and for variables related to length of work experience, $F(4, 261) = 4.07$, $p < .01$ (**H1b accepted)**. The mean scores of practitioners aged 61–70 years were significantly different from those aged 31–40 years and 41–50 years; and the mean score of practitioners with 1–2 years of work experience was significantly different from those with work experience of 3–5 years, 6–10 years, 11–20 years, and 20–30 years. No significant difference was found in the practitioners' dataset for variables related to professional backgrounds, $F(6, 259) = 1.29$, $p = .26$ (**H1c rejected**).

Significant differences were found in the students' dataset for variables related to age, $F(3, 200) = 6.6$, $p < .001$ (**H2a accepted**), and for variables related to educational backgrounds, $F(5, 198) = 5.84$, $p < .01$ (**H2b accepted**). The mean score of students aged 16–20 years was significantly different from those aged 21–25 years; the mean score of health promotion students was significantly different from that of dietetics, medicine, and pharmacy students; and the mean score of nursing students was significantly different from that of dietetics and medicine students. Detailed post-hoc results with LSD tests are provided in supplementary Table 5.1. Four of the five proposed hypotheses were accepted (80%), fulfilling the COSMIN requirement of >75% acceptance of priori hypotheses.

5.5 Discussion

We aimed to translate and conduct a cross-cultural validation of ISVS-21 in Bahasa Indonesia for use with both practitioners and students by examining the psychometric properties of the culturally adapted measure. The 1-Factor 19-Items solution was considered the best model for Indonesian ISVS. Two items, ISVS1 and ISVS15, were identified in internal structure analyses as the sources of discrepancy across cohorts and thus removed from the instrument. Possible factorial differences between healthcare practitioners and students were recognized in the earlier version of ISVS-21 (King et al., 2016), and in another study (De Vries et al., 2016), which supported the removal or rewriting of these two items.

The development of these two items requires a deeper cultural and linguistic understanding. ISVS1 (*aware of preconceived ideas)* was identified in our pilot study as confusing items (not comprehensible) and in need of rewording. However, our ISVS1 rewording did not make this item more acceptable to practitioners and students in the validation study; ISVS1 was identified as the item with the second lowest factor loading in both datasets; see Table 5.3.

This finding was similar to that reported in the original ISVS-21, where ISVS1 had the second-lowest mean loading (King et al., 2016). Not only was it problematic in our study but also in other ISVS-21 cross-cultural studies in Germany (Mahler et al., 2022), Spain (González-Pascual et al., 2022), and Australia (Vari et al., 2021). Participants' disagreement over the importance of including ISVS1 reflects difficulties with the concepts implied in this item (*aware of preconceived ideas)*. A practitioner's professional identity is believed to begin to form at least 6 months after clinical exposure (Bradby, 1990). Our study involved participants with at least 1 year of experience working in a team environment with different healthcare professionals. Over this time, the participants' perceptions, attitudes, and beliefs regarding teamwork have shaped their preconceived ideas. Many previous studies confirm that prejudice is evident in healthcare and mostly expressed concerning professional role stereotypes and medical dominance in care (Bollen et al., 2019; Clarin, 2007; Legault et al., 2012; Luetsch & Rowett, 2016; Mian et al., 2012).

Conversely, ISVS15 was discarded because the item correlated with many error terms with MI > 20 due to significant differences in the responses to this item given by participants in the two cohorts. However, the two error terms correlated with ISVS15 were only detected in the practitioners' dataset, indicating construct overlaps between related items in this cohort and not in the students' dataset. The findings in our study regarding ISVS15 were consistent with results from one earlier study where this item was suggested for rewording to improve the value of the instrument (De Vries et al., 2016).

Several attempted modelling alternatives indicated that more than the application of correlation between error terms with MI > 20 was needed to make the 1-Factor 21-item model pass the eroded constraints that would impact subsequent measurement invariance tests. Removing ISVS1 and ISVS15 significantly improved the model fit indices for MG-CFA and subsequent tests (see Figure 5.2).

The Indonesian ISVS-19 was also confirmed to have a unidimensional structure, which is consistent with the original instrument (King et al., 2016) and with previous studies involving cross-cultural validation of the ISVS-21 (González- Pascual et al., 2022; Mahler et al., 2022). The unidimensionality of Indonesian ISVS-19 was confirmed by combining results of exploratory and confirmatory factor analyses, which were then corroborated by excellent Cronbach's α, McDonalds omega, and inter-item correlation scores for both groups (Cronbach's α was .89 and .92, McDonald's Omega was .88 and .92, and *r* were .32 and .40 for practitioner and student datasets, respectively). These scores reaffirmed the instrument's unidimensionality and rejected the possibility of redundancy (Hayes & Coutts, 2020; Prinsen et al., 2018).

Collectively, these results suggest that the 19 items included in the instrument were strongly related to one construct. Measurement invariance analyses indicated that the Indonesian ISVS-19 met configural, metric, and scalar invariances, indicating that both practitioners and students agreed with the factorial structure of the Indonesian ISVS-19, the unidimensionality, the number of items included, and the meaning of the constructs underlying the Indonesian ISVS-19. The mean scores of both cohorts were expected to be comparable when assessed using the exact model, thereby enabling the identification and comparison of the student level of interprofessional development in their training (IPE) to the practitioners' level of collaborative practice in the workplace (IPCP). However, to our knowledge, there has yet to be a study on the psychometric properties of the adapted ISVS-21 using invariance testing; thus, we have no study to use as a comparator. Variables related to age and educational background are determinants for interprofessional socialisation among students. Health practitioners confirmed similar assumptions regarding age and length of work experience. However, professional background was a non-determinant factor for practitioners. COSMIN requirement for hypotheses testing was met, with 80% of the tested assumptions being accepted (Prinsen et al., 2018).

5.5.1 Limitations

The series of analyses performed for the exploratory, confirmatory, and multi-group confirmatory factor analysis used the same datasets; thus, it may not fully ensure the independence of the tests. Despite this limitation, the CFA and MG-CFA provided valuable psychometric data of the ISVS that can be tested in future studies with independent samples and by independent researchers. Physicians dominated the practitioner sample (64.7%). Moreover, most practitioners involved in this research were trained in a uniprofessional environment. However, understanding and experience regarding interprofessional collaborative practice varied widely among practitioners, considering the number of years working in healthcare. As for students, those involved had an average length of study of 3–4 years (73.3%) but were in the first year of their clinical placement program. This limited understanding and experience of interprofessional socialisation may have led to biased responses.

5.5.2 Conclusion

These findings suggest that the Indonesian ISVS-19 has good psychometric properties regarding content validity, structural validity, internal consistency reliability, measurement invariance (i.e., the internal structure), and hypotheses testing. The ISVS-19 has demonstrated robust psychometric qualities for assessing interprofessional socialisation for health practitioners and students in Indonesia.

5.6 Disclosure Statement

The authors have no relevant financial or non-financial competing interests to report.

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5.8 Notes on Contributors

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Chapter 6 Validation of the Collaborative Practice Assessment Tool (CPAT) Indonesia

Chapter 6 details the results of the cultural validation of the Collaborative Practice Assessment Tool (CPAT) in Indonesia. This chapter contains an accepted manuscript of an article published in the Narra J journal, which is available online: https://doi.org/10.52225/narra.v4i3.1106. The spelling and wording contained within this chapter are that of the published manuscript.

Journal Manuscript 4

Title

Psychometric evaluation of the Australian Interprofessional Socialisation and Valuing Scale: An invariant measure for health practitioners and students A psychometric evaluation of the Indonesian version of the Collaborative Practice Assessment Tool (CPAT) for assessing interprofessional education and collaborative practice among health practitioners and students

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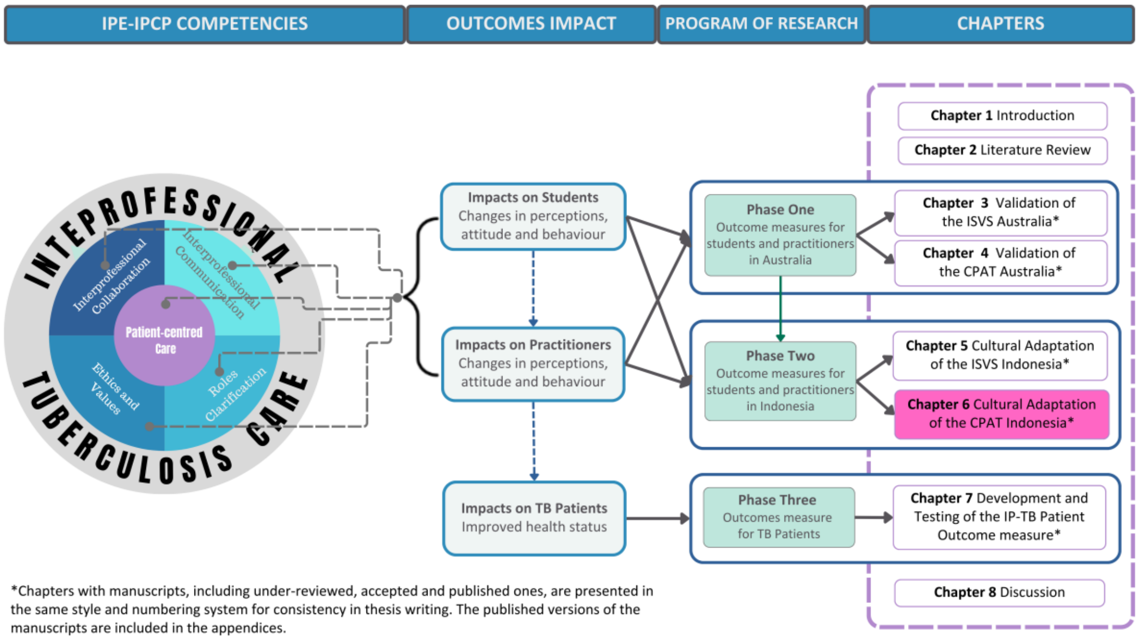

6.1 Abstract

The focus of research has transitioned from interprofessional collaborative practice among interprofessional education. It is essential to establish outcome measures to enhance the seamless integration of interprofessional education and collaborative practice. This study aimed to develop a culturally appropriate quality measure for assessing interprofessional education and collaborative practice for health practitioners and students in Indonesia by performing cross-cultural validation of the Collaborative Practice Assessment Tool (CPAT). The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) standards of psychometric properties were used to guide the study. The evaluation of the psychometric properties was conducted, involving meticulous structural validity evaluation based on a three-step factorial analysis (exploratory factor analysis, confirmatory factor analysis, and multi-group confirmatory factor analysis) and measurement invariance. The parameters analysed were related to the design requirements of a measure (i.e., targeted population, study sample, and size), the internal structure (structural validity, internal consistency, and measurement

invariances), and hypotheses testing for construct validity based on a validated conceptual framework. This study involved 266 practitioners and 232 students. The COSMIN standards for general design requirements were fulfilled. Structural validity confirmed the 7-factor of 48-item structure; measurement invariances indicated configural, metric, and scalar invariants in both practitioner and student cohorts. Construct validity was confirmed by meeting the COSMIN requirement, with over 75% of the tested hypotheses accepted. In conclusion, the findings suggest the newly validated Indonesian CPAT has good psychometric properties concerning internal structure (i.e., structural validity, internal consistency, and measurement invariance) and hypotheses testing and is, therefore, a quality measure for assessing interprofessional education and collaborative practice with health practitioners and students in Indonesia.

6.2 Introduction

Emerging evidence indicates that interprofessional education leads to interprofessional collaborative practice, strengthens health systems, and improves health outcomes (Guraya & Barr, 2018; Oandasan & Reeves, 2005; Reeves & Freeth, 2002; WHO, 2010). Accordingly, the World Health Organization (WHO) strongly recommends interprofessional education (IPE) and interprofessional collaborative practice (IPCP) as a strategic measure to overcome the global health workforce shortage and strengthen the healthcare system (WHO, 2010). When interprofessional education is introduced early in health professional education, it facilitates the development of the collaborative competencies needed for future practice (Reeves et al., 2016; Reeves & Freeth, 2002). However, disparity exists because many educational institutions currently provide only uniprofessional learning experiences with students from different professional backgrounds trained separately (Lapkin et al., 2013; Tong et al., 2016). This uniprofessional education nurtures fragmented provision of healthcare that limits the scope and integration of services, leading to an increase in the overall cost and duration but a decrease in the quality of healthcare (WHO, 2010).

As research has shifted its focus from interprofessional education for qualified health practitioners to include pre-qualifying students (Brewer & Barr, 2016; Reeves et al., 2016; Reeves & Freeth, 2002), outcome measures developed for both practitioners and students are needed to support greater integration between interprofessional education and interprofessional collaborative practice (i.e., greater integration between health professional education and healthcare). Indonesia recognises the urgent need to embed interprofessional education within health education programs (Ernawati et al., 2015; Findyartini et al., 2019; Lestari et al., 2018). Unfortunately, a limited number of instruments are available to assess interprofessional education and collaborative practice outcomes at both the education level (students) and in the workplace (practitioners). Moreover, those that are available were all developed in English (Oates & Davidson, 2015).

One outcome measure, the Collaborative Practice Assessment Tool (CPAT), has been validated in Bahasa Indonesia for practitioners (Yusra et al., 2019). The other available Indonesian measures, the Readiness for Interprofessional Learning Scale (RIPLS) and Chiba Interprofessional Competency Scale (CICS29) were validated for students (Soemantri et al., 2020; Tyastuti et al., 2014). To the best of the authors' knowledge, equivalent interprofessional outcome measures for use by practitioners and students are limited, with none unavailable for use in the Indonesian context.

COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) require instrument validation with the intended user's population and relevant settings, thus making it crucial to assess the psychometric properties of the instruments in each targeted population and setting (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018; Terwee et al., 2018). In other words, measures validated for health practitioners are not recommended for use by health students, and vice versa. Furthermore, following cross-cultural translation, evaluation is required to assess whether the measure's translated items adequately reflect the performance of the items in the original version, specifically concerning the content validity and internal structure of the translated measure (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018). Therefore, this current study adds one significant psychometric evaluation to the CPAT: to carry out measurement invariance tests as part of the structural validity evaluation to enable CPAT Indonesia to be used equivalently for health practitioners and students in Indonesia. Having an invariant measure for practitioners and students makes the scores related to relevant outcomes comparable (Ardyansyah et al., 2024; King et al., 2016). This makes it possible to identify the development and improvement of students' interprofessional identities and compare them with the interprofessional characteristics of practitioners in the workplace.

6.3 Methods

The study comprises three phases: a) cross-cultural validation of the CPAT; b) evaluation of the internal structure of the measure (i.e., structural validity, internal consistency, and measurement invariances); and c) hypotheses testing for construct validity using a validated conceptual framework for interprofessional collaboration. The COSMIN taxonomy and standards of psychometric properties were used to guide the study procedures (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018).

6.3.1 Procedures

Before the validation process, the necessary permission to use the instrument was obtained from the corresponding authors of the original English instrument (Schroder et al., 2011) and the previously validated Indonesian CPAT (Yusra et al., 2019), henceforth referred to as the previous Indonesian CPAT. The 53 items in the previous Indonesian CPAT were validated only (i.e., not re-piloted) in the current study. The data obtained were then used to analyse the instrument’s psychometric properties in terms of the general design requirements, internal structure for structural validity, and hypotheses testing for construct validity. The CPAT version developed in this study will be referred to as the newly validated Indonesian CPAT. An overview of the psychometric properties evaluated in this study is provided in Figure 6.1.

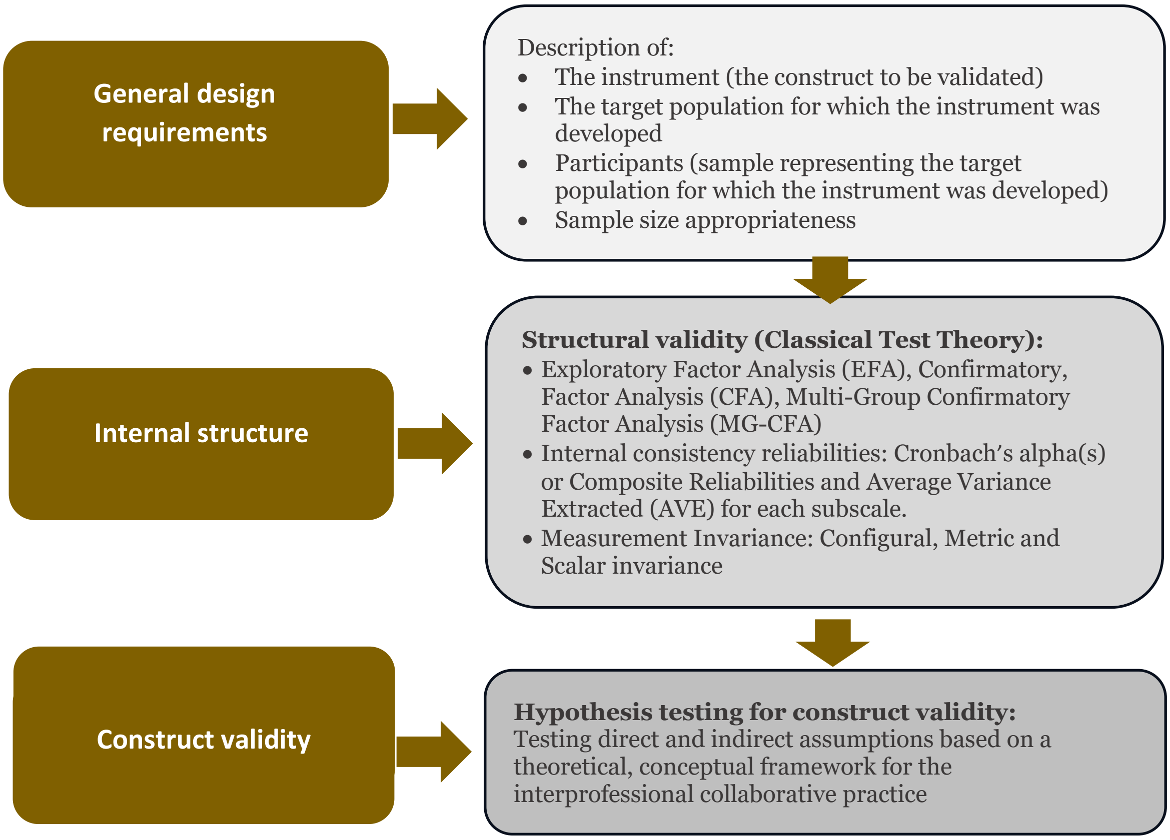

Figure 6.1. Study procedures for evaluating psychometric properties

6.3.2 Participants

This research was conducted in Indonesia. Participants were purposively sampled, targeting Indonesian health practitioners and students from various health backgrounds to ensure the representation of the intended users (Mokkink, Prinsen, et al., 2018). Participants must have met the following inclusion criteria: a) Indonesian health practitioners and students from any health professional/educational background, and b) experience in health-team collaboration with another practitioner or student with a different professional/educational background from their own. Participation in the study was voluntary, and all responses were anonymous. Potential participants were sent an information sheet providing details of the study, including the consent process and an invitation to complete the survey online using Qualtrics (Qualtrics, 2023), generated in Australia.

6.3.3 Collaborative Practice Assessment Tool (CPAT)

The CPAT is a self-assessment measure developed in English to measure interprofessional collaborative practice among health practitioners. The original version includes 56 items, eight subscales, and three open-ended questions (Schroder et al., 2011). Henceforth, this CPAT version will be referred to as the original CPAT. The Indonesian version of the CPAT consists of 53 items (three items were removed based on exploratory factor analysis), eight subscales, and three open-ended question (Schroder et al., 2011). Both versions of the CPAT were validated for use with healthcare practitioners.

The original instrument subscales are: 1) Mission, meaningful purpose, and goals (Cronbach's α = 0.88; 8 items); 2) General relationships (Cronbach's α = 0.89; 8 items); 3) Team leadership (Cronbach's α = 0.80; 8 items); 4) General roles responsibilities, autonomy (Cronbach's α = 0.81; 10 items); 5) Communication and information exchange (Cronbach's α = 0.84; 6 items); 6) Community linkages and coordination of care (Cronbach's α = 0.76; 4 items); 7) Decision-making and conflict management (Cronbach's 87 α = 0.67; 6 items); and 8) Patient involvement (Cronbach's α = 0.87; 5 items). Six of the items needed reverse coding. Responses were based on a 7-point Likert scale (1 = Strongly disagree, 2 = Mostly disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Mostly agree, and 7 = Strongly Agree).

The CPAT was chosen in this study because of its comprehensiveness in covering the most important aspects of interprofessional collaboration (Schroder et al., 2011; Stutsky & Spence Laschinger, 2014), such as team collaboration and communication, leadership, role clarity and understanding, team conflict management, and patient involvement in their care. The CPAT is widely used to measure team performance, recommended as the best instrument to assess interprofessional teamwork (Kang et al., 2022) and has been translated into several languages and used in many countries, including Japan, Taiwan, Singapore, the USA and Canada (Bookey-Bassett et al., 2016; Ho et al., 2023; Khan et al., 2022; Nagelkerk et al., 2018; Pfaff et al., 2014; Quek et al., 2022; Tomizawa et al., 2014), and Indonesian (Schroder et al., 2011). All studies validated the tool with health practitioners.

6.3.4 Structural validity

Structural validity reflects the extent to which conclusions drawn from observations on measurements (in terms of scores) adequately represent the dimensionality of the measured construct (Prinsen et al., 2018). Structural validity evaluation in this study was a three-step process of factor analysis, starting with Exploratory Factor Analysis (EFA), followed by Confirmatory Factor Analysis (CFA) and Multi-Group Confirmatory Factor Analysis (MG-CFA). EFA was conducted to determine if the 8-factor 53-item model for the newly validated Indonesian CPAT should be retained to reflect the findings of the original version and previous Indonesian CPAT. An initial structural model with the most suitable indices was then constructed to conduct the CFA. The CFA started by independently testing the initial model (EFA results) to the practitioner dataset, which was then verified to the student dataset; the practitioner dataset was used as a calibrator. The factor structures were set as equal across studies to enable the rating of the quality of the summary score (Prinsen et al., 2018). Missing data were treated with listwise deletion, so the analysis was run only on observations with complete datasets.

Factorial analyses were conducted using IBM SPSS 26 and AMOS 26 (SPSS, 2023).

While confirming the best-fit model for the two datasets, item deletion was treated cautiously by removing one item at a time and combined with the error term covariance, which was created based on the modification index (MI) >20 (Lei & Wu, 2007). There is no definitive cut-off to the application of model fit indices; for this study, the COSMIN good fit indices criteria were used (i.e., comparative fit index [CFI] > 0.95, or root mean square error of approximation [RMSEA] <0.06, or standard root mean square of the residual [SRMR] <0.08) (Prinsen et al., 2018).

6.3.5 Internal Consistency Reliability

Internal consistency refers to the interrelationship of the observed construct and how well these constructs are correlated in measuring the same general concept (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018). The common measurements of correlation reliability are represented with a Cronbach's *α* score and were calculated for each subscale to confirm its unidimensionality. To complement Cronbach's *α* score, the composite reliability (CR) for each factor was calculated for CFA. Composite reliability calculations are based on standard loadings and error variances; thus, unequal factor loadings of items associated with the analysis are weighted and accounted for (Deng & Chan, 2017). A Cronbach's *α* score of 0.70 is acceptable, with a score >0.80 considered high. A score >0.95 is undesirable, as a very high score may suggest item redundancy rather than homogeneity (Prinsen et al., 2018; Reeves et al., 2016). The average variances extracted (AVE) for each factor were also calculated (Hair et al., 2020).

6.3.6 Measurement Invariance

Next, the generated CPAT model was tested for configural, metric, and scalar invariances to assess the equivalence of the model when used for cross-group testing

(Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). The application of restraints to the model is expected to cause a decrease in the fit indices. Thus, a reduction in the value of the CFI can be expected, but this decrease should not be more than 0.01 to confirm invariances (Cheung & Rensvold, 2002). The higher the CFI, the better the data fits the model. As previously described, the COSMIN criterion for a good fit index was used as the cut-off. The targeted chi-square was between 1 and 3; values less than 5 are acceptable (Cheung & Rensvold, 2002).

Configural invariance tests a model by comparing the structure of tested groups based on the number of latent and observable variables that were estimated freely (i.e., testing the model without constraints). A good model fit indicates that the data passes configural invariance across groups and serves as confirmation to continue testing metric invariance (Cheung & Rensvold, 2002). Metric invariance analyses were performed with the observable variables' factor loadings constrained to be equal across groups. Scalar invariance imposes the same constraints as metric invariance, but with the additional constraint that the item thresholds (τ) are equated across groups (Putnick & Bornstein, 2016). Metric and scalar invariance is achieved when the difference in CFI (ΔCFI) is less than 0.01, and the fit indices difference between the two models is not significantly reduced or remains the same across groups despite the imposing constraints (Cheung & Rensvold, 2002).

6.3.7 Hypotheses Testing for Construct Validity

The CFA is a confirmatory, theory-driven test (Stutsky & Spence Laschinger, 2014; Williams et al., 2010). Therefore, an analytical planning model estimates the population covariance matrix based on a tested theoretical, conceptual framework for interprofessional collaboration. The model suggested by Stutsky and Spence Laschinger (Stutsky & Spence Laschinger, 2014) was used as the basic causal model to compare the estimated and the observed matrix in the participants' responses. This conceptual framework for interprofessional collaboration covers relevant aspects of interprofessional practice and is conceptualised based on a validated process. The model organised constructs as antecedent factors, mediators, and consequences. Based on this model, an assumption path was designed to evaluate construct validity; the *leadership and communication* domain comprised the antecedent factor, the *shared goals and roles understanding* domain was a mediator, and the domains of *members' relationship, barriers to team collaboration, conflict management and decision-making, patient involvement*, and *community empowerment* were consequence factors. The hypotheses proposed for each dataset were grouped into mediated assumptions (Figure 6.2), and direct assumptions (Figure 6.3).

The mediated hypothesis consists of five sub-hypotheses for both practitioner and student cohorts. First, *shared goals and roles understanding* mediates the positive effects of *leadership and communication* on *member relationships* (HMed.1); second, *shared goals and roles understanding* mediates the positive effects of *leadership and communication* on *barriers to team collaboration* (HMed.2)*;* third, *shared goals and roles understanding* mediates the positive effects of *leadership and communication* on *conflict management and decision-making* (HMed.3); fourth, *shared goals and roles understanding* mediates the positive effects of *leadership and communication* on *patient involvement* (HMed.4); and, fifth, *shared goals and roles understanding* mediates the positive effects of *leadership and communication* on *community empowerment* (HMed.5). The mediated assumptions are illustrated in the path analysis depicted in Figure 6.3.

6.4 Results

The results of this study are presented following the procedural flow shown in Figure 6.1 which includes reporting findings regarding the instrument's general design requirements, the internal structure (structural validity, internal consistency, measurement invariances of configural, metric, and scalar), and hypotheses testing on the direct and indirect assumptions.

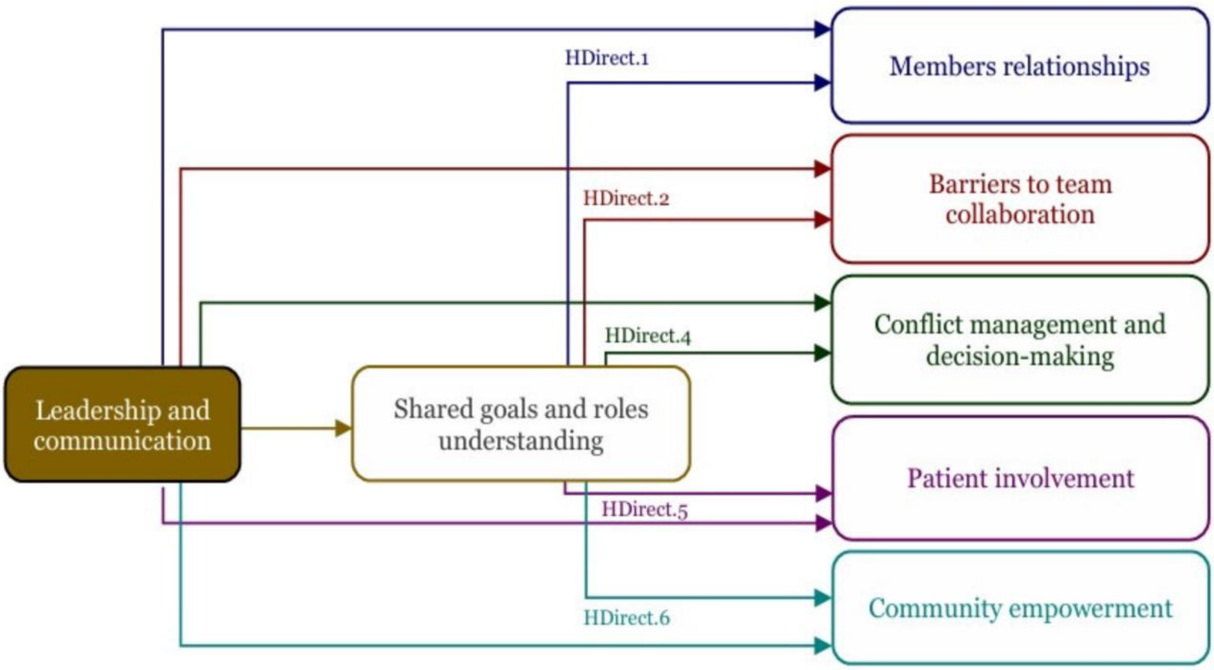

Figure 6.2 Mediated Assumptions

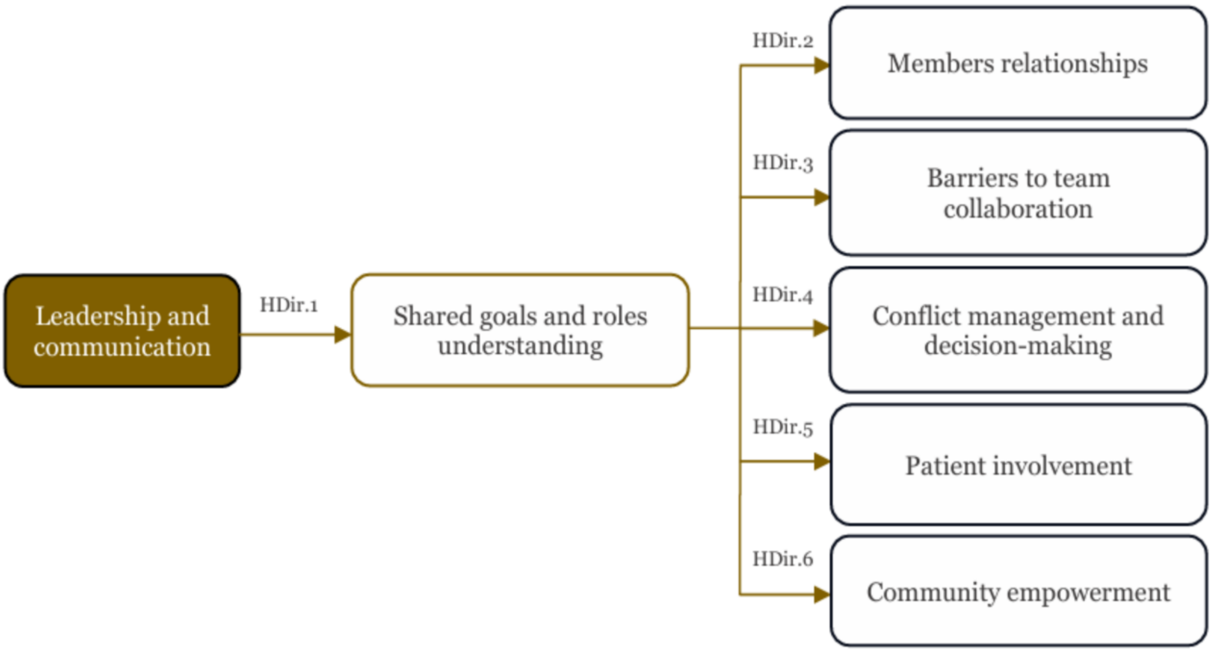

Figure 6.3 Direct Assumptions

6.4.1 Sample Description

The participants included 266 individuals, with 188 (70.7%) being women aged between 21 and 60 years (Mean=36.1, Standard Deviation=8.2). The top three participating professions were doctors, nurses, and physiotherapists. The student sample included 232 participants, with 174 (75%) females, aged between 16 and 35 years (Mean=22.5, Standard Deviation=3.7). The three most represented subjects were nursing, medicine, and dietetics. A detailed breakdown of participant characteristics is presented in Table 6.1.

Table 6.1 Participants Characteristics

Practitioners (n=266)		Students (n=232)	
Characteristics	**n (%)**	**Characteristics**	**n (%)**
Gender		Gender	
Male	78 (29.3)	Male	58 (25)
Female	188 (70.7)	Female	174 (75)
Age (years)		Age (years)	
21 - 30	69 (2.3)	16 - 20	55 (26.7)
31 - 40	123 (46.2)	21 - 25	127 (61.7)
41- 50	62 (23.3)	26 - 30	13 (6.3)
51 - 60	12 (4.5)	31 – 35	11 (5.3)
Professional Backgrounds		Study course	
Dentist	9 (3.4)	Dentistry	16 (7.8)
Nurse	39 (14.7)	Dietetics	30 (14.6)
Pharmacist	14 (5.3)	Health Promotion	25 (12.1)
Physician	172 (64.7)	Medicine	50 (24.3)
Physiotherapist	19 (7.1)	Nursing	67 (32.5)
Public health expert	7 (2.6)	Pharmacy	18 (8.7)
Radiographer	6 (2.2)		
Length of work (years)		Length of study (years)	
1 - 10	157 (59)	3 - 4	151 (73.3)
11 - 20	89 (33.5)	5 - 6	39 (18.9)
21 - 30	20 (7.5)	7 - 8	16 (7.8)

6.4.2 Structural Validity

The sample size for both datasets was within the 5 to 1 ratio of respondents to the number of tested items (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018). The suitability of the two datasets for factor analysis was confirmed with Kaiser-Meyer-Olkin (KMO) indexes of 0.92 (practitioner) and 0 .91 (student), and Bartlett's test of sphericity for both data sets indicated values of $p < 0.001$. The structure of the two 8-factor models was used as the basis for EFA modelling for this study, with items based on the original CPAT and the previous Indonesian CPAT version. The EFA was rigorously used to optimise the model for regrouping items on relevant latent factors and verified by Cronbach's α for the total score and each subscale until a suitable model was obtained.

The EFA results indicated that the original CPAT version of the factorial structure was not the best model for the current study. The previous Indonesian CPAT version of the instrument was more suitable, although not entirely defensible. Three subscales in the original CPAT version were entirely preserved in the previous Indonesian CPAT. Together with the contributory items, these three subscales (F1, F2, and F6 in the original CPAT version were retained as F1, F2, and F5 in the previous Indonesian CPAT) were decisive factors in both versions and confirmed by good Cronbach's α scores (see supplementary Table 6.1). One subscale was weak in both versions: F7 in the original CPAT version (Cronbach's α = .67) and F6 in the previous Indonesian CPAT version (Cronbach's α = .70). One new subscale was registered in the previous Indonesian CPAT, which was not a derivative of any of the subscales in the original CPAT version (F8, Cronbach's α = .61). Information related to the factorial structure of the instrument with the internal consistency score of each subscale and the change in item positioning in both versions is presented in supplementary Table 6.1. A final EFA model with good internal consistency for each subscale in both datasets was generated with 53 items specifying a 7-factor conformation and was used as the initial factorial structure for CFA (presented in Table 6.2).

Table 6.2 Comparison of the factorial structure between the previously validated Indonesian CPAT and the original English CPAT

Subscales	Domains	Remarks
F1	Members relationships (9 items)	All nine items from Ind.F2 relationships among team members (derived from Ori.F2 general relationships).
F2	Antecedent factor: Leadership & communication (14 items)	All five items from Ind.F3 leadership (derived from Ori.F3 leadership).
		Nine items from Ind.F4 team coordination and organisation (derived from Ori.F5 communication and information exchange).
F3	Interprofessional collaborative practice: Shared goals & roles understanding (14 items)	All nine items from Ind.F1 mission, goals, and objectives derived from Ori.F5 (derived from Ori.F1 mission, meaningful, purpose, goals).
		Five items from Ind.F4 (derived from Ori.F4 general roles responsibilities, autonomy).
F4	Community empowerment (4 items)	All four items from Ori.F5 Team Relationship with the Community (derived from Ori.F6 community linkages and coordination of care)
F5	Conflict management and decision-making (4 items)	All two items from Ind.F6 decision-making and conflict management (derived from Ori.F7 decision-making and conflict management)
		Two items from Ind.F7 (derived from Ori.F4 general roles responsibilities, autonomy).
F6	Patient involvement (3 items)	All three items from Ind.F7 patient involvement, responsibility, and autonomy (derived from Ori.F8 patient involvement).
F7	Barriers to team collaboration (5 items)	All five items from Ind.F8 barriers to team collaboration (derived from three different Ori factors).

