

Using directed-content analysis to identify a framework for understanding quality of life in adults with Rett syndrome

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Abstract

Purpose: Rett syndrome (RTT) is a rare neurodevelopmental disorder mainly affecting females and is caused by a mutation in the *MECP2* gene. Recent research identified the domains of quality of life (QOL) important for children with RTT but there has been no investigation of domains important for adults. This qualitative study explored QOL in adults with RTT and compared domains with those previously identified for children.

Methods: The sample comprised parents and/or primary caregivers of 20 adults, aged 18-38 years, who were registered with the Australian Rett Syndrome Database. Semi-structured telephone interviews were conducted to investigate aspects of life that were observed to be satisfying or challenging. Data were analysed using directed content analysis, based on existing QOL domains for children with RTT that related to health and wellbeing, daily activities, and community immersion and services.

Results: Each of the domains identified for children with RTT was represented in the adult dataset, with no new domains emerging.

Conclusion: This is the first study to identify QOL domains important for adults with RTT. Health and therapy needs are ongoing during adulthood but services may be limited. Findings will guide choice of an appropriate QOL measure for this group.

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Abbreviations

RTT - Rett syndrome

QOL - Quality of life

ARSD - Australian Rett Syndrome Database

MECP2 - methyl-CpG-binding protein 2

IMPLICATIONS FOR REHABILITATION

- Knowing the important domains of quality of life enables clinicians and service providers to systematically review and address key management issues.
- Despite a high level of dependency and sometimes poor health, parent caregivers perceive potential for strong quality of life in adulthood.
- Services that maintain functional skills and health throughout the lifespan are valued for their support of quality of life in adults with Rett syndrome.

Introduction

Rett syndrome (RTT) is a rare neurodevelopmental disorder [1] mainly affecting females and caused by a mutation in the X-linked methyl-CpG-binding protein 2 (*MECP2*) gene [2].

Associated with severe intellectual disability, RTT is characterized clinically by a lack of verbal language and hand functioning skills, hand stereotypies and impaired mobility [3], and the development of comorbid conditions such as epilepsy, sleep disturbances, gastrointestinal disorders and scoliosis [4]. Approximately 60% of females with RTT survive to 37 years of age [5]. For those who survive, health and wellbeing may have either declined with age [6] or remained stable depending on overall clinical severity [5, 7]. This highlights the importance of developing anticipatory guidance strategies and optimal care plans for management during adulthood.

Quality of life (QOL) refers to how an individual perceives and evaluates their health, wellbeing and life experiences [8]. Beyond universal domains of QOL (e.g. physical health), individuals with disabilities or diseases may experience QOL domains that differ from those of the general population (e.g. chronic pain) [9, 10]. Previous research suggests that QOL domains important to children are likely to differ from those that are important to adults, although this may not apply to those with severe intellectual disability where cognition and function remain stable over time [9, 10]. QOL domains important for adults with mild intellectual disability have previously been identified (e.g. psychological and material wellbeing, personal development and self-determination) [9], although these domains may not represent all domains important for adults with severe intellectual disability due to their limited communication and cognitive skills.

In RTT, research has mainly focused on clinical severity and impairments [4] with limited data on QOL [11, 12]. One study using the Child Health Questionnaire [12] not yet validated for RTT found that more severe clinical impairment was associated with better psychosocial QOL but

poorer physical QOL, impaired motor functioning, and earlier onset of stereotypies. Specific domains for QOL in children with RTT have been identified using qualitative thematic analysis of parent-reported observable behaviours [11], with some domains not represented in other QOL measures. For example, domains, previously used in existing measures, included physical health, body pain and discomfort, behavioural and emotional well-being, social connectedness and variety of activities [12]. However, the domains of stability of daily routines and the natural environment, important for children with RTT had not previously been described in the QOL literature [11]. This new set of domains for children with RTT remained consistent when exploring groups of children with autism spectrum disorder and intellectual disability [13] cerebral palsy and intellectual disability [14], and Down syndrome [15], suggesting that a specific QOL measure appropriate for intellectual disability could be necessary.

As yet, no study has investigated the QOL domains important for adults with RTT. Given that RTT is a severe disability with limited gains over time in health, cognition or independence, we hypothesized that the domains of QOL identified for children would also be applicable to the adult population with RTT. This study replicated previous qualitative methods [11, 13] and explored parental and/or caregiver observations to identify QOL domains important for adults with RTT. We then compared the QOL domains important for children to those identified for adults.

