# Physical literacy assessment amongst young children

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## Abstract

Physical literacy is defined as the motivation, confidence, physical competence and knowledge and understanding to value and engage in physical activity for life. The concept has increased in popularity in recent years, particularly within childhood. However, this popularity has preceded empirical evidence for the concept. It remains unclear how best to asses an individual's physical literacy journey, which is crucial to provide evidence to support pedagogy and accountability. The aim of this thesis was to inform the development of a rigorous, aligned, and feasible physical literacy assessment tool for use in young children, aged 5-7 years old.

**Study One (Chapter Three)** was a narrative review which aimed to clarify similarities, differences, and potential causes of contention across prominent international perspectives of physical literacy. It was recommended that work related to physical literacy should be transparent, enabling others to compare different interpretations and evaluate the effectiveness of intervention programs, policies and assessment.

**Study Two (Chapter Four)** used rigorous protocol to conduct a large-scale systematic review of existing assessments related to physical literacy used in young children. 27 assessments: affective (n=7), physical (n=15), cognitive (n=6), were identified, with one assessment appraised in both the affective and cognitive domains. Findings offered detailed insight regarding the measurement properties, feasibility and alignment to physical literacy amongst existing assessments.

**Study Three (Chapter Five)** explored stakeholders' perceptions physical literacy assessment. Concurrent focus groups were conducted with academics/practitioners (n=21), teachers (n=23) and 5-7-year-old children (n=39). Findings demonstrated that although participants indicated *demand* for an assessment, current *existing assessments* do not meet the needs of stakeholders, and various recommendations regarding *implementation* were identified. This is the first study to qualitatively investigate stakeholders' perceptions of physical literacy assessment.

The findings of these studies and external research have informed the development of 10 recommendations for the assessment of physical literacy in younger children, presented in **Chapter Six**. We hope the empirical evidence reported within this thesis has demonstrated the importance of the assessment of physical literacy with younger children and provides the foundation for the development of a future physical literacy assessment tool for this context, which could have positive impact across research, policy and practice.

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**The hardest amendment to make…Mum, I'm so glad you were there to see the hard work pay off, and the smile it put on all our faces. This is for you.**

## Declaration

I declare that the work contained within this thesis is my own, with the exception of Study One (Chapter Three), which was written and published under joint authorship.

**Communications resulting from this PhD work:**

**Publications**

Shearer, C., Goss, H. R., Knowles, Z. R., Boddy, L. M., Durden-Myers, E.J., & Foweather, L. (under review). A systematic review of assessments related to the physical domain of physical literacy among children aged 3-11.9 years. *Sports Medicine*

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**Conference presentations (oral)**

Shearer, C., **Goss, H.R.,** Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Exploring stakeholder perceptions of a physical literacy assessment tool for children aged 5-11. International Physical literacy Conference, 12/9/2019, Umea University, Sweden

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**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Exploring stakeholder perceptions of a physical literacy assessment tool for

children aged 5-7. Association Internationale des Écoles Supérieures d'Éducation Physique Conference, 21/6/2019, Adelphi University, New York

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**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Assessments of Physical Literacy in Children aged 3-11 years: A Series of Systematic Reviews. International Physical Literacy Conference, 12/6/2018, Cardiff

**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Assessments of Physical Literacy in Children aged 3-11 years: A Series of Systematic Reviews. Power of Sport Conference, 11/5/2018, Liverpool John Moores University

**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Assessments of Physical Literacy in Children aged 3-11 years: A Series of Systematic Reviews. Motor Competence Network Day, 17/1/2018, Coventry University

**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Developing a physical literacy assessment tool for children. International Physical Literacy Conference, 21/6/2017, Liverpool

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**Goss, H.R.,** Shearer, C., Knowles, Z.R., Boddy, L.M., Durden-Myers, E.J. and Foweather, L. Assessments of Physical Literacy in Children aged 3-7 years: A Series of Systematic Reviews. International Physical literacy Conference, 11/9/2019- 13/9/2019, Umea University, Sweden