Notes. Ind = the previous Indonesian CPAT; Ori = Original CPAT

Because this study used an assumption test based on a validated conceptual framework to synchronise with subsequent analyses, the subscale names were modified to match the labels used in the reference conceptual framework while retaining the main elements of each factor's name from the previous two versions. In the 7-factor 53-item model, five subscales (F1, F4, F5, F6, and F7) and their respective items almost entirely maintained the previous Indonesian CPAT constructs. Factor 2, antecedent factors of *leadership and communication*, was generated by combining the two complete latent factors of *team leadership* (Ori.F3) and *communication and information exchange* (Ori.F5) in the original CPAT version. Factor 3, *interprofessional collaborative practice*: *shared goals and roles understanding*, was also a merged version of two complete factors in the original CPAT version: *mission, meaningful, purpose, goals* (Ori.F1), and *general roles responsibilities, autonomy* (Ori.F4). EFA results for dimension reduction confirmed the pair's unidimensionality; when run independently and as MG-CFA for each dataset (trial testings), *team leadership* (Ori.F3) and *communication and information exchange* (Ori.F5) were linearly highly dependent (CFA confirmed bivariate correlation >0.85). This multicollinearity issue impacted the results, with AMOS in further trial testing declaring the model inadmissible.

A similar case was present for *mission, meaningful, purpose, goals* (Ori.F1), and *general roles responsibilities, and autonomy* (Ori.F4). These multicollinearity issues were solved by merging the two highly correlated factors (Deng & Chan, 2017), resulting in an admissible model. The merging of two sets of highly correlated factors was also in accordance with the conceptual framework used as a reference (Stutsky & Spence Laschinger, 2014). The factors of *team leadership* (Ori.F3) and *communication and information exchange* (Ori.F5) were recognised and validated as antecedent factors for *interprofessional collaborative practice*, and the factors of *mission, meaningful, purpose, goals* (Ori.F1) and *general roles responsibilities, and autonomy* (Ori.F4) were contributors to *interprofessional collaborative practice*. During this process, the EFA was run repeatedly to confirm each subscale's unidimensionality, and each subscale's internal consistency was verified with Cronbach’s α scores. The final EFA factorial structure (i.e., the initial CFA model) is presented in Figure 6.4a.

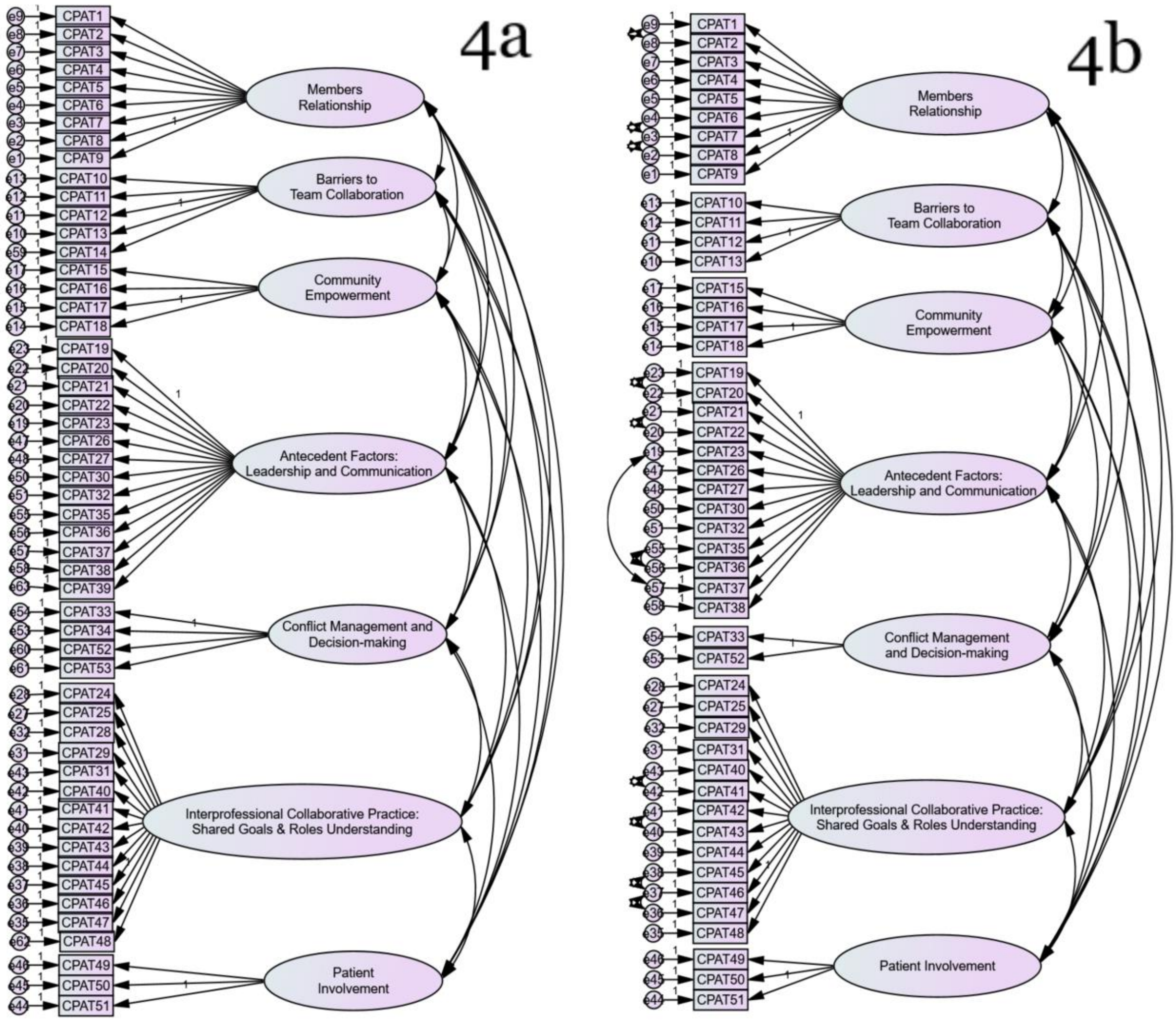

Figure 6.4 Construct models of the newly validated Indonesian collaborative practice assessment tool, the initial construct for CFA (7-Factor 53-Item model) (4a), and the final model for multi-group CFA (7-Factor 48-Item model) (4b).

Initial CFA modelling results demonstrated model fit requiring refinement in both datasets with CFI or comparable measure <0.95, RMSEA >0.06, and SRMR barely within <0.08 ranges. Since the model fit indices will inevitably deteriorate when tested for invariance measurements, refinement was performed to improve the fit indices. Smaller factor loadings were indicated for items 14, 34, and 53 in the practitioner dataset (the estimates were less than 0.30), compared with moderate loadings in the student dataset (standardised estimates ranged from 0.47 to 0.55). Removing item 14 increased the average variance extracted (AVE) of subscale *barriers to team collaboration* in both sets to over .50. Removing items 34 and 53 significantly increased the CR and/or the AVE of subscale *conflict management and decision-making* in both datasets (practitioner: CR = 0.64 to CR = 0.71; student: AVE = 0.39 increased to AVE = 0.53).

After removing items 14, 34, and 53, CFA was rerun to assess the acceptability of the 7-factor 50-item model to both datasets, with the practitioner dataset tested first. The CFA results indicated that the model had one negative variance. In addition, 12 covariances had MI>20 (ranging from 20.25 - 91.07). There were four covariances between error terms in different constructs, eight in a similar construct, three of which correlated with item 28 (with potential par changes of 0.10, 0.12, and 0.14).

Based on these results, trial tests were conducted to determine whether applying all or some of the five covariances between error terms within the same construct, combined with (or without) deleting item 28, would significantly increase the model fit indices. The most significant model fit improvement was obtained by removing item 28 and generating covariances between five correlated error terms in a similar construct. As a result, RMSEA decreased by 0.1 points to 0.070, and SRMR decreased by 0.141 points to 0.066. With CFI remaining <0.950 (CFI = 0.824), these improvements in RMSEA and SRMR were deemed significant to prepare the practitioner dataset for measurement invariance tests.

Assuming an adequate model fit has been generated for the practitioner dataset, the same 7-factor 49-item model (items 14, 34, 28, and 53 removed) was then applied to the student dataset. CFA resulted in fit indices of CFI = 0.742, RMSEA = 0.080, and SRMR = 0.072. The modification indices showed ten covariances had MI > 20 (ranging from 20.77 to 40.85). One of the covariances involved error terms in different constructs, and the remaining nine involved error terms in the same construct — three of which involved item 39 (with potential par changes of 0.15, 0.19, and 0.23). Repeating the same procedure previously performed on the practitioner dataset, the model fit was corrected significantly by removing item 28 and generating covariances between six correlated error terms within a similar construct. As a result, RMSEA decreased by 0.1 points to 0.069, and SRMR decreased by 0.04 points to 0.068. CFI in the student dataset was inadequate (CFI = 0.787); therefore, this improvement in the RMSEA index was deemed essential to increase the suitability of the student dataset for measurement invariance tests. CFA was run on the final 7-factor 48-item model (items 13, 28, 34, 39, and 53 removed; see Figure 6.4b) in the student dataset provided indices of SRMR = 0.068, RMSEA = 0.069, CFI = 0.787, $\chi^2(1048) = 2196.09$, and Chi-square minimum discrepancy function (CMIN)/degree of freedom (df) = 2.05, fulfilling the COSMIN criteria for a good model fit (Prinsen et al., 2018).

To assess the acceptability of the practitioner data to the 7-factor 48-item model, CFA was rerun on the practitioner dataset and generated a good model fit with SRMR = 0.065, RMSEA = 0.070, CFI = 0.829, $\chi^2(1048) = 2397.02$, CMIN/df = 2.29, fulfilling the COSMIN criteria for a good model fit (Prinsen et al., 2018). These good fit indices provided statistical support for performing an MG-CFA. Using the final CFA model (Figure 6.4b), an MG-CFA was performed to confirm the model's fit across the two groups. The model fit was good with SRMR = 0.065, RMSEA = 0.049, CFI = 0.812, χ^2 (2096) = 4593.14, CMIN/df = 2.19, fulfilling the COSMIN criteria for a good model fit (Prinsen et al., 2018).

6.4.3 Internal Consistency Reliability

Comprehensive results of item estimates and each subscale CR and AVE are shown in Table 6.3**.** The MG-CFA showed good internal consistency reliability for all subscales. The composite reliability was all ≥ 0.70.

Table 6.3 Item Estimates, Internal Consistency Reliabilities, and Factorial Validity

Subscales	Items#	Practitioners			Students		
		Estimates	CR	AVE	Estimates	CR	AVE
Members relationships (9 items)	CPAT1	0.65	0.86	0.42	0.60	0.86	0.41
	CPAT2	0.71			0.74		
	CPAT3	0.54			0.60		
	CPAT4	0.82			0.73		
	CPAT5	0.75			0.66		
	CPAT6	0.58			0.61		
	CPAT7	0.49			0.62		
	CPAT8	0.58			0.59		
	CPAT9	0.63			0.57		
Barriers to team collaboration (4 items)	CPAT10	0.65	0.86	0.61	0.72	0.86	0.61
	CPAT11	0.90			0.80		
	CPAT12	0.82			0.87		
	CPAT13	0.73			0.72		
	CPAT14	**Deleted**			Deleted		
Community empowerment (4 items)	CPAT15	0.84	0.88	0.66	0.71	0.82	0.54
	CPAT16	0.90			0.89		
	CPAT17	0.79			0.59		
	CPAT18	0.70			0.73		
Antecedent factors: leadership & communication (13 items)	CPAT19	0.56	0.92	0.48	0.50	0.86	0.33
	CPAT20	0.64			0.57		
	CPAT21	0.71			0.51		
	CPAT22	0.72			0.52		
	CPAT23	0.70			0.63		
	CPAT26	0.68			0.51		
	CPAT27	0.68			0.63		
	CPAT30	0.79			0.61		
	CPAT32	0.66			0.37		
	CPAT35	0.68			0.70		
	CPAT36	0.79			0.62		
	CPAT37	0.76			0.72		
	CPAT38	0.56			0.51		
	CPAT39	**Deleted**			Deleted		
Conflict management and decision-making (2 items)	CPAT33	0.49	0.71	0.58	0.63	0.70	0.54
	CPAT34	Deleted			Deleted		
	CPAT52	0.96			0.83		
	CPAT53	**Deleted**			Deleted		
Interprofessional collaborative practice: shared goals & roles understanding (13 items)	CPAT24	0.68	0.93	0.50	0.63	0.89	0.38
	CPAT25	0.72			0.62		
	CPAT28	**Deleted**			Deleted		
	CPAT29	0.73			0.62		
	CPAT31	0.71			0.61		
	CPAT40	0.80			0.59		
	CPAT41	0.80			0.63		

Subscales	Items#	Practitioners			Students		
		Estimates	CR	AVE	Estimates	CR	AVE
	CPAT42	0.59			0.56		
	CPAT43	0.73			0.67		
	CPAT44	0.56			0.46		
	CPAT45	0.76			0.62		
	CPAT46	0.71			0.65		
	CPAT47	0.58			0.58		
	CPAT48	0.74			0.71		
Patient Involvement (3 items)	CPAT49	0.64	0.71	0.45	0.58	0.72	0.47
	CPAT50	0.69			0.66		
	CPAT51	0.69			0.80		

Notes. CR = composite reliability; AVE = average variance extracted.

6.4.4 Measurement Invariance

Using the same model for MG-CFA (Figure 6.4b), measurement invariances were tested for the two groups. Because the data were analysed simultaneously, the resulting fit indices referred to the group data, not individual datasets, and were thus presented accordingly. The configural invariance testing showed a good fit with RMSEA = 0.049, SRMR = 0.065, CFI = 0.812, $\chi^2(2096) = 4593.14$ (CMIN/df = 2.19), and PClose = 0.80, fulfilling the COSMIN criteria for a good model fit. Based on these results, the unconstrained model indicated a good fit of the factor structure for each group. Configural invariance was achieved, thus passing the requirement for using metric invariance testing.

The metric invariance demonstrated a good fit, with RMSEA = 0.049, SRMR = 0.071, CFI = 0.807, and $\chi^2(2137) = 4699.87$ (CMIN/df = 2.20), PClose = 0.76, fulfilling the COSMIN criteria for a good model fit. The CFI difference between the configural and metric models was less than 0.01 (ΔCFI = 0.005). This ΔCFI confirmed that metric invariance was achieved, indicating that the items tested do not differ across the tested groups regarding the structural modelling of 7 factors with 48 items. The results supported the use of a scalar invariance test.

The scalar invariance test showed a good fit with RMSEA = 0.049, SRMR = 0.083, CFI = 0.803, $\chi^2(2165) = 4775.92$ (CMIN/df = 2.21), and PClose = 0.072, thus fulfilling the COSMIN criteria for a good model fit. The CFI difference was less than 0.01 (ΔCFI = 0.004), indicating no significant differences in the item factor loadings and intercepts between the practitioner and student datasets, resulting in scalar invariance. As predicted, imposing constraints on factor loading and intercepts can cause a decrease in the fit indices, as shown by SRMR decreasing to 0.083 (cut off < 0.8). The models' fit indices for both tested groups for model comparison are presented in Table 6.4.

Table 6.4 Full Model Comparison

Models	CMIN (df)	CMIN/df	CFI	ΔCFI	SRMR	RMSEA	PClose	Invariance
Unconstrained	4593.14 (2096)	2.19	0.812	-	0.065	0.049	0.80	Yes
Metric Invariance (measurement weights)	4699.86 (2137)	2.20	0.807	0.005	0.071	0.049	0.76	Yes
Scalar invariance (measurement intercepts)	4775.92 (2165)	2.21	0.803	0.004	0.083	0.049	0.72	Yes

Notes. CMIN = Chi-square Minimum Discrepancy Function; df = Degree of Freedom; CFI = Comparative Fit Index; SRMR = Standard Root Mean Square of The Residual; RMSEA: = Root Mean Square Error of Approximation.

6.4.5 Hypotheses Testing for Construct Validity

A path of causal effect model was generated based on the selected interprofessional conceptual framework to test the predefined assumptions (Stutsky & Spence Laschinger, 2014). The practitioners' dataset (see path analysis model in Figure 6.5a) showed a good model fit with SRMR = 0.048, CFI = 0.930, GFI = 0.981 (the $\chi^2(15) = 76.05$ (CMIN/df = 5.07), fulfilling the COSMIN criteria for a good model fit (Prinsen et al., 2018). The model obtained an inadequate fit for the student dataset (see path analysis model in Figure 6.5b) with SRMR = 0.089, CFI = 0.818, GFI = 0.861, $\chi^2(15)$ = 130.34 (CMIN/df = 8.69).

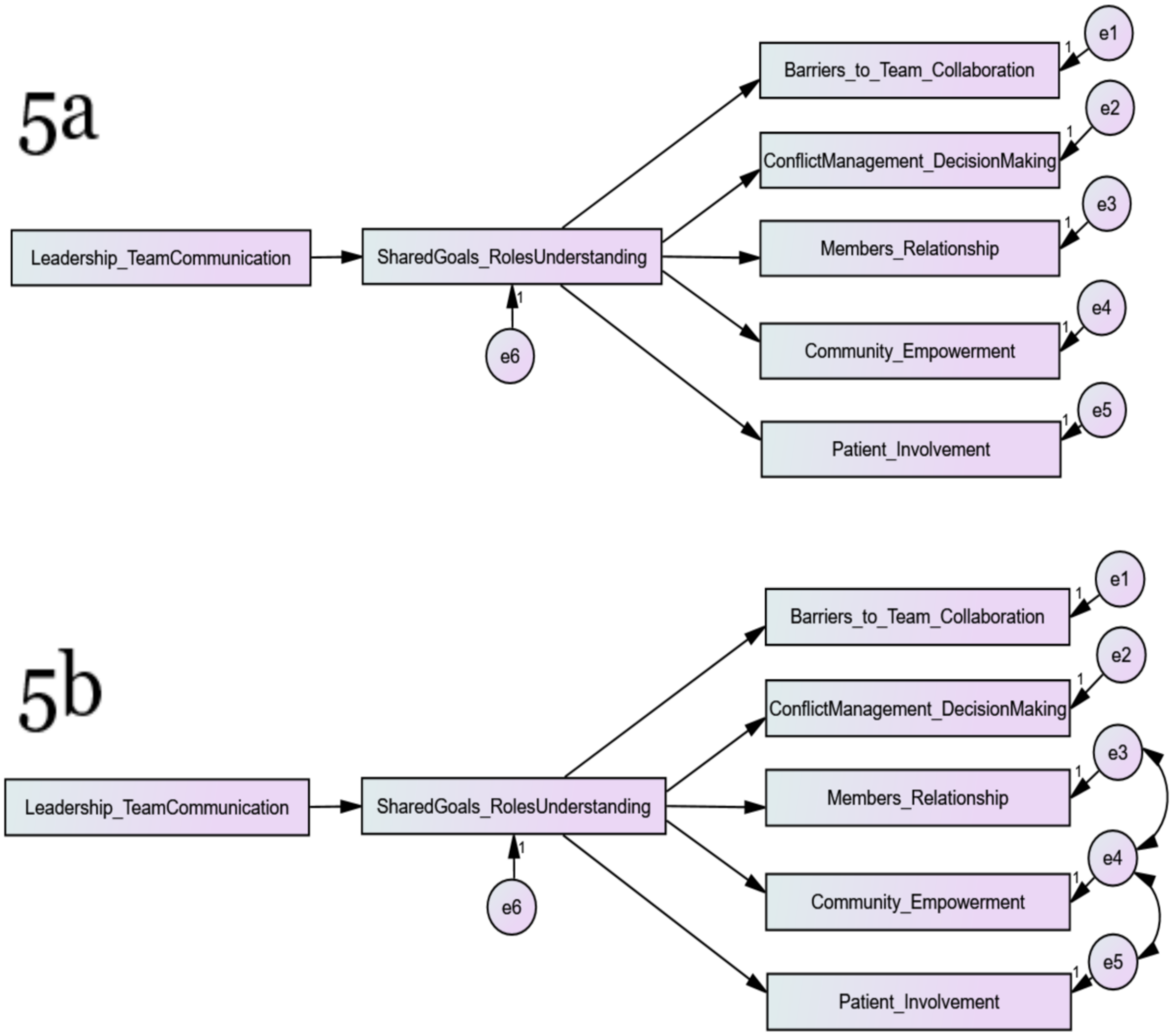

Figure 6.5 Path analysis of assumptions model for practitioners (5a) and students (5b).

The model had 13 covariances with two admissible correlations of error terms within a similar construct of the consequences factors. Creating the covariances resulted in significant improvement of the model with SRMR = 0.076, GFI = 0.900, CFI = 0.859, RMSEA = 0.172, $\chi^2(13)$ = 102.34 (CMIN/df = 7.873), fulfilling the COSMIN criteria for a good model fit (Prinsen et al., 2018). These results confirmed the model fit for hypotheses testing in both datasets.

The study assessed the mediating role of *IPCP: shared goals and roles understanding* between *antecedent factors: leadership and communication* on the *consequences factors*. Bootstrap properties were set to 5000 number of samples with a bias-corrected confidence interval of 95%. In both datasets, the results revealed positive and significant direct effects of impact on Antecedent Factors: *leadership and communication* on *shared goals - roles understanding;* and *shared goals - roles understanding* on *members relationships, barriers to team collaboration, conflict management and decision-making, patient Involvement,* and *community empowerment*, thus supporting **H Dir.1, H Dir.2, H Dir.3, H Dir.4, H Dir.5**, and **H Dir.6** in both cohorts.

The mediation analysis indicated that the *leadership and communication* relationship to *members relationships* and *patient involvement* was only partially mediated by *shared goals - roles understanding* in both cohorts. Full mediation of *shared goals - roles understanding* was provided in the relationship of *leadership and communication* on *barriers to team collaboration*. In both cohorts, no mediation effect was involved in the relationships of *leadership and communication* on *conflict management and decision-making,* and *community empowerment*. Summaries of hypotheses testing are presented in Table 6.5 and Table 6.6. With the tested hypotheses showing 77.3% positive and significant values, the COSMIN requirement was met, with at least 75% of the tested hypotheses being accepted.

6.5 Discussion

This study aimed to conduct cross-cultural validation of the CPAT in Indonesian by examining the previously translated and validated instrument's internal structure and performing hypotheses testing. In line with the aim of the study – to provide a quality

Table 6.5 Interprofessional Collaborative Practice Assumptions for Practitioners

Relationships			Direct Effect		
			β[a]	*p*[b]	Hypotheses
Leadership and communication	→	Shared goals - roles understanding	0.89	<0.001	HDir.1 **Accepted**
Shared goals – roles understanding	→	Members relationships	0.69	<0.001	HDir.2 **Accepted**
Shared goals – roles understanding	→	Barriers to Team Collaboration	0.16	0.01	HDir.3 **Accepted**
Shared goals – roles understanding	→	Conflict Management and Decision-Making	0.24	<0.001	HDir.4 **Accepted**
Shared goals – roles understanding	→	Patient involvement	0.52	<0.001	HDir.5 **Accepted**
Shared goals – roles understanding	→	Community empowerment	0.60	<0.001	HDir.6 **Accepted**

Relationships			Direct Effect			Indirect Effect			Conclusion
			β[a]	*p*[b]	Hypotheses	β[a]	*p*[b]	Hypotheses	
Leadership and communication →	Shared goals – roles understanding →	Members relationships	0.38	<0.001	HDirect.1. **Accepted**	0.18	0.01	HIndirect.1. **Accepted**	HMed. 1: Partial mediation
Leadership and communication →	Shared goals – roles understanding →	Barriers to team collaboration	0.18	0.19	HDirect.2. **Rejected**	0.00	0.98	HIndirect.2. **Rejected**	HMed. 2: No mediation
Leadership and communication →	Shared goals – roles understanding →	Conflict management and decision-making	-0.02	0.90	HDirect.3. **Rejected**	0.58	0.80	Hindirect.3. **Rejected**	HMed. 3: No mediation
Leadership and communication →	Shared goals – roles understanding →	Patient involvement	0.29	0.02	HDirect.4. **Accepted**	0.70	0.04	HIndirect.4. **Accepted**	HMed. 4: Partial mediation
Leadership and communication →	Shared goals – roles understanding →	Community empowerment	0.63	<0.001	HDirect.5. **Accepted**	0.02	0.74	Hindirect.5. **Rejected**	HMed. 5: No mediation

Notes. [a]β = Standardised regression weight; [b]*p* = Significant at 0.05 confidence interval levels.

Table 6.6 Interprofessional Collaborative Practice Assumptions for Students

Relationships			Direct Effect		
			β[a]	*p*[b]	Hypotheses
Leadership and communication	→	Shared goals - roles understanding	0.80	<0.001	HDir.1 **Accepted**
Shared goals – roles understanding	→	Members relationships	0.66	<0.001	HDir.2 **Accepted**
Shared goals – roles understanding	→	Barriers to Team Collaboration	0.28	<0.001	HDir.3 **Accepted**
Shared goals – roles understanding	→	Conflict Management and Decision-Making	0.30	<0.001	HDir.4 **Accepted**
Shared goals – roles understanding	→	Patient involvement	0.52	<0.001	HDir.5 **Accepted**
Shared goals – roles understanding	→	Community empowerment	0.40	<0.001	HDir.6 **Accepted**

Relationships					Direct Effect			Indirect Effect			Conclusion
					β[a]	*p*[b]	Hypotheses	β[a]	*p*[b]	Hypotheses	
Leadership and communication	→	Shared goals – roles understanding	→	Members relationships	0.27	<0.001	HDirect.1. **Accepted**	0.24	0.01	HIndirect.1. **Accepted**	HMed. 1: Partial mediation
Leadership and communication	→	Shared goals – roles understanding	→	Barriers to team collaboration	0.08	0.44	HDirect.2. **Rejected**	0.14	0.05	HIndirect.2. **Accepted**	HMed. 2: Full mediation
Leadership and communication	→	Shared goals – roles understanding	→	Conflict management and decision-making	0.50	<0.001	HDirect.3. **Accepted**	-0.02	0.50	Hindirect.3. **Rejected**	HMed. 3: No mediation
Leadership and communication	→	Shared goals – roles understanding	→	Patient involvement	0.30	<0.001	HDirect.4. **Accepted**	0.07	0.01	HIndirect.4. **Accepted**	HMed. 4: Partial mediation
Leadership and communication	→	Shared goals – roles understanding	→	Community empowerment	0.41	<0.001	HDirect.5. **Accepted**	0.04	0.44	Hindirect.5. **Rejected**	HMed. 5: No mediation

Notes. [a]β = Standardised regression weight; [b]*p* = Significant at 0.05 confidence interval levels.

measure for assessing interprofessional education and collaborative practice for health practitioners and students in the Indonesian context – respondents were selected from these two groups. Multilevel analyses performed on the newly validated CPAT, consisting of evaluations of the internal structure and construct validity, provide indications that the original CPAT's (Schroder et al., 2011) factorial structure was not the best model for this current study's populations. Instead, the constructed model of the newly validated CPAT confirmed a 7-factor 48-item conformation with a factorial solution that closely resembled the previous Indonesian CPAT.

One novelty offered by this study, which the previous Indonesian CPAT did not provide, is that it validates the use to potential end users of the instrument (i.e., healthcare practitioners and students). The CPAT was previously only validated by practitioners, so its use in students is not recommended (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018). Simultaneously validating the instrument by both practitioners and students is critical to bridging interprofessional education and interprofessional collaborative practice (Oates & Davidson, 2015). These two approaches are inseparable and mutually dependent (Oandasan & Reeves, 2005; Reeves et al., 2013; Tong et al., 2016; WHO, 2010; Xyrichis et al., 2018). IPE provides a training environment for better IPCP in actual practice, and IPCP reflects improvement and direction for IPE training.

However, to provide an instrument that is invariant to the groups tested, extreme perceptions that cannot be generalised across both groups must be moderated (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Consequently, items strongly endorsed by one cohort but not by another should be discarded. Five CPAT items demonstrated these consequences. The CFA performed separately for each cohort indicated the need for conformational change to a 7-factor 48-item model. Five items were removed from the previously validated Indonesian CPAT (Yusra et al., 2019). Items 13, 34, and 53 were removed to improve the dataset's composite reliability (CR) and average variance extracted (AVE). Furthermore, refinements were made to increase the fit indices of the factor 48-item model for the subsequent measurement invariance tests, resulting in the removal of items 28 and 39. After removing these five items, the CFA indicated good acceptability of both datasets to the 7-factor 48-item model. The MG-CFA, which simultaneously analysed the two cohorts, further corroborated that the factorial structure of the 7-factor 48-item model was suitable for both datasets (the fit indices [i.e., CFI/TLI, or RMSEA, or SRMR] required by COSMIN were all met), with good internal consistency reliability for total scores and each subscale for both datasets. Furthermore, measurement invariance analysis indicated that the newly validated Indonesian CPAT for practitioners and students met configural, metric, and scalar invariances.

With the configural and metric invariances met, indicating that concerning the measure tested, practitioners and students agreed on the structural modelling of 7 factors, the positioning of the 48 items to the relevant constructs, and their understanding of the items comprising the domains in CPAT was the same. Thus, regardless of the stage of development of their interprofessional collaboration, practitioners, and students perceived the constructs underlying the CPAT domains to have the same meaning. The achievement of scalar invariance indicated that the mean scores for the two cohorts were comparable when assessed using the newly validated Indonesian CPAT conformational structure. Comparable scores between the two cohorts have an important advantage. The newly validated CPAT Indonesia can measure students' interprofessional development at the training stage and compare it with practitioners' achievements in the actual practice settings. Collectively, these findings confirmed the equivalency of the newly validated Indonesian CPAT (7-factor 48-item model) for both cohorts.

Another highlight of this study is related to the latent factor of *conflict management and decision-making* (the current study Cronbach's α = 0.71 for practitioner, and Cronbach's α = 0.70 for student), which was also a relatively weak domain in both the original CPAT (Cronbach's α = .67) and the previous Indonesian CPAT (Cronbach's α = 0.70). Trial testing was conducted to explore the possibility of getting a significantly better fitting model if this subscale was to be omitted or retained. The trial resulted in similar trends for both datasets in the current study (i.e., no change in the SRMR and the chi-square), worsening of RMSEA (by 0.001-0.002 points), and a slight increase in CFI (by 0.002-0.003 points). Statistically, removing the subscale did not improve the model fit. In addition, *conflict management and decision-making* are essential theoretical constructs in the interprofessional collaborative practice conceptual framework (Barr et al., 2016; Canadian Interprofessional Health Collaborative, 2010; Spence Laschinger et al., 2010; Stutsky & Spence Laschinger, 2014). Therefore, removing this subscale would have significantly reduced the comprehensiveness of the CPAT as an outcome measure for interprofessional collaborative practice, and it was hence not removed. More rigorous analysis, such as that offered by item response theory, e.g. Rasch analysis (Baker & Kim, 2017; Boone, 2016), could provide more nuanced statistical information when deciding whether to retain or drop an item.

Evaluation of construct validity using the model proposed in Figure 6.4 and Figure 6.5 confirm several assumptions significant to the theoretical framework of the constructs underlying interprofessional collaboration. First, team leadership and communication can influence team values regarding shared goals, clarification and division of tasks, and relationships between team members. Leadership and communication can also directly and positively influence how a team resolves conflict and makes decisions, as well as the team's position regarding openness to the idea of engaging patients, their families, and communities in care. Both groups tested supported all of these assumptions and re-confirmed the conceptual framework used by the suggested model (Stutsky & Spence Laschinger, 2014) and other studies (Brown et al., 2011; Gergerich et al., 2019; Snyder & Engström, 2016; Spence Laschinger et al., 2010; Xyrichis et al., 2018).

This research also confirms that the role of leadership and communication within a team can be strengthened to optimise member relationships and patient engagement in their care if the team conforms to their shared goals and clarifies its roles (as suggested by the accepted path analysis for hypotheses tests on HMed. 1 and HMed. 4 in both datasets). However, characteristics related to leadership and communication may not directly influence the team's ability to handle conflict and community empowerment in patient care, even though the team firmly maintained its shared goals and had clear roles within it (as suggested by the rejected path analysis for hypotheses tests on HMed. 3 and HMed. 5 in both datasets). Interestingly, practitioners felt leadership and communication can directly influence how people view issues that hinder their interprofessional teamwork (without necessarily sharing common goals and clear roles; no mediation function was identified). In comparison, students were of the view that leadership and communication functions would only persevere if the team adopted the principles of shared goals and clear roles (full mediation function). Previous research has broadly confirmed assumptions regarding the direct impact of one or more interprofessional constructs on other constructs (Atwal & Caldwell, 2002; Brown et al., 2011; Clark, 2011; Gergerich et al., 2019; Lawrence et al., 2015; MacDonald et al., 2010; Mitchell et al., 2011; Snyder & Engström, 2016; Spence Laschinger et al., 2010; Will et al., 2019; Xyrichis et al., 2018). However, the mediating role of one construct in optimising or reducing the functional roles of other constructs is still limited, so further comparisons were not possible.

This study has strengths and limitations. Representing the voices of relevant stakeholders is critical in developing outcome measures (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018). These stakeholders, who will be the instrument's end users, namely healthcare practitioners and students, were well represented in this study with adequate sample sizes, according to COSMIN guidelines (practitioners, n = 266; students, n = 232). With this satisfactory number of participants, more diverse and robust data analyses such as the multi-group confirmatory factor analysis, measurement invariance tests, and hypotheses testing can be performed, requiring both cohorts to be analysed simultaneously with adequate respective samples. However, the diversity of health professions was restricted as participants were dominated by physicians/medical students and nurses/nursing students in both cohorts.

COSMIN highlights content validity requirements (assessing the items' relevance, comprehensibility, and comprehensiveness) as an essential aspect of an instrument. However, because this study used a previously translated version for validation, the 53

Indonesian CPAT items were not piloted and thus not tested for content validity requirements. In addition, one subscale (*conflict management and decision-making*) was weak in the previous two versions of the CPAT, a finding corroborated in this current study. Future studies should carefully examine the items corresponding to this subscale and consider developing new items using Item Response Theory (Rasch analysis) to verify the reliability and validity of those new items.

6.6 Conclusion

Based on COSMIN standards of psychometric parameters, the findings suggest that the newly validated Indonesian CPAT (7-factors 48-item model) has good psychometric properties in terms of internal structure (i.e., structural validity, internal consistency, and measurement invariance) and hypotheses testing and is, therefore, a quality measure for assessing interprofessional education and collaborative practice for health students and practitioners in Indonesia.

6.7 Ethics Approval

The Ethical approval for this study was obtained from the Curtin University Australia Human Research Ethics (Approval number: HREC2021–0274) and Faculty Medicine of Hasanuddin University Ethics Board (170/UN4.6.4.5.31/PP36/2023). All participants consented to participate in the study before completing the survey. Participants were presented with the previous Indonesian CPAT and requested to rate each item using the original instrument’s 7-point Likert scale to validate the instrument.

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6.9 Competing interests

All the authors declare that there are no conflicts of interest.

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6.11 Underlying data

All data underlying the results are available as part of the article, and no additional source data are required. Supplementary Table 1 is available at https://doi.org/10.5281/zenodo.13690762. The datasets used for this article are available under DOI: 10.5281/zenodo.7797090

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Chapter 7 Development and Testing of the Interprofessional-Tuberculosis (IP-TB) Patient Outcome Measure

Chapter 7 details the results of developing and testing the interprofessional tuberculosis (IP-TB) outcome measure. This chapter is currently in production in the journal *Emerging Science Journal.* The spelling and wording contained within this chapter are that of the accepted manuscript.

Journal Manuscript 5

Title

Development and Testing of a Patient Outcome Measure for Interprofessional Tuberculosis Care: A Delphi Study

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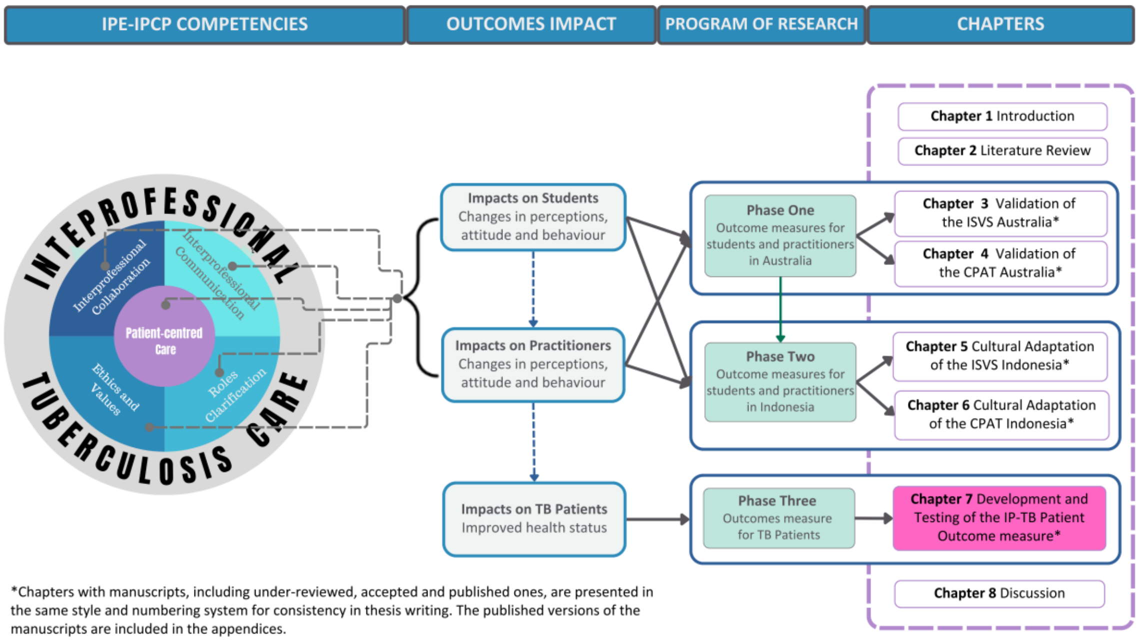

7.1 Abstract

Background: A chronic medical condition such as tuberculosis can be physically and emotionally challenging for both health practitioners and patients and their families. Tuberculosis requires a team-based care model that provides resilience and coordinated work, such as the one offered by an interprofessional collaborative practice team. Despite the increasing interest in interprofessional-based care globally, there is a notable lack of measures to assess patient impact. We aimed to develop a patient outcome measure to quantify the functional impact of interprofessional care on tuberculosis patients.