Materials and methods

Infrastructure and data source

The Australian Rett Syndrome Database (ARSD) was used for recruitment. The ARSD is a population-based register established in 1993 of Australian RTT cases born since 1976 [16] and cases are recruited through the Australian Paediatric Surveillance Unit and the Rett Syndrome Association of Australia [17]. As of May 2018, 451 females with clinically diagnosed or

genetically confirmed RTT, 81 of whom had died since registration, had been ascertained by the database. The adults in our recruitment pool ranged in age from 18-41 years.

Participants

Parents and/or caregivers of 22 adults with RTT who were registered with the ARSD were invited to participate in the study. Two of the invited families declined participation due to time constraints. Recruitment was purposive and, based on available data in the ARSD, aimed to capture variability in age, functional abilities (e.g. mobility), health (e.g. gastrostomy feeding, severity of epilepsy, scoliosis) in the adults with RTT and in sociodemographic characteristics (e.g. geographical location, level of maternal education) of the families (table 1). The adults with RTT had a variety of pathogenic mutation types (p.Arg168*, p.Arg133Cys, p.Arg294*, p.Arg270*, early truncating, large deletions, C-terminal deletions and those classified as ‘other’). The adults with RTT were aged 18–38 years and their mean (standard deviation) age at the time of the interview was 29 (5.9) years. Recruitment continued until thematic saturation was achieved as indicated by data coding.

All caregivers were English speaking and lived in eight states or territories across Australia. Sixteen parents (mothers) were interviewed in relation to their adult child with RTT who lived in the family home. Four of the 20 adults with RTT lived in group home settings. For two of the adults living in a group home, their primary caregivers were interviewed, each of whom had known the adults with RTT for longer than eight years. For the other two adults living in a group home, the parents were both in regular contact with their daughters and they were interviewed.

(Insert table 1 here)

Procedures

Parents or caregivers participated in semi-structured telephone interviews. Interviews ranged from 40–88 minutes in length and were undertaken, recorded, and transcribed by the primary researcher who was trained and supervised by researchers with extensive qualitative research experience (AE, JD).

The interview schedule was derived from an earlier qualitative study investigating QOL in children with RTT [11]. Open-ended questions allowed interviewees to describe comprehensively their observations relating to the QOL of the adult with RTT. Follow up and probing questions were used by the researcher to identify the types of observable behaviours the adult exhibited. Probing questions including “How do you know?”, “What does that look like to an outside observer?” and “Why do you think that is?” were asked. This strategy helped the primary caregiver interpret whether the adult found an experience satisfying or not and was used to avoid inferring caregiver emotion in relation to the adult who may not be able to verbally communicate to confirm the caregiver’s assumptions [13].

Interview recordings were transcribed and copies of the transcripts were sent to caregivers for member checking (completed by 80%). This provided the interviewee with an opportunity to clarify misinterpretations, emphasize their main concerns, and offer any important information that was not communicated in the original interview. Ethical approval of this study was provided by the Human Research Ethics Committee at Curtin University (HRE2017-0744). Verbal consent to participate in the digitally-recorded interview was obtained at the outset of the interview.

Data analysis

Data analysis using the qualitative software NVivo [18] commenced whilst data were still being collected. The primary researcher read the transcripts multiple times to become familiar with the data, enabling analysis and identification of key QOL domains. Data were reviewed to identify

recurring thoughts, ideas and phrases across the interviews. Similar codes were then integrated using directed content analysis [19]. That is, the previously identified child QOL domains [11] were used as an initial coding framework to assess whether the conceptual QOL framework for children is similar for adults with RTT. Operational definitions for each category were determined using the descriptions of the domains and their elements as found for children with RTT [11]. Any additional concepts would be coded as a newly identified domain. Coded data were reviewed by co-researchers (AE, JD), modified iteratively to ensure correct coding, and discussed within the research team. When all data were coded and themes identified, a comparison between existing QOL domains important to children were made with those important to adults with RTT.