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## List of Abbreviations

| Abbreviation | Definition |
|---|---|
| ALPHA | Assessing the Levels of Physical Activity and Fitness |
| AMP | Alle kouluika¨isten lasten PsykoMotoriset taidot |
| AST | Athletic Skills Track |
| BONES-PAS | Beat Osteoporosis Now-Physical Activity Survey |
| CMPI | Children's Perception of Motor Competence Scale |
| COSMIN | COnsensus-based Standards for the selection of health Measurement Instruments |
| CPD | Continual Professional Development |
| CS4L | Canadian Sport for Life |
| EYFS | Early Years Foundation Stage |
| FG-COMP | Furtado-Gallagher Computerized Observational Movement Pattern Assessment System |
| FMS | Fundamental Movement Skills |
| GDPR | General Date Protection Regulation |
| GRADE | Grading of Recommendations Assessment, Development, and Evaluation |
| GSPA | Golf Swing and Putt skill |
| HS Test | High/Scope beat competence analysis test |
| IPLA | International Physical Literacy Association |
| KAH | Knowledge, Attitudes, Habits |
| KPDPA Scale | Scales to measure knowledge and preference for diet and PA |
| KTK | Körperkoordinationstest für Kinder |
| KS1 | Key Stage One |
| KS2 | Key Stage Two |
| MOBAK-3 | Motorische Basiskompetenzen in der 3 |
| MUGI | Motorisk Utveckling som Grund för Inlärning |
| MVPA | Moderate to Vigorous Physical Activity |
| NR | Not reported |
| OTAGM | The Observation Tool of Active Gaming and Movement |
| PA | Physical Activity |

| | |
|---|---|
| PARAGON | Physical Activity Research and Assessment tool for Garden Observation |
| PE | Physical Education |
| PHE Canada | Physical and Health Education Canada |
| PHKA | Pupil Health Knowledge Assessment |
| PLFL | Physical Literacy for Life |
| PMSC | Pictorial Scale for Perceived Movement Skill Competence for young children |
| Pre-FPQ | Preschool Physical Activity and Food Questionnaire |
| PROM | Patient Reported Outcome Measure |
| RCS | Response to Challenge Scale |
| SHAPE | Society of Health and Physical Educators |
| TGMD-3 | Test of Gross Motor Development-3 |
| UK | United Kingdom |
| USA | United States of America |
| YBT | Y Balance Test |

## Glossary of Terms

| Term | Definition |
|---|---|
| Affective domain | Relates to the attitudes and emotions a person has towards movement and the impact they have on their confidence and motivation to move |
| Alignment | Throughout this thesis, the term alignment refers to the agreement of an assessment/approach with the theoretical conceptualisation of physical literacy |
| Assessment for Learning | Defined as *"any assessment for which the first priority in its design and practice is to serve the purpose of promoting pupils' learning"* (Black, Harrison, Lee, Marshall & Wiliam, 2004, p.10) |
| Assessment of Learning | Defined as *"…assessment often separate from the teaching and learning process and falls within a measurement paradigm which focuses on more formal external examinations"* (Torrance & Pryer, 1998, p.23) |
| Cognitive domain | Relates to an individual's understanding of how, why and when they move |
| Domains | In relation to physical literacy, this refers to the affective, physical and cognitive areas |
| Elements | In relation to physical literacy, this refers to the four components of physical literacy included within Whitehead's definition; motivation, confidence, physical competence and knowledge and understanding (p.8, 2019) |
| EYFS | Government set of standards for the learning, development and care of children from birth to 5 years old for all childminders, nurseries, preschools and primary schools with England |
| Formative assessment | Defined as *"when the evidence collected through assessment for learning is actually used to adapt the teaching work to meet learning needs"* (Black et al., 2004, p.10) |
| Key Stage One | Legal term for the first two years of school for maintained schools throughout England, normally known as years 1 and 2, where children are aged between 5-7 years old |
| Key Stage Two | Legal term for the four years of school for maintained schools throughout England, normally known as years 3, 4, 5 and 6, where children are aged between 7-11 years old |

| | |
|---|---|
| Parent/guardian | Defined as *"the biological parents of a child… anyone who although not a biological parent has parental responsibility for a child…any person who although not a biological parent and who does not have parental responsibility, has care of a child or young person"* (Education Act, 1996) |
| Physical activity | Defined as *"any bodily movement produced by skeletal muscles resulting in energy expenditure"* (Casperson, Powell & Christenson, 1985, p.126) |
| Physical domain | Relates to the skills and fitness a person acquires and applies through movement |
| Physical literacy | Defined as *"the motivation, confidence, physical competence and knowledge and understanding to value and take responsibility in physical activities for life"* (Whitehead, 2019, p.8) |
| Primary school | The name of the schooling system for children aged 4-11 years old within the UK |
| Sub-Elements | In the context of this thesis, refers to components of physical literacy not acknowledged within Whitehead's definition of physical literacy (2019) but recognised in other research as relating to the concept |
| Summative assessment | Defined as *"a judgement which encapsulates all the evidence up to a given point"* (Taras, 2005, p. 468) |
| Young children | For the purpose of this thesis, the term young children refers to those aged between 3 and 7 years old |

