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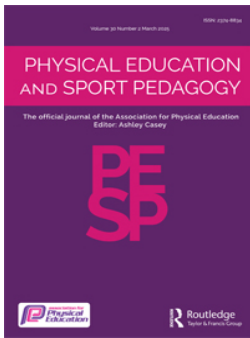
De Silva, C, Hawkins, M, Mazzoli, E, Essiet, IA and Barnett, LM (2023) First-nation Australian children's interpretation of a pictorial questionnaire designed to assess physical literacy. Physical Education and Sport Pedagogv. ISSN 1740-8989

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To cite this article: Chathurani De Silva, Melanie Hawkins, Emiliano Mazzoli, Inimfon Aniema Essiet & Lisa M. Barnett (21 Nov 2023): First-nation Australian children's interpretation of a pictorial questionnaire designed to assess physical literacy, Physical Education and Sport Pedagogy, DOI: [10.1080/17408989.2023.2284925](https://doi.org/10.1080/17408989.2023.2284925)

To link to this article: <https://doi.org/10.1080/17408989.2023.2284925>



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First-nation Australian children's interpretation of a pictorial questionnaire designed to assess physical literacy

Chathurani De Silva^a, Melanie Hawkins^{lb}, Emiliano Mazzoli^{lb a,c}, Inimfon Aniema Essiet^{a,d} and Lisa M. Barnett^{a,c}

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ABSTRACT

Background: The Physical Literacy in Children Questionnaire (PL-C Quest) is a pictorial tool designed to measure children's self-reported physical literacy. It measures 30 elements within the four domains (physical, psychological, cognitive, and social) of the Australian Physical Literacy Framework (APLF). The development study of the PL-C Quest only included children from non-Indigenous backgrounds living in a metropolitan city. Hence, little is known about how Indigenous children living in regional and rural areas understand and engage with the items.

Purpose: The study aims to determine if Indigenous children living in regional and rural areas in Australia understand the items in the PL-C Quest (test content) and if they cognitively engaged with the items (response processes) as intended by the APLF definitions.

Methods: The study followed a qualitative descriptive approach. The PL-C Quest includes an orange cartoon bunny carrying out 30 scenarios with accompanying statements. Each scenario has one bunny rabbit doing the activity well and the other bunny not so well. Cognitive interviews were conducted based on verbal probing using Tourangeau's four-stage cognitive model (comprehension, retrieval, judgment, and response). In the regional town, nine Indigenous children were interviewed one on one in after-school sessions. In the rural town, 12 Indigenous children enrolled in the school programme of a sports provider were interviewed in pairs or small groups. All individual and group interviews were audio recorded and transcribed verbatim. All transcripts were coded using the NVivo12 software. Each cognitive action of Tourangeau's model, comprehension, retrieval, judgment, and response, became a coding category. Responses coded into each category were further categorised into sub-categories. For instance, 'Understood as intended', 'Partially understood', and 'Misunderstood' were subcategories for comprehension; 'skills' and 'past events and experiences' were for retrieval; 'confident and unconfident' were for judgment; and 'justify' and 'unable to justify' were subcategories for response category. Once the first author completed the analysis of the children's responses to items, the other two authors' part of the data collection confirmed the accuracy of the coding.

ARTICLE HISTORY

Received 24 May 2023

Accepted 13 November 2023

KEYWORDS

pictorial scale; motor skills; Indigenous; self-report; tool testing; Aboriginal and Torres Strait Islander; cognitive interviews

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Findings: Overall, children in both sites understood most of the content of the items as intended. In addition, they could retrieve relevant information when responding to the items. For example, a few children reflected on their ability to play a ball-throwing Indigenous game and carry younger siblings when responding to the items, 'Object Manipulation' and 'Strength', respectively. Also, most children confidently selected the bunny that represented them more in all 30 items and were able to justify their responses.

Conclusion: The study is the first to generate validity evidence for the PL-C Quest when used with Indigenous children in regional and rural Australia. The findings demonstrate that this pictorial scale may be a suitable tool to collect data about the physical literacy of Indigenous children living in regional and rural areas – subject to further testing with a larger population. Future research may provide evidence on other sources of validity. For instance, whether these domains uphold the measured construct, physical literacy (internal structure), with Indigenous children.

Introduction

Despite the benefits of being physically active (Chaput et al. 2020), only 23% of Australian children aged 5–14 years met the guidelines of 60 min of daily physical activity (World Health Organization 2022). Physical literacy (PL) has emerged as a means to promote physical activity in children (Belanger et al. 2018; Cairney et al. 2019). Whilst there are many definitions for PL (Martins et al. 2021), in Australia, a physically literate person can rely on their physical, psychological, social, and cognitive abilities to facilitate physical activity that corresponds with their circumstances and environment (Australian Sports Commission 2019). This definition was developed alongside the Australian Physical Literacy Framework (APLF) (Australian Sports Commission 2019). The APLF recognises four domains (physical, psychological, social, and cognitive) and 30 elements within these domains as needed for PL development (Australian Sports Commission 2019). The APLF is one of few frameworks which includes the social domain, which refers to a person's ability to associate with others when participating in physical activities (Keegan et al. 2019; Australian Sports Commission 2019).