Trustworthiness

Data collection and analysis guidelines were followed to ensure trustworthiness, credibility and confirmability of the findings [20]. The primary researcher listened to the audio recordings and read the transcripts which were then reviewed by co-researchers to ensure accuracy of the transcription and interpretation of data. The themes identified by the researcher were reflected upon and reviewed by the research team to ensure clarity of coding. Detailed descriptions of the findings and transcript quotations were selected to illustrate each domain, further strengthening the trustworthiness of the study. Dependability was enhanced through using an appropriate methodological framework and consistent dialogue throughout data collection. Transferability was supported by the research team's description of the adults with RTT, who were selected to represent a range of characteristics, thereby approaching the research question from multiple perspectives [20].

Results

All qualitative data were coded into the QOL domain framework previously identified for children with RTT [11]. No new domains emerged during data analysis. The 10 domains and their

elements identified as important to adults with RTT are summarised below and sample quotes are presented to illustrate each domain (tables 2, 3, 4 and 5). While adult domains and elements were consistent with those for children, the ‘provision of targeted services’ was frequently described as a prominent issue related to QOL for adults with RTT, and quotes are presented in a separate table (table 5).

Health and wellbeing

‘Physical health’: This domain described aspects of bodily health relating to comorbidities such as epilepsy, gastrointestinal disorders, respiratory illnesses or difficulties with sleep that impacted energy levels and wellbeing. It also included the challenges and pleasures of eating orally or via a feeding device (e.g. gastrostomy). These health challenges noticeably reduced participation and engagement, and appeared to affect satisfaction with social experiences. For example, poor physical health hindered their ability to participate in community activities such as attending day programs or pursuing recreational interests such as swimming.

‘Body pain and discomfort’: This domain included periods of distress and unsettled behaviours that appeared to be associated with bodily pain or discomfort. Pain and discomfort were often related to constipation. For example, caregivers often observed the women crying in response to constipation, thereby lessening her enjoyment derived from activities such as eating or engaging in social interaction.

‘Behavioural and emotional wellbeing’: This domain referred to emotional states, both positive and negative. Positive descriptions included making eye contact, smiling and laughing, which were often observed during social participation. Negative descriptions included agitation, increased handwringing, becoming less responsive and disengaging socially, or falling asleep in uncomfortable situations. For example, anxiety and hypersensitivity to noisy environments were

observed with increased handwringing and reduced ability to engage with eye contact in busy social settings, such as cafes.

(Insert table 2 here)

Daily activities

‘Communication skills’: This domain referred to the ability to convey needs and emotions non-verbally or verbally. All adults in the study were identified as unable to use words.

Communication using body language and eye contact was frequently described, enabling the adults to express how they felt about activities and to indicate their needs and wants.

Communication aids such as eye gaze technologies were used by three adults at the time of data collection. One adult had previously used an assistive device but no longer used it.

Communication aids were observed to enable the adults to make their wants or needs known and improve their apparent life satisfaction.

‘Movement and mobility’: Expressions of satisfaction or enjoyment often coincided with the observable use of motor and other functional ability skills. This domain included women finding pleasure in the purpose or action of movement, both on land and in water. For example, caregivers observed calmness or excitement when women moved freely in water, could purposefully ambulate to reach a destination, or moved their body in response to music.

‘Stability of daily routines’: This domain referred to interactions with familiar people and comfort felt in recognizable environments. Familiarity with different aspects of daily life was noted to provide a sense of security to the women, which in turn allowed them to predict and better tolerate daily activities, such as meal and shower times. Most of the adults could adapt to change in their

routines if required, but some familiarity provided comfort and reassurance, and they remained more relaxed and exhibited fewer fearful or anxious behaviours.

(Insert table 3 here)

Community immersion and services

‘Social connectedness’: This domain referred to personal relationships with others within social settings such as at home, or in day or community programs. The women were often described as demonstrating enjoyment in their social relationships through positive body language, such as sitting taller and being alert, engaging in eye contact, smiling and laughing in response to interactions.

‘The natural environment’: This domain referred to interaction with the elements of nature and the outdoors, which was frequently associated with exhibiting settled behaviours. This included time spent at the beach, local park, or with animals. Behaviours such as relaxation of the shoulders or limbs and facial expressions reflecting calmness were commonly observed when the women were immersed in a natural environment, and agitated or unsettled behaviours such as handwringing became less prevalent.