Methods: The study involved four phases: 1) developing a conceptual framework and creating items, 2) evaluating the construct through Delphi studies to obtain international consensus, 3) back-to-back translation into Indonesian, and 4) re-evaluating the construct with Delphi study to obtain Indonesian consensus. The consensus was reached if the Content Validity Index covers at least 70% agreement from experts, an interquartile range <1, and a median score of 4 or 5 on a 5-point Likert-type scale. The **CO**nsensus-based **S**tandards for the Selection of Health Measurement Instruments (COSMIN) guidelines were used to assess item relevance, comprehensibility, and comprehensiveness.

Results: A total of 65 international and 61 Indonesian participants in the Delphi studies. The final instrument consists of 44 items organised into five domains. All items were relevant to the construct being measured and understandable, and significant concerns related to TB care were comprehensively addressed in the instrument.

Conclusion: The findings indicate that the instrument content validity was good, fulfilling COSMIN requirements for items' relevance, comprehensibility and comprehensiveness.

7.2 Introduction

Tuberculosis (TB) is the leading infectious cause of death worldwide. In 2021, the World Health Organization (WHO) reported that approximately 1.6 million people died from TB and TB-related diseases, underscoring the disease's severe public health impact (World Health Organization [WHO], 2022). More than 10 million people contract TB annually, with India, Indonesia, Myanmar, and the Philippines identified as the four countries most heavily affected (World Health Organization [WHO], 2022). Indonesia ranks second globally in terms of new TB cases, primarily due to its dense population and high prevalence rate, contributing significantly to the global TB burden (Directorate General of Prevention and Disease Control, 2022; Hafez et al., 2020; Mahendradhata et al., 2017).

In recent years, the escalating number of newly diagnosed infections and multi-drug-resistant TB cases have raised concerns about the quality of implementation of the current TB management (Mustikawati et al., 2017). Despite high diagnostic rates, a significant portion of TB cases may remain undiagnosed, attributed to an inadequate identification system, lack of awareness among healthcare practitioners regarding the TB program, and ineffective referral processes. Additionally, patients often hesitate to seek treatment due to various barriers, highlighting the need for a strategic response to these challenges (World Health Organization [WHO], 2022).

To enhance TB management, there is an urgent need to bridge gaps in case prevention, detection, and access to quality treatment (World Health Organization [WHO], 2022). Effective collaboration among healthcare providers is essential for driving system-wide improvements in TB care (World Health Organization, 2010; World Health Organization [WHO], 2022). Given the physical and emotional challenges associated with treating TB, a complex chronic disease such as TB demands a team-based care model, which not only benefits patients but also supports health practitioners. Fostering resilience and promoting coordinated teamwork is key to ensuring sustainable, high-quality care for both patients and healthcare providers (World Health Organization, 2010; World Health Organization [WHO], 2022). Furthermore, TB is a multifactorial disease that often requires a comprehensive approach involving various healthcare professionals, including physicians, nurses, social workers, and public health officials. Effective management demands coordination among these providers to address both clinical treatment and social determinants of health (World Health Organization [WHO], 2022). An interprofessional outcome measure is proposed to facilitate this integration, ensuring that all aspects of patient care are addressed. In 2010, the World Health Organization (WHO) launched an initiative to transform the health workforce. This initiative focused on strengthening and improving health systems by promoting team-based care through an interprofessional approach, including in the context of TB care. An interprofessional approach enhances coordination among healthcare providers, each contributing their unique expertise to create a comprehensive treatment plan (World Health Organization, 2010).

Despite the growing attention to interprofessional collaborative practice in various countries, measuring their impact on patient outcomes remains a significant challenge, with limited studies documenting such effects (Cox et al., 2016; Hammick et al., 2007; Oandasan & Reeves, 2005; Oosterom et al., 2019; Pelone et al., 2017; Perrier et al., 2013; Shuyi et al., 2023). This lack of research is compounded by the lack of valid measures (Canadian Interprofessional Health Collaborative, 2012; Oosterom et al., 2019; Yasobant et al., 2022). There is a pressing need for more evidence linking interprofessional collaborative practice with improved patient outcomes (Cadet et al., 2024; Pelone et al., 2017; Shuyi et al., 2023; Singh et al., 2024).

Traditional TB outcome measures often focus narrowly on clinical endpoints based on microbiological indicators (negative smear/culture), successful completion of treatment, reduction in symptoms, weight gain, or increased appetite (Aggarwal, 2010). Rather than relying solely on these clinical assessments to determine patient outcomes, more holistic quality-of-life scales are being developed that combine various domains related to the patient’s physical, social, psychological, economic, and spiritual well-being (Wong et al., 2021; Yasobant et al., 2022). Given calls for greater interprofessional collaborative practice for successful TB care, these outcome scales must include a measure of an interprofessional approach to TB patient care (World Health Organization, 2010; World Health Organization [WHO], 2022).

7.2.1 Instrument Constructs

This study aimed to develop an instrument to measure the impact of an interprofessional approach to TB care on patients from their perspective. The proposed framework combines the following two concepts: *interprofessional collaborative practice* (IPCP) and *TB care*. Concepts related to IPCP draw on literature from four areas: *Interprofessional Education Collaborative (IPEC) Core Competencies for Interprofessional Collaborative Practice* (Interprofessional Education Collaborative (IPEC), 2016), *Canadian Interprofessional Health Collaborative National Interprofessional Competency Framework* (Canadian Interprofessional Health

Collaborative, 2010), *Curtin University Interprofessional Capability Framework* (Brewer, 2013), *and WHO Framework for Action on Interprofessional Education and Collaborative Practice* (World Health Organization, 2010). The second concept regarding TB care was developed based on the growing literature on concepts that define TB care success, particularly the WHO Report on *Adherence to Long-term Therapies: Evidence for Action* (World Health Organization, 2003). In addition, relevant literature related to *patient engagement* (World Health Organization, 2016), *patient safety* (World Health Organization, 2009) and guides on *multi-professional care* (WHO TEAM Integrated Health Service, 2011) were also referenced.

The transition from professionalism to interprofessionalism has emphasised the importance of coordination and cooperation between healthcare professionals (Schmitz et al., 2017). Over the past decades, interprofessional collaboration has been increasingly studied, leading to various definitions that depend on context and author perspective. For this study, the WHO's definition is adopted: Collaborative practice is an inter-professional process that integrates separate and shared knowledge and skills from various care providers, working with patients, families, and communities to provide high-quality care, ultimately enhancing patient care (World Health Organization, 2010). This concept is rooted in social phenomena like communication, decision-making, and collaborative knowledge exchange. While these elements are essential to optimising patient care, they represent latent variables (i.e., factors that influence outcomes but cannot be directly measured). For practical application, these latent variables are assessed through observable indicators that provide insight into the effectiveness of collaborative practice and the development of the measure.

The core components of collaborative practice, communication, and collaboration are the primary latent variables influencing interprofessional care outcomes (Curran et al., 2011; Sigalet et al., 2012). These variables are critical in shaping the success of interprofessional teams and patient outcomes. The *communication* variable encompasses several sub-domains, including *communication skills* (Stutsky & Spence

Laschinger, 2014), *communication and information exchange* (Schroder et al., 2011), and *communication and teamwork* (Pollard & Miers, 2008). Effective communication within a team is not just about transmitting information but about creating a collaborative atmosphere where shared decision-making can thrive. Similarly, *collaboration* is a broad construct involving *team functioning* (Curran et al., 2011), *team working* (McFadyen et al., 2005), *interprofessional collaboration* (Almås & Ødegård, 2010), and *interprofessional interaction* (Pollard & Miers, 2008). These sub-domains of collaboration directly affect healthcare teams' ability to deliver comprehensive, patient-centred care. Effective teamwork and interprofessional collaboration are vital for ensuring that care providers work cohesively towards common patient outcomes (Curran et al., 2011; Sigalet et al., 2012).

Beyond communication and collaboration, other variables considered in the literature include the role or scope of practice of professionals, such as *understanding the value and contribution of professionals/other professions* (Luetsch & Rowett, 2016), *professional roles* (Oates & Davidson, 2015), *roles and responsibilities* (Curran et al., 2011; Sigalet et al., 2012), *general role responsibilities and autonomy* (Schroder et al., 2011), and *role understanding* (Stutsky & Spence Laschinger, 2014). Outcome measures highlight the importance of recognising the value of each profession's contributions and how this understanding shapes team dynamics and decision-making (Luetsch & Rowett, 2016; Oates & Davidson, 2015). Role clarity and autonomy are crucial for reducing role conflict and enhancing interprofessional collaboration (Schroder et al., 2011). Additionally, resolving conflicts and differences in perspectives is often necessary to maintain harmonious team functioning. Measures related to *conflict management, decision-making, team ethics, values and respect* are often used to assess how well interprofessional teams manage disagreements, which can directly affect team performance and patient care (Pollard & Miers, 2008; Schroder et al., 2011; Stutsky & Spence Laschinger, 2014).

In addition to the variables outlined above, a much smaller number of measures mention variables related to patient care. This variable is typically expressed as *a collaborative approach centred on the patient/client family* (Curran et al., 2011), *patient involvement* (Schroder et al., 2011), and *patient empowerment* (Stutsky & Spence Laschinger, 2014). The ultimate goal of collaborative practice is to improve patient care (World Health Organization, 2010). While many instruments focus on communication, collaboration, and role understanding, fewer measures address the patient-related outcomes that are central to collaborative practice. However, those who highlight the importance of a patient-centred approach involve the patient and their family in decision-making processes and empower patients to participate actively in their care (Ardyansyah et al., 2024; Jensen et al., 2024; Shuyi et al., 2023; Stutsky & Spence Laschinger, 2014). Interprofessional collaboration is most effective when it focuses on holistic, patient-centred care. Yet, the limited inclusion of patient-specific variables in many outcome measures poses a challenge in fully capturing the impact of collaborative practice on patient outcomes (Cadet et al., 2024; Cox et al., 2016; Jensen et al., 2024; Shuyi et al., 2023).

One of the significant challenges in evaluating the success of collaborative practice lies in the indirect measurement of latent variables such as communication and collaboration. Since these variables are complex and context-dependent, measuring them through observable variables — such as teamwork skills, role clarity, and conflict resolution is essential but highly challenging to interpret. Furthermore, while many instruments focus on improving health practitioners' attitudes and collaborative behaviours, i.e., Kirkpatrick's modified model of learning outcome level 2 to 3 (Oates & Davidson, 2015), or team functioning, fewer are designed to assess patient-related outcomes (level 4b) directly, making it difficult to ascertain the full impact of interprofessional collaboration on patient care (Cadet et al., 2024; Cox et al., 2016; Jensen et al., 2024; Shuyi et al., 2023).

7.2.2 Objectives

This study aimed to develop and test a patient outcome measure for interprofessional TB care, which can be used to quantify the quality and functional impact of an interprofessional model of TB care on the patient as perceived by that patient. This study was conducted in four key phases to achieve this goal: (a) Development of a conceptual framework for the instrument and the creation of items. This process identifies existing gaps in the literature, informs the item development process, and ensures that the items are aligned with the theoretical foundations of the framework; (b) Testing the instrument through a Delphi study to obtain international participants' consensus regarding the components to be included in the measure; (c) Back-to-back translation into Indonesian; and (d) Testing the instrument with a second Delphi study to obtain consensus from Indonesian participants.

7.3 Methods

7.3.1 Study Design

This research used a mixed methods approach that quantifies closed responses into values that can be ranked and compared and allows for the exploration of narrative responses to describe perceptions beyond the limitations of numbers. The stages of the Delphi series involving international and Indonesian participants, interspersed with massive translational work activities, represent the process's rigour and the desire to produce an instrument with robust psychometric properties. The Delphi study methodology was chosen as it allowed the experts to provide extensive input anonymously but in a controlled and structured manner (Diamond et al., 2014; Mokkink, Prinsen, et al., 2018). The Delphi study with international participants was conducted between May and October 2023. Delphi with Indonesian participants was conducted between January and February 2024. The overall study procedures, including instrument development requirements for data collection, analysis, and reporting, followed the

COnsensus-based **S**tandards for the selection of health **M**easurement **IN**struments (COSMIN) taxonomy and standards of content validity checks and translations (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018). The study procedures is outlined in Figure 7.1.

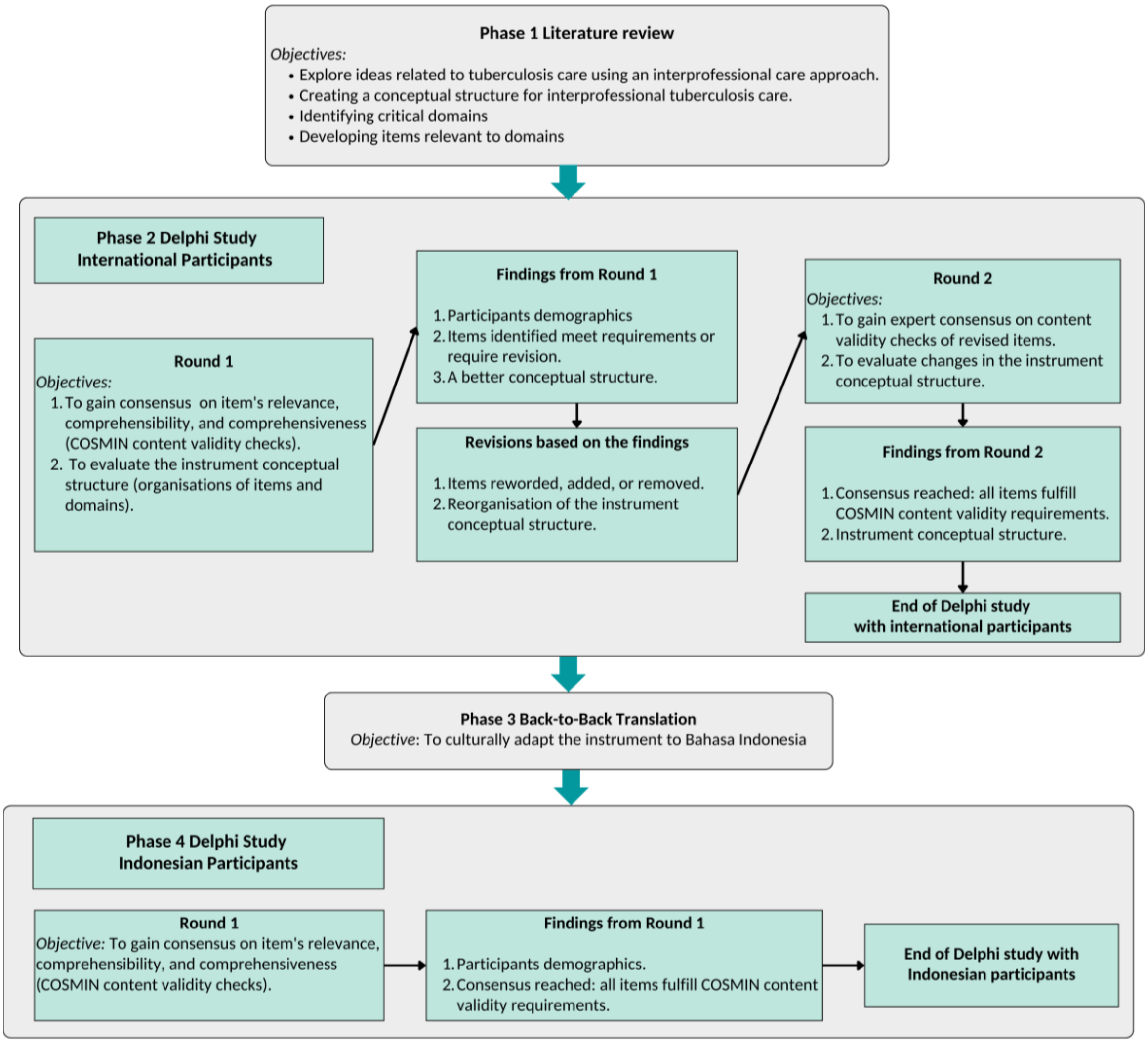

Figure 7.1 Study Procedures

The number of Delphi rounds depends on when experts reach a consensus; however, two or three Delphi rounds are the most common (Diamond et al., 2014). In this study, the international participants were involved in the first two rounds of the Delphi study (similar set of participants) to capture key information related to TB care globally, while the experts from Indonesia were involved in the final stage to ensure the specific practices aligned with TB care in Indonesia. Findings from the Delphi studies were used to evaluate the instrument's content validity and inform the development of the final measure.

Each participant was provided with a personalised link to an online Qualtrics survey (Qualtrics, 2023). At the start of the survey, information was provided regarding how to provide their consent, details of the study, links to further readings according to participants' interests, and an explanation of how consensus would be achieved. A feedback report was provided in the next round, including response percentages, arguments, and results for all items from the previous round. Participants were able to withdraw at any time during the survey. All information was anonymous. The first Delphi with international participants and the Delphi with Indonesian participants included questions with closed and open response options; the second round with international participants mainly was closed questions.

The survey questions were organised into three sections (Mokkink, De Vet, et al., 2018). The first section asked participants to rate **the *items' relevance*** to the outcome measure. The second section asked them to rate **the *items' comprehensibility*** (i.e., to assess whether each item's meaning was easily understood). Both sections used a 5-point Likert scale (1= *strongly disagree*, 2=*disagree*e, 3=*neither agree nor disagree*, 4=*agree*, 5=*strongly agree*). The third section asked participants to provide an opinion on ***the comprehensiveness*** of the items in each domain by inviting them to suggest any additional item(s) they felt were needed. Experts who answered *disagree* or *strongly disagree* with questions about comprehensibility were invited to provide their reasoning and alternative wording for the respective items. The first author of this study facilitated the Delphi in collaboration with all other authors. Findings from each Delphi were discussed, analysed and reported with the agreement of all authors before being presented for the next Delphi round. Aligned with the COSMIN requirements, all authors were involved in preparing and discussing Delphi questionnaires and made final decisions related to issues identified after the Delphi studies.

7.3.2 Participants and Recruitment

Expert participants considered actively involved in TB care and management in countries with high TB burden in Asia (WHO, 2022), but not limited to Asia, were identified through official portals of universities and hospitals and government and non-government institutions. Identification was also extended to researchers who published articles on TB team care in a hospital or community-based service in the previously mentioned countries. Participants who consented and members of the research team were also asked to identify other potential participants from their professional network. Once identified, potential participants were invited to engage in the study via email with an information sheet.

Health professionals with different areas of expertise in the construct and population of interest were targeted (Mokkink, Prinsen, et al., 2018). In particular, clinicians with experience in TB care and/or interprofessional approaches to care and professionals, academics, and researchers are actively involved in TB education, management, and control. A minimum of five relevant health professions with >50 sample size (for COSMIN *very good* size) were targeted (Mokkink, Prinsen, et al., 2018). The criteria of international participants to be eligible in the Delphi study were: 1) sufficient English skills to understand the main points, technical terms and study purposes; 2) at least one year of experience caring for TB patients in a hospital or community-based clinic as professional role identity is believed to begin developing at least six months to one year of clinical exposure (Bradby, 1990); 3) a health professional of any clinical background with experience working in a team that consisted of at least two health professions, given that IPCP requires a team to consist of at least two different health professions (WHO, 2010). Criteria 2 and 3 were also applied to the eligibility of the Indonesian participants.

7.3.3 Translation

Translation procedures followed COSMIN guidelines (Mokkink, De Vet, et al., 2018) and WHO standards (WHO, 2012). Four translators were used in total. Two forward translators who were native Indonesian speakers translated the instrument from English to Indonesian. One was a medical professional with a postgraduate degree from an English-speaking country and, therefore, was familiar with the terminology and content of the instrument. The other was a nationally certified translator and Fédération Internationale des Traducteurs member without a health professional background. Two backward translators, native English speakers, translated the instrument back into English. Both backward translators were fluent in Indonesian and had doctoral degrees from Indonesian universities, one of which was in English Education. To maintain the original constructs of the instrument, translators were encouraged to emphasise conceptual equivalence rather than a literal word-for-word translation of each item (WHO, 2012).

The translation process began with the forward translators working independently and then jointly to reach a consensus on words or statements where there was disagreement. The agreed Indonesian translation was sent to the backward translators, who worked independently and jointly to resolve any disagreements. Several review meetings were held involving the research team with the forward or backward translators, and meetings involving the four translators were held for final verification.

7.3.4 Data Analysis

Quantitative and qualitative approaches were used to analyse participants' responses. Quantitative responses were imported and analysed using the Statistical Package for the Social Sciences (SPSS) v26 (SPSS, 2023). Consensus criteria were defined in the information sheets; consensus was reached with a Content Validity Index (CVI) or agreement score of at least 70% of the experts selected *agree* or *strongly agree* with an interquartile range [IQR] of $\leq$ 1 and a median score of 4 or 5 on a 5-point Likert-type scale (Belton et al., 2019). Items with less than a 70% agreement score on *relevance* were removed from the instrument.

Qualitative responses from open-ended questions related to *comprehensibility* were analysed with content analysis (Vaismoradi et al., 2013) before deciding whether to reword or reorganise the item into a different domain. Responses related to the instrument's *comprehensiveness* were analysed using content analysis (Vaismoradi et al., 2013), where responses were grouped into themes and potential new items were identified based on the participants' feedback. Decisions regarding qualitative responses involved all authors and were used to inform item rewording, domain reorganisation, and item addition.

7.4 Results

7.4.1 Instrument Development

Key constructs regarding interprofessional TB care were synthesised and categorised into themes, resulting in several instrument constructs used to generate domains. The five domains were *patient-centred care, team collaboration, team communication, respect and ethics,* and *health awareness.* Items were developed based on relevant literature and the authors' expert opinion to ensure each domain was represented by items appropriate to the construct to be measured. The instrument conceptual framework is provided in Figure 7.2.

7.4.2 Delphi Participants

As outlined previously, the Delphi study was organised in two phases. Phase Two involved international participants (two rounds), and Phase Four involved Indonesian participants (one round). Delphi Round 1 involved 65 international experts; however, three participants completed less than 50% of the survey, so their responses were not included (response rate 95.4% [62/65]. A total of 56 of these international experts participated in Round 2 (response rate = 90.3% [56/62]). In Phase 4, 61 Indonesian participants provided their consent for participation, 55 of whom completed the survey (response rate 90.2% [55/61]. Participant demographics are represented in Table 7.1.

Background information collected on participants included age, gender, country of residence, professional background, area of expertise, educational level, and years of experience in TB care. Across the Delphi series, the two professions most frequently involved were medical doctors (31.8%) and nurses (26.6%). The majority of participants had completed postgraduate studies (57.2%) at a Master's (29.5%) or PhD (27.7%) level. Hospitals were the primary practice setting for most participants (59.5%). Length of experience directly caring for TB patients varied; the largest was 29.5%, who reported having worked for 3-5 years, and 43.4% of participants had more than five years of experience. International participants were mainly from Asia, namely Bangladesh (47.5%) and India (40.7). A small cohort was from Australia (7.6%), with another group (4.2%) from Solomon Island, South Africa and the United States.

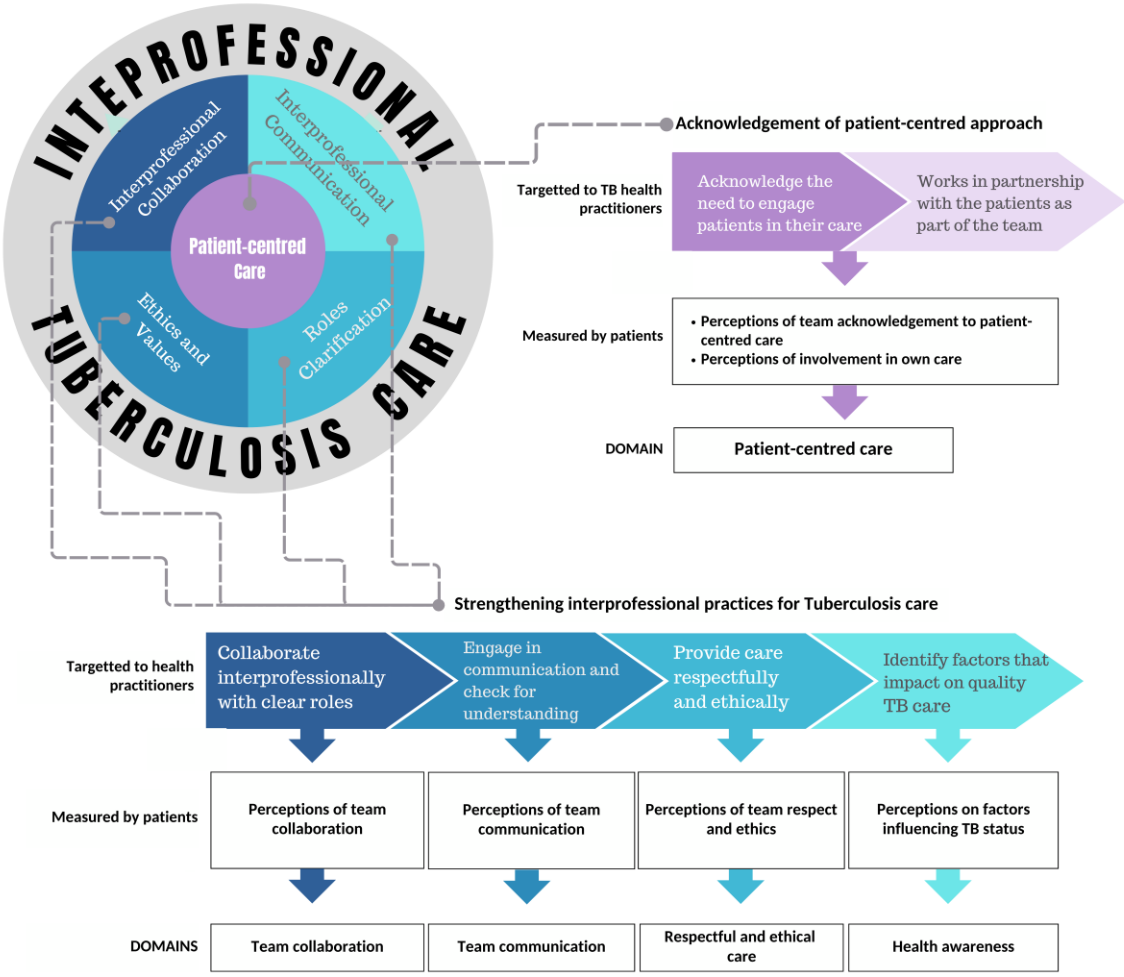

Figure 7.2 Conceptual Framework.

7.4.2.1 Delphi Round 1: International Participants

As outlined earlier, the Delphi involved two rounds with international participants followed by back-to-back translation and the process was completed with one Delphi round with Indonesian participants. The quantitative and qualitative results for the three rounds are described below. A separate thematic analysis of the qualitative comments across all three rounds is provided to assist in contextualising the findings from the Delphi rounds.

The Delphi's first round with international participants consisted of three sections. Participants were asked to rate the relevance of the item for inclusion, the comprehensibility of the items for clarity of understanding, and the comprehensiveness of items in representing the construct intended to be measured in a domain. Round 1 included 50 items related to the interprofessional approach to TB care. The items were classified into six domains: *patient-centred care* (*n*=4 items); *patient involvement* (*n*=8 items); *team collaboration* (*n*=8 items); *team communication* (*n*=5 items); *respectful and ethical* (*n*=10 items); and *health awareness* (*n*=15 items). A total of 39 items (78%) reached consensus for acceptance without revision. These items meet the criteria for percentage agreement > 70% and IQR $\leq$ 1 for responses related to item relevance and comprehensibility. Three items were reworded to improve clarity and avoid confusion when responding to the questions and presented again in Round 2.

Five items, 'Important issues asked at each visit/appointment', 'Important issues as highest priority', 'Active participation in care decision', 'Team membership', and 'Alternative treatment methods', although deemed relevant, clear and understandable (>70% agreement score on relevance and comprehensibility), were reviewed by the author panel based on participants' open-ended responses. All five items were determined to be redundant, so they were excluded from the instrument. Two items, 'High-risk people' and 'Material support', were removed as they were not considered relevant for a patient outcome measure of interprofessional TB care by participants (<70% agreement score). Furthermore, based on participants' feedback concerning the comprehensiveness of the instrument, one item was added, 'Treatment plan changes based on family/caregiver feedback'. Based on participants' feedback, the item,

Table 7.1 Participants Demographics

	International Participants		Indonesian Participants
	Round One	**Round Two**	**Round One**
Number of participants	***n*=62**	***n*=56**	***n*=55**
Demographics	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Residentials			
Asia (Participants; Countries)	54 (87%, 2) (Bangladesh [*n*=29]; India [*n*= 24])	51 (91%, 2); (Bangladesh [*n*=27]; India [*n*= 24])	
Non-Asia (Participants; Countries)	8 (13%; 4) (Australia [*n*=5]; South Africa [*n*=1]; Solomon Island [*n*=1]; United States [*n*=1])	5 (9%; 4) (Australia, [*n*=4]; Solomon Island [*n*=1])	
Highest qualification			
Bachelor	34 (54.8%)	30 (53.6%)	10 (18.2%)
Master	20 (32.3%)	18 (32.1%)	13 (23.6%)
PhD *(with/without clinical specialisation)*	8 (12.9%)	8 (14.3%)	32 (58.2%)
Profession			
Medical Doctor	17 (27.4%)	15 (26.8%)	23 (41.8%)
Nurse	17 (27.4%)	17 (30.4%)	12 (21.8%)
Social workers	9 (14.5%)	8 (14.3%)	0 (0%)

	International Participants		Indonesian Participants
	Round One	**Round Two**	**Round One**
Number of participants	***n*=62**	***n*=56**	***n*=55**
Demographics	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Public health expert	8 (12.9%)	6 (10.7%)	4 (7.3%)
Nutritionist	3 (4.8%)	3 (5.4%)	0 (0%)
Occupational therapist	2 (3.2%)	2 (3.5%)	0 (0%)
Pharmacist	2 (3.2%)	2 (3.6%)	7 (12.7%)
Psychologist	2 (3.2%)	2 (3.6%)	2 (3.6%)
Other allied healthcare professionals	2 (3.2%)	1 (1.8%)	0 (0%)
Midwife	0 (0%)	0 (0%)	3 (5.5%)
Physiotherapist	0 (0%)	0 (0%)	2 (3.6%)
Dentist	0 (0%)	0 (0%)	2 (3.6%)
Practice setting (Primary)			
Hospital	39 (62.9%)	36 (64.3%)	28 (50.9%)
University/Education sector	9 (14.5%)	9 (16.1%)	16 (29.1%)
Private practice	7 (11.3%)	7 (12.5%)	1 (1.8%)
Others[1]	4 (6.5%)	2 (3.6%)	5 (9.1%)
Community health centre	3 (4.8%)	2 (3.6%)	5 (9.1%)

	International Participants		Indonesian Participants
	Round One	**Round Two**	**Round One**
Number of participants	***n*=62**	***n*=56**	***n*=55**
Demographics	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Years of experience (TB patient care-related experience)			
1-2 years	14 (22.6%)	14 (25.0%)	13 (22.0%)
3-5 years	19 (30.6%)	17 (30.4%)	15 (25.4%)
6-10 years	10 (16.1%)	8 (14.3%)	8 (13.6%)
11-15 years	8 (12.9%)	8 (14.3%)	7 (11.9%)
16-20 years	6 (9.7%)	6 (10.7%)	2 (3.4%)
21- 30 years	3 (4.8%)	1 (1.8%)	3 (5.1%)
Over 30 years	2 (3.2%)	2 (3.6%)	1 (1.7%)
No direct contact with TB patients[2]	0 (0%)	0 (0%)	8 (13.6%)

Notes. [1] non-government organisation, Ministry/Department of Health, TB consultant; [2]Actively involved in teaching related to TB prevention, detection, and therapy at universities; providing consultation and education regarding TB for NGOs, involved in regional and national policy-making regarding TB management in their respective country

‘Coordination of appointments to meet multiple practitioners’, was deemed conceptually better connected to *Team Collaboration* rather than ‘*Team Communication’*; this change was made for Round 2.

Three of the seven items removed were part of the *Patient-centred Care* domain (previously *n*=4 items), leaving only one item for this domain. Single-item measures are poor representations of a construct (Allen et al., 2022). In addition, the domains of *Patient-centred Care* and *Patient Involvement* essentially stem from the central pillar of the construct (see Fig 2). As a result, the conceptual structure of the domains was modified with the *Patient-centred Care* (*n*=1 item) and *Patient Involvement* (*n*=8 items) domains combined into one domain, *Patient-centred Care.* Given the addition of the item ‘Treatment plan changes based on family/caregiver feedback’ to patient care (as outlined above)*,* this domain included ten items in the revised instrument.

7.4.2.2 Delphi Round 2: International Participants

The first section in Round 2 asked participants to rate their agreement with three revised items on relevance and comprehensibility, using the same 5-point Likert scale. The second section asked participants to identify the relevance and comprehensibility of one new item (‘*Treatment plan changes based on family/caregiver feedback’*) and whether this new item was redundant given the other items in that domain. Those who rated this new item as redundant were then asked to indicate whether they preferred this new item or a related item previously approved in Round 1 (‘*Inclusion of family/caregiver in care planning*’). The third section asked participants to rate their agreement on the inclusion of the item ‘Coordination of appointments to meet multiple practitioners’ under the domain *Team Collaboration* rather than *Team Communication*. No questions related to *comprehensiveness* were asked in this second round.

The three revised items received > 70% agreement and IQR $\leq$ 1 on relevance and comprehensibility. The newly added item, ‘Treatment plan changes based on family/caregiver feedback’, reached consensus for inclusion (>70% agreement on relevance and comprehensibility); the item was not considered redundant by 75% of participants. The item ‘Coordination of appointments to meet multiple practitioners’ was identified by 89.3% of participants to be better classified under the domain *Team Collaboration*.

Following the Delphi surveys with the international participants, a total of 44 items were classified into five domains for inclusion in the instrument (*Patient-centred Care* [*n*=10 items]; *Team collaboration* [*n*=8 items]; *Team Communication* [*n*=4 items]; *Respectful and Ethical* [*n*=9 items]; and *Health Awareness* [*n*=13 items]). The items were translated to Bahasa Indonesia (see Table 2 for the overview of agreement ratings and item decisions for Rounds 1 and 2 with international participants).

7.4.2.3 Back-to-Back Translation

The 44 items that reached consensus following the Delphi rounds were translated into Indonesian. Of these, a total of 33 items showed absolute similarity in terms of word choice and grammar structure and were, therefore, equivalent in meaning. The remaining 11 items used different word choices and grammatical arrangements, which were considered to have the potential to influence meaning and produce items that were not conceptually equivalent to the original version. These items were returned to the forward-translators for review and the backward-translators for suggestions. A final two-hour consensus meeting was held involving the four translators and the lead author to reach an agreement.

The issues discussed mainly concerned ensuring items were conceptually equivalent rather than a literal word-for-word translation (Mokkink, Prinsen, et al., 2018; WHO, 2012). The instrument being developed was a guided measure, with health workers assisting patients in completing it. Therefore, because the target users of this instrument were patients with various levels of health literacy, translators were encouraged to adopt language (words and sentences) that are commonly used.