# Chapter One

# Introduction

# *Introduction*

## *1.1 Physical activity in young children*

It is widely accepted that regular participation in physical activity (PA) is an essential component of a healthy lifestyle (World Health Organisation, 2018). PA is favourably associated with current and future physical, psychological and cognitive health indicators (Poitras et al., 2016; Lubans et al., 2016; Carson, Tremblay, Chaput, & Chastin, 2016; Warburton & Bredin, 2017). Childhood is a critical stage of life for promoting and establishing healthy lifestyle behaviours (Lu & Montague, 2016) and PA levels track from early childhood into adolescence and adulthood (Telama et al., 2014). Recent research in children aged 3-4 years old has suggested that PA and movement skills may not be fully developed at this age, therefore the early years could be a significant period to promote positive PA experiences (Roscoe, James & Duncan, 2019; Logan, Robinson, Wilson, & Lucas, 2015; Foweather, Knowles, Ridgers, O'Dwyer, Foulkes, & Stratton, 2015; Gu, 2016). High quality and positive childhood PA experiences are crucial as they allow children to develop physical competence, motivation and confidence, which have all been linked with increased PA and decreased sedentary behaviour (Biddle & Asare, 2011; Owen, Smith, Lubans, Ng & Lonsdale, 2014; Logan et al., 2015; Barnett et al., 2016; Belanger et al., 2018; Babic, Morgan, Plotnikoff, Lonsdale, White, & Lubans, 2014). Within the United Kingdom (UK), it is recommended that all children and young people aged 5-18 years old should engage in moderate to vigorous physical activity (MVPA) for an average of at least 60 minutes per day across the week (Department of Health and Social Care, 2019). However, the 2018 Sport England Active Lives Survey identified that only 17.5% of children aged 5-18 were achieving 60 minutes of MVPA each day. In a secondary survey exploring children's attitudes, levels of self-reported enjoyment,

confidence, motivation, competence and knowledge in relation to PA all declined with age (Sport England, 2019). Recent guidelines have given specific advice for preschool aged children advising that they should spend at least 180 minutes per day in a variety of physical activities spread throughout the day, including active and outdoor play, and this should include at least 60 minutes of MVPA (Department of Health and Social Care, 2019). Yet data from the 2016 Health Survey for England identified that only 9% of children aged between 2-4 years old were meeting the previous recommendations (Health Survey for England, 2016). Although the benefits and importance of PA in the younger years is understood across research and policy, PA levels in childhood are still worryingly low.

It is apparent that a proactive approach is needed to encourage PA in children. A number of strategies have been published in recent years by various national organisations with the aim of increasing participation in PA among children both within and outside of (pre)school (Sport England, 2016; Department of Health, 2016; UK Active, 2018; Youth Sport Trust, 2013). The Department for Culture, Media and Sport published Sporting Future: A strategy for an active nation (2015), outlining how investment in sport and physical activity would be inclusive of children aged five through to older adults. The Childhood Obesity Strategy (Department of Health, 2016), highlighted the need to 'do more' to help children achieve 60 minutes of moderate-to-vigorous PA a day, suggesting 30 minutes should be achieved at home with the support of parents/carers, whilst 30 minutes should be facilitated in school every day, through break times and clubs, as well as in PE lessons. To date, interventions aiming to promote children's PA have reported limited success, suggesting that a reconsideration of these approaches is perhaps needed (Lonsdale et al., 2013; Ling, Robbins, Wen & Peng, 2015; Brown et al., 2016; Hnatiuk et al., 2019).