‘Variety of activities’: This domain referred to the enjoyment generated by involvement in different interactive activities including community day programs, family activities, horse riding, sailing, looking at books, listening to music, watching television, and time spent in water.

Caregivers noted varying levels of engagement and satisfaction based on their personal interests, as demonstrated by their eye contact, smiling and attention to the task at hand.

(Insert table 4 here)

‘Provision of targeted services’: This domain included the availability and accessibility of support services by appropriately trained health professionals, therapists and support workers who provide high quality, comprehensive and long-term care. Access to suitable equipment (e.g. wheelchairs, specialised bathroom equipment) as well as provision of home modifications were considered important in facilitating comfort and therefore the QOL for the women. Caregivers noted that regular communication with service providers was essential to ensure timely attention to the women’s needs. However, many caregivers described a discontinuation of quality services upon transitioning to adulthood. Overall lack of adult services and difficulties in accessing them were described as barriers to addressing needs that then negatively impacted on the health, wellbeing and QOL of the women.

(Insert table 5 here)

Discussion

In this qualitative study, aspects of QOL important to adults with RTT were coded into a framework previously identified for children [11]. Based on extensive qualitative data for children with intellectual disability to 18 years of age [11, 13, 14, 15], we recently developed the Quality of Life inventory – Disability (QI-Disability) measure of QOL and found preliminary evidence of reliability and validity [21]. Domains and their elements appear similar for adults with RTT whose disability is severe and this concordance suggests that QI-Disability will also be appropriate for this group. Concerns regarding appropriate provision of services were more frequently discussed in the adult dataset.

In line with literature indicating potential for improvement in the general health of women with RTT [22], physical health in the current sample was found to be generally good when described

by parents and caregivers. However, constipation has been reported to persist into adulthood [5] and we found this to be associated with substantial pain and discomfort for the women in our study. Some studies have shown that sleep disturbances may persist into adulthood [5, 23] while others have identified improvement [7, 24]. In our dataset, sleep disturbances persisted but with some improvement, affecting mood and participation in daily activities for some women. Other ongoing health issues for women in our study included breath-holding and recurrent urinary tract infections. However, a reduction in seizures [22, 23] and reduced impact of respiratory hyperventilation [25] with age were also reflected in our sample.

Some behavioural and emotional problems were reported to have improved since childhood (e.g. behaviour in response to coping with disrupted routines), but in line with other literature, stereotypies and poor hand function were noted to have remained stable over time [26]. Similar findings were reported in an Italian study that evaluated health in adults with RTT [23]. Consistent with the literature, in our sample of adults there was some deterioration in gross motor function reported for some women [22] while others retained their mobility during adulthood [27]. Other literature indicates that some older individuals may achieve improvements in mobility with training [22], suggesting that therapy and physical activity for adults with RTT is still of importance to maintain skills. Most adults in our study had scoliosis and those with severe scoliosis had undergone corrective surgery. Consistent with knowledge that spinal fusion confers an advantage to life expectancy in RTT and may reduce risk of severe respiratory illness [28], women in our study who had had surgical treatment for scoliosis were reported to have good QOL and were not commonly affected by respiratory illness or other complications.

Satisfaction with daily activities like communication, movement and familiarity of routines was often associated with relaxed body postures, calm behaviour and reduced anxiety. These positive observations coincided with less observed crying and handwringing. Ability to communicate

through non-verbal means or learning to use assistive devices was associated with smiling and increased engagement with eye contact, demonstrating satisfaction in the women in our study [22]. Reflecting the Italian study [23], nonverbal communication in our sample of adults tended to improve over time and caregivers felt they could better understand the women's needs and wants.

Social connectedness was often emphasised as important above all other domains, provided that poor physical health did not restrict social participation. One study explored social participation in women with RTT and found that they frequently encountered social interactions in their community, often supported by their siblings. This enabled them to establish their own identities and become valued community members [29]. Similarly, women in our study were reported to enjoy community participation and achieve good QOL by engaging with family members and their caregivers with whom they had close relationships. This engagement occurred during one-on-one time with carers or time spent sharing experiences with family, often in the natural environment settings (e.g. at the beach, swimming, riding horses). We were surprised that the minority had access to communication devices and this is possibly an important area for additional support, to further facilitate engaging social interactions that were associated with enjoyable life experiences, observed through relaxed or excited behaviours like smiling and laughing. This is consistent with reports of child QOL [11] where social inclusion improved life quality.