PL tool developers have aligned measures to their interpretation of the definition of PL (Corbin 2016; Edwards et al. 2018; Young et al. 2021). The Physical Literacy in Children Questionnaire (PL-C Quest) is the only tool that measures all 30 elements of all four domains of the APLF (see Table 1). In addition, the PL-C Quest is unique in its combined use of pictures and statements to describe each questionnaire item. It was purposefully designed in a cartoon format to assist children in understanding the PL constructs (Barnett et al. 2020). The main character in the images is an orange bunny, designed to not represent any specific gender, race, or ethnicity. As such, the character can theoretically relate to all children (Barnett et al. 2020). Each item presents an image of a bunny able to do the physical activity scenario and a bunny that is not as able. For instance, Figure 1 shows an item in the psychological domain where the bunny on the left can control its disappointment when they miss the target; in contrast, the bunny on the right cannot control its disappointment when they miss the target. The administrator shows each scenario to a child. First, the child selects the image most like them; then, the child chooses how much the image resembles them (resulting in a four-point response option).

The PL-C Quest was developed to assess self-reported PL (Australian Sports Commission 2022). First, however, studies need to be conducted to determine the extent to which the data generated by an assessment tool are valid for making decisions for their intended purpose (American Educational Research Association et al. 2014). Validity evidence can be understood within the theoretical framework of the Standards for Educational and Psychological Testing (the Standards)

Table 1. Physical Literacy in Children Questionnaire (PL-C Quest): Definition according to Australian Sports Commission for each of the 30 physical literacy elements and the associated pictorial detail (Barnett et al. 2022).

Elements	Australian Sports Commission Definition	Detail in image
Physical domain		
Movement Skills	Movement skills that allow a person to move (land, water, ice, etc.), from one place to another	Child hopping well vs. child hopping poorly
Moving with Equipment	Movement skills used to move on, in or with equipment from one place to another	Child skateboarding well vs. child skateboarding poorly
Object Manipulation	Movement skills that use a body part(s) to move or manipulate an object	Child overarm throwing well vs child throwing poorly
Cardiovascular Endurance	Ability of the heart and lungs to deliver oxygen to working muscles	Child looking energetic in cross country race vs. child looking exhausted and slow
Muscular Endurance	Ability of a muscle(s) to repeatedly exert force over a sustained period of time	Child hanging on climbing bar frame for a long time vs. child letting go
Coordination	Ability to move different body parts in a controlled, smooth and efficient manner	Child doing lots of jumps vs. child getting leg caught in rope
Stability/Balance	Movement skills involving balance and weight transfer	Child balancing well with one leg on a rock vs. child wobbling on rock
Flexibility	Capacity of a joint or muscle to move through its full range of motion	Child touching toes with fingers and straight legs vs. child reaching only as far as knees
Agility	Ability to quickly change body position and/or direction of body	Child dodging others in tag game vs. child getting tagged
Strength	Ability to carry out work against a resistance	Child in garden lifting a heavy rock vs. child not able to pick rock up
Reaction Time	Length of time taken to respond to a given stimulus	Child starts running at sound of starter gun vs. child slower than the gun
Speed	Ability to move quickly across the ground, through the water or air or move limbs rapidly.	Child winning race vs. child coming towards end of race
Psychological domain		
Motivation	Reasons for engaging in movement and physical activity in response to internal or external factors	Child with thought bubbles signifying several motivations for activity (i.e. because it is 'good for you' and 'fun', winning 'reward' and 'trophy') vs. child not seeing reasons to be active
Self-regulation (emotions)	Ability to manage emotions and resulting behaviours in relation to movement and physical activity	Child looking cross when they miss the target vs. child controlling their feelings
Self-regulation (physical)	Recognising and managing physical signals such as pain, fatigue and exertion	Child who understands how to pace themselves to get to the top of a hill vs. child who rushes halfway up and then has to slow down
Self-perception	Understands self in relation to movement and physical activity and recognises personal strengths and areas for development	Child doing a poor performance of a cartwheel and understanding through a thought bubble that it is a poor performance vs. a child doing a poor performance who thinks they are doing a good performance
Confidence	A belief in self-worth and ability to perform in movement and physical activity	Child trying an experience like a zip-line vs. child not being willing to try
Engagement and Enjoyment	Positive emotions and experiences derived from movement and physical activity	Child engaged in lots of different activities (shooting hoops, skipping, scooter) in front yard looking happy vs. child looking bored and walking away
Connection to Place	Appreciation and connection to the environment, both built and natural in relation to movement and physical activity	Child who can find a special place in nature vs. child unsure of where to play /go
Social domain		
Ethics	Moral principles that govern a person's behaviour relating to fairness and justice, inclusion, equity, integrity and respect	Child shakes hand to children at end of game vs. child who walks away without shaking hands
Relationships	Building and maintaining respectful relationships that enable a person to interact effectively with others	Child offering for child to join ball game vs. child not welcoming child to join game
Collaboration	Social skills for successful interaction with others, including communication, cooperation, leadership and conflict resolution	Child in a group with others building a cubby that is progressing well vs. child on their own building a cubby that is not progressing as well
Society and Culture	Appreciation of cultural values which exist within groups, organisations, and communities	Child looking interested/ clapping at children doing unfamiliar dances vs. child turning away
Cognitive domain		
Perceptual Awareness	Tacit knowledge used to quickly recognise the environment and make accurate decisions: based	Child cycling and being aware of a dog about to run into their path vs. a child who is unaware of what is around them and likely to run into the dog

(Continued)

Table 1. Continued.