*1.2 Physical literacy*

Physical literacy has emerged as a potential alternative way of addressing the global problems of physical inactivity (Whitehead, Durden-Myers & Pot, 2018). It has been positioned as an integrated, holistic, diverse and inclusive concept, which potentially offers different insights in comparison to traditional approaches to understanding and enhancing PA, PE and sport (Whitehead, 2019). Physical literacy is proposed as an 'umbrella term' that crosses these multi-dimensional fields; it enables those working within these separate fields, who are arguably already working towards the same goal, to collaborate and co-operate. As a result, it could potentially generate better outcomes for more people, as it would incorporate a more diverse array of activities, levels, outcomes, and so likely lead to more movement and subsequently more (well-evidenced) health benefits.

Throughout this thesis, physical literacy is defined as the "motivation, confidence, physical competence and knowledge and understanding to value and take responsibility for engaging in physical activities for life" (Whitehead, 2019, pg.8). Although a lifelong concept, there has been particular focus on youth populations throughout research and practice, as focussing on this age group is often seen as a positive and proactive approach. Physical literacy is positioned as a foundation to lifelong engagement in physical activity and as result, understanding supporting physical literacy in the early years has the potential to increase these lifelong behaviours (Cairney, Clark, James, Mitchell, Dudley & Kriellaars, 2018). Recent strategy documents relating to children's PA have begun to incorporate the term *physical literacy* in national policy: for example, the British Heart Foundation's "The Best Start in Life: A Manifesto for PA in the Early Years"(British Heart Foundation, 2016), the Youth Sport Trust's "Primary School Physical Literacy Framework." (Youth

Sport Trust, 2016), The Childhood Obesity Strategy (Department for Health, 2016), the Active Lives Children and Young People Survey (Sport England, 2019) and internationally the "National Standards and Grade Level Outcomes for K-12 Physical Education" (Society for Health and Physical Educators America, 2014), "Play.Sport" (New Zealand, 2017), and the "Australian Physical Literacy Framework"(Sport Australia, 2019). This would seem to indicate an emphasis on a holistic and inclusive approach to understanding and increasing PA for overall health and well-being in childhood and throughout life (Roetert, Ellenbecker & Kriellaars, 2018).

Whitehead advocates that the elements of motivation, confidence, physical competence, and knowledge and understanding, are equally important, and recognises that a person has an individual PA journey that necessitates a lifelong and personalised approach (2010). Yet, there has been debate regarding differing approaches to defining and operationalising the concept of physical literacy, and specifically, divergence from Whitehead's intended meaning (Hyndman & Pill, 2017; Pot, Whitehead, Durden-Myers, 2018; Robinson, Randall & Barrett, 2018; Whitehead, 2019; Tremblay et al., 2018). Harvey and Pill (2018) claimed 'physical literacy has been subject to revision, editing and distortion over time' (pg. 3). This has posed difficulties in comparing, evaluating and developing best practice, and in some cases, resulted in confusion and conflict regarding understanding and application of physical literacy (Keegan et al., 2019). To overcome this, there is need for a clear articulation of international approaches to enable understanding and development of physical literacy.

In addition to this confusion around the meaning of physical literacy, whilst the popularity of physical literacy is growing, one of the main criticisms of the concept is the lack of empirical evidence linking physical literacy to health outcomes,

PA correlates or determinants, or its own defining elements (Cairney, Dudley, Kwan, Bulten, & Kriellaars, 2019). In part, this may have resulted from the difficulty in defining the concept, debate regarding the appropriateness of assessment, and ultimately, the lack of an accepted measurement of physical literacy (Edwards, Bryant, Keegan, Morgan & Jones, 2018). As a consequence, the assessment of physical literacy is now a key foci within the field. In particular, the assessment of physical literacy in children may be a priority for both research and intervention, as this stage in a child's life is a critical period for the development of important PA correlates (i.e., gross-motor skills, fine-motor skills, coordination, preferences, and confidence) and physical literacy elements (Belanger et al., 2018).