A noticeable decline in the quality of services after transitioning to adulthood was often discussed by parents and caregivers. Issues included a lack of funding for one-on-one assistance, which affected the women's ability to participate in social outings and day programs which could not cater to the needs of individuals with severe disability. Other matters such as women not receiving urgent medical care (e.g. for dental issues) illustrated poor or inconsistent service provision. Limited clinical knowledge and understanding of adults with RTT including specific aspects such as autonomic dysfunction were also discussed. Many caregivers mentioned the absence of a

multidisciplinary team approach for the young adult, making coordination of professional advice very difficult. Each of these posed barriers to maintaining or improving QOL for some women.

Previous research has identified an inadequacy of health services for young people with disability as they move into adulthood [30]. Given recognition that RTT is not a neurodegenerative disorder [31], the need for intervention and support in adulthood to maintain or improve skills relating to functioning for daily activities and communication is important. The relationship between health status and health service use in RTT has been investigated and results showed a decline in the use of health services parallel to poorer clinical wellbeing. Typically, health service use was higher at a younger age but reduced considerably by 25 years of age [7]. There could be various reasons for this decline, such as greater specialist intervention at diagnosis, family beliefs that medical care and interventions have less to offer as women age, a lack of available services generally, or difficulty in obtaining access to health services when women move to residential accommodation [7]. Caregivers in the current study consistently reported feeling frustrated at the lack of quality services that they believed detrimentally affected the adult's QOL.

Parents regularly described previously feeling fearful during their daughters' childhood that she would have a poor QOL throughout her life. This expectation stems from RTT often being described in the literature as a very severe disability with high mortality [5]. However, in keeping with the notion of the Disability Paradox, where severe impairment is not necessarily associated with poor life quality [32], caregivers of women with RTT consistently reported and described a good QOL. One caregiver reported *"They're no different to us. We all have the same needs, they've just got a few special needs."* This quote highlights that these women achieve QOL through similar means as those without disability (e.g. social participation, communicating needs and desires, feeling comfortable and being physically healthy), provided that activity and participation restrictions are avoided or moderated by appropriate contextual interventions [33].

Many caregivers wished that the data they provided to this study would enlighten young families about the positive experiences and good QOL that women with RTT can have. Clinicians also need to be aware of potential for a good QOL to counsel families as well as implement management strategies to help achieve this.

The strengths of this study include the diversity in genotype, functioning level, comorbidities and sociodemographic factors, as well as a sample size adequate to achieve thematic saturation. Due to the severity of the disability, all data were proxy-reported from the parental and/or caregiver perspective, but only observable behaviours were coded and probing questions were asked to avoid inferring parental or caregiver emotion [13]. One limitation of our study was that for individuals living in group home settings, interviews were inconsistently undertaken by parents or caregivers. Although no difference between parent and caregiver responses were noted, we acknowledge that there may have been varying perspectives of what contributes to a good QOL for the women. Further quantitative research could measure QOL using an appropriate measure and investigate relationships with age, health and participation factors for both children and adults with RTT in a much larger and preferably population-based sample.

This qualitative study provides empirical evidence for the important components of QOL in adults with RTT. It also offers insight into the stability of QOL domains from childhood into adulthood, where individuals face similar challenges for health, functioning and participation. The data provided in this study will inform the choice of a suitable QOL measure for this group. Data also suggest that the newly validated QI-Disability [21] recently developed for children with RTT would be appropriate for use in the adult population. Use of this measure could guide clinicians in identifying the need for supports and services and aid in the provision of life-long and individualized management strategies to promote a good QOL for women with RTT.

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Declaration of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Tables

Table 1. Characteristics of the adults with the Rett syndrome (n=20).

Characteristics	n
Age group	
18 to 28 years	11
29 to 39 years	9
Place of residence	
Family home	16
Group home	4
Mutation group	
p.Arg168*	5
p.Arg294*	1
p.Arg270*	1
p.Arg133Cys	4
C-terminal deletion	2
Early truncation	2
Large deletion	3
Other	2
Walking ability	
Independent	5
With assistance	6
Unable	9
Feeding	
Gastrostomy*	4
Oral	16
Current seizure frequency	
Daily/ weekly	5
Monthly	3
None in 6 months	1
Nil	11
Scoliosis	
No scoliosis	3
Conservatively managed	9
Spinal fusion	8
Residence	
Major city	14
Regional	6
Maternal education	
No post school qualification	10
Post school trade qualification or diploma	7
Tertiary qualification	3

*One adult with a gastrostomy took some food orally and another took hydration via her gastrostomy, with majority of food orally

Table 2. Domains and elements identified for children with Rett syndrome within the ‘Health and wellbeing’ category of domains [12] and sample quotes illustrating their relevance to adults with Rett syndrome.