Elements	Australian Sports Commission Definition	Detail in image
	on experiences, observations, emotions and intuition	
Content Knowledge	Factual knowledge a person can understand and convey; often important in recognition, recall and planning	Child with thought bubbles showing benefits of physical to the heart, brain etc. vs. child looking unsure with one thought bubble
Rules	Explicit or understood regulations and principles governing conduct or procedure within movement and physical activities	Clear sign saying bombing not allowed. Child obeys sign and steps in vs. child does bomb in pool.
Reasoning	Consciously making sense of things by verifying facts and applying logic to construct, change or justify practices and beliefs	Child looking outside at backyard in the rain and decides to play actively indoors vs. child who is unsure what to do next
Strategy and Planning	Strategy and planning describes how set goals will be achieved using reflection and resources available	Child climbing and reasoning through the route looking ahead to where they are going vs. child getting stuck looking into wall
Tactics	Planned and ad hoc decisions and actions, employed in the moment for the pursuit of goal/s	Child leading into space to create an option for a pass vs. child standing still behind defender waiting for pass
Safety and Risk	Understanding of risks, risk-management and safety considerations for self and others in movement contexts	Child going between flags vs. child going to another part of water to swim

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(American Educational Research Association et al. 2014). The Standards outline five sources of validity evidence (including test content, response processes, internal structure, relation to other variables, and the consequences of testing) (American Educational Research Association et al. 2014).

The development study of the PL-C Quest provided evidence based on the content of the items and the children's response production processes when engaging with the content (Barnett et al. 2020). Although this study followed a comprehensive approach to develop and conduct initial testing of the data of the PL-C Quest (Barnett et al. 2023), the sample only included children from non-Indigenous backgrounds living in Melbourne, Australia (Barnett et al. 2020). Indigenous communities in regional and rural areas participate in traditional games and face different challenges in being physically active compared to those living in metropolitan areas (Dahlberg et al. 2018; Dubnewick et al. 2018). Therefore, it is important during an assessment tool's development and testing stages to be sensitive to the individual characteristics of participants (American Educational Research Association et al. 2014). In addition, the targeted tool users must understand and cognitively engage with the items as intended by the developer before quantitative methods, usually requiring large samples, are utilised in subsequent testing phases (Dietrich and Ehrlenspiel 2010). Little is known about how Indigenous children living in regional and rural areas understand and cognitively engage with the items in the PL-C Quest. Therefore, the current study aims to explore how children aged 6–12 from regional and rural Indigenous communities interpret the PL-C Quest content and whether they engage with it as intended by the APLF framework.

Method

Sample and recruitment

This qualitative descriptive study (Neergaard et al. 2009) rests on a partnership with the Moriarty Foundation's John Moriarty Football (JMF) programme (<https://moriartyfoundation.org.au/programs/john-moriarty-football/>). Moriarty Foundation is an affiliate of an Australian Aboriginal-owned strategy and design company, Balarinji. The football programme is conducted in partnership with Indigenous Australian communities and explicitly focuses on Indigenous children (Moriarty Foundation 2022). In consultation with the Foundation, the research team selected

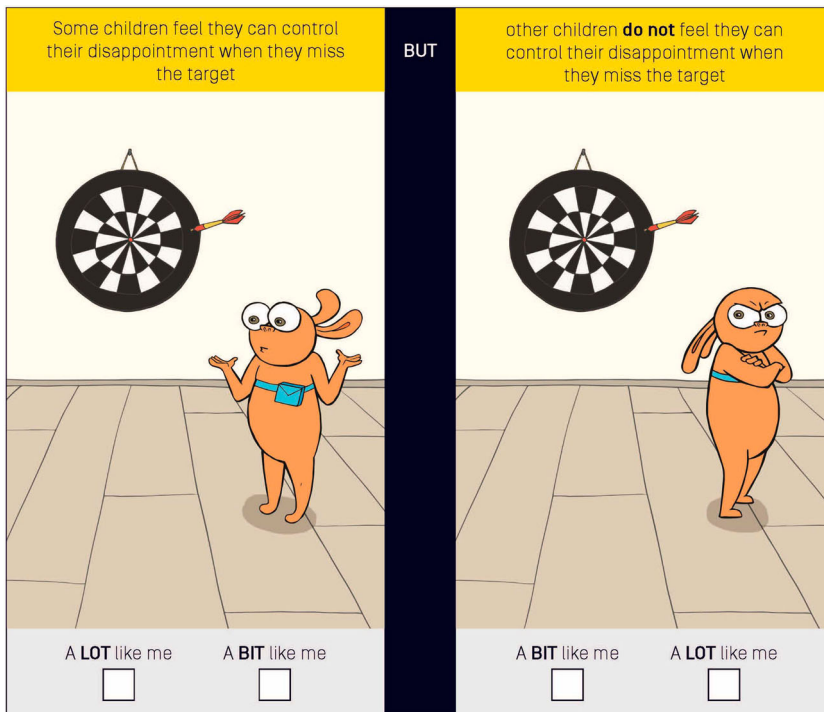


Figure 1. Physical Literacy in Children Questionnaire (PL-C Quest), Self-Regulation (emotions): (a) ‘Some children feel they can control their disappointment when they miss the target.’ (b) ‘Other children do not feel they can control their disappointment when they miss the target.’ (Australian Sports Commission 2021). This work has been based [in part] on the ‘Physical Literacy in Children Questionnaire (version 1)’, which was accessed with the permission of the Australian Sports Commission. This Physical Literacy tool is an initiative of the Australian Sports Commission and more information regarding the tool can be found at https://www.sportaus.gov.au/physical_literacy/resources.

programmes delivered in two localities (the regional town in New South Wales – Site 1 and a rural town in the Northern Territory – Site 2). Australian Indigenous peoples are made up of many different communities that differ in language and heritage. At least one Indigenous community lived in the region for Site 1 and nine communities in Site 2 (National Indigenous Australians Agency n.d.).