*1.3 Assessment of physical literacy*

To address this lack of evidence, researchers have called for robust, peer-reviewed studies, and crucially, an assessment of physical literacy (Corbin, 2016). An appropriate assessment tool will enable researchers and practitioners to monitor and assist physical literacy development, will provide robust evidence to assist policy makers, and will improve credibility of the physical literacy concept by presenting physical literacy in an accessible and feasible manner. It has been argued that appropriate assessment of childhood physical literacy could also improve the standards, expectations, and profile of physical education, which will lead to more physically literate children (Tremblay & Lloyd, 2016). As a result of these perceived benefits, there has been focussed interest in physical literacy assessment in recent years across research, policy and practice (Robinson, Randall, & Barrett, 2018; Edwards, Bryant, Keegan, Morgan & Jones, 2017; Green, Roberts, Sheehan, & Keegan, 2018). Yet existing assessments relating to the concept have been critiqued for not being aligned to the holistic nature of physical literacy, with focus being given to the

physical domain (Almond, 2013; Robinson & Randall, 2017; Whitehead, 2019). The first systematic review to explore existing assessments of physical literacy found that assessments varied greatly depending on the needs and values of the user (Edwards et al., 2018). It is therefore important for an assessment of physical literacy to be valid, reliable and trustworthy for the specific population of use (Barnett et al., 2019). Yet little is known regarding the validity and reliability of existing assessments (Longmuir & Tremblay, 2016). Furthermore, little consideration of user needs and the feasibility of assessments in practice is presented within current research (Klingberg, Schranz, Barnett, Booth & Ferrar, 2018). As physical literacy is a relatively novel, untested and developing concept, there continues to be debate around what an authentically aligned physical literacy assessment should look like.

It is evident that there is a pressing need to increase physical activity levels globally. In line with this, international interest in physical literacy continues to grow given the proposed claimed benefits to physical, behavioural, psychological and social outcomes (Barnett et al., 2019; Cairney et al., 2019). The majority of existing physical literacy work has focussed on 'children and youth populations' (Edwards et al., 2017). This attention reflects the growing perception that formative physical education has the potential to affect lifelong PA, health and well-being (Jess, Keay & Carse, 2016). Pre and Primary schools provide a pertinent context to facilitate the development of physical literacy in children, as they may have access to personnel and resources, such as qualified teachers, equipment, space, and through PE, have the ability to ensure all children are exposed to physical activity experiences and opportunities (Hulteen et al., 2015; Tinner et al., 2019). However, within this age group and context, there is ever increasing demand to assess children's progress, often using quantitative measures (Longmuir & Tremblay, 2016; Edwards et al., 2017). In line

with all these considerations, the appropriate assessment of physical literacy will provide much needed empirical evidence for the concept and enable physical literacy development, at both an individual and population level (Barnett et al., 2019). However, there are many issues that present a barrier to this, such as difficulties in defining the concept, confusion regarding the philosophy, lack of evidence regarding measurement properties, and issues regarding the feasibility of implementing an assessment tool in context.

### *1.4 Introduction to the thesis*

Developing an assessment of physical literacy for use in younger children is a key area for physical literacy research and practice**.** In line with Sallis and Owen (1999), the development of a measure will enable researchers to identify influences on physical literacy, evaluate interventions to develop physical literacy, and translate this research into practice. The central aim of this thesis is to therefore inform the development of a physical literacy assessment tool for younger children.

This thesis is comprised of three studies, described in the thesis study map (pg. 29). Following this introductory chapter, **Chapter 2** (Literature Review), will provide a review and critique of the current and relevant research relating to physical literacy, early years physical education, and assessment. This review will outline the gaps in the evidence base providing a rationale and aims for the subsequent study chapters. **Chapter 3** presents Study One; a narrative review of international definitions of physical literacy. **Chapter 4** describes Study Two; a systematic review in relation to the affective, cognitive and physical domains of physical literacy. **Chapter 5** will report Study Three; a qualitative study exploring stakeholders' current perceptions and future ideas for physical literacy assessment in key stage

one. This study was granted ethical approval by the Research Ethics Committee of Liverpool John Moores University (Ref. 18/SPS/037). **Chapter 6** will provide recommendations for a valid, feasible and aligned physical literacy assessment tool for use in younger children based on the findings of chapters 4 and 5. To conclude, **Chapter 7** will provide a synthesis of the results from the study chapters and draw on their implications for the research area, finally providing recommendations for future research.