Table 7.2 Agreement Ratings and Items Decisions

Domains	Variables	International Participants					Indonesian Participants			
		Relevance		Comprehensibility			Relevance		Comprehensibility	
		% Agreement	Median (IQR)	% Agreement	Median (IQR)	Decision for inclusion	% Agreement	Median (IQR)	% Agreement	Median (IQR)
Patient-centred Care	Main issues with TB identified at each visit/appointment	82.3	5 (1)	88.7	5 (1)	Round 1	94.6	5 (0)	89.1	5 (1)
	Treatment plan can be adapted to current need	85.5	5 (1)	87.1	5 (1)	Round 1	81.8	5 (1)	90.9	5 (1)
	Focus care on most important issues	95.2	5 (1)	93.5	5 (1)	Round 1	98.2	5 (0)	90.9	5 (1)
	*Meet with team members**	94.6	5 (0)	94.6	5 (0)	Round 2	96.4	5 (0)	94.6	5 (0)
	Relevant information shared	91.9	5 (1)	88.7	5 (1)	Round 1	98.2	5 (0)	90.9	5 (0)
	Inclusion in one's own care planning	88.7	5 (1)	91.9	5 (1)	Round 1	96.4	5 (0)	96.4	5 (0)
	Inclusion of family/caregiver in care planning	95.2	5 (1)	91.9	5 (1)	Round 1	98.2	5 (0)	96.4	5 (1)
	Encouragement to participate when evaluating care	90.3	5 (1)	93.5	5 (1)	Round 1	98.2	5 (1)	94.6	5 (1)
	Treatment plan changes based on patient feedback	85.5	5 (1)	93.5	5 (1)	Round 1	94.6	5 (1)	94.6	5 (1)
	*Treatment plan changes based on family/caregiver feedback***	72.1	5 (2)	78.6	5 (1)	Round 2	89.1	5 (1)	92.7	5 (1)

Domains	Variables	International Participants					Indonesian Participants			
		Relevance		Comprehensibility			Relevance		Comprehensibility	
		% Agree ment	Median (IQR)	% Agree ment	Median (IQR)	Decision for inclusion	% Agree ment	Median (IQR)	% Agree ment	Median (IQR)
Team Collaboration	*Coordination of appointments to meet multiple practitioners****	82.3	5 (1)	85.5	5 (1)	Round 2	89.1	5 (0)	89.1	5 (0)
	Providing care as a team	88.7	5 (1)	90.3	5 (1)	Round 1	98.2	5 (0)	96.4	5 (0)
	Team knowledge and skill	90.3	5 (1)	90.3	5 (1)	Round 1	98.2	5 (0)	96.4	5 (0)
	Clear roles and responsibilities	93.5	5 (1)	96.8	5 (1)	Round 1	98.2	5 (0)	98.2	5 (0)
	Respect of roles and expertise	90.3	5 (1)	90.3	5 (1)	Round 1	98.2	5 (0)	98.2	5 (0)
	Constraint to roles and responsibilities	93.5	5 (1)	91.9	5 (1)	Round 1	94.5	5 (0)	96.4	5 (0)
	Being respectful to each other	96.8	5 (0)	91.9	5 (0)	Round 1	100.0	5 (0)	100.0	5 (0)
	Enjoy working as a team	93.5	5 (1)	95.2	5 (1)	Round 1	96.4	5 (0)	98.2	5 (0)
Team Communication	Access to information needed	93.5	5 (1)	93.5	5 (1)	Round 1	94.5	5 (0)	90.9	5 (0)
	Team checks for understanding	90.3	5 (1)	93.5	5 (1)	Round 1	100	5 (0)	98.2	5 (0)
	Communicating concerns to the team	87.1	5 (1)	88.7	5 (1)	Round 1	83.6	5 (1)	83.6	5 (0)
	Team understanding of care plan and goals	93.5	5 (1)	93.5	5 (1)	Round 1	98.2	5 (0)	90.9	5 (0)

Domains	Variables	International Participants					Indonesian Participants			
		Relevance		Comprehensibility			Relevance		Comprehensibility	
		% Agreement	Median (IQR)	% Agreement	Median (IQR)	Decision for inclusion	% Agreement	Median (IQR)	% Agreement	Median (IQR)
Respectful & Ethical	Request and share information respectfully	88.7	5 (1)	91.9	5 (1)	Round 1	98.2	5 (0)	94.5	5 (0)
	Being respectful to patient	98.4	5 (0)	96.8	5 (0)	Round 1	96.4	5 (0)	94.5	5 (0)
	Team listens to concerns	95.2	5 (0)	96.8	5 (0)	Round 1	98.2	5 (0)	100.0	5 (0)
	Non-judgmental manner	87.1	5 (1)	91.9	5 (1)	Round 1	100.0	5 (0)	96.4	5 (0)
	Consent before treatment	96.8	5 (0)	88.7	5 (0)	Round 1	100.0	5 (0)	98.2	5 (0)
	Options regarding the costs of available medications	88.7	5 (1)	83.9	5 (1)	Round 1	92.7	5 (0)	96.4	5 (0)
	Options regarding available tests	91.9	5 (1)	93.5	5 (1)	Round 1	98.2	5 (0)	100.0	5 (0)
	*Options to get medications best suits one's situation'**	92.9	4 (1)	89.3	5 (1)	Round 2	98.2	5 (0)	94.5	5 (0)
	Team communicating adverse event	96.8	5 (0)	90.3	5 (0)	Round 1	100.0	5 (0)	100.0	5 (0)
Health Awareness	Access to health service	93.5	5 (1)	91.9	5 (1)	Round 1	100.0	5 (0)	96.4	5 (0)
	The need to take medications as prescribed	98.4	5 (1)	96.8	5 (1)	Round 1	96.4	5 (0)	96.4	5 (0)
	Understanding of medications	95.2	5 (1)	96.8	5 (1)	Round 1	98.2	5 (0)	94.5	5 (0)
	Miss taking medications	96.8	5 (1)	96.8	5 (1)	Round 1	98.2	5 (0)	100.0	5 (0)
	Understanding of side effects of medications	90.3	5 (1)	91.9	5 (1)	Round 1	100.0	5 (0)	98.2	5 (0)

Domains	Variables	International Participants					Indonesian Participants			
		Relevance		Comprehensibility			Relevance		Comprehensibility	
		% Agreement	Median (IQR)	% Agreement	Median (IQR)	Decision for inclusion	% Agreement	Median (IQR)	% Agreement	Median (IQR)
	Understanding of action to side effects of medication	87.1	5 (1)	90.3	5 (1)	Round 1	98.2	5 (0)	96.4	5 (0)
	Support and monitoring for medication adherence	91.9	5 (1)	90.3	5 (1)	Round 1	98.2	5 (0)	92.7	5 (0)
	Monitoring of treatment progress	88.7	5 (1)	93.5	5 (1)	Round 1	100.0	5 (0)	98.2	5 (0)
	Preventing others from being infected	90.3	5 (1)	93.5	5 (1)	Round 1	98.2	5 (0)	94.5	5 (0)
	Vaccination for tuberculosis	88.7	5 (1)	88.7	5 (1)	Round 1	94.5	5 (0)	100.0	5 (0)
	The need for nutritious food	95.2	5 (0)	96.8	5 (0)	Round 1	100.0	5 (0)	100.0	5 (0)
	Counselling support	87.1	5 (1)	95.2	5 (1)	Round 1	100.0	5 (0)	90.9	5 (0)
	Health education*	92.9	5 (0)	91.1	5 (0)	Round 2	100.0	5 (0)	90.9	5 (0)

Notes. IQR = Inter quartal range.
*Items reworded based on participants' feedback on Round 1 and presented in Round 2 with international participants (*n*=3 items);
**Item added based on participants' feedback in Round 1 and presented in Round 2 with international participants (*n*=1 item);
***Item with domain reorganised, presented in Round 2 with international participants (*n*=1 item);
All Items presented in the table are included in the final measure (*n*=44 items.

7.4.2.4 Delphi One Round: Indonesian Participants

Indonesian participants were presented with 44 items written in Bahasa Indonesia, organised into five domains: Patient-centred Care (n=10 items); Team collaboration (n=8 items); Team Communication (n=4 items); Respectful and Ethical (n=9 items); and Health Awareness (n=13 items). As with Delphi Round 1 with international participants, Indonesian participants were asked to assess the relevance of the items to be included, the comprehensibility of the items, and the comprehensiveness of the instrument in representing the constructs it intended to measure.

Regarding the relevance and comprehensibility of the items, all 44 items received >70% agreement (with IQR $\leq$1 and Median = 5, see Table 2), indicating that all items were considered relevant and supported the construct proposed by the instrument. These items were clear, easy to understand and not confusing. Qualitatively, we received input on alternative wording for some items, given by at most 5.1% of participants for related items. This input was conveyed in a panel meeting involving the translators and lead author. As a result, the words and sentences used were considered to be better represented by the existing words/sentences compared to the alternatives proposed by the participants.

No changes have been made regarding the use of words and sentences. We received no feedback regarding the comprehensiveness of the instrument, indicating the instrument's coverage of all relevant constructs it was intended to measure. Participants' responses were deemed to have achieved a saturated agreement with one round of Delphi. A summary of the Delphi study findings across rounds is provided in Table 7.3.

Table 7.3. Summary of Delphi Findings

Delphi Round	Domain	Initial Items	Final Items	Changes Made
1 International	Patient-Centred Care	4	1	3 items were deemed redundant and removed; 1 item was reviewed for rewording
	Patient Involvement	8	8	No changes; all items were accepted
	Team Collaboration	8	9	No changes; all items were accepted
	Team Communication	5	4	1 item was moved to *Team Collaboration*
	Respectful and Ethical	10	9	1 item was deemed redundant, and removed
	Health Awareness	15	13	2 items were deemed redundant, and removed
	Total Items	50	39	-
2 International	Patient-Centred Care	1 (revised)	10	1 revised item was accepted; 1 new item was added; and 8 items from the domain Patient Involvement were merged into this domain.
	Patient Involvement	8	0	All items merged to the domain *Patient-Centred Care*
	Team Collaboration	9	9	No changes; all items were accepted
	Team Communication	4	4	No changes; all items were accepted
	Respectful and Ethical	9	9	No changes; all items were accepted
	Health Awareness	13	13	No changes; all items were accepted
	Total Items	44	44	-
Translation Process	Total Items	44	44	33 items reached consensus without revision by the translators; 11 items were reviewed for rewording
3 Indonesian	Patient-Centred Care	10	10	No changes; all items were accepted
	Team Collaboration	9	9	No changes; all items were accepted
	Team Communication	4	4	No changes; all items were accepted
	Respectful and Ethical	9	9	No changes; all items were accepted
	Health Awareness	13	13	No changes; all items were accepted
	Total Items	44	44	-

7.4.3 Qualitative Findings

Content analysis of participants' narrative responses identified three main themes: 1) the potential roles of family and caregivers, including their influence on treatment adherence, emotional support, and decision-making processes; 2) ethical considerations in treatment options, such as ensuring patient autonomy, balancing beneficence with non-maleficence, and addressing issues of equity and access to care; and 3) factors impacting the delivery of quality tuberculosis (TB) care, which encompassed barriers like stigma, and social determinants of health, as well as facilitators such as provider competency, and effective communication. These themes highlight the multifaceted nature of TB care and underscore the need for a holistic and ethically grounded approach to improve outcomes for patients. A more detailed explanation of this is presented below.

7.4.3.1 Potential Roles of Family/Caregivers

The importance of patient involvement was specifically addressed in the instrument by including items related to 'Inclusion in one's own care planning', 'Encouragement to participate when evaluating care', and 'Treatment plan changes based on patient feedback'. In addition, recognition of the family/caregiver(s) role in care was confirmed with the item 'Inclusion of family/caregiver in care planning'. Some participants found the above statement about the family/caregiver(s) role insufficient. The following quote supports this: "*Feedback from the support/caregiver should also be encouraged as they may provide further insight into behaviour, adherence, substance use and what their challenges are in supporting the patient".*

The researchers used the feedback to create an item representing a relevant construct: 'Treatment plan changes based on family/caregiver feedback'*.* Given that a related item, 'Inclusion of family/caregiver in care planning', had reached a consensus for inclusion in Round 1 with international participants, participants in Round 2 were asked to rate whether including both items was redundant. The participants were of the view both items should be included.

7.4.3.1 Ethical Consideration in Treatment Options

The domain Respectful and Ethical included items related to ‘Options regarding the costs of available medications’, ‘Options regarding alternative treatment methods’, ‘Options regarding available tests’, and ‘Options to get medications best suits one’s situation’. Some participants disagreed with the ethical aspect of providing options for alternative treatments, medicine or available tests before deciding on the best approach for TB care. The following quote supports this: “There are sometimes meaningful options for diagnosis or its timing, but these are often limited, and decision-making is often illusory. I think it's important to offer real choices while avoiding decision theatre”.

Conversely, one participant expressed difficulty getting the medicine the patient needed despite available health services. The following quote supports this: *“Sometimes there is a health service available, but the service does not include TB, so the medication will not be available from them.”*

Another participant raised an ethical dilemma related to offering medications to patients who refused to take them due to cultural beliefs. The following quote supports this: *“How to be ethical with a cultural or ethical dilemma arises, for example, patient refuses medication due to cultural beliefs.”* The researchers used the participants’ feedback to remove an item related to ‘Options regarding alternative treatment methods. The remaining items were included in the final measure.

7.4.3.2 Factors Impacting Quality of TB Care

The items presented in the survey were organised to align with the flow in the conceptual framework (see Figure 2). As a result, the domain ‘Health Awareness’ was presented at the end of the survey. Participants identified several factors that they felt were important in determining the success of TB care. Consequently, most (57%) narrative texts in the health awareness domain questioned the absence of three aspects: 1) the role of monitoring/follow-up, 2) understanding of nutrition/food requirements, and

3) understanding of drug side effects. The following quote supports this: “Questions related to adverse drug reactions should be asked.” After presenting the items related to 'Health Awareness', participants stated that the instrument was comprehensive. The qualitative key findings are provided in Table 7.4.

Table 7.4. Summary of Qualitative Findings

Themes	Key Findings	Supporting Quotes
Potential Roles of Family/Caregivers	• Family/caregivers' involvement in care planning is crucial. • Patients should be encouraged to provide feedback and participate in care decisions. • Participants felt the role of caregivers was not adequately captured. • A new item about treatment plan changes based on family/caregiver feedback was added.	“Feedback from the support/caregiver should also be encouraged as they may provide further insight into behaviour, adherence, substance use and what their challenges are in supporting the patient.” “How are you doing overall? How was your journey here? (questions to identify patient overall health and access to care) TB is more than a disease; it involves social and economic concerns and other acute or chronic illnesses that impact adherence, economic stability and social support).”
Ethical Considerations in Treatment	• Ethical dilemmas arise when offering treatment options, such as alternative methods or medications. • Concerns over cultural beliefs and patient autonomy in decision-making.	“How to be ethical when a cultural or ethical dilemma arises, for example, the patient refuses medication due to cultural beliefs.” “Sometimes there is a health service available, but the service does not include TB, so the medication will not be available from them.”
Factors Impacting Quality TB Care	• Monitoring/follow-up, nutrition/food requirements, and understanding drug side effects were seen as components needing to be strengthened in TB care assessment. • Participants emphasised these as critical aspects for improving TB care quality.	“Some more information related to follow-up should have been asked, i.e., follow-up investigations like culture reports.” “There is a detailed, shared clinical record that has the history of my illness and treatment to date that is shared amongst the professionals.”

7.5 Discussions

This study focuses on developing an instrument to measure the impact of interprofessional collaboration in tuberculosis (TB) care, specifically from the perspective of patients. The research addresses the need for an assessment tool that goes beyond traditional professional silos, capturing how interprofessional collaborative practice affects patient outcomes. This is particularly important in TB care, where a multi-faceted, patient-centred approach is essential for TB treatment adherence and successful long-term therapy outcomes. To facilitate the achievement of this goal, this study aimed to develop and test a patient outcome measure for interprofessional TB care. The instrument attempts to capture most, if not all, of the complexity of TB treatment. This study represents an important step toward bridging the gap between research and practice involving two essential yet very complex fields of study: interprofessional collaborative practice (Xyrichis et al., 2018) and TB care (World Health Organization [WHO], 2022); drawing on key interprofessional competency frameworks, such as the *Interprofessional Education Collaborative (IPEC) Core Competencies for Interprofessional Collaborative Practice* (Interprofessional Education Collaborative (IPEC), 2016), *Canadian Interprofessional Health Collaborative National Interprofessional Competency Framework* (Canadian Interprofessional Health Collaborative, 2010)*, Curtin University Interprofessional Capability Framework* (Brewer, 2013), *and WHO Framework for Action on Interprofessional Education and Collaborative Practice* (World Health Organization, 2010). The authors also refer to literature on TB care success, patient engagement, and safety (WHO TEAM Integrated Health Service, 2011; World Health Organization, 2003, 2009, 2016).

The instrument is intended to be completed by patients with practitioner(s) guidance, making both practitioners and patients the instrument's end users. Health practitioners' opinions are important in determining the quality of patient outcome measures (Belton et al., 2019; Diamond et al., 2014). Hence, COSMIN's requirements for content validity extend to practitioner involvement in developing and evaluating the measurement properties. Professionals' opinions can ensure that the items included align with the constructs intended to be measured in the instrument and are consistent with the underlying theories, conceptual framework, and disease models (Mokkink, Prinsen, et al., 2018).

COSMIN's requirements for content validity are fulfilled in this study by meeting four criteria. First, the surveys involved professionals from various relevant health disciplines, with a minimum of eight health disciplines being involved in each Delphi study. The sample population represented a group of qualified and experienced participants, with the majority having completed postgraduate studies (57.2%) and reported having over three years of experience working with TB patients (72.9%). Second, each item was tested on an appropriate number of professionals and thus fulfilled the '*very good*' COSMIN sample size requirement with > 50 participants completing each survey. Third, a widely recognised approach using Delphi surveys with standard consensus thresholds was used to analyse the data. Fourth, at least two researchers were involved in analysing the data. The findings from this study suggested that important concerns related to TB care were comprehensively addressed in the instrument. Furthermore, all items included were considered clear and relevant to the instrument.

7.5.1. Interprofessional-Tuberculosis Constructs

This instrument validates previously established constructs identified as key principles of interprofessional care, including trust, collaboration, communication, shared understanding of roles, and knowledge exchange among healthcare professionals, all of which contribute to improved patient outcomes (Brewer, 2013; Canadian Interprofessional Health Collaborative, 2010; Schroder et al., 2011; Stutsky & Spence Laschinger, 2014; World Health Organization, 2010). This instrument also covers a domain, *patient-centred care*, which has never been explicitly included as a domain in instruments measuring interprofessional or TB patient outcomes. The primary aim of a patient-centred care approach is to empower patients to actively participate in decisions regarding their care (Brewer, 2013; Canadian Interprofessional Health Collaborative, 2012; Interprofessional Education Collaborative, 2016). The foundation used to develop this instrument is visualised in Fig 7.2, centring on patient involvement as the core focus. This approach is integral to interprofessional-based care, emphasising that patient care holds true value only when carried out in the best interests of the patient and their family. Understanding the impact of treatment approaches on patient health outcomes, as well as how patients and their families perceive the care they receive, is crucial (Jensen et al., 2024; Shuyi et al., 2023). Many advanced tools have been developed to measure collaborative behavioural outcomes in interprofessional care (Ardyansyah et al., 2024; Curran et al., 2011; Schroder et al., 2011; Stutsky & Spence Laschinger, 2014). These instruments, which strongly focus on the key domain of patient involvement, underscore the significant role of patients in the collaborative care model. However, an important limitation of these tools is that their primary users are healthcare practitioners, not patients themselves. This raises the question of whether the tools genuinely capture the patient’s voice or merely reflect the providers' perspectives.

While the principles behind this patient-centred care framework are well-defined, the instrument could benefit from incorporating more concrete, real-world examples that demonstrate how these theoretical concepts are applied in practice. For this reason, this newly developed instrument incorporates statements such as *the team including me in my care planning, the team making changes to my treatment plan based on my feedback,* or *the health practitioners focusing care on my most important issues.* Patient experiences regarding interprofessional care remain little studied (Morgan et al., 2020). Nonetheless, existing research shows that patients recognise the importance of their involvement in the care and care process and provide valuable feedback, which, in turn, can help caregivers develop a better understanding of them and the dynamics of the healthcare team (Jensen et al., 2024; Morgan et al., 2020).

Throughout the construct validity process, the participants' responses to open-ended questions solidified the construct of patient-centred care proposed. Crucial constructs were confirmed, including patients being integral members of their care team, unlimited access to information as needed, and flexibility in treatment plans based on patient and family input; these constructs received strong reinforcement by the participants and were captured and included in the final construct of the instrument. Unfortunately, existing instruments related to TB patient outcomes or health-related quality of life do not prioritise patient involvement in their care as an essential outcome (Aggarwal, 2019; Wong et al., 2021; Yasobant et al., 2022). Consequently, there is no basis for comparison. In addition, it is important to note that most studies were conducted on patients, not with patients, highlighting the need for more inclusive instruments that engage patients as end users and involve them in the development process.

7.5.2 Strengths and Limitations

A key strength of this study is its robust, multi-step Delphi process, which involved international participants from different regions, followed by massive translational work for Indonesian participants. The Delphi rounds allowed the researchers to gather expert feedback on the proposed instrument items' relevance, clarity, and comprehensiveness (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018). The Delphi study was chosen to meet COSMIN requirements on content validity as this method allows a broader exploration of opinions, where participants can express their opinions anonymously and openly but in a controlled environment without feeling intimidated by other participants (Belton et al., 2019; Diamond et al., 2014).

This Delphi study resulted in a measure that can be used to assess the outcomes for TB patients after undergoing TB care with an interprofessional collaborative approach. The final measure comprised 44 items organised into five domains: *Patient-centred Care* (*n*=10 items); *Team collaboration* [*n*=8 items]; *Team Communication* (*n*=4 items); *Respectful and Ethical* (*n*=9 items); and *Health Awareness* (*n*=13 items).

These domains reflect the core components of interprofessional collaborative practice while focusing on aspects most relevant to patient outcomes. Including domains like "Health Awareness" and "Respect and Ethics" is particularly notable as it highlights the ethical and cultural dimensions of TB care, which can often be overlooked in more traditional, disease-centred approaches.

Evaluation of the psychometric properties of the current measure is limited to content validity. A more detailed analysis of the instrument’s remaining psychometric properties will be discussed after testing and validation in TB patients, which will be targeted in future research. The diversity of participants' professional backgrounds meets COSMIN's requirement to include as many relevant disciplines as possible in the research field of interest. However, the distribution was uneven, with medical doctors and nurses dominating the participant panel population. Conversely, this reflects the contextual circumstances as these two professions comprise most of the health workforce (Organisation for Economic Cooperation and Development, 2023) and, thus, are the leading contributors to TB care.

While the study provides a thorough and well-supported framework, there are inherent limitations. The focus on an international panel followed by Indonesian participants may not have fully accounted for regional variations in TB care practices, social structures, or healthcare system differences that could influence how patients in diverse settings experience collaborative care. Moreover, while the study emphasises patient-centred care, the subjective nature of patient perspectives on interprofessional collaboration may vary widely across individuals, complicating the process of measuring these experiences. There may also be challenges in translating the instrument to other languages or contexts, especially if the TB healthcare workers are not familiar with the core concepts of interprofessional collaborative practice.

Future studies are needed to trial and validate this interprofessional-TB care outcome instrument in patients to evaluate its psychometric properties using both classic test theory (CTT) and item response theory (IRT; Rasch analyses). The use of unvalidated measures in studies violates the principles of data reliability and validity (Mokkink, De Vet, et al., 2018; Prinsen et al., 2018). Measures that have not been validated can generate biased and inaccurate conclusions, the results of which cannot be generalised to represent the observed population. Some of the specific issues with unvalidated measures: they limit the researcher's ability to draw clear conclusions and significantly hinder the interpretation and comparison of data (Chad-Friedman et al., 2017; Course-Choi & Hammond, 2021); can alter the relationship with outcome variables, leading to an inadequate adjustment of treatment (Halvorson et al., 2013), and generate inconclusive results, in which the causality of interventions and their impact on clinical therapy is complex to conclude with certainty (Yerrakalva et al., 2015; Zywiel et al., 2013). Unfortunately, many studies still use these unvalidated measures despite the well-established knowledge that they contravene evidence-based measurement (Chad-Friedman et al., 2017; Prinsen et al., 2018; Terwee et al., 2018). COSMIN taxonomy and standards of psychometric properties (Mokkink, De Vet, et al., 2018; Mokkink, Prinsen, et al., 2018; Prinsen et al., 2018) should be used to guide future analyses with patient participants, including evaluation of content validity regarding three aspects of items: relevance, comprehensibility and comprehensiveness to ensure patients' voices are included in the instrument. The internal structure of the instruments (structural validity, internal consistency reliability, and cross-cultural validity/measurement invariance) and hypothesis testing for construct validity should also be evaluated. Finally, patients' responses before and after interprofessional TB care should be evaluated to determine the instrument's responsiveness to change.

7.6 Conclusions

Construct validity is crucial in developing and evaluating measurement tools, particularly in the context of interprofessional healthcare outcomes. In the case of tuberculosis (TB), an interprofessional TB outcome measure assesses the effectiveness of collaborative care strategies among diverse healthcare providers. This measure evaluates clinical outcomes and incorporates various dimensions of patient care, such as adherence to treatment, patient satisfaction, and acknowledgement of patient involvement in their care. Establishing construct validity involves demonstrating that the tool accurately reflects the theoretical concepts it intends to measure. For interprofessional tuberculosis care, this includes examining how well the outcome measure aligns with existing frameworks in TB treatment, healthcare collaboration, and patient-centred care.

This study presents the first step in developing and testing patient outcome measures for interprofessional TB care in Indonesia. This instrument consists of 44 items organised into five domains. The findings of this current study support COSMIN requirements regarding content validity; all items are relevant to the construct being measured, understandable, and comprehensive.

While communication and collaboration are foundational to successful interprofessional care, the challenge remains in adequately measuring these latent variables and linking them to patient outcomes. Outcome measures that focus on patient involvement, empowerment, and a collaborative approach to care are essential. Their limited inclusion in most measures underscores the difficulty in thoroughly evaluating the impact of collaborative practice on patient care. As collaborative practice continues to evolve, future research and outcome measures should aim to bridge these gaps and enhance the ability to assess both the process and the outcomes of interprofessional collaboration in healthcare. For the following process, instrument development will focus on validating the instrument in patients to evaluate its psychometric properties comprehensively. Through rigorous testing and validation processes, researchers can ensure that the measure effectively captures the complexities of TB management, facilitating improved communication and cooperation among healthcare professionals. Ultimately, a valid interprofessional tuberculosis outcome measure can enhance the quality of patient care, inform policy decisions, and guide future research in this critical area of public health.

7.7 Declarations

7.7.1 Author Contributions

Conceptualisation, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer, Dave Parsons;

Methodology, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer;

Software, Bau Dilam Ardyansyah, Reinie Cordier;

Validation, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer, Dave Parsons;

Formal analysis, Bau Dilam Ardyansyah, Reinie Cordier;

Investigation, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer, Dave Parsons;

Resources, Margo Brewer, Dave Parsons;

Data Curation, Bau Dilam Ardyansyah;

Writing - Original Draft, Bau Dilam Ardyansyah;

Writing - Review & Editing, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer, Dave Parsons;

Visualisation, Bau Dilam Ardyansyah, Reinie Cordier, Margo Brewer, Dave Parsons;

Supervision, Reinie Cordier, Margo Brewer, Dave Parsons;

Project administration, Bau Dilam Ardyansyah;

Funding acquisition, Bau Dilam Ardyansyah, Reinie Cordier.

All authors have read and agreed to the published version of the manuscript.

7.7.2 Data Availability Statement

Data is contained within the article or supplementary material.

7.7.3 Funding

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7.7.5 Institutional Review Board Statement

Ethics approval for this study was obtained from the Curtin University Research Ethics Committee (HREC Approval number: HREC2021–0274) and the Medical Faculty of the Hasanuddin University Ethics Board (Approval number: 170/UN4.6.4.5.31/PP36/2023).

7.7.6 Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

7.7.7 Conflicts of Interest

The authors have no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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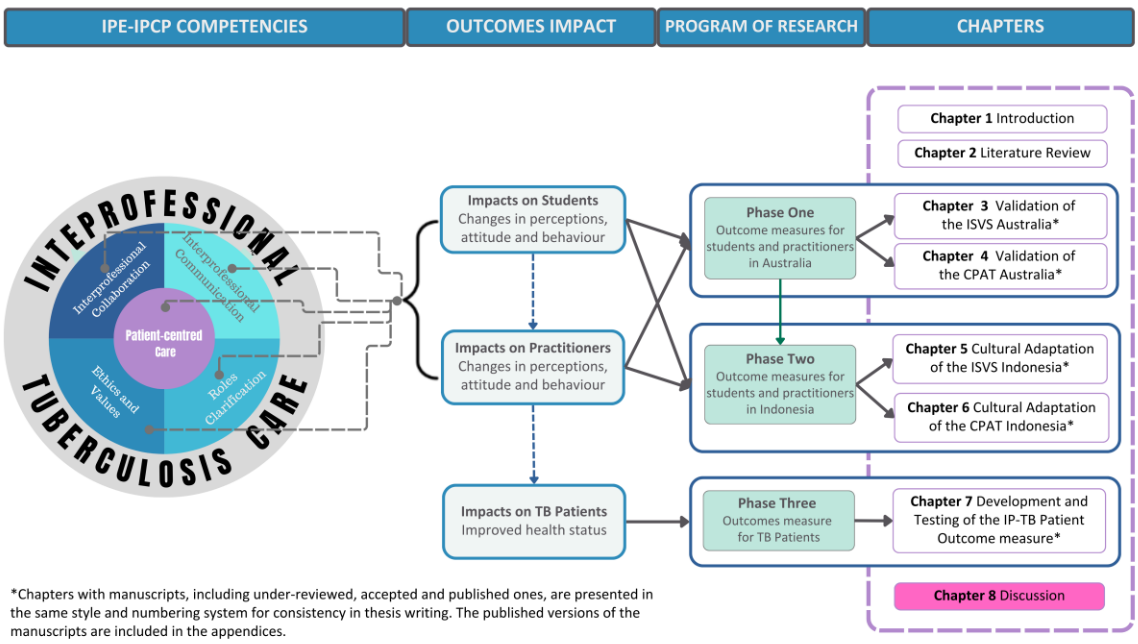
Chapter 8 Discussion

Now that I have completed the thesis, some significant developments have occurred. These developments are expected to contribute meaningfully to healthcare education and practice. Verified instruments are now available to evaluate interprofessional outcomes for healthcare practitioners and students in both Australia and Indonesia. The development and validation of the measure are essential to ensure that assessments are reliable and valid, and that outcomes can be more precisely measured using validated measures.

The final chapter synthesises all of the research findings, contextualises the stated aims, and analyses the current program of research's strengths, challenges, limitations, and contributions to the world of knowledge. Opportunities and potential impacts on future practice are elaborated on, and directions for future research are mapped.



*Chapters with manuscripts, including under-reviewed, accepted and published ones, are presented in the same style and numbering system for consistency in thesis writing. The published versions of the manuscripts are included in the appendices.

8.1 Identifying Knowledge Gaps and Practical Needs: A Foundation for the Research Direction

Indonesia's healthcare system faces significant challenges, including a shortage and unequal distribution of healthcare workers and a lack of integrated healthcare professions beyond doctors and nurses. These issues are especially critical for managing complex diseases like TB, requiring a team-based approach, such as offered by interprofessional collaboration. Despite national policies promoting IPE (Interprofessional Education) and IPCP (Interprofessional Collaborative Practice), their implementation is hindered by the absence of standardised frameworks and measures to evaluate outcomes for the related stakeholders, namely practitioners, students and patients.

A critical issue emerges from the early discussions in this thesis regarding the modified Kirkpatrick model, which is often touted as essential for evaluating interprofessional learning outcomes. The problem lies in the fact that much of the academic literature surrounding Kirkpatrick's modified model tends to focus disproportionately on the lower levels—Level 1 (learner reactions), Level 2a (changes in knowledge and skills), and Level 2b (changes in attitudes and perceptions). These levels, while foundational, fail to capture the deeper, more substantive impacts of IPE and IPCP initiatives. This thesis attempts to rectify this gap by aiming for higher-level assessments, particularly Level 3 (learner behaviour) and Level 4b (improvements in patient outcomes). The current lack of robust measures at these higher levels, especially Level 4b, is a significant limitation in evaluating the true impact of IPE and IPCP programs.

Before the articles (Chapters 3 - 6) included in this thesis were published, there was only one interprofessional outcome measure the PhD candidate found to be validated and therefore offered invariant use for healthcare practitioners and students, namely the ISVS-21. This lack of culturally relevant, validated measures globally and in Indonesia underscores a critical gap in evidence-based practice, limiting the ability to reliably measure interprofessional outcomes among practitioners, students, and patients. Addressing these issues is essential for bridging the gap between education and practice and improving healthcare outcomes globally, particularly in Australia and Indonesia.

The thesis argues that introducing validated measures targeting higher-level outcomes is crucial for proving the effectiveness of IPE and IPCP programs. Without these advanced measures, IPE initiatives' potential value and impact remain underappreciated, hindering efforts to demonstrate their contribution to improved patient outcomes, resource optimisation, and overall sustainability. The lack of adequate measures of these critical higher-order outcomes calls into question the effectiveness of existing evaluations. It underscores the need for more comprehensive, culturally validated instruments to advance the field.

This thesis attempts to tackle the longstanding challenge of measuring outcomes from interventions involving IPE and IPCP for health practitioners and students in Australia and Indonesia, focusing on interprofessional-based TB care in Indonesia. The main objectives of this research are to validate the ISVS and CPAT across Australian and Indonesian cultural contexts and to develop a measure for IP-TB patient outcomes.

8.2 Synthesis of Research Findings

The studies were designed with a coherent progression of studies, each addressing a specific research aim that collectively advances the understanding of IPE, IPCP, and patient outcomes in the contexts of Australia and Indonesia. The underlying structure of this work forms a foundation for evaluating interprofessional outcomes at multiple levels—education, practice, and patient care.

While the studies focus on validating psychometric measures (ISVS and CPAT) and developing a new patient outcome measure for interprofessional TB care, they collectively address critical gaps in the field. These gaps include the lack of invariant, validated measures for interprofessional outcomes and the need for patient-centred metrics to evaluate the impact of interprofessional interventions.

The interplay between these studies lies in their shared goal of creating reliable, valid, and culturally sensitive measures to enhance interprofessional education and practice. Together, the studies are expected to address the following overarching themes that contribute to building knowledge in several key ways:

a) Rigorous methodology. The studies set a benchmark for validating and developing measures in healthcare education and practice by adhering to COSMIN guidelines. This methodological rigour ensures that the findings are robust and reproducible.

b) Cultural Context and Adaptation. The validation of the ISVS and CPAT across Australian and Indonesian contexts (Chapters 3–6) highlights the critical need for culturally sensitive instruments. Differences in interprofessional dynamics, such as the rejection of physician dominance in Australian CPAT and its acceptance in Indonesia, underscore the role of cultural hierarchies in shaping collaborative practices. These findings illustrate how professional norms and cultural expectations influence interprofessional socialisation and collaborative behaviour, emphasising the necessity of localised adaptations for robust assessments.

c) Linking education to practice. A key strength of this thesis lies in its ability to bridge the educational and professional spheres. The validation of ISVS and CPAT for students and practitioners provides a continuum of assessment, enabling longitudinal evaluations of interprofessional outcomes. By confirming measurement invariance across these cohorts, the studies demonstrate that interprofessional socialisation and collaboration constructs are consistently understood across different stages of professional development. This is a critical step in unifying educational and clinical practices under a shared framework for interprofessional competence.

d) Linking practice to patient outcomes. Developing a patient-centred TB outcome measure (Chapter 7) represents a significant contribution to interprofessional practice by addressing Kirkpatrick’s Level 4b outcomes. Unlike previous measures focusing solely on TB clinical or quality-of-life indicators, this instrument integrates interprofessional care principles, emphasising patient involvement in decision-making and care planning. Its foundation on stakeholder engagement and rigorous content validation strengthens its relevance and potential impact.

The research presented in this thesis represents an original and crucial contribution to the fields of IPE, IPCP and TB care, thus will likely impact the following positively: 1) assessment of IPE for healthcare students and IPCP for healthcare practitioners; 2) healthcare quality and patient safety, especially in TB care; and 3) research in healthcare education and practice.

The next section of this chapter is structured around three main objectives, each discussed in detail in the following. Each objective is highlighted in a dialogue box at the start of the respective sub-sections to showcase key findings.

8.2.1 Measures with Good Psychometric Properties

To validate the ISVS-21 and CPAT and provide quality measures that can be used to measure interprofessional outcomes in Australia and Indonesia.

This section pertains to the studies presented in Chapters 3, 4, 5, and 6 of this thesis. The objectives of the studies presented in these chapters involve providing quality measures to assess interprofessional socialisation and collaborative practice among health practitioners and students in Australia and Indonesia by conducting cross-cultural validation of two existing instruments: the Interprofessional Socialisation and Valuing Scale (ISVS) and the Collaborative Practice Assessment Tool (CPAT). A quality measure refers to measures with robust psychometric properties (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018). The measures' psychometric properties are analysed in terms of *content validity, the internal structure* of the measure (i.e., *structural validity, internal consistency reliabilities,* and *measurement invariances*), and hypothesis testing for *construct validity*.