The initial setup of the project involved presentations to leaders from the local Indigenous communities to explain the project and seek support, feedback, and advice. Once support was gained, ethics was submitted and approved by the Deakin University Human Research Ethics Committee (2021-373). Following ethics approval, one of the researchers (Author 3) emailed the parent information sheets, consent forms, and parent surveys to the JMF programme director, who subsequently emailed them to the programme head coach on both sites. The head coach and the coaches running the sessions handed the parent information sheets, consent forms, and parent surveys to the parents or carers of the children in the after-school sessions. In Site 1, 11 parents consented to their child being interviewed, with two consenting children absent on both testing days. In Site 2, 14 parents consented for their child to be interviewed, with two consenting children absent.

Data collection

Approach to data collection

Consenting parents and carers completed a short survey that included information about their children’s age, gender, cultural background, and language spoken at home. Then, using Tourangeau’s

1984 four-stage cognitive model, the researchers conducted cognitive interviews in English (based on verbal probing) with children in both sites (Tourangeau 1984). Tourangeau's 1984 four-stage cognitive model (comprehension, retrieval, judgment, and response) is particularly useful when studying the response processes individuals undergo when responding to questionnaire items and fits well with cognitive interviews (Willis 2015).

The interview process involved the researcher asking the children the verbal probes in the interview guide (see Table 2) while administering the PL-C Quest.

Considering young children's short attention span (Palfrey et al. 1985) and the need to ensure that information-rich data were gathered across all questionnaire items, the researchers prepared two spiral-bound books. Book number one had the items in the order that the PL-C Quest was designed to be administered, while the order of the items in book number two was reversed after the 12 items of the physical domain. The physical domain items were asked first in both versions. The rationale was that the physical domain questions being asked first would warm children up to the task. This approach was taken because a validity study of a past pictorial instrument focused only on the physical domain (motor skills) and reported that children aged 5–8 years found pictures about such skills easy to relate to and understand, e.g. *'How good are you at throwing?'* (Barnett et al. 2015).

Procedure

In Site 1, the regional town, two researchers conducted individual interviews outside at a sport field during the after-school programme. As advised by JMF staff, the male researcher (Author 3) interviewed the boys, and the female researcher (Author 1) interviewed the girls. The children being interviewed were always in sight of the coach and other children. All interviews were audio recorded. The researchers alternately used the two spiral books (Books One and Two) with the children they interviewed. At the start of the interview, the researcher briefly explained the interview process, commencing the recording, and ran through an example before formally beginning the interview. Then, the researcher showed the first item from the PL-C Quest and probed using the interview guide. In a few instances, the researcher had to use additional probes not contained in the interview guide to reinforce what children had to say when describing some of the complex items of the PL-C Quest (e.g. items in the Cognitive domain, Content and Knowledge, and Safety and Risk). In addition, the researchers asked all children if they needed a short break after completing the first half of the questionnaire (first 15 questions).

In Site 2, the rural town, two researchers (Author 3, male and Author 5, female) conducted four paired/group interviews. Both researchers were present in each session. All the group interviews (except for one) were of mixed gender. It was considered more appropriate by the community

Table 2. Interview guide.

Cognitive action	Verbal probes
Comprehension	<ul style="list-style-type: none"> • (After showing the item) Can you tell me in your own words what the bunny character is doing? <i>Wait for the child to respond.</i> • (After readings the words) What is the difference between the two pictures?
Retrieval	<ul style="list-style-type: none"> • Have you seen or done the activity in this picture before? • (If the child has not done the activity before) Is this something you might try in the future?
Judgement	<ul style="list-style-type: none"> • Which is more like you? • (After the child has picked a bunny) Is this picture a lot like you or a little like you?
Response	<ul style="list-style-type: none"> • Why did you pick that picture?

advisory group at this site for the children to be interviewed with other children, not on their own. Like Site 1, the researchers used the two spiral books and the interview guide for the group interviews. The 12 children were grouped according to class groupings by the JMF programme. Three sessions had two children each, while six participated in one group interview. Each child responded to a question when they felt they had something to say, and they raised their hand to indicate they wanted to speak. They showed the first item and, similar to Site 1, asked the questions relating to the cognitive actions, comprehension, retrieval, and judgement contained in the view interview guide (see Table 2). Unlike Site 1, the researchers did not ask the children questions relating to the cognitive action response due to the window of time available to complete the interviews. Based on the knowledge gained from Site 1, the researchers expanded the interview guide to encourage children to talk when describing some of the complex items of the PL-C Quest (e.g. items relating to the psychological and social domains).

Data analysis

All individual and group interviews were audio recorded and transcribed verbatim immediately after they were completed (Author 1), and information from the parent surveys was summarised. Next, the researcher (Author 1) uploaded the transcripts from both sites to NVivo12 for coding. Each transcript was analysed using coding categories established in advance. Each cognitive action of Tourangeau's model, comprehension, retrieval, judgment, and response (Willis 2015). The coded data was presented (Author 1) in a tabular form to the other researchers (Author 3 and Author 5) in the data collection team to confirm the accuracy of these codes as applied to the data. Each item of the PL-C Quest was presented as a column, while each child represented a row. Each row had four sections, and each section constituted a coding category. Next, the responses for an item coded to the comprehension category were compared (Author 1) against the definition provided for that item in the APLF (see Table 1). Subsequently, responses coded into the comprehension category were categorised (Author 1) into the following three sub-categories: 'Understood as intended,' where the child described the activity and explained why they knew the bunny was performing it; 'Partially understood' when the child accurately described the activity in the item without explaining why they knew the bunny was performing that activity; and 'Misunderstood' when the child could not accurately describe the activity and could not explain why they knew the bunny was performing it.