*1.5 Independent contribution to the thesis*

The purpose of my PhD was to explore the development of an assessment of physical literacy in young children aged 3-7 years old. This age group was identified as the most common age to be entering formal education in the UK. This project was closely linked to another PhD exploring the development of an assessment for children aged 7-11 years old. These PhD programmes of research were funded by Liverpool John Moores University and fed into a wider research project examining assessment of physical literacy throughout preschool and primary school aged children. The wider research project team consisted of myself and the other PhD student, as well as our research supervisors. The team met monthly and decisions related to the project were arrived at by consensus and taken collaboratively. The following section details my specific role within this project, and how it has contributed to the independent work presented within this thesis (see Figure 1.1 for a visual overview).

- Study One (Chapter Three): Conception and design of the study. Data acquisition. Writing of the paper (50%). Finding relevant references. Preparation of the tables and figures. Preparation of manuscript. Published under joint first authorship.

- Study Two (Chapter Four): Conceived and designed analysis. Collected data. Finding relevant references. Performed analysis (leading on affective and cognitive domain). Preparation of the tables and figures. Completed narrative writing.
- Study Three (Chapter Five): Conceived and designed analysis. Collected data. Performed analysis (leading on key stage one and expert/practitioner data). Preparation of the tables, figures and writing.

All writing throughout other chapters was completed independently.

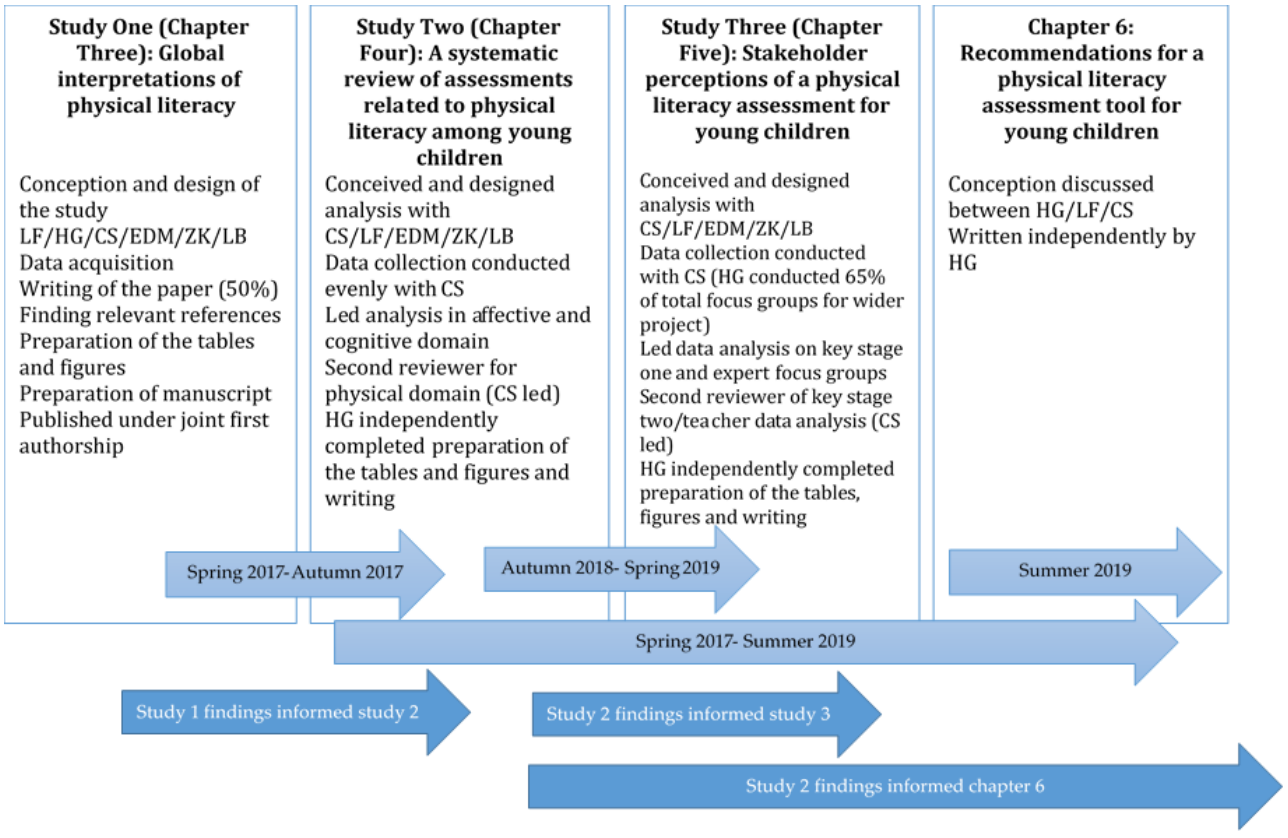


*Figure 1.1 Overview of PhD project, providing an overview of my contribution. Where other research team members contributed, this is highlighted with their initials.*