The relevant psychometric analysis performed in each study differed depending on the needs. COSMIN standards for classical test theory were applied to evaluate all four measures of psychometric properties in terms of *content validity, internal structure* (including analysis of *structural validity*, *measurement invariance*, and *internal consistency reliability*), and *hypothesis testing* for *construct validity*.

This program of research strongly emphasises content validity as a fundamental factor in the development of a measure. Four of the five reported studies (Chapters 3, 4, 5 and 7) involved pilot studies to ensure that the targeted constructs accurately represented the intended constructs in the original measures. In accordance with the universal commitment held by instrument developers (Streiner et al., 2015), this thesis focuses on optimising the performance of existing instruments whenever possible rather than creating new instruments. Therefore, Chapter 6 (Indonesian CPAT validation) did not include a pilot study because an Indonesian version of the instrument was already available.

One might argue for the need to validate a measure originally written in English before it is used in Australia. Chapters 3 and 4 of this thesis underscore the vital role of cross-cultural validation, even when the language remains consistent across different settings. It is evident that adopting a measure goes beyond mere language translation and demands significant adjustments. Two items from ISVS Australian received the least endorsement in the pilot and validation studies: ISVS1 (*aware of preconceived ideas*) and ISVS6 (*comfortable being a leader*). The results show more significant agreement with other research in Australia (Vari et al., 2021) than its original research in Canada (King et al., 2016), where the instrument was developed. Two items from CPAT Australia, Item 27 (*Physicians assume the ultimate responsibility*) and Item 49 (*Final decision rests with the physician*), were consistently rejected in both my pilot and validation studies, which strongly reaffirms participants' disapproval of including these items (refer to Chapter 4).

Three aspects of content validity are distinguished by COSMIN, which are referred to in this thesis (Mokkink et al., 2018a; Mokkink et al., 2018b): *1) Relevance* - including only items directly related to the construct of interest within the specific population; *2) Comprehensibility* - ensuring that end-users can easily understand the items in the measure; *3) Comprehensiveness* - representing all essential aspects of the construct in the measure.

In terms of internal structure, a systematic approach to factorial analysis was employed. This included starting with factor exploration using exploratory factor analysis (EFA), confirming the EFA results using confirmatory factor analysis (CFA), and simultaneously exploring the feasibility of the proposed model for two cohorts of factor analysis through multi-group confirmatory factor analysis (MG-CFA) (Williams et al., 2010). In testing construct validity, the following two methods were used: hypothesis testing based on existing assumptions regarding the construct being tested for ISVS Australia and Indonesia and verification of assumptions based on the path analysis model (Stutsky & Spence Laschinger, 2014) for CPAT Australia and Indonesia. The Australia and Indonesia ISVS are considered unidimensional, precluding the measurement of assumptions related to the interprofessional socialisation construct using modelling hypotheses.

The psychometric properties of the four validated measures (ISVS and CPAT Australia and ISVS and CPAT Indonesia) are shown in Table 8.1. According to the table, the psychometric properties of all four instruments regarding content validity, internal structure (including structural validity, internal reliability, measurement invariance), and hypothesis testing are rated as either 'good' or 'very good'. However, some values deviate from expectations, such as the Australian ISVS composite reliability value, which was higher than 0.95. While a value higher than 0.95 suggests redundancy of items and is considered undesirable, we decided to maintain this value to preserve the comprehensiveness of the instrument rather than discarding one or more ISVS Australia items. Additionally, the proposed 1 Factor 21-Item factorial structure model already meets the requirements for good model fit indices. The priority was to retain as many items as possible to maintain the instrument's comprehensiveness (content validity aspect) rather than improving internal consistency.

Table 8.1 Summary of Psychometric Properties of the Validated Measures

Properties Evaluated	Design Requirements	Validated Instruments: ISVS-21 Australia* (*n* item = 21)	CPAT Australia* (*n* item = 54)	ISVS-19 Indonesia** (*n* item = 19)	CPAT Indonesia** (*n* item = 48)	Psychometric Standards and Criteria
Content Validity	Back-to-Back Translation	✘	✘	✓	✘	Back-to-Back Translation
	Sample size	**Practitioner**, *n* = 32; **Student**, *n* = 9	**Practitioner**, *n* = 22; **Student**, *n* = 9	**Practitioner**, *n* = 34; **Student**, *n* = 22	✘	*Good* if 30-50; *adequate* if 10-30; *doubtful* if 10-30
	Study population	**Practitioner**: 8 Different Professions; **Student**: 5 Different Courses	**Practitioner**: 8 Different Professions; **Student**: 5 Different Courses	**Practitioner**: 5 Different Professions; **Student**: 5 Different Professions	✘	Minimum 5 professions/courses involved
	Items relevance, comprehensibility and comprehensiveness	>70% agreement score for all items in terms of item relevance and comprehensibility; no missing concepts recorded	>70% agreement score for all items in terms of item relevance and comprehensibility; no missing concepts recorded	>70% agreement score for all items in terms of item relevance and comprehensibility; no missing concepts recorded	✘	Verified Content Validity if: 1) >70% agreement score for all items in terms of item relevance and comprehensibility; 2) no missing concepts recorded
Structural Validity	Sample size adequacy for Factor Analysis: Kaiser-Meyer-Olkin (KMO) at $p<0.001$	**Practitioner** = 0.93; **Student** = 0.95	**Practitioner** = 0.90; **Student** = 0.96	**Practitioner** = 0.90; **Student** = 0.91	**Practitioner** = 0.92; **Student** = 0.91	*Very good* if > 0.90; *High* if 0.80 - < 0.90; *Acceptable* if > 0.7 - <0.8; *Poor* if < 0.70, Not recommended for Factor Analysis if < 0.6
	Sample size	***Practitioner**,* *n* = 147 (Ratio = 7:1); **Student**, *n* = 207 (Ratio = > 7: 1)	***Practitioner**,* *n* = 152 (Ratio = < 5:1); **Student**, *n* = 247 (Ratio = < 5:1)	***Practitioner**,* *n* = 266 (Ratio > 7:1); **Student**, *n* = 206 (Ratio > 7:1)	***Practitioner**,* *n* = 266 (Ratio = 5:1); **Student**, *n* = 232 (Ratio = 5:1)	The ratio of respondents to test items: *Very good*, if 7:1 and >100; *adequate* if at least 5:1 and *n*>100; *Doubtful* if < 5:1/ *n*<100

Properties Evaluated	Design Requirements	Validated Instruments				Psychometric Standards and Criteria
		ISVS-21 Australia* **(*n* item = 21)**	**CPAT Australia*** **(*n* item = 54)**	**ISVS-19 Indonesia**** **(*n* item = 19)**	**CPAT Indonesia**** **(*n* item = 48)**	
	Study Population	**Practitioners**: 15 Different Professions; **Student**: 13 Different Courses	**Practitioners**: 14 Different Professions; **Student**: 13 Different Courses	**Practitioners**: 7 Different Professions; **Student**: 6 Different Courses	**Practitioners**: 7 Different Professions; **Student**: 6 Different Courses	Minimum 5 professions/courses involved
	Factor Analysis Performed	EFA[3], CFA[4], MG-CFA[5]	EFA[3], CFA[4], MG-CFA[5]	EFA[3], CFA[4], MG-CFA[5]	EFA[3], CFA[4], MG-CFA[5]	*Very good if CFA[4]* was performed *Adequate* If EFA[3] was performed *Inadequate if* No factor analysis was performed
Internal Consistency Reliabilities	Cronbach's α **and/or** McDonald's Omega **and/or** CR[1]	**Practitioner**, CR[1]=0.96; **Student**, CR[1]=0.96	**Practitioner**, subscales CR[1]=0.82 - 0.90; **Student**, subscales CR[1]=0.87 - 0.95	Cronbach's α/ McDonald's Omega **Practitioner** =0.89 / 0.88; **Student** =0.92 / 0.92	**Practitioner**, subscales CR[1]=0.71-0.93 **Student**, subscales CR[1]=0.70-0.89	*Poor* if < 0.7; *Acceptable* if > 0.7; *High* if $\geq$ 0.8; *Undesirable* if ≥ .95 (if possible, should be avoided, indicating redundancy)
	AVE[2] or Inter-item Correlation	AVE[2] **Practitioner** = 0.51; **Student** = 0.57	AVE[2] **Practitioner** =0.43 - 0.62 **Student** =0.54 - 0.70	Inter-item correlation **Practitioner**, r=0.32; **Student**, r=0.40	AVE[2] **Practitioner** =0.45 - 0.66 **Student** =0.33 - 0.61	AVE[2], *good* if > 0.50; acceptable if > 0.40; Inter-item correlation: *Good* if between 0.30 - 0,50
Measurement Invariance	Final CFA model indices	**Practitioner**, CMIN/df =3.06; SRMR =0.071 **Student**, CMIN/df=3.87; SRMR=0.059	**Practitioner**, CMIN/df =2.04; SRMR=0.069 **Student**, CMIN/df = 2.53; SRMR=0.057	**Practitioner**, CMIN/df =2.88; SRMR=0.061 **Student**, CMIN/df=3.09; SRMR=0.067	**Practitioner**, CMIN/df =2.29; SRMR=0.065 **Student**, CMIN/df=2.05 SRMR=0.068	*Good* model fit indices: CFI[6] > 0.95; or RMSEA[7]<0.06; or SRMR[8]<0.08
	Configural	SRMR=0.059	SRMR=0.058; RMSEA=0.057	SRMR=0.061	SRMR=0.065; RMSEA = 0.049	
	Metric	SRMR=0.061	SRMR=0.059; RMSEA=0.057	SRMR=0.067	SRMR=0.071; RMSEA=0.049	
	Scalar	SRMR=0.061	SRMR=0.060; RMSEA=0.058	SRMR=0.069	SRMR=0.083; RMSEA=0.049	

Properties Evaluated	Design Requirements	Validated Instruments				Psychometric Standards and Criteria
		ISVS-21 Australia* **(*n* item = 21)**	**CPAT Australia*** **(*n* item = 54)**	**ISVS-19 Indonesia**** **(*n* item = 19)**	**CPAT Indonesia**** **(*n* item = 48)**	
Construct Validity	Hypothesis Testing	83.3% assumptions accepted	81.3% assumptions accepted	80% assumptions accepted	77.3% assumptions accepted	>75% assumptions accepted

Notes.
*Both studies used the ISVS and CPAT questionnaires, distributed simultaneously, leading to overlapping participants in Australia. The varying sample sizes resulted from some participants not completing one of the measures during validation;
**Both studies used the ISVS and CPAT questionnaires, distributed simultaneously, leading to overlapping participants in Indonesia. The varying sample sizes resulted from some participants not completing one of the measures during validation;
[1]Composite Reliability;
[2]Average Variance Extracted;
[3]Exploratory Factor Analysis;
[4]Confirmatory Factor Analysis;
[5]Multi-Group Confirmatory Factor Analysis;
[6]Confirmatory Fit Index;
[7]Root Mean Square Error of Approximation;
[8]Standard Root Mean Square of The Residual.

Furthermore, IRT (Item Response Theory) – a method more suited to removing items - was not applied in this thesis due to limitations in sampling size. Therefore, it was prudent to leave item removal until Rasch analysis is done in the future to make a more informed decision.

In conclusion, study findings presented in Chapters 3, 4, 5, and 6 regarding the psychometric evaluation of the ISVS and CPAT Australia and ISVS and CPAT Indonesia, the procedures and standards of which are based on COSMIN guidelines, confirmed that the evaluation of the psychometric properties of the four instruments provides quality measures in terms of content validity, structural validity, internal consistency reliability, measurement invariance, and hypotheses testing. These results demonstrate that the four instruments are quality outcome measures for evaluating interprofessional socialisation and collaborative practice. These include interprofessional teamwork, communication, leadership, task allocation, conflict management, and patient and family/community involvement in care.

8.2.2 Invariant Measures

To provide invariant measures for assessing interprofessional socialisation (ISVS) and collaborative practice (CPAT) outcomes among health practitioners and students in both Australia and Indonesia.

This section also pertains to the studies in this thesis's Chapters 3, 4, 5, and 6. The objective of these studies involved providing invariant measures for assessing interprofessional socialisation (ISVS) and collaborative practice (CPAT) outcomes among health practitioners and students in both Australia and Indonesia. Measurement invariance evaluates a construct's psychometric consistency across different groups or measurement occasions or measures adjusted for different cultures. Measurement invariance demonstrates that the construct maintains the same meaning across these groups or over repeated measurements as on the original versions (Putnick & Bornstein, 2016). The word "cultures" can refer to various populations based on ethnicity, language, gender, age groups, or patient populations. Measurement occasions can refer to invariance across time, including pre-test and post-test, or before and after intervention (Putnick & Bornstein, 2016). This program of research specifically examines the invariant of ISVS and CPAT in the cultural contexts of health practitioners and students (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018).

IPE focuses on the interprofessional interactions among students during their training, while IPCP emphasises interprofessional interactions among health practitioners in actual work settings. If each stage (students in training and health professional practitioners in the workplace) uses distinct outcome measures, the results cannot be compared, hindering the ability to measure the progression in achieving interprofessional competence as health professionals transition from student to experienced practitioner. Furthermore, the results cannot effectively be utilised as a basis for making improvements due to the different constructs being evaluated by diverse measures.

How healthcare practitioners and students interact can differ, as the construct is influenced by factors such as age, years of experience, professional background, and training or practice settings (Anderson & Thorpe, 2008; Fletcher et al., 2007; Legault et al., 2012; Oandasan & Reeves, 2005; Thannhauser et al., 2010; Van et al., 2007). As a result, the responses of these two groups can also differ. Invariant measures enable the determination of whether these differences are significant or simply a matter of chance (Putnick & Bornstein, 2016). Given that healthcare practitioners and students may respond differently to an item (De Vries et al., 2016), using instruments validated only for practitioners or students for use by both groups is highly not advisable (Mokkink et al., 2018a; Prinsen et al., 2018). Measurement invariance analysis allows practitioners' and students' opinions, attitudes, and behaviours toward interprofessional outcomes to be compared and moderated to obtain an equivalent measure. Separate validation and data analysis on the two cohorts eliminates response moderation.

Measurement invariance can be tested using *Differential Item Functioning* or a *Structural Equation Modelling (SEM)* framework (Putnick & Bornstein, 2016). Some researchers aim to integrate both approaches (Bean & Bowen, 2021). SEM using multi-group confirmatory factor analysis (MG-CFA), an extension of Confirmatory Factor Analysis modelling, tests the invariance of estimated parameters of two nested models across groups and is more widely used for invariance tests (Bean & Bowen, 2021; Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). This program of research used the SEM MG-CFA framework and included the top three invariance tests: *Configural, Metric* and *Scalar* tests (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). A good model fit is required for the configural test, and a good model fit with the metric test is necessary for the scalar test. The configural is the weakest, and the scalar is the most rigorous test. '*Invariant*' in the studies reported in this thesis is based on CFI differences (ΔCFI) between two tests (Cheung & Rensvold, 2002): ΔCFI of configural and metric determining metric invariance or ΔCFI of metric and scalar tests determining scalar invariance). Configural invariance is determined by MG-CFA good fit indices.

Determining the appropriate index for a model is not standardised (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Fit indices such as Chi-square, CFI (The Comparative Fit Index), GFI/AGFI (The (Adjusted) Goodness of Fit), NFI/NNFI/TLI (The (Non) Normed Fit Index/Tucker Lewis index), RFI (Relative Fit Index), IFI (The Incremental Fit Index), and RMSEA (Root Mean Square Approximation Error), and SRMR (Standard Root Mean Square of The Residual) are commonly used in confirmatory analysis or structural equation modelling. However, there is no consensus on which index or combination of indices to use. Researchers generally rely on their expert judgment (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). In response to this epidemiological gap, COSMIN proposed a standard and criteria for determining good model fit indices, which are integral to this program of research measures' validation (Prinsen et al., 2018). COSMIN criteria for good fit indices were based on either a comparative fit index (CFI), a Tucker-Lewis index (TLI) or a comparable measure > 0.95;

or the root mean square error of approximation (RMSEA) < 0.06; or standardised root mean square of the residual (SRMR) < 0.08.

The four validated instruments have demonstrated a good statistical fit (see Table 8.1) to the proposed model (see Figures 3.2, 4.2, 5.,2 and 6.4) for the exact model for each instrument) up to scalar invariance with *full model* invariance. Full model invariance involves applying constraints on the model's factor loadings, means, and intercepts without losing any constraints on any subscales or items (Putnick & Bornstein, 2016). This confirms that the four instruments have a high level of invariance stringency. The practitioners and students agree on the factorial structure of the instrument, including the number of subscales and items and the positioning of items relevant to the subscales (*configural* invariance). Additionally, the practitioners and students perceive the meaning of the constructs underlying all measures in similar ways (*metric* invariance), and the mean scores of the two cohorts are expected to be comparable when assessed using the suggested model (*scalar* invariance). The practitioners' outcomes scores serve as the standard for comparison.

Before conducting this program of research, limited invariant measures were available for assessing practitioners' and students' interprofessional outcomes. The one available is the ISVS-21 (King et al., 2016). As all four instruments have successfully met the criteria for a full model of configural, metric, and scalar invariance, they can now be recommended for use in evaluating and comparing students' interprofessional outcomes and development in their training (IPE) with the interprofessional collaborative practice of practitioners in the workplace (IPCP) in their respective settings.

8.2.3 Measure Assessing Patient Outcomes

To develop and evaluate a patient outcome measure for interprofessional TB care, a measure that can be used to quantify the quality and functional impact of an interprofessional model of TB care on the patient, as reported by the patient.

This section addresses the content presented in Chapter 7 of this thesis. Researchers are strongly advised to explore existing measurements that could be utilised or modified before creating a new one (Streiner et al., 2015). As no suitable instrument was available, this study aimed to develop a measure to assess patient outcomes following interprofessional-based care for TB.

The impact of interprofessional education (IPE) and interprofessional collaborative practice (IPCP) has garnered considerable attention globally in recent years. However, there is a pressing need for outcome measures focusing on patient impact (Cadet et al., 2024), assessing Kirkpatrick's modified model for outcomes Level 4b (Oates & Davidson, 2015). Effectively measuring the effects of IPE and IPCP on patients is a significant challenge since limited published studies available on this subject (Cox et al., 2016; Hammick et al., 2007; Oandasan & Reeves, 2005; Oosterom et al., 2019; Perrier et al., 2013). The lack of valid measures further exacerbates this shortage of research (Canadian Interprofessional Health Collaborative, 2012; Oosterom et al., 2019; (Cadet et al., 2024).

Developing countries encounter substantial hurdles when implementing IPE and IPCP, such as managing complex curriculum structures, overcoming resource constraints, and addressing prevailing stereotypes (Sunguya et al., 2014). Considering these obstacles, IPE should target cases that will capture the interest of health practitioners and students and, most importantly, select cases that can effectively address significant health problems within the country's context. Enthusiasm and determination are essential in tackling resource constraints, particularly concerning budgeting and the scarcity of the health workforce. Given these factors, TB is a suitable focus for the Indonesian context as it meets these requirements.

When considering the existing literature, there are outcome measures available for TB patients. However, several issues have been identified. Firstly, the focus is on clinical treatment effectiveness only (Aggarwal, 2010, 2019), based on symptom relief or microbiological indicators (i.e., positive or negative sputum for acid-fast bacteria). Secondly, the existing quality-of-life instruments related to TB patient outcomes measures are not designed to evaluate patient outcomes related to an interprofessional approach (Bauer et al., 2013; Brown et al., 2015; Guo et al., 2009; Khan et al., 2017), and therefore, do not cover essential principles of interprofessional aspects of patient care.

The research described in Chapter 7 of this thesis is dedicated to the crucial initial stage of measure development: assessing content validity of the IP-TB patient outcome measure. This study used a mixed methods approach that quantifies closed responses into values that can be ranked and compared and allows for the exploration of narrative responses to describe perceptions beyond the realm of numbers. The stages of the Delphi series involving international and Indonesian participants, interspersed with substantial translational work activities, represent the process's rigour and the desire to produce an instrument with robust psychometric properties.

Including key stakeholders and the target population is paramount to ensure that the measure is relevant, understandable, and comprehensive (Mokkink et al., 2018a; Mokkink et al., 2018b; Terwee et al., 2018). The study engaged practitioners who were experienced in treating TB patients and knowledgeable about team collaboration. Regrettably, due to COVID-19, patients, the primary end-users of the developed measures, could not participate at this stage; the design of the pilot study in late 2021 was hindered by the lack of feasibility in mobilising TB patients and their families under the prevailing conditions. The objective of this study was achieved by developing a measure that satisfied COSMIN requirements for content validity. All 44 items in this measure demonstrate relevance, comprehensibility, and comprehensiveness across five domains to the construct being assessed. Future research will centre on capturing patient feedback to guarantee comprehensive data for refining the IP-TB instrument.

Developing countries encounter substantial hurdles when implementing IPE and IPCP, such as managing complex curriculum structures, overcoming resource constraints, and addressing prevailing stereotypes (Sunguya et al., 2014).

8.3 Characteristics of Construct Validated

Returning to the IPE and IPCP outcomes measures, the adapted ISVS and CPAT were rigorously tested to verify their construct validity (refer to hypotheses testing in Chapters 3, 4, 5 and 6). The Australian ISVS-21 and Indonesian ISVS-19 strongly support the idea that age and years of work or study play a crucial role in determining interprofessional socialisation for both health practitioners and students. Interestingly, in Australia, professional background was seen as a discriminatory factor by practitioners but not by students. In Indonesia, educational background determines interprofessional socialisation among students but not among practitioners. These ISVS-21 Australia assumptions fortify the importance of professional background in Australia's health professions environment, as validated by CPAT Australia.

In the Australian CPAT, the removal of Item 27 (*Physician assumes the ultimate responsibility*) and Item 49 (*Final decision rests with the physician*) was warranted due to consistent rejection in pilot and validation studies, indicating participant disagreement with including these items. The extremely low factor loading of these items (-0.002 and 0.080 for Items 27 and 49, respectively) suggests that Australian practitioners do not endorse the items, causing the items to fail to reflect constructability against the relevant factors (refer to Chapter 4 Table 4.1). Both items pertain to the perception of the physician's role in an interprofessional team. These findings reinforce Australian health practitioners' opposition to the concept of medical doctors having the highest hierarchical position in decision-making and patient care, which is widely recognised as a barrier to interprofessional collaborative practice (Bollen et al., 2019; Clarin, 2007; Mian et al., 2012). On the other hand, these two items (27 and 49) in the Indonesian CPAT show substantial results, with factor loadings for both items being greater than 0.5 (refer to Chapter 6, Table 6.3). Indonesian practitioners continue to perceive the prevailing dominance of doctors as customary within the healthcare system.

Another interesting finding was that *shared goals*, *interprofessional collaboration, role clarification, and team member relationships* were solid constructs verified in the validation studies (refer to Chapters 4 and 6). The unwavering agreement among practitioners and students is evidenced by the strong internal consistency reliability scores across domains representing these constructs in both Australian and Indonesian contexts. The forthcoming section will delve into compelling discoveries regarding the authenticity of constructs foundational to the Australian and Indonesian ISVS and CPAT.

8.3.1 Preconceived Ideas in Teamwork

The confirmation from both the Australian and Indonesian ISVS about the existence of preconceived ideas of teamwork is significant. The participants in the validation studies were healthcare professionals, and their experiences in healthcare shaped their professional character. Their perceptions, attitudes, and beliefs about interprofessional teamwork form these preconceptions. The expression of stereotypes and prejudices about roles and the dominance of certain professions has been noted in several studies (Nicol, 2013; Will et al., 2019; Xyrichis et al., 2018). These findings align with the original ISVS-21 report, where ISVS1 (*aware of preconceived ideas*) had the second-lowest mean loading (King et al., 2016). This challenge is not unique to our study but is also evident in other ISVS-21 cross-cultural studies in Germany (Mahler et al., 2022), Spain (González-Pascual et al., 2022), and Australia (Vari et al., 2021). Participants' varying perspectives on the importance of including ISVS1 (*aware of preconceived ideas*) demonstrate the complexity of addressing preconceived ideas.

The item in question (*aware of preconceived ideas*) was found to be confusing during the ISVS pilot study in Indonesia and had low factor loading in validation despite attempts to rephrase it. The rejection for the item was so strong that removing it from the Indonesian ISVS (along with another item, Item 15 [*comfortable clarifying misconception*]) resulted in a final *good* factorial structure of 1-Factor 19-Item (ISVS-19). The decision to remove the item was supported by the strong rejection of the concept it represented (as reflected by the item's loading factor). On the other hand, removing the item did not significantly change the Australian ISVS-21 model, indicating that the concept of preconceived ideas persists among health professionals in Australia but not to the extent observed in Indonesia. Another study has also confirmed that stereotyping is a significant issue among health practitioners and students in Indonesia, creating barriers to effective teamwork (Darmayani et al., 2020).

8.3.2 Leadership in Interprofessional Team

The study in Chapter 3 provides evidence that the concept of leadership presents unique challenges within Australian interprofessional socialisation. Most health practitioners in Australia are women, accounting for 74.2% of the workforce (Australian Institute of Health and Welfare, 2023). Nurses and midwives comprise the largest percentage. Additionally, female participants were predominant in the ISVS study mentioned in this thesis, 79.9% being practitioners and 77.3% students. It is important to consider how women perceive the concepts presented in ISVS, as this may influence research findings. Despite being the largest group in Australia's health workforce, women are not equally represented in leadership positions (McGowan & Stokes, 2019). This suggests that women in Australia have fewer opportunities for leadership roles in the healthcare industry.

The concept of *Team Leadership* is an essential focus in Australian CPAT studies. The psychometric evaluation of the *Team Leadership* subscale in the Australian CPAT received strong support from the validation participants. For practitioners, the composite reliability was 0.935, and the average variance extracted was 0.618. For students, the composite reliability was 0.938, and the average variance extracted was 0.632. In the original CPAT developed in Canada, the *Team Leadership* construct was also a crucial independent factor, with Cronbach's alpha at 0.80 and *good* fit indices including CFI = 0.984, TLI = 0.967, and RMSEA = 0.049 for the subscale.

The analysis of CPAT Australia's assumptions revealed that *Team Leadership* does not directly influence constructs such as *Member Relationships, Decision-making, Conflict Resolution, or Patient Involvement*. Leadership was viewed as a concept that can only be impacted if *mediated* by other concepts, such as shared goals and a clear understanding of each member's roles. In the Australian health service context, the role of leaders is considered optional, as confirmed by an Australian study that excluded item 6 of the ISVS-21 (*comfortable being a leader*) in their analysis (Vari et al., 2021).

Likewise, the perceptions of leadership among health practitioners in ISVS-19 Indonesia do not emphasise its importance to the level expected. However, students showed strong support for the concept of leadership. When moderation is conducted on two cohorts, the low factor loading from practitioners (factor loading = 0.31) can be counteracted by the higher factor loading from students (factor loading = 0.51) in item 6.

Additionally, the lack of participant support for the concept of leadership in interprofessional teams was reflected in CPAT Indonesia, where *Team Leadership* was not considered a distinct domain. The current model does not accommodate this, as a good model fit cannot be achieved with *Team Leadership* as an independent domain. A potential solution to enhance the Indonesian CPAT modelling involves merging *Team Leadership* with *Team Communication* (see Chapter 4, Figure 4.2) after several iterations.

Effective interprofessional teamwork hinges on solid leadership (Stutsky & Spence Laschinger, 2014; WHO, 2010). Effective leadership in an interprofessional setting involves recognising and leveraging the diverse expertise of team members (Brewer et al., 2016). However, there is still ambiguity surrounding the definitions and concepts of "leader" and "leadership" within interprofessional teams (Brewer et al., 2016). The absence of a shared leadership conceptualisation poses significant barriers to evaluating and sharing effective leadership practices. Generally, all validation studies reported in this thesis demonstrated a lack of full support for item ISVS6 (*comfortable being a leader*) and the *Team Leadership* subscale for the CPAT, highlighting the existing challenges with leadership skills in interprofessional teams, echoing previous research on the complexities of interprofessional practice (Xyrichis et al., 2018). Research has revealed stereotypes in leadership, where one professional typically takes the lead, often overlooking the potential leadership capabilities of other team members (Lestari et al., 2016; Sunguya et al., 2014).

8.3.3 Patient Involvement

The instrument developed in Chapter 7 covers a domain, *patient involvement*, which has never been explicitly included as a domain in instruments measuring TB patient outcomes. The foundation used to develop this instrument is visualised in Fig 2, centring on patient involvement as the core focus. The primary aim of a patient-centred care approach is to empower patients to actively participate in decisions regarding their care (Brewer, 2013; Canadian Interprofessional Health Collaborative, 2012; Interprofessional Education Collaborative, 2016). This approach is integral to interprofessional-based care, emphasising that patient care holds true value only when carried out in the best interests of the patient and their family. Many advanced tools have been developed to measure collaborative behavioural outcomes in interprofessional care (Ardyansyah et al., 2024; Curran et al., 2011; Schroder et al., 2011; Stutsky & Spence Laschinger, 2014). These instruments, with a strong focus on the key domain of patient involvement, underscore the significant role of patients in the collaborative care model. It is crucial to understand the impact of treatment approaches on patient health outcomes and how patients and their families perceive the care they receive.

Throughout the construct validity process, the participants' responses to open-ended questions solidified the proposed construct of patient-centred care. Crucial constructs were confirmed, including patients being integral members of their care team, unlimited access to information as needed, and flexibility in treatment plans based on patient and family input; these constructs received strong reinforcement by the participants and were captured and included in the final construct of the instrument.

Unfortunately, existing instruments related to TB patient outcomes or health-related quality of life do not prioritise patient involvement in their care as an essential outcome (Aggarwal, 2010, 2019; Bauer et al., 2013; Brown et al., 2015; Guo et al., 2009; Khan et al., 2017). Consequently, there is no basis for comparison. In addition, it is essential to note that most studies were conducted on patients, not with patients, highlighting the need for more inclusive instruments that engage patients as end users and involve them in the development process.

8.4 Triangulation

Triangulation refers to using multiple theories, data sources, methods, or researchers to study a single phenomenon to avoid potential biases from using a single methodology (Fusch et al., 2018). Triangulation allows for a more thorough understanding of a phenomenon by comparing findings from different perspectives, thus strengthening the overall validity of the research. Using COSMIN standards (Mokkink et al., 2018a; Mokkink et al., 2018b; Prinsen et al., 2018) has greatly facilitated triangulation in this research. Compliance with COSMIN standards mandates a robust sample size, diverse participant representation, and a comprehensive investigative approach, best achieved through data triangulation.

8.4.1 Data Triangulation

The quality of research evidence for therapeutic intervention is organised into a pyramid scale (Harbour & Miller, 2001), with evidence from expert opinion at the base and considered as the weakest evidence (level 5), non-randomised intervention studies in the middle (level 2), and randomised control studies at the top, as the strongest (level 1). Non-experimental studies (level 4) and observational studies (level 3) are in between. While expert opinion is often considered the weakest form of research evidence, the data triangulation applied in this program of research proves its value.

This thesis included the rich profile of the research subject involved, taking into account the sample size, the diverse professional and educational backgrounds, and the demographic diversity of the participants (the online ISVS and CPAT validation surveys were distributed to practitioners throughout Australia and Indonesia, and the Delphi study participants gathered from several countries), to discover commonalities within dissimilar settings of professional backgrounds of health practitioners). Including participants with diverse professional backgrounds was a prerequisite to comprehensively represent the health workforce in the respective real-life settings. Data triangulation in this program of research also incorporates research over time, encompassing multilevel pilot studies for the ISVS and CPAT, a series of Delphi studies with interprofessional and Indonesian participants, and subsequent validation. This approach has demonstrated the comprehensiveness of the data due to the varying time slices during data collection.

8.4.2 Methodological Triangulation

The most common type of triangulation in research involves methodology, where two or more data sources are collected qualitatively, or mixed-methods studies that include both qualitative and quantitative data (Fusch et al., 2018). This program of research applies mixed methods to enrich and deepen its research inquiries. To enhance the rigour, as per COSMIN standards, qualitative methods are strategically employed in pilot studies, including Delphi studies, to delve into experts' opinions to establish the content validity of the five measures reported in this thesis. When analysing quantitative data, it is essential to thoroughly evaluate the psychometric properties of the measures from multiple angles (Fusch et al., 2018). The comprehensive approach in this research includes assessing internal consistency reliability, structural validity, measurement invariance, and conducting hypothesis testing for construct validity, all of which contribute to creating methodological triangulation for the studies.

The data analysis presented in this thesis, in terms of internal consistency reliability, goes beyond relying solely on Cronbach's scores. In addition to Cronbach's alpha, researchers also consider other reliability measures, such as McDonald's Omega and Composite reliability, along with inter-item correlation or average variance extracted (AVE). By incorporating these measures, the reliability of the factor loadings obtained through CFA becomes a more comprehensive understanding compared to relying on Cronbach's calculations alone (Hayes & Coutts, 2020; Prinsen et al., 2018).

The four validation studies did not involve creating a measure from scratch but rather aimed to capture the essence of the new cultural settings, Australia and Indonesia. This was achieved by exploring the factorial structure of the adapted measures with EFA and confirming it with CFA (Bean & Bowen, 2021; Thompson, 2004; Williams et al., 2010). By undertaking the three-step process of EFA, CFA, and MG-CFA, the unique cultural aspects of each setting can be uncovered and incorporated into the final factorial structure of the measures. This process ensures adaptability to new cultural settings and applicability across broader populations. Notably, the Australian ISVS and CPAT, both in English like the original measure, demonstrated stronger alignment with the original measure than the Indonesian ISVS and CPAT, emphasising the importance of cultural nuances in validation studies.

In evaluating construct validity, we utilised a robust conceptual framework rooted in interprofessional socialisation and collaborative practice. Employing a model path analysis for CPAT (Stutsky & Spence Laschinger, 2014) allowed us to elevate the assessment of construct validity. This assessment facilitated the verification of assumptions and enabled a deeper analysis to determine the nature of the impact correlation between constructs. This in-depth analysis helped reveal both indirect effects (*full mediation*, requiring the involvement of other constructs to mediate the impact) and direct effects (*partial mediation*, not requiring mediation).

8.4.3 Investigator Triangulation

Investigator triangulation involves different investigators observing the same data who may disagree on its interpretation to avoid bias (Fusch et al., 2018). The decision-making process for analysing the pilot and validation results involved panel meetings with collective participation from the PhD candidate and the entire supervisory team. Investigator triangulation aligns with COSMIN's *very good* requirement to involve at least two researchers in analysing data (Mokkink et al., 2018a).

8.5 Methodological Advantages and Pitfalls

8.5.1 COSMIN Framework

The programs of research outlined in this thesis closely follow COSMIN guidelines. With its comprehensive taxonomy and stringent standards, COSMIN meticulously determines sample sizes, population selection, and precise data collection, analysis, and reporting methods. The application of COSMIN had a profound impact on this program of research. By utilising COSMIN, the measures validated and developed to assess IP-TB care outcomes were comprehensively evaluated and refined. Furthermore, COSMIN provides a standardised framework for evaluating the methodological quality of the measures' properties, ensuring consistent and reliable data analysis. By addressing the relevant spectrum of COSMIN requirements on measurement properties, including but not limited to content validity, internal consistency reliabilities, factor analysis, measurement invariance, and hypothesis testing, COSMIN plays a pivotal role in elevating the quality of the ISVS, CPAT and IP-TB outcome measures developed, resulting in instruments that are not only validated but also of good quality.

However, applying COSMIN can be intricate and time-consuming, particularly for individuals without extensive research experience. It demands significant resources such as time, expertise, and a strong grasp of research methods, statistics, and measurement theory. Additionally, it is crucial to note that the COSMIN standards emphasised in this thesis primarily focus on methodological quality rather than the measures' practical utility or clinical relevance. While COSMIN ensures that the measures are well-designed and rigorously tested, evaluating the measures' practicality and effectiveness in real-world clinical settings is yet to be performed. As this thesis has not covered the measures' practical utility and clinical relevance, the next crucial step is to ensure that the measures effectively enhance interprofessional healthcare outcomes in real-world settings.

8.5.2 Repeated Analytical Procedures

Reflecting on the analytical approaches performed for the validation studies (Chapters 3 – 6), indeed, a relatively similar methodological approach was performed for Chapters 3 and 5 (for the ISVS validations) and Chapters 4 and 6 (for the CPAT validations), These two sets of chapters intentionally utilise similar analytical frameworks to ensure consistency and comparability in addressing related research questions across two educational and practice settings: Australia and Indonesia. However, as indicated in the chapters, while a similar methodological framework is applied in Chapters 3 and 5 or 4 and 6, the data is sourced from different environments. Hence, the analysis cannot be entirely uniform.

Chapters 3 and 5, both of which focus on validating the ISVS in the Australian and Indonesian contexts, were performed differently in one key aspect. Chapter 5, in particular, included a detailed back-to-back translation process, drawing on two respected sources: COSMIN and WHO (Mokkink et al., 2018; World Health

Organization, 2012). This methodological choice was crucial in preserving the integrity of the translation process, ensuring that the instruments' conceptual accuracy and clarity were maintained across languages. Through this process, the PhD candidate learned essential skills in managing translation tasks and gained invaluable experience. These skills were further refined as the candidate took on more complex translation work in Chapter 7, underscoring the growing depth of her expertise in this area.