Furthermore, responses coded into retrieval were categorised (Author 1) into 'skills' (a child's ability to perform an activity) and 'past events or experiences.' Responses coded into judgement were categorised (Author 1) as 'confident' and 'unconfident,' while responses coded to the response category were categorised (Author 1) as able to 'justify' and 'unable to justify.' The responses to an item categorised into subcategories of each cognitive action (categories) were also presented to the researchers of the data collection team in a table form to confirm accuracy. In addition, a summary of findings was prepared (Author 1) at the individual child level for both sites, including how many of each child's responses matched the corresponding item intent, how many only partially matched the item intent, and how many did not match.

Results

Over both sites, the children understood most of the content of the items (see Figure 2) as intended by the APLF definitions. However, a few items in each domain were either 'Partially understood' or 'Misunderstood' by the children, i.e. Physical domain (Cardiovascular Endurance; Muscular Endurance; Coordination; Stability/ Balance, Agility; and Reaction Time), Psychological (Motivation; Self-Regulation – Emotions and Physical; and Self-Perception), Social (Ethics), and Cognitive domain (Content Knowledge; Reasoning; Tactics; and Safety and Risk). Figure 2 is a summary chart of the children's responses grouped into the three sub-categories within the comprehension category.

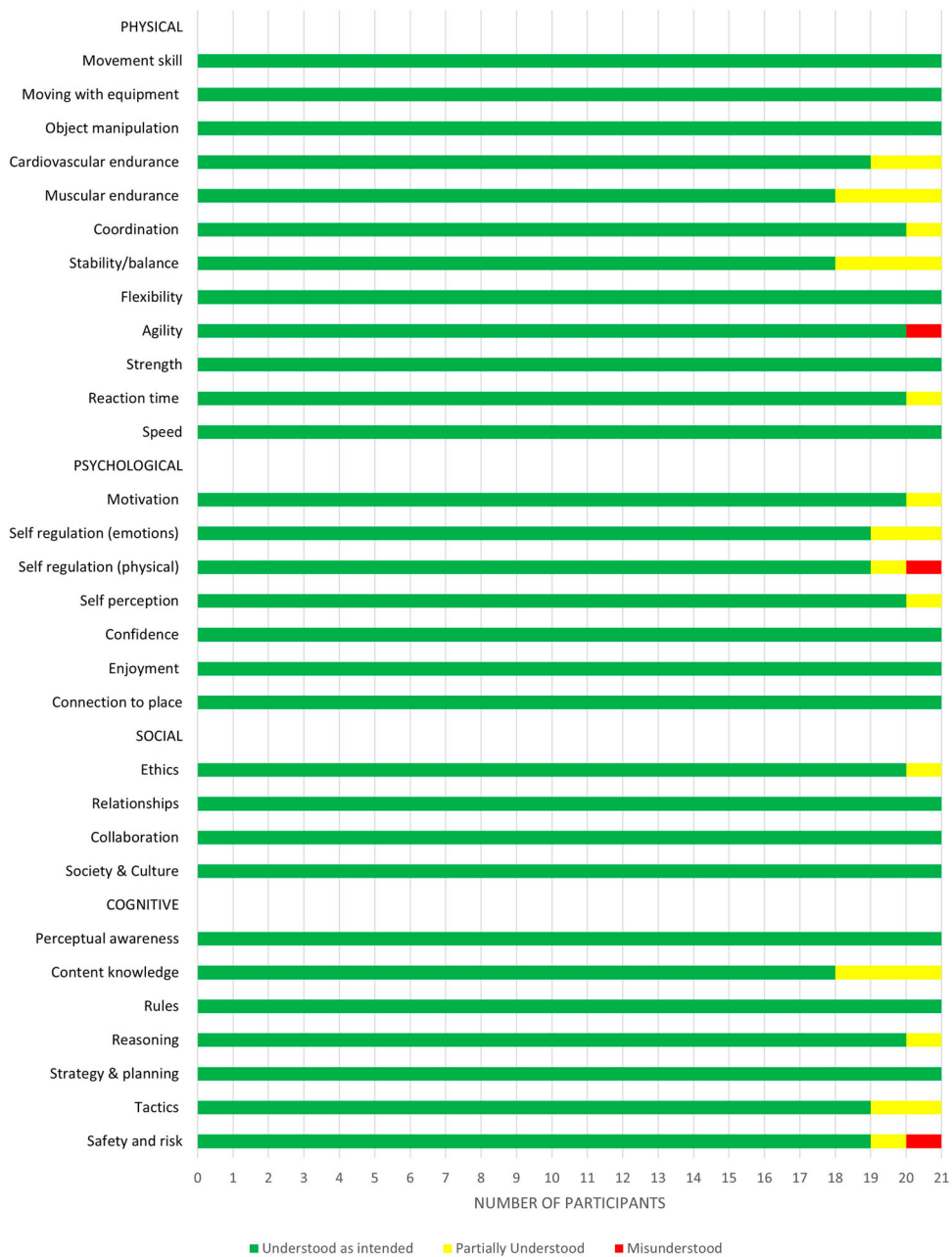


Figure 2. The summary chart of children’s responses grouped into understood as intended, partially understood, and misunderstood for each item.