QOL coding categories for children with Rett syndrome		Experiences of adults with Rett syndrome
Physical health	Elements	
	Enjoyment of food	<p>“She can get very wiped out with seizures. She will just sleep, sit down, not want to walk and refuse to do anything... When she is not having seizures she has a spring in her step. She is willing to participate in things and she wants to get up. If I give her a choice of things, she will do it. If I say, ‘do you want to go and sit outside?’ she will say yes and do it. She is more alive... She would be using her eyes a lot to communicate.”</p> <p>(30 years old)</p>
	Respiratory infection	
	Impacts of scoliosis	
	Impacts of epilepsy	
	Side effects of medications	
	Periods of unwellness	
Periods of low energy/ poor sleep quality		
Body pain and discomfort	Regulating body	<p>“When she is physically well, basically her eyes are clear, she's smiling, she's vocal and frequently laughing... She's walking well, she's not putting her hands in her mouth, there's no tremors, her face is free from anxiety.... She's not anxious, the hands aren't wringing so much and she has good movement. She's actually not tense in respect to her muscles as well as her joints.”</p> <p>(37 years old)</p>
	Temperature	
	Gastrointestinal discomfort	
	Prolonged sitting	
Behavioural and emotional wellbeing	Regulating body	<p>“If she's unhappy or uncomfortable with pains in the tummy, she'll get a bit agitated. She will wander around from room to room... She does get constipated and you can see that in her face... She's just not content-looking. I can usually tell because I rub her stomach and it's hard, but she just has this really solemn look about her and it becomes hard to get her to focus or get her to look at you. She looks away or she'll have her head downcast or even sometimes she'll sit there and close her eyes for no reason.”</p> <p>(23 years old)</p>
	Temperature	
	Gastrointestinal discomfort	
	Prolonged sitting	
	Prolonged sitting	
Behavioural and emotional wellbeing	Bruxism	<p>“I know when she is uncomfortable because she has hand-mouthing and if she gets really stressed out, her hand-mouthing will become very aggressive, so that is a good indication of how she is feeling. When she is really unsettled her hand-mouthing gets really bad and she will make herself gag and vomit.”</p> <p>(22 years old)</p>
	Handwringing	
	Self-injury	
	Fear and anxiety	
	Sensory hyper-sensitivity (e.g. excessive noise/light)	
		<p>“She doesn't have a full-on meltdown in a noisy place... She just shuts down and goes to sleep... She will drop her head, not put it up for you and then just go to sleep. Sometimes she will rub her head a lot.”</p> <p>(25 years old)</p>

Table 3. Domains and elements identified for children with Rett syndrome within the ‘Daily activities’ category of domains [12] and sample quotes illustrating their relevance to adults with Rett syndrome.

QOL coding categories for children with Rett syndrome		Experiences of adults with Rett syndrome
Domains	Elements	
Communication	<ul style="list-style-type: none"> Eye contact Facial expressions Body language Communication aids Can make needs known 	<p><i>“When I am working with her with her tablet and her PCEye Go, she just seems very content to be able to use that to communicate and looking at her, you can just see she is enjoying it ... I can tell by watching her face, her vocalising and her body posture... She kind of makes happy sounds. She looks happy. It is certainly not a grin but it’s an appropriate smile.”</i></p> <p style="text-align: right;">(22 years old)</p>
Movement and mobility	<ul style="list-style-type: none"> Opportunities for movement Mobility aids Pleasure in movement 	<p><i>“She enjoys walking... She stands up straight with her head up. You can feel her trying to initiate the steps. If she’s not pushing back and trying to sit down or complaining, she is looking forward to where she is going... She ends up straight and she tries to initiate the steps which means that she wants to do it.”</i></p> <p style="text-align: right;">(25 years old)</p>
Stability of routines	<ul style="list-style-type: none"> Familiar activities Predictable routines Consistent carers 	<p><i>“If her lunch is late she might get up out of her chair and come to the kitchen to investigate. She will come to someone if there is anybody around. She might rub her face in frustration.”</i></p> <p style="text-align: right;">(38 years old)</p> <p><i>“She will smile more or give more eye contact and have slightly brighter expressions for familiar people. She is more relaxed if she is being handled. An example is when someone is helping her out of a chair. If it is a new person, she will test them. She sometimes acts likes she doesn’t want to or can’t move, whereas we know that with someone familiar she will cooperate.”</i></p> <p style="text-align: right;">(38 years old)</p>