Turning to Chapters 4 and 6, which explore the validation of the CPAT, the contrast between the Australian and Indonesian contexts highlights significant insights. Although the CPAT was originally developed in English in Canada, the pilot testing and validation studies conducted in Australia, also in English, did not simplify the data analysis process compared to the Indonesian context. The two datasets, each shaped by distinct cultural practices, demanded independent analytical strategies. This divergence was not viewed as a challenge but rather as a strength.

A similar approach for each context helped strengthen the validity of the analytical steps. Using the same method provides certainty for comparing results, which can be used to confirm the robustness of the validated instrument. For example, the concept of shared responsibility and collective goals has been identified as the main interaction point for interprofessional collaboration (Stutsky & Spence Laschinger, 2014), and aspects such as member relationships, coordination of care, and team communication are factors that interplay with this crucial domain. Both studies provide results that strengthen this fundamental concept of interprofessional collaboration in the hypothesised model developed (see Figure 4.3 Path Analysis of Assumption and Figure 6.5 Path Analysis of Assumptions Model For Practitioners (5a) and Students (5b).

On the other hand, related to aspects of team leadership, decision-making, and conflict management, the results from the studies differed significantly, which aligns with the recognised cultural differences between the two contexts (Pekerti & Sendjaya, 2010; Asmorowati & Schubert, 2024); these cultural differences impact how leadership styles are perceived and enacted. Australian leaders are more likely to emphasise authenticity and self-assertion, be more individualistic and merit-based, and place less emphasis on communal roles. Decision-making in Australia is generally more open and consultative, fostering critical thinking and autonomy. In contrast, Indonesian leaders prioritise moral responsibility and transformative influence, prioritising harmony and avoiding open confrontation. Indonesian leaders are more likely to use indirect methods to address disagreements (Asmorowati & Schubert, 2024). The validated Indonesian CPAT indicate leadership as a weak theme, which cannot be identified as an independent domain (see Chapter 6, Figure 6.5 Path Analysis of Assumptions Model For Practitioners [5a] and Students [5b]). The interplay between structural consistency and cultural variation highlights the reliability of the validated CPATs and the crucial influence of cultural context on item interpretation. These findings demonstrate the methodology's effectiveness in maintaining the validity of measures across diverse settings while considering cultural specificities.

8.5.3 Datasets Non-normality Distribution

Factor analysis, such as EFA and CFA, aims to uncover latent constructs by analysing the patterns of inter-correlation among observed variables (Thompson, 2004; Williams et al., 2010). Using non-normally distributed data in EFA and CFA presents methodological considerations that warrant careful evaluation. While assumptions of multivariate normality are necessary for specific estimation methods, they are not strictly required for all approaches (Williams et al., 2010; Yang & Liang, 2013). Given the non-normality of the data (i.e., the study presented in Chapter 3), it is critical to assess the stability of the factor structure.

Several considerations were applied to the data for factor analysis to ensure that valid and interpretable factor solutions were derived from non-normality distributed datasets:

a) The significant Bartlett's test was used to indicate sufficient correlations among variables to justify factor analysis;

b) The high KMO score was used to confirm the adequacy of the sample for identifying coherent factor structures;

c) The absence of outliers;

d) Bootstrapping was employed to estimate robust standard errors and confidence intervals for factor loadings (for the study presented on CPAT Australia and Indonesia presented in Chapters 4 and 6);

e) Comparing results across different estimation methods to further validate the findings. As stated in ***Chapter 3, p. 82, line 6***: "Alternative iterations were performed to improve the model fit by applying one or more covariances representing the MI findings [64].";

f) The study only includes items with factor loadings and communalities consistently aligned with theoretical expectations and with sufficiently high scores (i.e., factor loading > 0.30); and

g) Because the data was non-normally distributed, construct validity was evaluated for hypothesis testing following relevant data analysis, as stated in the thesis document ***Chapter 3, p. 91, line 7.*** "As neither dataset was normally distributed, non-parametric statistics of the Kruskal-Wallis *H*-test were performed with the Mann-Whitney U posthoc test for comparisons to identify exact group differences. All responses (practitioners, n=134, students, n=207) were included for hypotheses testing."

These methodological strategies ensured that the factor analyses conducted in this study were robust and reliable, even in the presence of non-normally distributed data. The study produced valid and interpretable results that contributed to the overall research objectives by carefully considering the implications of non-normality and applying appropriate statistical techniques.

8.5.4 Self-assessment Measures

Self-report measures are widely used in IPE and IPCP research (Oates & Davidson, 2015) due to their ability to capture subjective experiences, attitudes, and perceptions, which are integral to understanding interprofessional interactions. Validated in this thesis, measures such as the ISVS and CPAT rely on self-reported data to assess constructs like interprofessional socialisation and collaborative practice (Schroder et al., 2011; King et al., 2016). These constructs inherently involve personal insights into behaviour, team dynamics, and values, which are best understood through the individuals' perspectives.

However, self-reports are not without their limitations. Common biases, such as social desirability, recall inaccuracies, and response tendencies, can affect the validity of the data (Nayar et al., 2020; Otero-Saborido et al., 2021; Palenzuela-Luis et al., 2022). These issues warrant critical consideration to ensure the robustness of findings derived from self-reported measures. Despite these limitations, studies have shown that self-reports can be reliable when carefully designed to ensure appropriate coherence and sequence (Palenzuela-Luis et al., 2022) with a standardised structure (Nayar et al., 2020).

The potential for bias in self-report assessment is acknowledged throughout this program of research. Therefore, several strategies were implemented to mitigate these biases. The first and foremost strategy was using the COSMIN framework, enabling measures to be developed and validated rigorously. Throughout the process, abiding by COSMIN guidelines ensures the following steps were followed:

a) Content validity involving diverse stakeholders (e.g., clinicians, educators, students) ensured that items comprehensively captured the intended constructs and were culturally sensitive.

b) Pilot testing and revision cycles enhanced items' clarity, relevance, and comprehensiveness, reducing the potential for misinterpretation and inconsistent responses.

c) Three-tier factor analysis of EFA, CFA and multi-group CFA strengthened the factorial structure and ensured internal consistency across diverse participant groups.

d) The inclusion of construct validity testing, such as path analysis in CPAT and hypothesis verification in ISVS, ensured that constructs were grounded in evidence-based theory and interprofessional collaboration practice.

e) Ensuring anonymity across studies minimised social desirability bias, fostering more honest and accurate responses.

f) Experience and self-confidence impact objectivity in self-assessment (Nayar et al., 2020; Palenzuela-Luis et al., 2022). Thus, all studies in this research included participants with at least one year of clinical experience, as professional identity typically develops within this timeframe of teamwork (Legault et al., 2012).

g) The triangulation approach related to data collection and data analysis was applied to triangulate findings and further strengthen the evidence base for IPE and IPCP outcomes.

These efforts reflect a deliberate and methodical approach to addressing the inherent limitations of self-reported data. While no measure is immune to bias, the steps undertaken in this research program demonstrate a commitment to rigorously validating and developing self-report measures.

8.6 Study Limitation

The COSMIN general design requirements for validating and developing measures were fully met across all five studies in this thesis (Chapters 3, 4, 5, 6, and 7). Notably, the number of participants in each study adhered to the criteria for multi-group analysis, demonstrating a solid alignment between participants and test items (within a 7:1 ratio of participants and test items, and n > 100). The KMO and Bartlett criteria were also met satisfactorily, enabling robust data analyses such as multi-group confirmatory factor analysis, measurement invariance tests, and hypotheses testing. Nevertheless, there is potential for enhancement in individual cohort analyses. Notably, the participation of practitioner cohorts for CPAT Australia was relatively low, constraining the extent of analysis that could be conducted; a limited number of practitioners involved in the study impacted the feasibility of performing item response theory.

In the pilot and validation studies of the four measures (ISVS and CPAT Australia, and ISVS and CPAT Indonesia), the diversity of health professions was restricted as participants were dominated by physicians/medical students and nurses/nursing students in both cohorts. Similarly, in the study on the IP-TB patient outcome measure presented in Chapter 7, the diversity of participants' professional backgrounds meets COSMIN's requirement to include as many relevant disciplines as possible in the research field of interest. However, the distribution was uneven, with medical doctors and nurses dominating the participant panel population.

However, these two professions represent the largest groups of registered health workers in both countries (Organisation for Economic Cooperation and Development, 2023). The participants were purposively sampled, and the measures were distributed online, targeting health practitioners from any professional background. Given the significant presence of nurses and medical doctors in the two countries' health workforce profiles, more participants are expected to be recruited from these two groups, reflecting the Indonesian leading health workforce contributors to TB care.

Furthermore, most students involved in the ISVS and CPAT Australia studies already had experience working in healthcare teams. The students were still in tertiary education and not formally certified health practitioners; however, they had work experience in health centres or clinics such as aged care or disability care. Students' experiences working in healthcare teams provide two sides of a coin for this research. It is important to note that student experiences may lead to biased results compared to results from certified practitioners. Even though students may have significant work experience, they are still categorised as students in data analysis, which could skew the findings. However, the experience provides insight into some aspects of the measure items (i.e., capacity to work in an interprofessional team, understanding of role clarity in a team-based work), which they would not have been able to respond to had they not experienced interprofessional teamwork in the healthcare context.

Indonesian student participants, whose average study length was 3–4 years and who were in their first year of the clinical placement program, lacked extensive teamwork experience compared to their Australian counterparts. These students only had a basic understanding of interprofessional terms and concepts, limited by the lack of a cultural concept of working and studying simultaneously in Indonesia. Consequently, their limited experience may have led to biased responses.

It is important to note that the emphasis on IPE and IPCP has only gained significance in Australia and Indonesia over the past decade. This means that many practitioners involved in this research may have been educated in non-professional environments, leading to varied levels of understanding and experience in interprofessional collaborative practice. As a result, standardising this experience is challenging and greatly depends on the individual's years of work in the healthcare field.

Another limitation of the research is that the content validity of the CPAT Indonesia was not analysed. COSMIN highlights content validity requirements (assessing the items' relevance, comprehensibility, and comprehensiveness) as an essential aspect of a measure. However, because this research used a previously translated version for validation, the 53 Indonesian CPAT items were not piloted and thus not tested for content validity requirements. In addition, one subscale (*Conflict Management and Decision-making*) was weak in the previous two versions of the CPAT, a finding corroborated in the current two CPAT validation studies. Future studies should carefully examine the items corresponding to this subscale and consider developing new items using Item Response Theory (Rasch analysis) to verify the reliability and validity of those new items.

Finally, the interprofessional values adopted by the two validated measures are expected to adapt both the meaning conveyed in the measures' original language and the constructs underpinning them. As Australians are more closely related to Canadians historically and culturally compared to Indonesians, the adapted Australian ISVS and CPAT factorial model agreed more with the original measures developed in Canada than the Indonesian ISVS and CPAT.

8.7 Implication and Recommendation

8.7.1 Implications for Literature

The studies presented in Chapters 3, 4, 5, and 6 of this thesis focus on the cultural adaptation and validation of interprofessional outcome measures (ISVS and CPAT). These studies mark the first adaptation and validation of standardised measures for health practitioners and students in the field of interprofessional socialisation and collaborative practice in Australia and Indonesia. These studies fill a significant gap in the existing body of literature by providing validated and reliable invariant measures that both practitioners and students can use. Additionally, the study presented in Chapter 7 concerns the development of a measure to assess TB patient outcomes following an interprofessional-based care intervention, providing valuable new insights. The rigorous method of analysing psychometric properties used in this research also offers new alternatives, which can be leveraged as a benchmark for similar studies involving different measures.

8.7.2 Implication on Clinical Practice

A series of rigorous psychometric analyses carried out on the measures validated and developed by this program of research was not only conducted to satisfy the COSMIN prerequisites for measure development but also to ensure a clear understanding of the constructs underpinning interprofessional socialisation, interprofessional collaborative practice, and interprofessional TB outcome measures in their specific contexts. Gaining a profound understanding of health practitioners' and students' perceptions, attitudes, and behaviours towards interprofessional socialisation and collaborative practice in Australia and Indonesia represents a significant finding in itself, in addition to the successful provision of evidence-based information on the validity and reliability of these measures. Health practitioners and students are current and future healthcare providers in Australia and Indonesia. Understanding the constructs of IPE and IPCP as reflected by the practitioners and students, as well as their expectations and concerns, can help determine how best to engage these stakeholders and maximise their contributions to implementing an interprofessional care approach in Australia and Indonesia.

This program of research validates several generalisable findings related to collaborative teams that involve practitioners and students from various professional backgrounds, as seen in interprofessional care. These findings are encouraged to be integrated into the academic curriculum of health students and clinical practice to ensure IPE and IPCP learning occur on a continuum. These key findings are highlighted below.

Characteristics of *shared goals, team collaboration, communication*, and *role clarification* are fundamental to the success of interprofessional teams, as confirmed by this research and numerous studies. The learning outcomes of an IPE curriculum must focus on exploring these four characteristics, and their achievement includes the targeted competencies. Additionally, critical traits that are difficult to conceptualise and enact, such as *leadership, shared decision-making, conflict management*, and *patient involvement*, should be given dedicated focus in the curriculum to solidify them as targeted competencies.

Indistinct characteristics linked to *leadership, shared decision-making, conflict management*, and *patient involvement* may suggest a deficit in self-confidence or discomfort among practitioners and students. This could be attributed to the insufficient nurturing of these traits during education or the absence of opportunities for practitioners to demonstrate and receive validation for these skills in their practice. Education and health institutions are strongly urged to embrace more active learning methods and offer early clinical exposure to engage students and practitioners with hands-on experiences of these four aspects of IPCP. Engaging in discussions on real clinical scenarios is essential as it fosters active participation and enriches skills and knowledge for the practice environment.

Given the valid and reliable measures now available to assess the achievement of outcomes related to interprofessional socialisation and collaborative practice in Australia and Indonesia, it is possible to integrate these standardised outcome measures into learning and practice. These measures allow effective tracking of progress and improvement over the lifelong journey of health professionals, facilitate comparisons, and enhance the interpretation of findings across studies. Together, these measures ensure that targeted traits become an integral part of a graduate profile, a crucial step in enhancing the quality of education. This research could lead to care development to enhance IPE and IPCP, improve healthcare team collaboration, and ultimately benefit patients.

8.7.3 Recommendations for Future Research

The research outlined in this thesis represents a groundbreaking contribution, providing measures to evaluate interprofessional outcomes for healthcare students and practitioners in Australia and Indonesia and TB patients involved in interprofessional TB care in Indonesia. The Australian ISVS-21, CPAT, and Indonesian ISVS-19 and CPAT are readily available to healthcare students and practitioners in their respective settings. Yet, there are opportunities for future research. Enhancing the item construct underlying the measures through Rasch analysis (Item Response Theory), a method not previously utilised due to limited participants in the validation studies is highly recommended.

As the title of Chapter 7 of this thesis suggests, the newly developed TB-IP patient outcome measure presents the ‘first step’ in developing and testing patient outcome measures for IP-TB care in Indonesia. This study's findings support COSMIN requirements regarding content validity; all items are relevant to the construct being measured, understandable, and comprehensive, and they have shown promise through multilevel Delphi studies, marking a major step forward. Although the measure has established its construct, a considerable amount of work must be done before it is ready for use, including piloting and validating the measure with TB patients, to name a few.

Emphasising the patient's role as the primary user of the measure is essential. COSMIN taxonomy and standards of psychometric properties should steer future analyses with patients, ensuring their voices are included in the instrument. As per COSMIN recommendations, future studies should aim to trial and validate the interprofessional-TB care outcome measure with patients. The measure will undergo validation using a representative sample of TB patients. Similar to ISVS and CPAT, the validation data will undergo a thorough assessment to evaluate its psychometric properties utilising classic test theory (CTT) and item response theory (IRT; Rasch analyses). This comprehensive analysis will encompass testing the internal structure, ensuring structural validity, internal consistency reliability, and conducting hypothesis testing for construct validity. In addition, as the reproducibility of the measure is essential, patients' responses before and after receiving interprofessional TB care will be compared, allowing the researcher to gauge the instrument's responsiveness to the changes brought about by the intervention. These future studies are outlined in Figure 8.1 below.

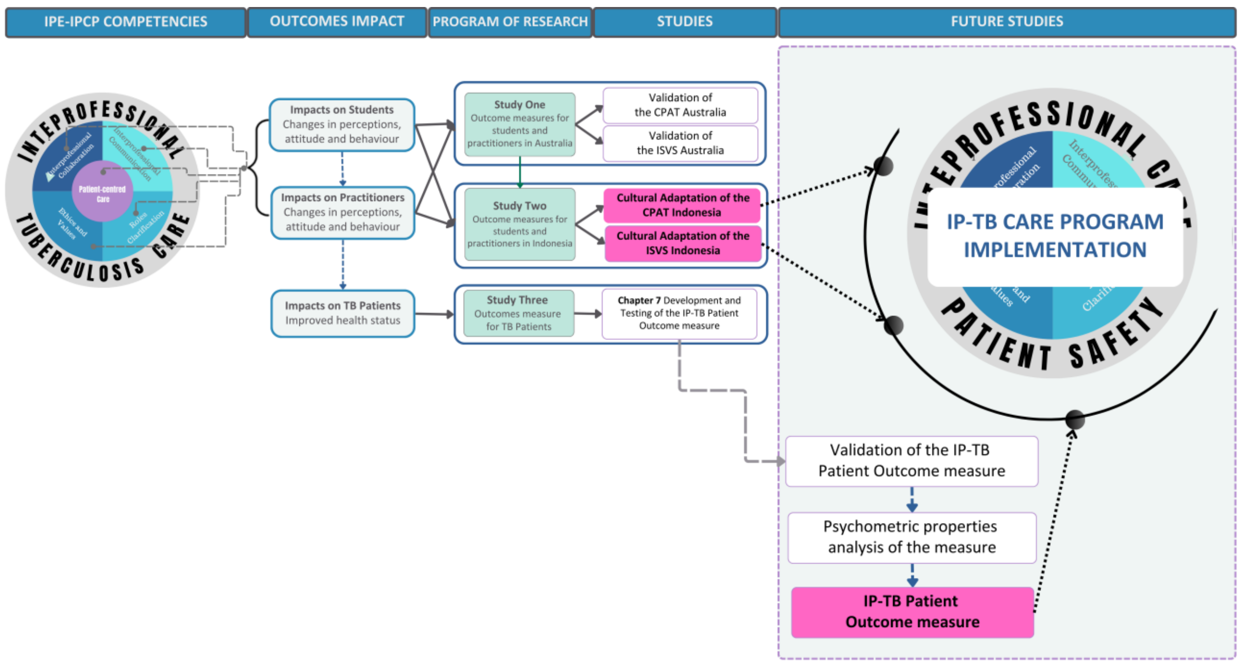


Figure 8.1 Future Studies

Once all targeted measures become available for use (measures coloured pink in Figure 8.1 have been validated according to COSMIN requirements), the study will swiftly move forward in achieving its ultimate objective, to create interprofessional outcome measures for practitioners, students, and patients to streamline the implementation of an interprofessional TB care program in Indonesia. These validated measures would be instrumental in making the IP-TB care program a reality, as they offer a means to continuously monitor progress, improvements, and the attainment of interprofessional outcomes by all stakeholders involved. These measures are essential for evaluating the effectiveness and success of the IP-TB care program.

8.8 Conclusion

The instruments used in this program of research aimed to overcome the limitations identified in existing instruments used to measure interprofessional outcomes in Australia and Indonesia. It is concerning that ISVS-21 and CPAT are still being used in many settings and countries without validation. The use of unvalidated ISVS-21 and

CPAT suggests that these instruments are deemed suitable for evaluating interprofessional outcomes in the contexts in which they are employed, even though the instruments are not yet validated.

Before this program of research, there was a notable lack of validated outcome measures for health practitioners and students in Australia and Indonesia. The methods discussed in this thesis are cutting-edge and boast significant value in data collection and analysis, utilising modern statistical procedures for measure validation and development.

This thesis makes an essential contribution to the evidence base by providing quality measures with good psychometric properties regarding content validity, internal structure (i.e., structural validity, internal consistency reliability, and measurement invariance), and hypotheses testing to measure the interprofessional outcomes for 1) healthcare students in Australia and Indonesia; 2) healthcare practitioners in Australia and Indonesia; and 3) TB patients involved in interprofessional TB care in Indonesia. The availability of the quality, valid, and reliable measures developed provides a robust scientific basis for evaluating, determining treatment progress, and assessing the efficacy of interprofessional approaches to TB intervention.

As I close this chapter, I am reminded of the power of resilience and determination. May this research contribute to:

1. Evaluating the implementation and effectiveness of IPE and IPCP in health and education institutions in Australia and Indonesia.
2. Assessing the impact of an IPE program on practitioners and students from diverse health professional backgrounds, informing strategies for improving collaboration and patient care.
3. Pioneering the evaluation of IP-TB care on patient health outcomes, providing a foundation for future research and quality improvement initiatives.

I look forward to future endeavours armed with the knowledge, skills, and connections forged during this transformative experience. These contributions have important implications for healthcare education, practice, and policy, ultimately enhancing the quality of patient care and outcomes.

8.9 References

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Copyright Statement

Every reasonable effort has been made to acknowledge the owners of the copyrighted material used in this thesis. The original authors of the questionnaires and models used were contacted, and written approval was obtained for their use in the PhD research. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Signature: ________________________

September 19, 2024

Appendix A Human Research Ethics Committee Approval

A.1 Curtin Human Research Ethics Committee

A.1.1 Ethics Approval

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

21-May-2021

Name: Reinie Cordier
Department/School: Curtin School of Allied Health
Email: Reinie.Cordier@curtin.edu.au

Dear Reinie Cordier

RE: Ethics Office approval
Approval number: HRE2021-0274

Thank you for submitting your application to the Human Research Ethics Office for the project **Interprofessional education outcome measures on Tuberculosis care in Community-based settings in Indonesia (The Australian Studies)**.

Your application was reviewed through the Curtin University Low risk review process.

The review outcome is: **Approved.**

Your proposal meets the requirements described in the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007).*

Approval is granted for a period of one year from **21-May-2021** to **20-May-2022**. 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
Cordier, Reinie	CI
Brewer, Margo	Co-Inv
Madjid, Bau Dilam Ardyansyah	Co-Inv

Approved documents:

Document

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the approved proposal and/or regulatory guidelines
   - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)

4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the Western Australian University Sector Disposal Authority (WAUSDA) and the Curtin University Research Data and Primary Materials policy
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Special Conditions of Approval

It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

This letter constitutes low risk/negligible risk 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

A.1.2 Ethics Extension 1

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

27-Apr-2022

Name: Reinie Cordier
Department/School: Curtin School of Allied Health
Email: Reinie.Cordier@curtin.edu.au

Dear Reinie Cordier

RE: Annual report acknowledgment
Approval number: HRE2021-0274

Thank you for submitting an annual report to the Human Research Ethics Office for the project **Interprofessional education outcome measures on Tuberculosis care in Community-based settings in Indonesia (The Australian Studies)**.

The Human Research Ethics Office acknowledges the project is ongoing and approval will remain current until 19-May-2023.

Special Condition of Approval Extension.

It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the HREC approved protocol procedures and/or regulatory guidelines
   - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
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11. Ethics approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Yours sincerely

A.1.3 Ethics Extension 2

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

03-May-2023

Name: Reinie Cordier
Department/School: Curtin School of Allied Health
Email: Reinie.Cordier@curtin.edu.au

Dear Reinie Cordier

RE: Annual report acknowledgment
Approval number: HRE2021-0274

Thank you for submitting an annual report to the Human Research Ethics Office for the project **Interprofessional education outcome measures on Tuberculosis care in Community-based settings in Indonesia (The Australian Studies)**.

The Human Research Ethics Office acknowledges the project is ongoing and approval will remain current until 19-May-2024.

Special Condition of Approval Extension.

It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
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12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Yours sincerely

A.1.4 Ethics Extension 3

Curtin University

Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

18-Apr-2024

Name: Reinie Cordier
Department/School: Curtin School of Allied Health
Email: Reinie.Cordier@curtin.edu.au

Dear Reinie Cordier

RE: Annual report acknowledgment
Approval number: HRE2021-0274

Thank you for submitting an annual report to the Human Research Ethics Office for the project **Interprofessional education outcome measures on Tuberculosis care in Community-based settings in Indonesia (The Australian Studies).**

The Human Research Ethics Office acknowledges the project is ongoing and approval will remain current until 18-May-2025.

Special Condition of Approval Extension.

It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the HREC approved protocol procedures and/or regulatory guidelines
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3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
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10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Ethics approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Should you have any queries regarding consideration of your project, please contact the Ethics Office at hrec@curtin.edu.au or on 9266 9223.

Yours sincerely

A.2 Hasanuddin University Research Ethics Committee

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN FAKULTAS KEDOKTERAN
KOMITE ETIK PENELITIAN UNIVERSITAS HASANUDDIN
RSPTN UNIVERSITAS HASANUDDIN
RSUP Dr. WAHIDIN SUDIROHUSODO MAKASSAR
Sekretariat : Lantai 2 Gedung Laboratorium Terpadu
JL.PERINTIS KEMERDEKAAN KAMPUS TAMALANREA KM.10 MAKASSAR 90245.
Contact Person: dr. Agussalim Bukhari.,MMed,PhD, SpGK TELP. 081241850858, 0411 5780103, Fax : 0411-581431

<u>REKOMENDASI PERSETUJUAN ETIK</u>

Nomor : 170/UN4.6.4.5.31/ PP36/ 2023

Tanggal: 15 Maret 2023

Dengan ini Menyatakan bahwa Protokol dan Dokumen yang Berhubungan Dengan Protokol berikut ini telah mendapatkan Persetujuan Etik :

No Protokol	UH23030159	No Sponsor Protokol	
Peneliti Utama	**dr. Bau Dilam Ardyansyah, MBSc. MHPE**	Sponsor	
Judul Peneliti	Interprofessional education outcome measures on Tuberculosis care in Community-based settings in Indonesia		
No Versi Protokol	**1**	Tanggal Versi	**6 Maret 2023**
No Versi PSP	**1**	Tanggal Versi	**6 Maret 2023**
Tempat Penelitian	Indonesia		
Jenis Review	[X] Exempted [ ] Expedited [ ] Fullboard Tanggal	Masa Berlaku **15 Maret 2023** sampai **15 Maret 2024**	Frekuensi review lanjutan
Ketua KEP Universitas Hasanuddin	Nama **Prof.Dr.dr. Suryani As'ad, M.Sc.,Sp.GK (K)**	Tanda tangan	
Sekretaris KEP Universitas Hasanuddin	Nama **dr. Agussalim Bukhari, M.Med.,Ph.D.,Sp.GK (K)**	Tanda tangan	

Kewajiban Peneliti Utama:

- Menyerahkan Amandemen Protokol untuk persetujuan sebelum di implementasikan
- Menyerahkan Laporan SAE ke Komisi Etik dalam 24 Jam dan dilengkapi dalam 7 hari dan Lapor SUSAR dalam 72 Jam setelah Peneliti Utama menerima laporan
- Menyerahkan Laporan Kemajuan (progress report) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah
- Menyerahkan laporan akhir setelah Penelitian berakhir
- Melaporkan penyimpangan dari prokol yang disetujui (protocol deviation / violation)
- Mematuhi semua peraturan yang ditentukan

Appendix B Information Sheets and Consent Forms

B.1 Studies in Australia (Chapters 3 and 4)

B.1.1 Pilot Study

Information Statement

Research on Interprofessional Education and Collaborative Practice in Health: A Pilot Study

<u>What is the research about?</u>
Preparing health practitioners for the interprofessional workforce is a fundamental issue in healthcare globally. The World Health Organisation states that all health practitioners need to be provided with opportunities to engage in interprofessional education to build their competencies for interprofessional practice. The World Health Organisation defines **interprofessional education** is occurring "when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes", and **collaborative practice** is occurring "when multiple health workers from different professional background provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across setting". While interprofessional education has gained attention in many countries, including Australia and Indonesia, the quality of outcome measures remains a concern. To facilitate the advancement of interprofessional education research, this pilot study aims to trial two instruments to identify components that need improvement and ensure their applicability. The instruments are self-rating measures developed in Canada. Findings from this Australian study will inform the development of an Indonesian version of the instrument.

<u>Who is doing the research?</u>
The project is being conducted by Bau Dilam Ardyansyah Madjid, a PH.D candidate under the supervision of A/Professor Reinie Cordier and A/Professor Margo Brewer. The Ph.D candidate is a sponsored student of the Australia Award Scholarship.

<u>Why am I being asked to take part and what will I have to do?</u>
You have been asked to participate in this study because you are someone with a relevant health professional/educational background. You will be presented with the two instruments and requested to rate each item on the importance of the item and the clarity of the item using a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). To further explore your opinion, if you opt for 'disagree' or 'strongly disagree', you will be invited to provide your alternative wording for this rating. In addition, you will be asked to suggest items for inclusion you felt were missing. If further testing of the revised version of the instrument is required, you will be asked to complete the new version within three weeks of the first test. Therefore, if you agree to participate, you will be asked to

complete the: a) preliminary pilot testing, b) subsequent pilot testing (if required). We will notify you if subsequent pilot testing is needed. The survey will take approximately 20 minutes to be completed online using the online survey tool Qualtrics. The survey will remain accessible for a month. You can leave the survey multiple times and come back later where you left off if you use the same computer and the same web browser each time. There will be no cost for you taking part in the survey.

Are there benefits to being in the research project?
There may be no direct benefit for participating in this study, however, your participation may improve your understanding of relevant aspects related to teamwork in health that can be beneficial for your future practice. You will also be contributing to interprofessional education research in Australia and Indonesia.

Participation in this pilot study places you in a draw prize of **one pair of Apple Airpods with a charging case (2nd Gen),** valued at $250. If you are interested in entering the draw prize, please provide your email address in the next section allocated for it. The prize draw will be performed in front of the student's researcher supervisory team no later than two weeks after the closing date. You will be notified of the result through your provided email address no later than one week after the prize draw is performed. If you win the prize, the prize will be sent to your address no later than one week after you provide your postal address.

Are there any risks, discomforts or inconveniences from being in the research?
There are no foreseeable risks from this research project. Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study.

Who will have access to my information?
To protect your identity, any information in the data that identifies you will be replaced with a code. Only the research team will have access to the codes to match your name if it is necessary to do so. Any information we collect will be treated as confidential and used only in this project unless otherwise specified. The following people will have access to the information we collect in this research: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research. Development Electronic data will be password-protected and hard copy data will be in locked storage. The information we collect in this study will be kept under secure conditions at Curtin University for at least 7 years after the research has ended and then it will be destroyed. The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented.

What happens next and who can I contact about the research?
If you need further information or question about the study, you can contact Bau Dilam Ardyansyah Madjid through email: bau.madjid@postgrad.curtin.edu.au. If you decide to participate, please click 'Continue' at the bottom right of this page, and you will be directed to provide your consent in the Consent section, after which the survey will commence. If you do not want to take part, please exit this window. Curtin University Human Research Ethics Committee (HREC) has approved this study (**Approval number: HRE2021-0274**). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.

PARTICIPANT CONSENT FORM

HREC Project Number:	**HRE2020-0382**
Project Title:	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Chief Investigator:	Professor Reinie Cordier
Student researcher:	Bau Dilam Ardyansyah

- I have read the information statement, and I understand its contents.
- I believe I understand the purpose, extent and possible risks of my involvement in this project.
- I acknowledge that I fulfil the below criteria:
    1. A health practitioner with at least one year of experience collaborating within a healthcare team with other practitioners from different professional backgrounds
    2. A health student from any educational background with at least one year of experience working within a healthcare team with other students from different educational backgrounds.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions, and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

OPTIONAL CONSENT TICK BOXES

Participant Name	
Participant Signature	
Date	

☐ I do	☐ I do not	consent to be contacted about future research projects that are related to this project
☐ I do	☐ I do not	consent to the storage and use of my information in future ethically approved research projects related to this project

Declaration by the researcher: I have supplied an Information Letter and Consent Form to the participant who has signed the above

Name	
Researcher Signature	
Date	

Researcher

Note: All parties signing the Consent Form must date their own signature

B.1.2 Validation Study

Information Statement

Research on Interprofessional Education and Collaborative Practice in Health: A Validation Study

What is the research about?

Preparing health practitioners for the interprofessional workforce is a fundamental issue in healthcare globally. The World Health Organisation states that all health practitioners need to be provided with opportunities to engage in interprofessional education to build their competencies for interprofessional practice. The World Health Organisation defines interprofessional education as occurring "when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes", and interprofessional collaborative practice as occurring "when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across setting".

While interprofessional education has gained attention in many countries, including Australia and Indonesia, the quality of outcome measures remains a concern. To facilitate the advancement of interprofessional education and practice research, this study aims to validate two instruments that are self-rating measures developed in Canada. Findings from this Australian study will inform the development of an Indonesian version of the instrument.

Who is doing the research?

The project is being conducted by Bau Dilam Ardyansyah Madjid, a Ph.D candidate under the supervision of Professor Reinie Cordier, A/Professor Margo Brewer, Professor Jaya Dantas, and Dr David Parsons. The Ph.D candidate is a sponsored student of the Australia Award Scholarship.

Why am I being asked to take part and what will I have to do?

You have been asked to participate in this study because you are someone with a relevant health professional background.

The purpose of this stage is to validate two interprofessional outcome measures (instruments). You will be presented with the two instruments and asked to rate each statement based on your interprofessional team experience within Australia using a 7-point Likert scale (from a scale value of *1='Strongly Disagree'* to *7='Strongly Agree',* or from a scale value of *0='Not at all'* to *6= 'To a very great extent'*). The survey will take approximately 15 minutes to complete using the online survey tool Qualtrics. The survey will remain accessible for two months. You can leave the survey multiple times and come back later where you left off if you use the same computer and the same web browser each time. There will be no cost for you taking part in the survey.

Are there benefits to being in the research project?

There may be no direct benefit for participating in this study, however, your participation may improve your understanding of relevant aspects related to teamwork in health that can be beneficial for your future practice. You will also be contributing to interprofessional education research in Australia and Indonesia.

Participation in this study places you in a draw prize of three pairs of Apple Airpods with a charging case (2nd Gen), valued at $250. If you are interested in entering the draw prize, please provide your email address in the next section allocated for it. The prize draw will be performed in front of the student's researcher supervisory team no later than two weeks after the closing date.

If you win the prize, you will be notified of the result through your provided email address no later than one week after the prize draw is performed, and the prize will be sent to your address no later than one week after you provide your postal address.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

There are no foreseeable risks from this research project. Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study.

What happens next and who can I contact about the research?

If you need further information or question about the study, you can contact Bau Dilam Ardyansyah Madjid through email: bau.madjid@postgrad.curtin.edu.au. If you decide to participate, please click 'Continue' at the bottom right of this page, and you will be directed to provide your consent in the Consent section, after which the survey will commence. If you do not want to take part, please exit this window. Curtin University Human Research Ethics Committee (HREC) has approved this study (Approval number: HRE2021-0274). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

PARTICIPANT CONSENT FORM

HREC Project Number:	**HRE2020-0382**
Project Title:	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Chief Investigator:	Professor Reinie Cordier
Student researcher:	Bau Dilam Ardyansyah

- I have read the information statement, and I understand its contents.
- I believe I understand the purpose, extent and possible risks of my involvement in this project.
- I acknowledge that I fulfil the below criteria:
  3. A health practitioner with at least one year of experience collaborating within a healthcare team with other practitioners from different professional backgrounds
  4. A health student from any educational background with at least one year of experience working within a healthcare team with other students from different educational backgrounds.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions, and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

OPTIONAL CONSENT TICK BOXES

Participant Name	
Participant Signature	
Date	

☐ I do	☐ I do not	consent to be contacted about future research projects that are related to this project
☐ I do	☐ I do not	consent to the storage and use of my information in future ethically approved research projects related to this project

Declaration by the researcher: I have supplied an Information Letter and Consent Form to the participant who has signed the above

Name	
Researcher Signature	
Date	

Note: All parties signing the Consent Form must date their own signature

B.2 Studies in Indonesia (Chapters 5 and 6)

B.2.1 Pilot Study

Information Statements
Penelitian tentang Pendidikan Interprofesional
dan Praktik Kolaboratif dalam Kesehatan (Uji Pilot)

Survey ini membahas tentang apa?

Survey ini adalah suatu Uji Pilot terhadap dua set instrument yang telah diterjemahkan dari bahasa aslinya ke Bahasa Indonesia. Instrumen-instrumen ini akan digunakan untuk mengukur dan memberikan gambaran praktik kolaboratif profesi kesehatan di Indonesia. Pendidikan dan Kolaborasi Interprofesi. Dengan menempatkan praktisi-praktisi kesehatan dari berbagai latar belakang pendidikan yang berbeda pada unit yang sama di rumah sakit atau pusat pelayanan kesehatan lainnya, tidak dapat secara otomatis diartikan bahwa para praktisi kesehatan ini melakukan praktik kolaboratif secara interprofesi.