Site 1

In the regional town, nine interviews were completed over two days. Five girls and four boys aged six to 12 years (mean ± SD = 9 ± 2.03 years) were interviewed, all with an Aboriginal and/or Torres Strait Islander background. The main language spoken in each child’s household (except for one) was English. Only two children took the offered break after the first half of the questionnaire. In a few instances, in the ‘Understood-as-intended’ sub-category, the children used familiar games to

describe what the bunny was doing in the image, thereby showing their understanding. For example, Child 4 (age 9) described the bunny that was good at hopping (Movement Skill) as *'The bunny character is jumping hopscotch.'* In addition, a few children who had not done the pictured activity could still interpret the item as intended by the APLF definitions. For example, for the item Safety and Risk, Child 5 (age 11) had not swum in the ocean but understood that one should swim between the flags: *'I watched a video about safe flags, so I know where to go.'*

Mainly two children 'Partially understood' some of the items. For example, the following response by Child 6 (age 7) for item Self-Regulation (emotions) was categorised into the 'Partially understood' sub-category: *'Playing darts. That one likes playing darts'* (referring to the bunny that could control its disappointment when it missed the target) and *'Not playing darts, and that one does not'* (referring to the bunny who could not). An example of a response categorised into the 'Misunderstood' sub-category was by Child 6 (age 7). The child misunderstood the item Agility as they said: *'Handshake. One likes handshakes'* (referring to the bunny good at dodging other kids), and *'Not handshaking. One does not'* (referring to the bunny not good at dodging).

In relation to the retrieval category, most children referred to their ability to carry out an activity ('skills') or 'past event or experience' when responding to an item. An example of 'skills' is when Child 5 (age 11) referred to their ability to balance on one leg, *'I am good at balancing'* when responding to item Stability/ Balance (where one bunny was balancing well on a rock, and the other bunny not so well). An example of 'past events or experiences' is when Child 1 (age 10) refers to his experience at the local pool when responding to item Rules (see Table 1), where one bunny obeys the no-bombing sign at the pool, and the other does not. *'Like in the [name of town] pool, since I know, I am really sure that I won't hit my head.'*

In the judgement category, all children (except Child 3, age 7) 'confidently' selected a bunny that represented them in all 30 items. On the other hand, Child 3 (age 7) could not select a bunny ('unconfident') for two items (i.e. Movement Skill and Self-Perception). Similarly, most children (except Child 3) could 'justify' their selected response in the response category. For example, when Child 2 (Age 6) was asked why she chose the bunny that could control its disappointment when it missed the target (Self-Regulation – emotions), she responded, *'I don't really care [about the outcome].'*

All nine children could maintain concentration throughout the interview, and there appeared to be no difference between the quality of the responses from children who were interviewed with the items in the reverse order after the physical items or the original order. Moreover, no differences were observed in the richness of the answers between the two children who took the break and the children who did not. The findings for each child revealed no pattern in terms of age. Instead, the summaries revealed that Child 4 (age 9) and Child 6 (age 7) found it the most challenging to interpret the items as intended. Another finding from the child-level summary was that although Child 3 (age 7) understood all items as intended, they needed more probing to extract information relating to cognitive actions than the rest of the children. Also, all children selected the bunny inviting other kids to play for the item Relationships.

Site 2

Twelve children, nine girls and three boys aged six to 12 years (mean \pm SD = 8 ± 1.16 years), were interviewed in the rural town, all with an Aboriginal and/or Torres Strait Islander background. The main language spoken in each child's household was English. Overall, the children understood most of the content of the items of the PL-C Quest as intended. For example, all children understood the content of all six items in the psychological domain. Similar to Site 1, a few children used games that they were familiar with to describe what the bunnies were doing. For instance, Child 16 (age 8) described the bunny that was good at overarm throwing (Object Manipulation) as doing shot put. When describing what the bunny character was doing, a few children included intentions of other items in the PL-C Quest. For example, for Enjoyment, where one bunny likes being active

in lots of different ways, and the other bunny does not, Child 18 (age 10) responded: ‘*He [the bunny that is enjoying] has so much energy he doesn’t give in.*’ In this example, the child understood that the proficient bunny enjoys different activities than the other bunny. However, elaborating that the proficient bunny has the energy to carry out various activities in an extended period also aligns with the intent of the item, Cardiovascular Endurance, in the physical domain.

For the other three domains (physical, social, and cognitive), there were a handful of items for which some children ‘Partially understood’ (e.g. Muscular Endurance, Stability/ Balance, Ethics, and Reasoning). For example, the following response by Child 11 (age 8) for the item, Ethics, was categorised into the ‘Partially understood’ sub-category: ‘*shaking hands, one is joining,*’ (bunny that wanted to shake hands with kids from the other team after losing) and ‘*the one is quitting*’ (bunny not wanting to shake hands after a loss). In this example, Child 11 (age 8) demonstrated an understanding of what the bunny rabbit was doing, which was that the bunny was shaking hands. However, they could not understand the meaning of the item as intended (the behaviours relating to respect, integrity, and sportsmanship in a competitive setting). None of the children’s responses were categorised into the ‘Misunderstood’ sub-category.

The children in the rural town also recalled their ability to carry out activities (‘skills’) or ‘past events or experiences’. For instance, Child 17 (age 8) said, ‘*I can skip with one leg*’ for item Coordination (see Table 1). Child 15 (age 10) and Child 18 (age 10) remembered their time carrying their younger siblings when responding to item Strength (see Table 1). Child 13 (age 7) recalled the time they were running and playing at the dam in the rural town when responding to the item Connection to Place (where one bunny feels they have favourite places to hang out and play and the other bunny does not).