Table 4. Domains and elements identified for children with Rett syndrome within the ‘Community immersion and services’ category of domains [12] and sample quotes illustrating their relevance to adults with Rett syndrome.

QOL coding categories for children with Rett syndrome		Experiences of adults with Rett syndrome
Domain	Elements	
Social connectedness	Inclusiveness in social settings	<p><i>“If she has a lot of people around her, she seems to be more responsive and more alert. If we have a birthday party and everyone's sitting and standing around talking, then she'll be sitting there in the middle with a smile on her face and she'll be giving little giggles.”</i></p> <p>(24 years old)</p>
	<p>Responsiveness in social settings</p> <p>Enjoyable time with family members and other familiar people</p>	
Nature and outdoors	Exploration of plant life	<p><i>“I've noticed that nature is one of the greatest things she loves.... She will just sit when we're camping, looking at the tops of trees in the blowing wind. One night we saw her head looking right up and she just stared at the stars. She was quite engaged just looking at the stars in the sky... She loves sitting outside and looking at nature...She'll be looking at the birds and looking around at the trees and the leaves contently.”</i></p> <p>(35 years old)</p>
	Sensation of land elements and weather patterns	
	Time spent with animals (including pets and wildlife)	
Variety of activities	Motivation to engage	<p><i>“She can be totally serious and then as soon as the music starts she recognises it and brightens right up with a big smile... She will also let you know sometimes by looking at it or walking over to the music if it is not playing. If we are sitting next to her and the music stops she might pat us on the arm.”</i></p> <p>(38 years old)</p>
	Responsiveness to music and entertainment	
	Responsiveness to music to soothe when upset	
	Enjoys a range of activities	
		(24 years old)

Table 5. ‘Provision of targeted services’ domain and elements identified for children with Rett syndrome within the domain category of ‘Community immersion and services’ [12] and sample quotes illustrating the relevance to adults with Rett syndrome.

QOL coding categories for children with Rett syndrome		Experiences of adults with Rett syndrome
Domain	Elements	
Provision and access to services	<p>Informed service providers</p> <p>Accessibility of services</p> <p>Individualised programs</p> <p>Continuity of care</p> <p>Accessibility to equipment</p> <p>Availability of respite services</p>	<p><i>“I’ve had to so strongly advocate for her in the medical world.... Stepping into the adult world from the paediatric world, wow what a challenge that is. You basically feel like you’re being walked to a cliff, pushed over, you’re hanging on and you’re on your own. You’re just a number, whereas I felt that she mattered and was cared about when she was a child at the children’s hospital. She was so well known by her teams and the teams communicated. Well you know what, that doesn’t happen now.... I’ve been managing so much on my own that I should not be managing. I’m the only person to take bloods from her since she left the children’s hospital. She has a central port, so you can’t get blood through a vein. Taking bloods from a central port is a sterile procedure that you must be trained to do. No pathology nurse can do it and no standard nurse can do it, so you know who is left to do it? Me! I’m fighting the system now saying this is just disgusting that I am required to take bloods from her port. Once a month I have to flush it with Heparin and take her bloods.”</i></p> <p style="text-align: right;">(24 years old)</p> <p><i>“She grinds her teeth. She has three that have snapped off. We have been to the dentist and they have said that she has to go under anaesthetic, so we’re on a waiting list for 12 months. We’re getting pushed to the bottom of the list because she can’t say that it’s hurting. People that can say that it’s hurting get to jump the queue. I have been told if they get infected, we can jump the queue then... I don’t think that’s a way to treat a person, allow her to get infected when there’s no communication.”</i></p> <p style="text-align: right;">(37 years old)</p>