Satu hal yang menandakan praktik kolaboratif interprofesi adalah jika para praktisi kesehatan dari minimal dua latar belakang profesi kesehatan yang berbeda, bekerja dan belajar bersama, dari, dan tentang satu sama lain, dengan melibatkan pasien, keluarga pasien, dan masyarakat untuk mengejar pencapaian satu tujuan bersama, yaitu memberikan pelayanan komprehensif dengan kualitas terbaik pada setiap prosesnya untuk pasien/klien.

Pendekatan pelayanan kesehatan secara interprofesional dilaporkan memberi perubahan bermakna terhadap: 1). Kerjasama TIM Penyedia pelayanan kesehatan. Secara khusus terkait: Kepuasan praktisi kesehatan dalam melakukan pelayanan, Akses dan koordinasi pelayanan kesehatan, Konflik antar praktisi, Tingkat kesalahan dalam prosedur klinis. 2). Sistem kesehatan dan program manajemen penyakit. Secara khusus terkait: Pembentukan dan implementasi tim layanan kesehatan primer untuk pasien dengan penyakit kronis, Pengujian medis yang berlebihan dengan biaya yang tidak perlu, Penggunaan yang tepat dari sumber daya klinis spesialis dan praktisi kesehatan dari latar belakang pendidikan yang berbeda.
3). Perawatan dan keselamatan pasien. Secara khusus terkait: Tingkat kepuasan pasien, Jumlah komplikasi, Lama inap di rumah sakit, Frekuensi masuk rumah sakit, Lama pengobatan, Kepatuhan terhadap pengobatan, Biaya perawatan, Presentasi gejala, Status kesehatan secara keseluruhan.

WHO mengindikasikan kebutuhan mendesak untuk mengintegrasikan pendidikan interprofesi ke dalam pendidikan dan layanan kesehatan primer secara global untuk memperkuat sistem perawatan kesehatan nasional setiap negara. Pendidikan interprofesi mempersiapkan tenaga kesehatan yang saat ini berada dalam fase pendidikan dan pelatihan, untuk menjadi tenaga kesehatan yang siap pakai dengan pengalaman melakukan praktik kolaboratif dengan sesama sejawatnya para praktisi kesehatan dari berbagai latar belakang pendidikan yang berbeda.

Mengapa saya diundang untuk berpartisipasi dalam penelitian ini dan apa yang harus saya lakukan?
Anda diminta untuk berpartisipasi karena Anda adalah target responden yang memiliki peran berkaitan dengan latar belakang pendidikan Anda yang berbasis kesehatan.

Dua instrumen telah dipilih untuk mengukur outcome pendidikan interprofesional dan praktik kolaboratif di Indonesia. Tujuan dari tahap ini adalah untuk menilai apakah makna setiap item dipahami secara akurat dan menghilangkan kemungkinan kebingungan atas pernyataan yang tidak jelas. Anda akan diminta untuk:
1. menilai setiap item mengenai pentingnya (relevansi) item tersebut dan kejelasan (pemahaman) item tersebut menggunakan skala Likert 5 poin (dari 1=sangat tidak setuju hingga 5= sangat setuju).
2. mengeksplorasi pendapat Anda lebih jauh, jika Anda memilih 'tidak setuju' atau 'sangat tidak setuju', Anda akan diminta untuk memberikan kata-kata alternatif untuk item tersebut.
3. memberikan pendapat mengenai kelengkapan item (sebagai instrumen) dalam mencerminkan konstruk yang akan diukur.

Semua informasi yang Anda berikan akan dijadikan sebagai input untuk proses pilot kuisioner ini. Proses yang Anda butuhkan untuk menjawab pertanyaan-pertanyaan yang ada sekitar 10-15 menit secara online. Anda tidak akan dimintai biaya apapun terkait keterlibatan Anda dalam penelitian ini, dan Anda tidak akan mendapatkan bayaran dengan keikutsertaan Anda.

Siapa yang melakukan penelitian?
Penelitian ini dilaksanakan oleh Bau Dilam Ardyansyah Madjid, staf pengajar di Fakultas Kedokteran Universitas Hasanuddin yang sedang menempuh pendidikan doctoral di Curtin University, di bawah bimbingan Professor Reinie Cordier, A/Professor Margo Brewer, and Professor Jaya Dantas. Peneliti adalah penerima beasiswa dari Australia Award Scholarship.

Siapa saja yang dapat mengakses informasi yang saya berikan?
Keterangan yang Anda berikan akan diberi kode. Hal ini berarti bahwa tidak akan ada data mengidentifikasi Anda. Segala informasi yang mengandung data identifikasi pada dokumen yang Anda gunakan akan dihapus atau diganti dengan kode. Hanya tim peneliti yang memahami makna kode untuk keperluan pencocokan nama jika diperlukan. Segala informasi yang kami kumpulkan akan dirahasiakan dan hanya akan digunakan dalam penelitian ini

Apa yang terjadi selanjutnya dan siapa yang dapat Saya hubungi terkait survey ini?
Jika Anda memiliki pertanyaan terkait survey ini Anda dapat menghubungi Bau Dilam Ardyansyah melaui email: bau.madjid@postgrad.curtin.edu.au.
Komite Etik Penelitian pada Manusia, Curtin University Australia telah menyetujui penelitian ini (Nomor HREC HRE2020-0382). Jika Anda ingin mendiskusikan dengan pihak yang tidak terlibat secara langsung, khususnya, hal yang berkaitan dengan masalah tentang penelitian ini atau mengenai hak Anda sebagai peserta, atau Anda ingin mengajukan keluhan yang sifatnya rahasia, Anda dapat menghubungi petugas etika melalui telepon (08) 9266 9223 atau manajer Research Integrity pada (08) 9266 7093 atau melalui email hrec@curtin.edu.au.

LEMBAR PERSETUJUAN PARTISIPAN

Nomor Persetujuan Etik	**HRE2020-0382 (HREC); 170/UN4.6.4.5.31/ PP36/2023 (UNHAS)**
Judul Penelitian	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Peneliti Utama	Professor Reinie Cordier
Siswa Peneliti	Bau Dilam Ardyansyah

- Saya telah membaca pernyataan informasi yang ada di atas dan saya paham.
- Saya yakin telah memahami tujuan, cakupan dan kemungkinan resiko atas keterlibatan dalam penelitian ini.
- Saya mengakui bahwa saya memenuhi salah satu kriteria di bawah ini:
    1. **Praktisi kesehatan / staf akademik** dari salah satu program studi berikut: Farmasi, Fisioterapi, Kebidanan, Kedokteran, Kedokteran Gigi, Keperawatan, Kesehatan Masyarakat, Psikologi
    2. **Mahasiswa aktif** dari salah program studi berikut: Farmasi, Fisioterapi, Kebidanan, Kedokteran, Kedokteran Gigi, Keperawatan, Kesehatan Masyarakat, Psikologi yang sedang berada pada fase klinik. **Mahasiswa aktif** dari program studi Kesehatan Masyarakat atau Psikologi yang sedang berada pada semester terakhir/baru saja lulus
- Saya secara sukarela setuju untuk berpartisipasi dalam penelitian ini.
- Saya telah mendapatkan kesempatan untuk mengajukan pertanyaan dan puas dengan jawaban yang saya terima.
- Saya memahami bahwa penelitian ini telah disetujui oleh Komite Etik Penelitian pada Manusia, Curtin University (HREC) dan Komite Etik Fakultas Kedokteran Universitas Hasanuddin dan akan dilaksanakan sesuai dengan ketentuan yang ada dalam *The National Statement on Ethical Conduct in Human Research* (2007).
- Saya mengetahui bahwa saya akan mendapatkan salinan Pernyataan Informasi dan Lembar Persetujuan.

KOLOM PERSETUJUAN TAMBAHAN

☐ Saya bersedia	☐ Saya tidak bersedia	memberikan persetujuan untuk dapat dihubungi terkait penelitian ini
☐ Saya bersedia	☐ Saya tidak bersedia	Memberikan persetujuan untuk penyimpanan dan penggunaan data Saya pada masa yang akan datang untuk kepentingan penelitian lain terkait penelitian ini

Nama Partisipan	
Tanda Tangan	
Tanggal	

Pernyataan Peneliti: saya telah memberikan lembar informasi dan lembar persetujuan kepada partisipan

Catatan: Semua pihak yang bertandatangan harus mencantumkan tanggal penandatanganannya sendiri

B.2.2 Validation Study

Information Statements
Penelitian tentang Pendidikan Interprofesional
dan Praktik Kolaboratif dalam Kesehatan (Uji Validasi)

Survey ini membahas tentang apa?

Survey ini adalah suatu Uji Validasi terhadap dua set instrument yang telah diterjemahkan dari bahasa aslinya ke Bahasa Indonesia, dan telah melalui Uji PILOT. Instrumen-instrumen ini akan digunakan untuk mengukur dan memberikan gambaran praktik kolaboratif profesi kesehatan di Indonesia.

Pendidikan dan Kolaborasi Interprofesi. Dengan menempatkan praktisi-praktisi kesehatan dari berbagai latar belakang pendidikan yang berbeda pada unit yang sama di rumah sakit atau pusat pelayanan kesehatan lainnya, tidak dapat secara otomatis diartikan bahwa para praktisi kesehatan ini melakukan praktik kolaboratif secara interprofesi.

Satu hal yang menandakan praktik kolaboratif interprofesi adalah jika para praktisi kesehatan dari minimal dua latar belakang profesi kesehatan yang berbeda, bekerja dan belajar bersama, dari, dan tentang satu sama lain, dengan melibatkan pasien, keluarga pasien, dan masyarakat untuk mengejar pencapaian satu tujuan bersama, yaitu memberikan pelayanan komprehensif dengan kualitas terbaik pada setiap prosesnya untuk pasien/klien.

Pendekatan pelayanan kesehatan secara interprofesional dilaporkan memberi perubahan bermakna terhadap: 1). Kerjasama TIM Penyedia pelayanan kesehatan. Secara khusus terkait: Kepuasan praktisi kesehatan dalam melakukan pelayanan, Akses dan koordinasi pelayanan kesehatan, Konflik antar praktisi, Tingkat kesalahan dalam prosedur klinis. 2). Sistem kesehatan dan program manajemen penyakit. Secara khusus terkait: Pembentukan dan implementasi tim layanan kesehatan primer untuk pasien dengan penyakit kronis, Pengujian medis yang berlebihan dengan biaya yang tidak perlu, Penggunaan yang tepat dari sumber daya klinis spesialis dan praktisi kesehatan dari latar belakang pendidikan yang berbeda.
3). Perawatan dan keselamatan pasien. Secara khusus terkait: Tingkat kepuasan pasien, Jumlah komplikasi, Lama inap di rumah sakit, Frekuensi masuk rumah sakit, Lama pengobatan, Kepatuhan terhadap pengobatan, Biaya perawatan, Presentasi gejala, Status kesehatan secara keseluruhan

WHO mengindikasikan kebutuhan mendesak untuk mengintegrasikan pendidikan interprofesi ke dalam pendidikan dan layanan kesehatan primer secara global untuk memperkuat sistem perawatan kesehatan nasional setiap negara.
Pendidikan interprofesi mempersiapkan tenaga kesehatan yang saat ini berada dalam fase pendidikan dan pelatihan, untuk menjadi tenaga kesehatan yang siap pakai dengan pengalaman melakukan praktik kolaboratif dengan sesama sejawatnya para praktisi kesehatan dari berbagai latar belakang pendidikan yang berbeda.

Mengapa saya diundang untuk berpartisipasi dalam penelitian ini dan apa yang harus saya lakukan?
Anda diminta untuk berpartisipasi karena Anda adalah target responden yang memiliki peran berkaitan dengan latar belakang pendidikan Anda yang berbasis kesehatan. Tahap ini adalah UJI VALIDASI. Berdasarkan pengalaman kolaborasi Anda dengan praktisi kesehatan lainnya pada berbagai lingkungan kerja, pendidikan dan pelatihan, Anda akan diminta untuk menjawab pertanyaan-pertanyaan yang tertera. Jawaban yang sesuai dengan kondisi dan persepsi Anda akan sangat bermanfaat dalam proses validasi ini.

Semua informasi yang Anda berikan akan dijadikan sebagai input untuk proses validasi kuisioner ini. Proses yang Anda butuhkan untuk menjawab pertanyaan-pertanyaan yang ada sekitar 10-15 menit secara online. Anda tidak akan dimintai biaya apapun terkait keterlibatan Anda dalam penelitian ini, dan Anda tidak akan mendapatkan bayaran dengan keikutsertaan Anda.

Siapa yang melakukan penelitian?
Penelitian ini dilaksanakan oleh Bau Dilam Ardyansyah Madjid, staf pengajar di Fakultas Kedokteran Universitas Hasanuddin yang sedang menempuh pendidikan doctoral di Curtin University, di bawah bimbingan A/Professor Reinie Cordier, A/Professor Margo Brewer, and Professor Jaya Dantas. Peneliti adalah penerima beasiswa dari Australia Award Scholarship.

Siapa saja yang dapat mengakses informasi yang saya berikan?
Keterangan yang Anda berikan akan diberi kode. Hal ini berarti bahwa tidak akan ada data mengidentifikasi Anda. Segala informasi yang mengandung data identifikasi pada dokumen yang Anda gunakan akan dihapus atau diganti dengan kode. Hanya tim peneliti yang memahami makna kode untuk keperluan pencocokan nama jika diperlukan. Segala informasi yang kami kumpulkan akan dirahasiakan dan hanya akan digunakan dalam penelitian ini

Apa yang terjadi selanjutnya dan siapa yang dapat Saya hubungi terkait survey ini?
Jika Anda memiliki pertanyaan terkait survey ini Anda dapat menghubungi Bau Dilam Ardyansyah melaui email: bau.madjid@postgrad.curtin.edu.au.

Komite Etik Penelitian pada Manusia, Curtin University Australia telah menyetujui penelitian ini (Nomor HREC HRE2020-0382). Jika Anda ingin mendiskusikan dengan pihak yang tidak terlibat secara langsung, khususnya, hal yang berkaitan dengan masalah tentang penelitian ini atau mengenai hak Anda sebagai peserta, atau Anda ingin mengajukan keluhan yang sifatnya rahasia, Anda dapat menghubungi petugas etika melalui telepon (08) 9266 9223 atau manajer Research Integrity pada (08) 9266 7093 atau melalui email hrec@curtin.edu.au.

LEMBAR PERSETUJUAN PARTISIPAN

Nomor Persetujuan Etik	**HRE2020-0382 (HREC); 170/UN4.6.4.5.31/ PP36/2023 (UNHAS)**
Judul Penelitian	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Peneliti Utama	Professor Reinie Cordier
Siswa Peneliti	Bau Dilam Ardyansyah

- Saya telah membaca pernyataan informasi yang ada di atas dan saya paham.
- Saya yakin telah memahami tujuan, cakupan dan kemungkinan resiko atas keterlibatan dalam penelitian ini.
- Saya mengakui bahwa saya memenuhi salah satu kriteria di bawah ini:
  3. **Praktisi kesehatan / staf akademik** dari salah satu program studi berikut: Farmasi, Fisioterapi, Kebidanan, Kedokteran, Kedokteran Gigi, Keperawatan, Kesehatan Masyarakat, Psikologi
  4. **Mahasiswa aktif** dari salah program studi berikut: Farmasi, Fisioterapi, Kebidanan, Kedokteran, Kedokteran Gigi, Keperawatan, Kesehatan Masyarakat, Psikologi yang sedang berada pada fase klinik. **Mahasiswa aktif** dari program studi Kesehatan Masyarakat atau Psikologi yang sedang berada pada semester terakhir/baru saja lulus
- Saya secara sukarela setuju untuk berpartisipasi dalam penelitian ini.
- Saya telah mendapatkan kesempatan untuk mengajukan pertanyaan dan puas dengan jawaban yang saya terima.
- Saya memahami bahwa penelitian ini telah disetujui oleh Komite Etik Penelitian pada Manusia, Curtin University (HREC) dan Komite Etik Fakultas Kedokteran Universitas Hasanuddin dan akan dilaksanakan sesuai dengan ketentuan yang ada dalam *The National Statement on Ethical Conduct in Human Research* (2007).
- Saya mengetahui bahwa saya akan mendapatkan salinan Pernyataan Informasi dan Lembar Persetujuan.

KOLOM PERSETUJUAN TAMBAHAN

☐ Saya bersedia	☐ Saya tidak bersedia	memberikan persetujuan untuk dapat dihubungi terkait penelitian ini
☐ Saya bersedia	☐ Saya tidak bersedia	Memberikan persetujuan untuk penyimpanan dan penggunaan data Saya pada masa yang akan datang untuk kepentingan penelitian lain terkait penelitian ini

Nama Partisipan	
Tanda Tangan	
Tanggal	

Pernyataan Peneliti: saya telah memberikan lembar informasi dan lembar persetujuan kepada partisipan

Catatan: Semua pihak yang bertandatangan harus mencantumkan tanggal penandatangananannya sendiri

B.3 The IP-TB Patient Outcome Measure (Chapter 7)

B.3.1 Delphi Study: International Participants

Information Statement

Research on Interprofessional Education and Collaborative Practice in Health: A Delphi Study

What is the research about?

Preparing health practitioners for the interprofessional workforce is a fundamental issue in healthcare globally. The World Health Organization (WHO) states that all health practitioners need to be provided with opportunities to engage in interprofessional education to build their competencies for interprofessional practice. Research evidence has shown that interprofessional education promotes effective collaborative practice, which in turn, optimises health-service, strengthens the health system and improves health outcomes (WHO, 2010).

While interprofessional education has gained attention in many countries, outcome measures, particularly ones to measure the impacts of care on patients, remains a concern. To facilitate the delivery of interprofessional education and collaborative practice in Tuberculosis care, this study aims to gain consensus of opinions from experts on components to be included in an outcome measure. Findings from this study will be used to inform the development of the Tuberculosis Patient Outcome Measure following Interprofessional Tuberculosis (IPE-TB) care delivery.

Who is doing the research?

The project is being conducted by Bau Dilam Ardyansyah Madjid, a PhD candidate at Curtin University Australia, under the supervision of Professor Reinie Cordier, A/Professor Margo Brewer, Professor Jaya Dantas, and Dr David Parsons.

Why am I being asked to take part, and what will I have to do?

You have been asked to participate in this study because your expertise meets the following criteria: You are a health practitioner with experience in Tuberculosis care, control and prevention, management, or teaching Tuberculosis in higher educational settings for health practitioners' training. You will be asked to participate in an online Delphi study. These surveys will help us obtain consensus from experts in the field regarding components to be included in the Patient Outcome Measurement following interprofessional education and collaborative Tuberculosis (IP-TB) care. The first Delphi survey includes both Likert scales and open-ended questions. The number of Delphi rounds will depend on when experts reach consensus; however, two or three Delphi rounds are most common. After each survey, you will be provided with a summary of findings from the previous round and be asked to review your decisions or specify the reasons why you remain outside of the consensus. All information will be de-identified. There will be no cost to you for taking part in this research.

Are there benefits to being in the research project?

There may be no direct benefit to you from participating in this research. You may appreciate the opportunity to share your thoughts and expertise. Your feedback will help develop the outcome measure's design. We hope the result of this study will provide a significant contribution to the evidence base concerning: 1) the implementation of interprofessional education and collaborative care for Tuberculosis patients, 2) the impact of interprofessional education and collaborative care programs on students from different health professional backgrounds at a pre-qualification stage, and 3) the impact of an interprofessional education program on the quality of Tuberculosis patients' healthcare. Therefore, this study will provide a broader understanding in formulating an appropriate Tuberculosis learning and care strategy, particularly at the educational level.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

There are no foreseeable risks from this research project. Apart from volunteering your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study.

Who will have access to my information?

Any information in the data that identifies you will be replaced with a code to protect your identity. Only the research team will have access to the codes to match your name if it is necessary to do so. Any information we collect will be confidential and used only in this project unless otherwise specified. The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented.

What happens next, and who can I contact about the research?

If you need further information or question about the study, you can contact Bau DA Madjid by email: bau.madjid@postgrad.curtin.edu.au. If you decide to participate, please click 'Continue' at the bottom right of this page, and you will be directed to provide your consent in the Consent section, after which the survey will commence. If you do not want to take part, please exit this window.

Curtin University Human Research Ethics Committee (HREC) has approved this study (Approval number: HRE2021-0274). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

PARTICIPANT CONSENT FORM (INTERNATIONAL DELPHI)

HREC Project Number:	**HRE2021-0274**
Project Title:	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Chief Investigator:	Professor Reinie Cordier
Student researcher:	Bau Dilam Ardyansyah

Consent

I hereby declare that:

- I fulfil the two criteria below:
  1. A health practitioner from any professional background, and
  2. I have expertise and experience in Tuberculosis care, and/or control and prevention, and/or management, and/or teaching Tuberculosis in higher educational settings as part of health practitioners' training.
- I have read the information statement, and I understand its contents.
- I believe I understand the purpose, extent and possible risk of my involvement in this project.
- I understand that my participation will involve at least one Delphi round completed via an online survey. My de-identified survey responses will be provided to other participants during the Delphi purposes.
- I understand this project has been approved by Curtin University Human Research Ethics Committee and will be carried out according to the National Statement on Ethical Conduct in Human Research (2007).

Please indicate your consent to participate below:

○ Yes. I Consent to participate as detailed in the information

○ No. I do not consent to participate as detailed in the information

Please indicate your consent to participate below (optional).

If you do not consent to participate to the following statements, your eligibility for participation in the current study will not be affected.

○ I consent to be contacted about future research projects related to this project

○ I consent to the storage and use of my information in future ethically approved research projects related to this project

B.3.2 Delphi Study: Indonesian Participant

Information Statement

Penelitian tentang Pendidikan Interprofesional dan Praktik Kolaboratif dalam Kesehatan: Uji Delphi

<u>Penelitian tentang apa?</u>

Mempersiapkan praktisi kesehatan untuk tenaga kerja interprofessional adalah masalah mendasar dalam perawatan kesehatan secara global. Organisasi Kesehatan Dunia (WHO) menyatakan bahwa semua praktisi kesehatan perlu diberikan kesempatan untuk terlibat dalam pendidikan interprofessional untuk membangun kompetensi mereka untuk praktek interprofessional. Bukti penelitian telah menunjukkan bahwa pendidikan interprofessional mempromosikan praktik kolaboratif yang efektif, yang pada gilirannya, mengoptimalkan layanan kesehatan, memperkuat sistem kesehatan dan meningkatkan hasil kesehatan (WHO, 2010).

Sementara pendidikan interprofessional telah mendapat perhatian di banyak negara, ukuran hasil, terutama yang mengukur dampak perawatan pada pasien, tetap menjadi perhatian. Untuk memfasilitasi penyampaian pendidikan interprofessional dan praktik kolaboratif dalam perawatan Tuberkulosis, penelitian ini bertujuan untuk mendapatkan konsensus pendapat dari para ahli tentang komponen yang akan dimasukkan dalam ukuran hasil. Temuan dari penelitian ini akan digunakan untuk menginformasikan perkembangan Pengukuran Hasil Pasien Tuberkulosis setelah pemberian perawatan Tuberkulosis Interprofesional (IPE-TB).

<u>Siapa yang melakukan penelitian?</u>

Proyek ini dilakukan oleh Bau Dilam Ardyansyah Madjid, seorang kandidat PhD di Curtin University Australia, di bawah pengawasan Profesor Reinie Cordier, A/Profesor Margo Brewer, Profesor Jaya Dantas, dan Dr David Parsons.

<u>Mengapa saya diminta untuk ambil bagian, dan apa yang harus saya lakukan?</u>

Anda telah diminta untuk berpartisipasi dalam penelitian ini karena keahlian Anda memenuhi kriteria berikut: Anda adalah praktisi kesehatan dengan pengalaman dalam perawatan, pengendalian dan pencegahan Tuberkulosis, manajemen, atau mengajar Tuberkulosis di lingkungan pendidikan tinggi untuk pelatihan praktisi kesehatan. Anda akan diminta untuk berpartisipasi dalam studi Delphi online. Survei ini akan membantu kami memperoleh konsensus dari para ahli di bidangnya mengenai komponen yang akan dimasukkan dalam Pengukuran Hasil Pasien setelah pendidikan interprofessional dan perawatan Tuberkulosis kolaboratif (IPE-TB). Survei Delphi pertama mencakup skala Likert dan pertanyaan terbuka. Jumlah putaran Delphi akan tergantung pada saat para ahli mencapai konsensus; namun, dua atau tiga putaran Delphi adalah yang paling umum. Setelah setiap survei, Anda akan diberikan ringkasan temuan dari putaran sebelumnya dan diminta untuk meninjau keputusan Anda atau menentukan alasan mengapa Anda tetap berada di luar konsensus. Semua informasi akan dide-identifikasi. Anda tidak akan dipungut biaya apapun untuk ikut serta dalam penelitian ini.

Apakah ada manfaat untuk berada dalam proyek penelitian?

Mungkin tidak ada manfaat langsung bagi Anda dengan berpartisipasi dalam penelitian ini. Anda mungkin menghargai kesempatan untuk berbagi pemikiran dan keahlian Anda. Umpan balik Anda akan membantu mengembangkan desain ukuran hasil. Kami berharap hasil penelitian ini akan memberikan kontribusi yang signifikan terhadap basis bukti mengenai: 1) pelaksanaan pendidikan interprofessional dan perawatan kolaboratif untuk pasien Tuberkulosis, 2) dampak pendidikan interprofessional dan program perawatan kolaboratif pada siswa dari kesehatan yang berbeda latar belakang profesi pada tahap prakualifikasi, dan 3) dampak program pendidikan interprofesional terhadap kualitas pelayanan kesehatan pasien Tuberkulosis. Oleh karena itu, penelitian ini akan memberikan pemahaman yang lebih luas dalam merumuskan strategi pembelajaran dan perawatan Tuberkulosis yang tepat, khususnya di tingkat pendidikan.

Apakah ada risiko, efek samping, ketidaknyamanan atau ketidaknyamanan karena berada dalam proyek penelitian?

Tidak ada risiko yang dapat diperkirakan dari proyek penelitian ini. Selain meluangkan waktu Anda secara sukarela, kami tidak mengharapkan bahwa akan ada risiko atau ketidaknyamanan yang terkait dengan keikutsertaan dalam penelitian ini.

Siapa yang akan memiliki akses ke informasi saya?

Setiap informasi dalam data yang mengidentifikasi Anda akan diganti dengan kode untuk melindungi identitas Anda. Hanya tim peneliti yang akan memiliki akses ke kode yang cocok dengan nama Anda jika perlu. Setiap informasi yang kami kumpulkan akan dirahasiakan dan hanya digunakan dalam proyek ini kecuali ditentukan lain. Hasil penelitian ini dapat dipresentasikan pada konferensi atau diterbitkan dalam jurnal profesional. Anda tidak akan diidentifikasi dalam hasil apa pun yang dipublikasikan atau disajikan.

Apa yang terjadi selanjutnya, dan siapa yang dapat saya hubungi tentang penelitian ini?

Jika Anda memerlukan informasi atau pertanyaan lebih lanjut tentang studi ini, Anda dapat menghubungi Bau DA Madjid melalui email: bau.madjid@postgrad.curtin.edu.au. Jika Anda memutuskan untuk berpartisipasi, silakan klik 'Lanjutkan' di kanan bawah halaman ini, dan Anda akan diarahkan untuk memberikan persetujuan Anda di bagian Persetujuan, setelah itu survei akan dimulai. Jika Anda tidak ingin ambil bagian, silakan keluar dari jendela ini.

Komite Etika Penelitian Manusia Universitas Curtin (HREC) telah menyetujui penelitian ini (Nomor persetujuan: XXX). Jika Anda ingin mendiskusikan penelitian ini dengan seseorang yang tidak terlibat langsung, khususnya, hal-hal yang berkaitan dengan pelaksanaan penelitian atau hak-hak Anda sebagai peserta, atau Anda ingin mengajukan keluhan rahasia, Anda dapat menghubungi Pejabat Etika di (08) 9266 9223 atau Manajer, Research Integrity di (08) 9266 7093 atau email hrec@curtin.edu.au.

LEMBAR PERSETUJUAN PARTISIPAN

Persetujuan Etik	**HRE2021-0274** **170/UN4.6.4.5.31/ PP36/2023 (UNHAS)**
Judul Projek	Outcome Measurement in Interprofessional Education and Collaborative Practice for Tuberculosis Care in Indonesia
Peneliti Utama	Professor Reinie Cordier
Peneliti Mahasiswa	Bau Dilam Ardyansyah

Persetujuan

Dengan ini saya menyatakan bahwa:

1. Saya memenuhi dua kriteria di bawah ini:
   - Praktisi kesehatan dari latar belakang profesional apa pun, dan
   - Saya memiliki keahlian dan pengalaman dalam perawatan Tuberkulosis, dan/atau pengendalian dan pencegahan, dan/atau manajemen, dan/atau mengajar Tuberkulosis di lingkungan pendidikan tinggi sebagai bagian dari pelatihan praktisi kesehatan.
2. Saya telah membaca pernyataan informasi, dan saya memahami isinya.
3. Saya yakin saya memahami tujuan, tingkat, dan kemungkinan risiko keterlibatan saya dalam proyek ini.
4. Saya mengerti bahwa partisipasi saya akan melibatkan setidaknya satu putaran Delphi yang diselesaikan melalui survei online. Respons survei saya yang tidak teridentifikasi akan diberikan kepada peserta lain selama tujuan Delphi.
5. Saya memahami bahwa proyek ini telah disetujui oleh Komite Etika Penelitian Manusia Universitas Curtin dan akan dilaksanakan sesuai dengan Pernyataan Nasional tentang Perilaku Etis dalam Penelitian Manusia (2007).

Harap tunjukkan persetujuan Anda untuk berpartisipasi di bawah ini:

○ Yes. Saya Menyetujui untuk berpartisipasi sebagaimana dirinci dalam informasi

○ No. Saya tidak setuju untuk berpartisipasi seperti yang dijelaskan dalam informasi

Harap tunjukkan persetujuan Anda untuk berpartisipasi di bawah ini (opsional).

Jika Anda tidak setuju untuk berpartisipasi pada pernyataan berikut, kelayakan Anda untuk berpartisipasi dalam penelitian ini tidak akan terpengaruh.

○ Saya setuju untuk dihubungi tentang proyek penelitian masa depan yang terkait dengan proyek ini

○ I Saya menyetujui penyimpanan dan penggunaan informasi saya di proyek penelitian yang disetujui secara etis di masa mendatang terkait dengan proyek ini

Appendix C Acceptance Letter

The following is an acceptance letter from the Emerging Science Journal for the manuscript presented in Chapter 7, *Development and Testing of the Interprofessional-Tuberculosis (IP-TB) Patient Outcome Measure*

[ESJ] Editor Decision (Article #2024-2750)

10 messages

Office ESJ <office@ijournalse.org> Mon, Nov 11, 2024 at 5:29 PM
To: "Dr. Bau Dilam Ardyansyah" <bardyansyah@med.unhas.ac.id>
Cc: Reinie Cordier <reinie.cordier@northumbria.ac.uk>, Margo Brewer <m.brewer@curtin.edu.au>, Dave Parsons <dave.parsons@curtin.edu.au>

Dear Dr. Ardyansyah:

We have reached a decision regarding your submission to Emerging Science Journal, "Development and Testing of a Patient Outcome Measure for Interprofessional Tuberculosis Care: A Delphi Study".

Our decision is to: Accepted

If you want to publish your article into Volume 9, Issue 01 please pay the APC (Article Processing Charge) of the Emerging Science Journal till 14th of November.

- VISA/MasterCard (22% VAT and Transfer fees Included):

https://buy.stripe.com/9AQ6qE2XlfNt3AY6MC
Amount: 1395 Euro + 22%

**NOTE: Please send us a receipt (screenshot) after payment.

Regards,
Editor: Prof. X. Shen
Editor@ijournalse.org
____
Emerging Science Journal
http://ijournalse.org/index.php/ESJ

Appendix D Author Contribution Statements

D.1 Author Contribution Statement: Chapter 3

As co-authors of the paper entitled, '*Psychometric evaluation of the Australian Interprofessional Socialisation and Valuing Scale: An invariant measure for health practitioners and students'*, we confirm that Bau Dilam Ardyansyah has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;

Our contribution to the paper was consistent with the co-author and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with analysis and interpretation;
- Review and editing of the manuscript; and
- Corresponding author for communication with the journal

Signed. **Reinie Cordier** Date: 06/9/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection; and
- Review and editing of the manuscript.

Signed. **Margo Brewer** Date: 05/9/2024

Signed. **Dave Parsons** Date: 05/9/2024

D.2 Author Contribution Statement: Chapter 4

As co-authors of the paper entitled, '*An evaluation of the psychometric properties of the Australian Collaborative Practice Assessment Tool*, we confirm that Bau Dilam Ardyansyah has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with analysis and interpretation;
- Review and editing of the manuscript; and
- Corresponding author for communication with the journal

Signed. **Reinie Cordier** Date: 06/9/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection; and
- Review and editing of the manuscript.

Signed. **Margo Brewer** Date: 05/9/2024

Signed. **Dave Parsons** Date: 05/9/2024

D.3 Author Contribution Statement: Chapter 5

As co-authors of the paper entitled, '*Psychometric evaluation of the culturally adapted interprofessional Socialisation and valuing scale (ISVS)-19 for health practitioners and students in Indonesia'*, we confirm that Bau Dilam Ardyansyah has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with analysis and interpretation;
- Review and editing of the manuscript; and
- Corresponding author for communication with the journal

Signed. **Reinie Cordier** Date: 06/9/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection; and
- Review and editing of the manuscript.

Signed. **Margo Brewer** Date: 05/9/2024

Signed. **Dave Parsons** Date: 05/9/2024

D.4. Author Contribution Statement: Chapter 6

As co-authors of the paper entitled, '*A psychometric evaluation of the Indonesian version of the Collaborative Practice Assessment Tool (CPAT) for assessing interprofessional education and collaborative practice among health practitioners and students',* we confirm that Bau Dilam Ardyansyah has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with analysis and interpretation;
- Review and editing of the manuscript; and

Signed. **Reinie Cordier** Date: 06/9/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection; and
- Review and editing of the manuscript.

Signed. **Margo Brewer** Date: 05/9/2024

Signed. **Dave Parsons** Date: 05/9/2024

D.5 Author Contribution Statement: Chapter 7

As co-authors of the paper entitled, '*Development and Testing of a Patient Outcome Measure for Interprofessional Tuberculosis Care: A Delphi Study*, we confirm that Bau Dilam Ardyansyah has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with analysis and interpretation;
- Review and editing of the manuscript; and

Signed. **Reinie Cordier** Date: 06/9/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection; and
- Review and editing of the manuscript.