All children could select the bunny that represented them. For example, Child 21 (age 6) responded, ‘*I like to invite*’ when asked which bunny looked more like them for item Relationships (image of a bunny inviting other kids to play with them and the other bunny not inviting other kids). Like Site 1, all children who responded selected the bunny inviting other kids to play for the item Relationships. Also, all children were able to explain their chosen response options. For example, for Cardiovascular Endurance (Table 1), Child 10 (age 8) explained that they would be a lot like the bunny not so good at running for a long time because they have asthma.

The researchers observed that most children in the rural town provided narrative-style responses. For example, when Child 17 (age 8) was responding to the question if they had done the activity in Stability/ Balance, the child said, ‘*When I go to [my friend’s] house, there is a rock in the backyard, and five minutes before I go, me and [my friend] practice balancing*’. At the child level, there was no pattern of children belonging to a particular age or gender not understanding the content of the items as intended.

Discussion

This is the first study that provides evidence for the content of the items in the PL-C Quest and the response production process of Indigenous children ages 6 and 12 years from a regional and a rural town. Overall, the children understood most of the content of the items as intended. In addition, most children could retrieve relevant information when responding to the items in the PL-C Quest. They either referred to their skill levels, past events, or experiences during their decision-making. For example, a few children in the regional town referred to the bunny that was good at overarm throwing as playing handball. In this instance, handball is an Indigenous ball-throwing game played by the children as part of their school programme run by JMF. Similarly, a few children recalled their time at the dam in the rural town when discussing the bunny who had a favourite place to hang out and play. Furthermore, in response to the judgment and response verbal probes, most of the children could select the bunny that represented them more and justified their answers. These results confirm that most children found the questionnaire straightforward and could relate to the response options provided in all 30 scenarios. Although the 30-item questionnaire was

administered in a partially reverse order for half of the children in the regional town and two of the group interviews in the rural town, there did not appear to be differences in how they responded to the items; children were engaged throughout the questionnaire administration.

Other tool developers have confirmed the importance of following a respondent-focused approach and concentrating on the components of the question-answer process of a child during the early stages of development and testing. These tool developers, based on the findings from the child interviews, either made improvements to items, response options, the way the final version of the questionnaire was distributed to the children or the contexts in which the questionnaire can be used in the future (Barnett et al. 2015; Lodewyk and Mandigo 2017; Mota, Martins, and Onofre 2021; Spencer, Bouffard, and Watkinson 2020; Woolley, Bowen, and Bowen 2004). A few researchers have tested assessment tools with Indigenous children age from 8 to 18 years (Stearns et al. 2019; Young et al. 2015). For instance, a Canadian study investigated two PL assessment tools, the Physical Literacy Assessment for Youth (PLAY) *PLAYfun* and *PLAYbasic*, in two remote Canadian Indigenous communities with children aged 8–14 years (Stearns et al. 2019). However, this study followed a quantitative approach to evaluate the tool's psychometric properties and did not report on how the children understood and cognitively engaged with the items of the tool (Stearns et al. 2019). The other Canadian study used cognitive interviews to investigate whether Aboriginal children aged 8–18 years understood the items of a self-report survey (the Aboriginal Children's Health and Well-Being Measure) as intended (Young et al. 2015). The findings (e.g. difficulties in understanding expressions used and relating to the response options provided for an item) assisted the researchers in changing the expressions in 19 items (Young et al. 2015). However, these challenges were not experienced by the children in the current study. This may be due to the pictorial nature of the PL-C Quest. As previously mentioned, the tool developers of the PL-C Quest intended that the cartoon images would assist children from diverse backgrounds to understand items with abstract concepts. In addition, items in the PL-C Quest were re-drawn based on child feedback from the interviews in the development study, helping to ensure the images were relevant to children's understanding (Barnett et al. 2020).

There is evidence that yarning, or storytelling, is an appropriate method of collecting data about Indigenous Australians, especially regarding personal experiences (Smith, Devine, and Preston 2020). The findings from the group interviews with the children from the rural town support these findings and favour the PL-C Quest as a suitable assessment tool to measure Indigenous children's self-perceived PL because the questionnaire has a narrative design involving an orange bunny carrying out 30 different scenarios. Children could relate these scenarios to their context; in some cases, the response to these scenarios signified known aspects of Indigenous culture. For instance, when asked about the items concerning strength, two children in Site 2 referred to carrying siblings. Young children looking after and carrying younger siblings has been reported as part of Australian Indigenous culture (Long and Sephton 2011). Another example is that children in both sites, when asked to respond to the social item (Relationships) regarding including others in play, said without hesitation that they would include the other child. This collectivist approach is well documented in Australian Indigenous culture (Lohar, Butera, and Kennedy 2014).

A few children in both sites found a few items challenging. Children in Site 1 found the item Self-Regulation in the physical domain difficult to comprehend. This was also one of the items that some of the children in the PL-C Quest development study found challenging to comprehend (Barnett et al. 2020). In Site 1, mainly, two children (Child 4 and Child 6) found some of the items challenging. However, these challenging items were only 'Partially misunderstood' by both children, meaning that they could explain the activity in English depicted in the items but could not understand the intent because they could not match the accompanying words with the images. For example, for the Self-Regulation (Physical) item, Child 4 (age 9) described the bunny pacing themselves to get to the top as '*want to quickly to get home I want to get on technology maybe he is running up the hill, and he may have a long way and likes to run*'; and the bunny who rushes halfway up and then has to slow down as '*he is going like walking up a hill and one likes to walk*'. Self-regulation is important for

children to develop and is addressed in the Australian Curriculum F-10 Version 8.4 under the personal and social capability section (Australian Curriculum, Assessment and Reporting Authority 2021). This section covers competencies young Australians need to develop to understand themselves and others to lead successful lives, and one of the four interrelated elements in personal and social capability is self-management (learning to develop ways to manage themselves in a variety of different circumstances) (Australian Curriculum, Assessment and Reporting Authority 2021). Future research may seek to investigate this aspect further in relation to PL.