Signed. **Margo Brewer** Date: 05/9/2024

Signed. **Dave Parsons** Date: 05/9/2024

Appendix E Supplementary Documents

E.1 Supplementary Documents for Journal Manuscript 1

E.1.1 S1 Table. Pilot Participants Characteristics

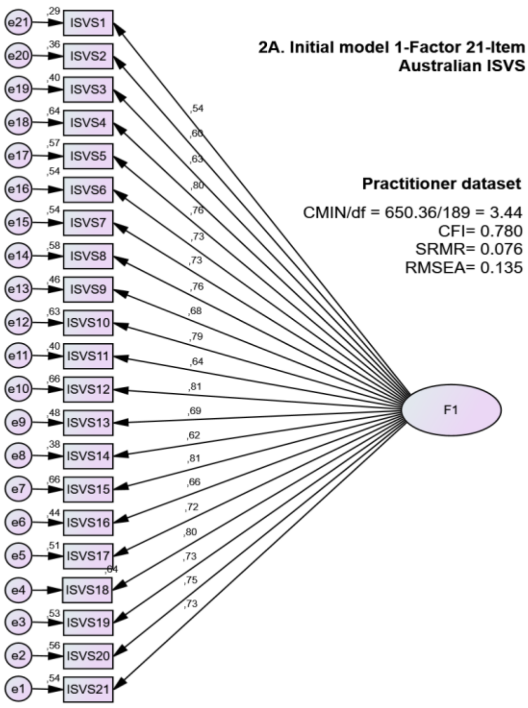
Practitioners (n = 23)				Students (n = 9)			
Demographics	**Frequency (%)**	**Mean**	**SD**	**Demographics**	**Frequency (%)**	**Mean**	**SD**
Gender							
Male	5 (21.7%)			Male	0 (0%)		
Female	18 (78.3%)	-	-	Female	9 (100%)	-	-
Total	23 (100%)			Total	9 (100%)		
Age							
21-25 years	1 (4.3%)			18-24 years	5 (55.6%)		
26-30 years	4 (17.4%)			25-29 years	1 (11.1%)		
31-35 years	2 (8.7%)			30-34 years	0 (0%)	27	7.3
36-40 years	5 (21.7%)			35-40 years	3 (33.3%)		
41-45 years	7 (30.4%)	39.3	8.7	Total	9 (100%)		
46-50 years	1 (4.3%)						
51-55 years	2 (8.7%)						
56-60 years	1 (4.3%)						
Total	23 (100%)						
Length of Work/Length of Study							
1-2 years	7 (30.4%)			1-2 years	2 (22.2%)		
3-5 years	4 (17.4%)			3-4 years	7 (77.8%)	3.0	0.9
6-10 years	4 (17.4%)	9.2	8.5	Total	9 (100%)		
11-15 years	4 (17.4%)						
21-30 years	4 (17.4%)						
Total	23 (100%)						
Professional/Educational Backgrounds							
Medical practitioner	1 (4.3%)			Medicine	2 (22.2%)		
Midwife	1 (4.3%)			Nursing	1 (11.1%)		
Nurse	11 (47.8)			Occupational therapy	5 (55.6%)		
Pharmacist	1 (4.3%)	-	-	Dentistry	1 (11.1%)	-	-
Physiotherapist	1 (4.3%)			Total	9 (100%)		
Public health expert	1 (4.3%)						
Speech pathologist	5 (21.7%)						
Social Workers	2 (8.7%)						
Total	23 (100%)						

E.1.2 S2 File. Detailed CFA results

Practitioner	Student

Practitioner

Initial CFA model with fit indices



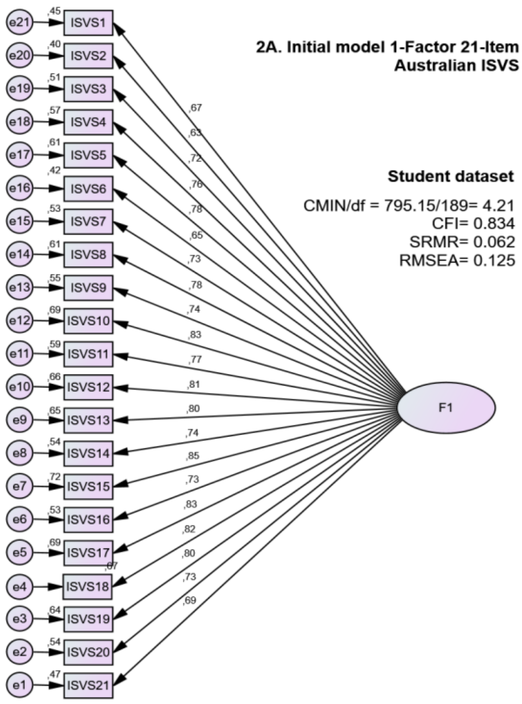
Initial Standardised Regression Weights

			Estimate[1]	S.E.[2]	C.R.[3]	*p*[4]
ISVS21	<--	F1	0.731			
ISVS20	<--	F1	0.748	.131	8.769	< 0.001
ISVS19	<--	F1	0.727	.109	8.497	< 0.001
ISVS17	<--	F1	0.717	.128	8.375	< 0.001
ISVS16	<--	F1	0.661	.103	7.684	< 0.001
ISVS15	<--	F1	0.815	.133	9.608	< 0.001
ISVS14	<--	F1	0.618	.130	7.157	< 0.001
ISVS13	<--	F1	0.690	.096	8.034	< 0.001
ISVS12	<--	F1	0.813	.121	9.587	< 0.001
ISVS11	<--	F1	0.636	.119	7.371	< 0.001
ISVS10	<--	F1	0.793	.140	9.328	< 0.001
ISVS9	<--	F1	0.678	.124	7.895	< 0.001
ISVS8	<--	F1	0.765	.138	8.973	< 0.001
ISVS7	<--	F1	0.734	.145	8.582	< 0.001
ISVS5	<--	F1	0.758	.128	8.892	< 0.001
ISVS4	<--	F1	0.802	.134	9.442	< 0.001
ISVS3	<--	F1	0.632	.113	7.328	< 0.001
ISVS2	<--	F1	0.603	.125	6.980	< 0.001
ISVS1	<--	F1	0.542	.130	6.236	< 0.001
ISVS6	<--	F1	0.732	.168	8.564	< 0.001
ISVS18	<--	F1	0.799	.137	9.407	< 0.001

Notes. [1]Standardised estimates; [2]Standar Error; [3]Critical ratio; [4]Significant at 95% CI.

Student

Initial CFA dataset with fit indices

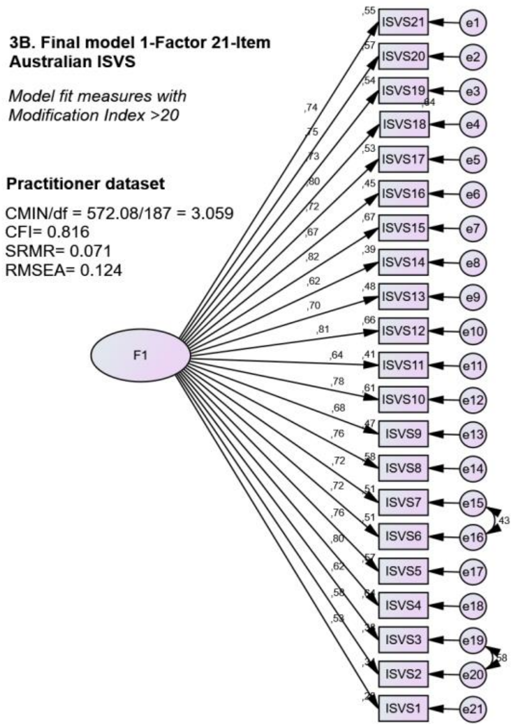


Initial Standardised Regression Weights

			Estimate[1]	S.E.[2]	C.R.[3]	*p*
ISVS21	<--	F1	0.686			
ISVS20	<--	F1	0.734	.109	10.024	< 0.00
ISVS19	<--	F1	0.801	.112	10.870	< 0.00
ISVS17	<--	F1	0.831	.125	11.250	< 0.00
ISVS16	<--	F1	0.728	.118	9.942	< 0.00
ISVS15	<--	F1	0.846	.125	11.429	< 0.00
ISVS14	<--	F1	0.736	.110	10.054	< 0.00
ISVS13	<--	F1	0.803	.110	10.903	< 0.00
ISVS12	<--	F1	0.813	.129	11.021	< 0.00
ISVS11	<--	F1	0.771	.111	10.498	< 0.00
ISVS10	<--	F1	0.831	.135	11.241	< 0.00
ISVS9	<--	F1	0.745	.118	10.163	< 0.00
ISVS8	<--	F1	0.783	.118	10.641	< 0.00
ISVS7	<--	F1	0.730	.134	9.967	< 0.00
ISVS5	<--	F1	0.779	.118	10.601	< 0.00
ISVS4	<--	F1	0.758	.121	10.329	< 0.00
ISVS3	<--	F1	0.717	.099	9.805	< 0.00
ISVS2	<--	F1	0.634	.104	8.730	< 0.00
ISVS1	<--	F1	0.674	.113	9.249	< 0.00
ISVS6	<--	F1	0.647	.160	8.903	< 0.00
ISVS18	<--	F1	0.816	.134	11.056	< 0.00

Notes. [1]Standardised estimates; [2]Standar Error; [3]Critical ratio; [4]Significant at 95% CI

Final CFA model with fit indices

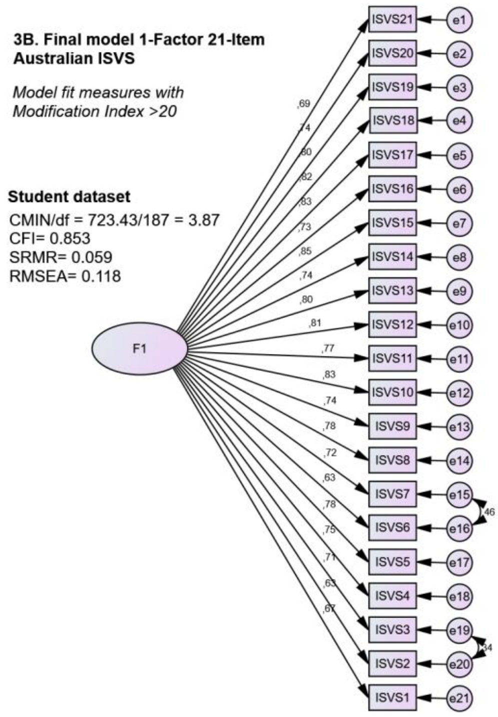


Final Standardised Regression Weights

			Estimate[1]	S.E.[2]	C.R.[3]	*p*[4]
ISVS21	<--	F1	0.744			
ISVS20	<--	F1	0.755	0.127	9.014	< 0.001
ISVS19	<--	F1	0.732	0.105	8.713	< 0.001
ISVS17	<--	F1	0.725	0.124	8.617	< 0.001
ISVS16	<--	F1	0.668	0.100	7.876	< 0.001
ISVS15	<--	F1	0.817	0.127	9.855	< 0.001
ISVS14	<--	F1	0.621	0.127	7.276	< 0.001
ISVS13	<--	F1	0.696	0.093	8.236	< 0.001
ISVS12	<--	F1	0.811	0.116	9.769	< 0.001
ISVS11	<--	F1	0.639	0.116	7.503	< 0.001
ISVS10	<--	F1	0.784	0.135	9.400	< 0.001
ISVS9	<--	F1	0.683	0.120	8.077	< 0.001
ISVS8	<--	F1	0.762	0.133	9.107	< 0.001
ISVS7	<--	F1	0.717	0.140	8.507	< 0.001
ISVS5	<--	F1	0.756	0.123	8.892	< 0.001
ISVS4	<--	F1	0.801	0.129	9.442	< 0.001
ISVS3	<--	F1	0.617	0.110	7.328	< 0.001
ISVS2	<--	F1	0.584	0.122	6.980	< 0.001
ISVS1	<--	F1	0.530	0.127	6.236	< 0.001
ISVS6	<--	F1	0.716	0.163	8.564	< 0.001
ISVS18	<--	F1	0.800	0.132	9.407	< 0.001

Notes. [1]Standardised estimates; [2]Standar Error; [3]Critical ratio; [4]Significant at 95% CI.

Final CFA model with fit indices



Final Standardised Regression Weights

			Estimate[1]	S.E.[2]	C.R.[3]	*p*[4]
ISVS21	<--	F1	0.692			
ISVS20	<--	F1	0.738	0.107	10.156	< 0.0(
ISVS19	<--	F1	0.804	0.110	11.018	< 0.0(
ISVS17	<--	F1	0.833	0.123	11.388	< 0.0(
ISVS16	<--	F1	0.733	0.116	10.087	< 0.0(
ISVS15	<--	F1	0.846	0.123	11.553	< 0.0(
ISVS14	<--	F1	0.739	0.109	10.168	< 0.0(
ISVS13	<--	F1	0.803	0.108	10.997	< 0.0(
ISVS12	<--	F1	0.815	0.127	11.154	< 0.0(
ISVS11	<--	F1	0.774	0.109	10.624	< 0.0(
ISVS10	<--	F1	0.828	0.132	11.323	< 0.0(
ISVS9	<--	F1	0.743	0.116	10.226	< 0.0(
ISVS8	<--	F1	0.781	0.116	10.718	< 0.0(
ISVS7	<--	F1	0.721	0.132	9.9380	< 0.0(
ISVS5	<--	F1	0.777	0.116	10.660	< 0.0(
ISVS4	<--	F1	0.754	0.119	10.368	< 0.0(
ISVS3	<--	F1	0.712	0.098	9.8170	< 0.0(
ISVS2	<--	F1	0.627	0.102	8.6840	< 0.0(
ISVS1	<--	F1	0.669	0.111	9.2470	< 0.0(
ISVS6	<--	F1	0.635	0.157	8.7940	< 0.0(
ISVS18	<--	F1	0.816	0.132	11.169	< 0.0(

Notes. [1]Standardised estimates; [2]Standar Error; [3]Critical ratio; [4]Significant at 95% CI.

E.1.3 S3 Table. Mann-Whitney U Post-Hoc Analysis of Significant Hypotheses Testing

Practitioners

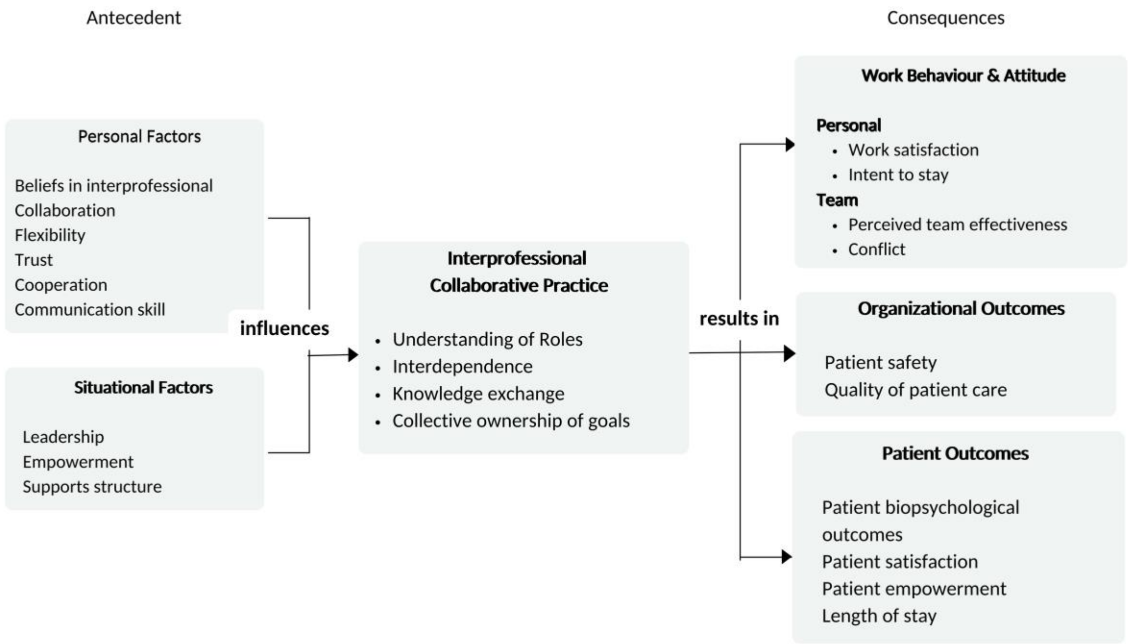
Demographics		Mann-Whitney U	Z	*p*	*r*
Age					
51-60 years (*Md*=112, *n*=15)	21-30 years (*Md*=93.0, *n*=31)	103.00	-3.04	0.002	0.45
	31-40 years (*Md*=114.5, *n*=56)	271.00	-2.10	0.036	0.25
	41-50 years (*Md*=94.0, *n*=26)	100.50	-2.56	0.010	0.40
Length of service					
1-2 years (*Md*=93, *n*=22)	16-20 years (*Md*=113.5, *n*=12)	73.00	-2.13	0.033	0.37
	11-15 years (*Md*=94.0, *n*=19)	98.00	-2.22	0.026	0.37
3-5 years (*Md*=94, *n*=18)	16-20 years (*Md*=113.5, *n*=21)	41.00	-2.84	0.005	0.52
	21-30 years (*Md*=94.0, *n*=18)	106.50	-2.33	0.020	0.37
	30-40 years (*Md*=109.0, *n*=11)	38.50	-2.72	0.007	0.51
Professional Backgrounds					
Optometrist (*Md*= 86.0, *n*=6)	Speech pathologists (*Md*= 105.0, *n*=23)	26.00	-2.32	0.020	0.43
	Social Workers (*Md*= 117.5, *n*=4)	2.00	-2.15	0.032	0.68
Psychologists (*Md*=77.00, *n*=4)	Podiatrists (*Md*= 123.5, *n*=2)	0.00	-2.00	0.046	0.71
	Social Workers (*Md*= 117.5, *n*=4)	0.00	-2.31	0.021	0.82
	Speech pathologists (*Md*= 105.0, *n*=23)	3.00	-2.94	0.003	0.57
	Nurses (*Md*= 106.0, *n*=18)	7.00	-2.47	0.014	0.53
	Occupational therapists (*Md*= 102.5, *n*=30)	15.00	-2.41	0.016	0.41
	Pharmacists (*Md*= 90.0, *n*=15)	10.00	-2.01	0.044	0.46
	Nutritionists (*Md*= 104.0, *n*=3)	0.00	-2.12	0.034	0.80
	Medical practitioners (*Md*= 104.0, *n*=10)	2.50	-2.48	0.013	0.66
	Physiotherapists (*Md*= 98.0, *n*=7)	0.00	-2.06	0.040	0.69
Dentists (*Md*=72.50, *n*=2)	Nurses (*Md*= 106.0, *n*= 18)	2.00	-2.02	0.044	0.45
	Speech pathologists (*Md*= 105.0, *n*= 23)	1.00	-2.21	0.027	0.44

Students

Demographics		Mann-Whitney U	Z	*p*	*r*
Age					
35-40 years (*Md*=83, *n*=11)	18-24 years (*Md*=100.5, *n*=150)	481.00	-2.31	0.021	0.18
	25-34 years (*Md*=104.0, *n*=46)	112.00	-2.85	0.004	0.38
Length of Study					
5-6 years (*Md*=91.50, *n*=10)	3-4 years (*Md*=102.0, *n*=73)	190.50	-2.00	0.046	0.23
	7-8 years (*Md*=117.50, *n*=12)	0.00	-2.15	0.032	0.62

E.2 Supplementary Documents for Journal Manuscript 2

E.2.1 S1 Figure. Reference Model For Hypotheses Testing



Note. Adapted from Stutsky BJ and Spence Laschinger HK. 2014. Development and testing of a conceptual framework for interprofessional collaborative practice. *Health and Interprofessional Practice. 2*(2):eP1066. doi.or/10.7710/2159-1253.1066

E.2.2 S2 Table. Items Modification

Items	Original CPAT Items	Australian CPAT Items				
		Items	Minimum	Maximum	Mean	Std.
CPAT 1	No changes were made to the item		4	5	4.7	0.5
CPAT 2	No changes were made to the item		4	5	4.8	0.4
CPAT 3	No changes were made to the item		2	5	4.4	0.9
CPAT 4	No changes were made to the item		1	5	4.4	0.9
CPAT 5	No changes were made to the item		2	5	4.3	0.9
CPAT 6	No changes were made to the item		2	5	4.4	0.8
CPAT 7	No changes were made to the item		3	5	4.4	0.7
CPAT 8	No changes were made to the item		3	5	4.4	0.6
CPAT 9	No changes were made to the item		3	5	4.7	0.5
CPAT 10	No changes were made to the item		2	5	4.1	1.0
CPAT 11	No changes were made to the item		2	5	4.1	1.0
CPAT 12	No changes were made to the item		3	5	4.3	0.8
CPAT 13	No changes were made to the item		2	5	4.3	0.9
CPAT 14	No changes were made to the item		2	5	4.2	0.9
CPAT 15	No changes were made to the item		3	5	4.4	0.7
CPAT 16	No changes were made to the item		4	5	4.6	0.5
CPAT 17	No changes were made to the item		3	5	4.5	0.7
CPAT 18	No changes were made to the item		2	5	4.4	0.8
CPAT 19	No changes were made to the item		3	5	4.6	0.6
CPAT 20	Team leadership discourages professionals from taking the initiative to support patient/client care goals.	Our team leader encourages professionals to take the initiative to support patient/client care goals.	1	5	**2.9**	**1.4**
CPAT 21	No changes were made to the item		2	5	4.4	0.8
CPAT 22	No changes were made to the item		3	5	4.5	0.7
CPAT 23	Our team leader is out of touch with team members' concerns and perceptions.	Our team leader is in touch with the concerns and perceptions of team members.	1	5	**3.1**	**1.5**
CPAT 24	No changes were made to the item		2	5	4.3	0.8

CPAT 25	No changes were made to the item		2	5	4.0	1.0
CPAT 26	No changes were made to the item		2	5	4.4	0.8
CPAT 27	Physicians assume the ultimate responsibility for team decisions and outcomes.	In our team, medical doctors assume the ultimate responsibility for team decisions and outcomes.	1	5	**3.4**	**1.2**
CPAT 28	No changes were made to the item		2	5	3.9	1.1
CPAT 29	No changes were made to the item		2	5	4.5	0.8
CPAT 30	No changes were made to the item		3	5	4.6	0.6
CPAT 31	No changes were made to the item		3	5	4.1	0.7
CPAT 32	No changes were made to the item		2	5	4.5	0.7
CPAT 33	No changes were made to the item		2	5	4.2	1.0
CPAT 34	No changes were made to the item		2	5	4.4	0.8
CPAT 35	Team members feel limited in the degree of autonomy in patient/client care that they can assume.	Team members have a degree of autonomy in patient/client care.	2	5	**3.5**	**1.1**
CPAT 36	No changes were made to the item		2	5	4.5	0.8
CPAT 37	No changes were made to the item		2	5	4.3	0.9
CPAT 38	No changes were made to the item		2	5	4.5	0.9
CPAT 39	No changes were made to the item		2	5	4.3	0.8
CPAT 40	No changes were made to the item		4	5	4.7	0.5
CPAT 41	No changes were made to the item		2	5	4.2	1.0
CPAT 42	No changes were made to the item		2	5	4.3	0.8
CPAT 43	No changes were made to the item		2	5	4.3	0.7
CPAT 44	No changes were made to the item		2	5	4.4	0.8
CPAT 45	No changes were made to the item		2	5	4.1	1.1
CPAT 46	No changes were made to the item		2	5	4.4	0.9
CPAT 47	No changes were made to the item		2	5	4.3	1.0
CPAT 48	Disagreements among team members are ignored or avoided.	Disagreements among team members are addressed.	1	5	**2.9**	**1.7**
CPAT 49	On our team, the final decision in patient/client care rests with the physician.	The final decision in patient/client care in our team rests with the medical doctor(s).	2	5	**3.5**	**1.1**

CPAT 50	In our team, there are problems that regularly need to be solved by someone higher up.	In our team, problems rarely need to be solved by a senior staff member outside of our team.	1	5	**3.2**	**1.4**
CPAT 51	No changes were made to the item		2	5	4.4	1.0
CPAT 52	No changes were made to the item		1	5	4.5	0.9
CPAT 53	No changes were made to the item		1	5	4.5	1.0
CPAT 54	No changes were made to the item		3	0	4.5	0.7
CPAT 55	No changes were made to the item		2	5	4.3	0.9
CPAT 56	No changes were made to the item		2	5	4.4	0.8

E.2.3 S3 File. Additional EFA Results

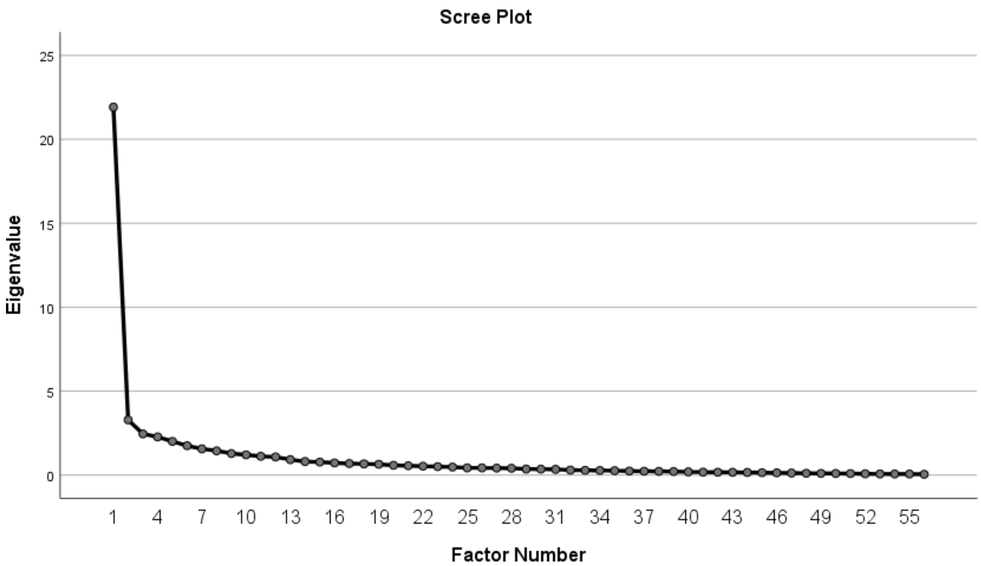
A. Items Loading Factor With Eigenvalue>1 and the Scree Plot for Practitioner Dataset

	1	2	3	4	5	6	7	8	9	10	11	12
C20	.820											
C19	.813											
C22	.766											
C18	.756											
C23	.719											
C17	.681											
C21	.668											
C24	.615											
C25	.501											
C51												
C15		.696										
C13		.683										
C26		.570										
C34		.565										
C35		.564										
C30		.528										
C32												
C5			.692									
C6			.603									
C3			.568									
C4			.554									
C8			.532									
C1												
C7												
C38				.691								
C39				.690								
C37				.547								
C40												
C46												
C41												
C47												
C48												
C12					.699							
C16					.594							
C9					.564							
C11					.554							
C14					.540							
C10					.501							
C55						.721						
C54						.615						
C52						.548						
C56												
C28							.560					
C36												
C33												
C29												
C42								.776				
C43								.651				
C44								.627				
C27									.988			
C49									.821			
C31												

C2										.655		
C53											.913	
C50												
C45												

Total Variance Explained

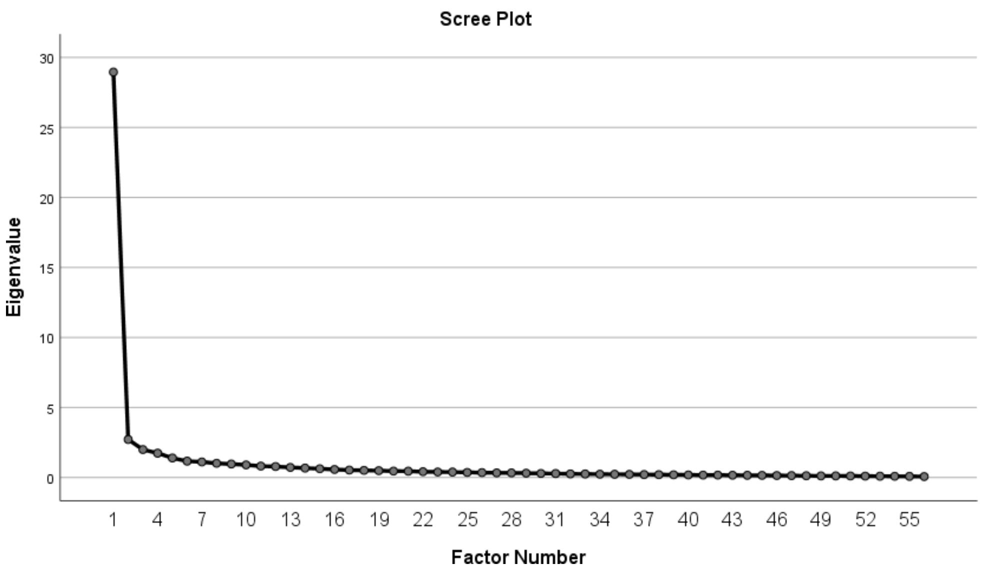
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	21.92	39.14	39.14	3.99	7.12	7.12
2	3.29	5.87	45.01	4.27	7.63	14.75
3	2.45	4.38	49.39	16.66	29.74	44.49
4	2.27	4.06	53.45	2.88	5.14	49.63
5	2.01	3.58	57.04	1.95	3.47	53.11
6	1.75	3.12	60.16	1.58	2.82	55.93
7	1.56	2.79	62.95	1.25	2.24	58.17
8	1.45	2.58	65.53	1.27	2.27	60.44
9	1.29	2.30	67.83	0.94	1.68	62.12
10	1.21	2.16	69.99	1.09	1.95	64.07
11	1.12	2.00	71.99	0.84	1.49	65.56
12	1.08	1.93	73.92	0.80	1.43	66.99
13	0.92	1.65	75.56			
14	0.81	1.44	77.00			
15	0.78	1.39	78.39			



B. Items Loading Factor With Eigenvalue>1 and the Scree Plot for Student Dataset

	1	2	3	4	5	6	7	8
C12	0.776							
C10	0.750							
C13	0.738							
C14	0.737							
C16	0.724							
C8	0.705							
C9	0.684							
C15	0.683							
C5	0.650							
C11	0.648							
C3	0.579							
C7	0.558							
C1	0.555							
C6	0.552							
C26								
C2								
C39								
C17								
C4								
C35								
C47		0.786						
C48		0.778						
C40		0.594						
C51		0.551						
C46								
C33								
C50								
C25								
C41								
C28								
C20			0.726					
C22			0.689					
C19			0.652					
C18			0.624					
C24			0.569					
C23			0.510					
C21			0.508					
C55				0.720				
C54				0.719				
C56				0.694				
C52				0.661				
C53				0.658				
C42					0.773			
C43					0.681			
C44					0.628			
C34						0.524		
C32								
C29								
C31								
C30								
C36								
C27							0.798	
C49							0.749	
C45								
C38								0.503
C37								

Total Variance Explained						
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	28.95	51.70	51.70	28.59	51.06	51.06
2	2.72	4.85	56.55	2.37	4.23	55.29
3	1.99	3.56	60.11	1.69	3.02	58.32
4	1.74	3.10	63.21	1.43	2.55	60.87
5	1.39	2.49	65.70	1.14	2.03	62.90
6	1.17	2.09	67.79	0.88	1.57	64.47
7	1.11	1.98	69.77	0.73	1.30	65.77
8	1.02	1.81	71.58	0.71	1.26	67.03
9	0.96	1.71	73.30			
10	0.90	1.61	74.90			
11	0.81	1.45	76.35			



E.2.4 S4 File. The Australian Collaborative Practice Assessment Tool

Collective Goals and Understanding of Roles	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
1. Our team mission embodies an interprofessional collaborative approach to patient/client care.							
2. Our team's primary purpose is to assist patients/clients in achieving treatment goals.							
3. Our team's goals are clear, useful and appropriate to my practice.							
4. Our team's mission and goals are supported by sufficient resources (skills, funding, time, space).							
5. All team members are committed to collaborative practice.							
6. Members of our team have a good understanding of patient/client care plans and treatment goals.							
7. Patient/client care plans and treatment goals incorporate best practice guidelines from multiple professions.							
8. There is a real desire among team members to work collaboratively.							
26. Team members acknowledge the aspects of care where members of my profession have more skills and expertise.							
28. Team members negotiate the role they want to take in developing and implementing the patient/client care plan.							
29. Team members are held accountable for their work.							
30. It is clear who is responsible for aspects of the patient/client care plan.							
31. Physicians usually ask other team members for opinions about patient/client care.							
32. Team members feel comfortable advocating for the patient/client.							
33. Each team member shares accountability for team decisions and outcomes.							
34. Team members have the responsibility to communicate and provide their expertise in an assertive manner.							
35. Team members have a degree of autonomy in patient/client care.							
General Relationships							

9. Respect among team members improves with our ability to work together.							
10. Team members care about one another's personal well-being.							
11. Socializing together enhances teamwork effectiveness.							
12. It is enjoyable to work with other team members.							
13. Team members respect each other's roles and expertise.							
14. Working collaboratively keeps most team members enthusiastic and interested in their job.							
15. Team members trust each other's work and contributions related to patient/client care.							
16. Our team's level of respect for each other enhances our ability to work together.							
Team Leadership							
17. Procedures are in place to identify who will take the lead role in coordinating patient/client care.							
18. Team leadership ensures all professionals needing to participate have a role on the team.							
19. Team leadership assures that roles and responsibilities for patient/client care are clearly defined.							
20. Our team leader encourages professionals to take the initiative to support patient/client care goals.							
21. Team leadership supports interprofessional development opportunities.							
22. Our team leader models, demonstrates and advocates for patient/client-centered best practice.							
23. Our team leader is in touch with the concerns and perceptions of team members.							
24. Our team leader encourages members to practice within their full professional scope.							
25. Our team has a process for peer review.							
Communication and Information Exchange							
36. Patients/clients concerns are addressed effectively through regular team meetings and discussion.							
37. Our team has developed effective communication strategies to share patient/client treatment goals and outcomes of care.							
38. Relevant information relating to changes in patient/client status or care plan is reported to the appropriate team member in a timely manner.							
39. I trust the accuracy of information reported among team members.							
40. Our team meetings provide an open, comfortable, safe place to discuss concerns.							

41. The patient/client health record is used effectively by all team members as a communication tool.							
Community Linkages and Coordination of Care							
42. Our team has established partnerships with community organizations to support better patient/client outcomes.							
43. Members of our team share information relating to community resources.							
44. Our team has a process to optimize the coordination of patient/client care with community service agencies.							
45. Patient/client appointments are coordinated so they can see multiple providers in a single visit.							
Decision-making and Conflict Management							
46. Processes are in place to quickly identify and respond to a problem.							
47. When team members disagree, all points of view are considered before deciding on a solution.							
48. Disagreements among team members are addressed.							
50. In our team, problems rarely need to be solved by a senior staff member outside of our team.							
51. Our team has an established process for conflict management.							
Patient Involvement							
52. Team members encourage patients/clients to be active participants in care decisions.							
53. Team members meet face-to-face with patients/clients cared for by the team.							
54. Information relevant to health care planning is shared with the patient/client.							
55. The patient/client is considered a member of their healthcare team.							
56. The patient's/client's family and supports are included in care planning, at the patient's request.							

E.3 Supplementary Documents for Journal Manuscript 3

E.3.1 Supplementary Table 5.1. Significant Results of Individual Group Comparisons With Post-Hoc Analysis

Hypotheses			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
H1a.	31-40 years	61-70 years	-6.6	2.4	0.01	-11.20	-1.91
	41-50 years	61-70 years	-5.2	2.3	0.02	-9.67	-0.75
H1b.	1-2 Years	3-5 Years	-4.1	1.7	0.02	-7.38	-0.77
		6-10 Years	-3.6	1.5	0.02	-6.47	-0.66
		11-20 Years	-5.1	1.4	< 0.01	-7.92	-2.22
		20-30 Years	-7.0	2.1	< 0.01	-11.09	-3.00
H2a.	16-20 years	21-25 years	6.6	1.5	< 0.01	3.67	9.57
H2b.	3-4 years	5-6 years	5.3	1.7	< 0.01	1.93	8.70
H2c.	Health Promotion	Dietetics	6.2	2.5	0.01	1.32	11.11
		Medicine	6.8	2.2	< 0.01	2.37	11.15
	Nursing	Pharmacy	6.0	2.4	0.01	1.20	10.74
		Dietetics	7.3	2.0	< 0.01	3.35	11.35
		Medicine	7.9	1.7	< 0.01	4.53	11.25

E.4 Supplementary Documents for Journal Manuscript 4

E.3.1 Supplementary Table 6.1. Item Structure Changes Between the Original and Previous Indonesian CPAT

	Original (Ori) CPAT[a]		
	Subscales	**Cronbach's α**	**Remarks**
F1	Mission, Meaningful, Purpose, Goals (8 items)	0.88	All items included in Ind.F1
F2	General Relationship (8 items)	0.89	All items included in Ind.F2
F3	Team Leadership (9 items)	0.80	Four items included in Ind.F3 Two items moved to Ind.F8 One item moved to Ind.F1 One item moved to Ind.F2 One item deleted
F4	General Roles Responsibilities, Autonomy (10 items)	0.81	Five items included in Ind.F4 Two items moved to Ind.F7 Two items deleted One item moved to Ind.F8
F5	Communication and Information Exchange (6 items)	0.84	All items included in Ind.F4
F6	Community Linkages and Coordination of Care (4 items)	0.76	All items included in Ind.F5
F7	Decision Making and Conflict Management (6 items)	0.67	Two items included in Ind.F6 Two items moved to Ind.F8 One item moved to Ind.F3 One item moved to Ind. F4
F8	Patient Involvement (5 items)	0.87	Three items included in Ind.F7 Two items moved to Ind.F4
	Previous Indonesian (Ind) CPAT[b]		
	Subscales	**Cronbach's α**	**Remarks**
F1	Mission, Goals and Objectives (9 items)	0.88	Eight items from Ori.F1 One item added from Ori.F3
F2	Relationships Among Team Members (9 items)	0.90	Eight items from Ori.F2 One item added from Ori.F3
F3	Leadership (5 items)	0.77	Four items from Ori.F3 One item added from Ori.F7
F4	Team Coordination and Organisation (14 items)	0.93	Five items from Ori.F4 Six items from Ori.F5 Two items added from Ori.F8 One Item added from Ori.F7
F5	Team Relationship with the Community (4 items)	0.92	Four items from Ori.F6
F6	Decision-making and Conflict Management (2 items)	0.70	Two items from Ori.F7
F7	Patient Involvement, Responsibility and Autonomy (5 items)	0.77	Three items from Ori.F8 Two items added from Ori.F4
F8	Barriers to Team Collaboration (5 items)	0.61	Two items from Ori.F3. Two items from Ori.F7 One item from Ori.F4

Notes. Adapted from [a]Schroder et al. (2015). [b]Yusra et al. (2019); Ori = original; Ind = Indonesia