Although the current study provides evidence based on the first two sources of validity evidence, this is only the foundational level of validity testing. The Standards outlines five sources of evidence (American Educational Research Association et al. 2014). A recent study in a large Australian sample (>600) has focused on testing the internal structure of the PL-C Quest (Barnett et al. 2022). However, researchers did not collect information about whether children were Aboriginal or Torres Strait Islander (Barnett et al. 2022). Hence, future studies need to focus on larger scale quantitative testing of the internal structure with samples that knowingly include Indigenous children.

More Indigenous children aged 5–17 years in 2012–2013 living in non-remote areas meet the recommended physical activity guidelines than non-Indigenous children (National Indigenous Australians Agency 2021). This may indicate higher participation by Indigenous children in informal physical activities (Macniven et al. 2017). Research conducted in Canada has found that Indigenous adolescents are attracted to traditional activities to keep themselves active, and these games support PL (Dubnewick et al. 2018). Hence, programmes and interventions tailored for Indigenous children must be culturally sensitive, given the historical context and distinctive health conditions of the Indigenous population. The PL-C Quest can assist in evaluating the extent to which PL programmes, interventions and government policies support the PL journey of Indigenous children living in regional and rural areas over time (Barnett et al. 2020). Also, PL-C Quest score interpretations can contribute to making informed decisions when designing programmes and policies that can develop areas of PL in children (Barnett et al. 2020). The current study is the first to assess the validity of the data of the PL-C Quest in the context of children from Indigenous communities in a regional and rural area within a well-recognised validity testing framework, the Standards (American Educational Research Association et al. 2014). Additional strengths of the current study were identified with reference to the COSMIN (COnsensus-based Standards for the selection of health Measurement Instruments) study design checklist (COSMIN 2019). The checklist identifies standards for studies on nine measurement properties, and one of them is content validity. In this section, the following has been described as ‘very good’ in the design requirements area, using a ‘widely recognised or well-justified method for qualitative research’ and including ‘an appropriate number of patients or professionals for qualitative studies, which is ≥ 7 ’ (COSMIN 2019). The current study used cognitive interviews to investigate the content of the PL-C Quest and how a group of children living in a regional area and rural area engaged with each of the questions. Cognitive interviews are considered one of the leading methods for recognising and rectifying issues with questionnaires (Beatty and Willis 2007). Also, the study was conducted within a well-recognised validity testing framework, which is the Standards (American Educational Research Association et al. 2014). Furthermore, the sample sizes in both sites (Site 1, 9 and Site 2, 12) were within the range of 5 and 15 interviews, which was generally accepted as adequate to uncover important questionnaire problems (Beatty and Willis 2007). However, the study was restricted to the communities of the Indigenous population living in these locations, and information regarding whether children had any special educational needs and/or disabilities was not collected. Hence, further studies need to be carried out with children from other Indigenous communities in Australia to ensure that the PL-C Quest score interpretations can be used to make decisions about children within the different communities. Also, in the current study, different methods (one-on-one interviews and group interviews) were used at the two sites, which may have impacted how the children responded to the questions from each site. However, both sites provided similar results with only minor differences.

Prior to data collection, the data collection team in both sites observed at least one programme session conducted by the JMF programme, enabling the researchers to better understand the context and setting and to meet children on an informal basis. To ensure that the children felt as comfortable as possible in the interview setting, the head coach briefly explained what to expect and introduced the researchers to the children. On the day of the interviews, the head coach decided which children went to which researcher. In each site, the interviews were carried out at venues the children are familiar with and with coaches and programme leads close to them.

It is important to note that the study was conducted with regular consultations with an organisation that works collaboratively with Indigenous community leaders and employs Indigenous people. From a positional standpoint, the author team members are not Indigenous. The lead author, a student researcher and one of the interviewers, is a first-generation Sri Lankan woman living in Australia who identifies as a woman of colour with descendants from a country colonised by three European countries – Portugal, the Netherlands and Great Britain. The other two interviewers are white – one a senior Australian academic and the other an early career academic with a European background. The authors acknowledge there may have been power imbalances among the data collection team, and in the relationship between interviewers and children, given Australia’s white colonial history.

Conclusion

In summary, a self-report pictorial scale where an orange bunny carries out different scenarios may be a suitable tool for collecting data on the self-reported PL of children from Indigenous communities in regional and rural areas. The current study findings contribute evidence to an argument that, for Indigenous children living in regional and rural Australia, the understanding and engagement of PL-C Quest data may be valid for making decisions about children’s self-reported PL.

Acknowledgments

Thank you to the Indigenous community advisory groups in both locations for supporting the project. Thank you to Mr. Jamie Morriss and Mr. Raihan Anwar from the Moriarty Foundation for their time and support for this project. Thank you to the Moriarty Foundation team leaders at the sites, Stewart Wiley (Tennant Creek) and Wailwan Woman, Jorja Fuller (Dubbo) for supporting the recruitment of students to participate in the study and helping to facilitate the children on the day. Thank you very much to the parents and children for participating in the study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by Deakin University.

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