*1.6 Philosophical positioning*

When considering the methodology and findings of this thesis, it is important to acknowledge my own experiences and philosophical position. This may be especially pertinent when I am representing stakeholder's perceptions of physical literacy assessment. Having completed an undergraduate degree in sport and exercise science with a solely positivist outlook, whilst completing my MSc I began to adopt a humanistic approach to my research and practice. I then spent a period working in a primary school before starting my PhD. Throughout the PhD project, my knowledge of the underpinning philosophies of physical literacy (monism, existentialism and phenomenology) has continued to develop. The subsequent interpretations made throughout this PhD will have been influenced by my own experiences and understandings. As a result, it is important to recognise that I view myself as a pragmatic researcher; I believe that there are many different ways of interpreting the world and undertaking research, and that no single stance can give a complete understanding (Poucher, Tamminen, Caron, & Sweet, 2019). Pragmatists link the choice of approach directly to the purpose of and the nature of the research questions posed (Creswell & Creswell, 2018). To ensure the methodological coherence of a study, researchers must demonstrate the approach they have chosen is the best approach to answer their research question and that their approach aligns with the philosophical position from which they approached their work (Poucher et al., 2019). In line with this, I believe research should generate meaningful impact, and various approaches to research, dependent on the research question, can and should be adopted to achieve this.

*1.7 Thesis study map*

A thesis study map will be presented at the start of each chapter detailing the objectives and key findings of each chapter (see below).

| | |
|---|---|
| Study One (Chapter Three): Global interpretations of physical literacy | Objectives:<br>• To collate, compare, and critically review existing international definitions of physical literacy |
| Study Two (Chapter Four): A systematic review of assessments related to physical literacy among young children | Objectives:<br>• To systematically review the academic literature for tools to assess the domains of physical literacy within children aged 3-7.9 years |
| Study Three (Chapter Five): Stakeholder perceptions of a physical literacy assessment for young children | Objectives:<br>• To explore key stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups |
| Recommendations for a physical literacy assessment tool for young children | Objectives:<br>• To draw on research findings from within this thesis and externally, to identify common themes and provide evidence-based recommendations for a physical literacy assessment tool, suitable for use in young children |

# Chapter Two

# Literature Review

The purpose of this chapter is to review the literature related to physical literacy, physical education and assessment, with particular reference to younger children (aged three to seven years old)**.** Finally, a summary and rationale will conclude the section set against the aims and objectives of the thesis.

## *2.1 Physical literacy*

Margaret Whitehead defines physical literacy as "The motivation, confidence, physical competence and knowledge and understanding to value and take responsibility in physical activities for life" (Whitehead, 2019). Whitehead is acknowledged as a key figure in the area (Cairney, Kiez, Roetert & Kriellars, 2019), having published two books (2010; 2019) and edited two special issues (2013; 2018) detailing her stance on physical literacy. Over the past 20 years, the concept has emerged and gained popularity as an approach that captures the desire to participate in PA, as well as gaining meaningful, fulfilling experiences through doing so (Whitehead, 2010). Physical literacy is proposed to be associated with physical, psychological, cognitive, health, behavioural, and social variables (Edwards et al., 2018; Cairney et al., 2019). For example, researchers have proposed physical literacy can lead to an increase in lifelong PA, a decrease in sedentary behaviour and subsequently a decrease in non-communicable diseases, including obesity (Roetert, Ellenbecker & Kriellaars, 2018). Consequently, physical literacy has received increasing international attention across research, policy and practice. Although crucially, this popularity has preceded empirical evidence for the concept, leading to some calling for caution regarding the 'fantasmic claims' made on the behalf of physical literacy (Quennerstedt, 2019).

*2.2 Definition of physical literacy*

Within the Whitehead definition of physical literacy, the domains are represented as four physical literacy elements; the affective domain is broken down into motivation and confidence, the physical domain is termed physical competence, and the cognitive domain is characterised as knowledge and understanding (2010). All of these domains and elements are viewed as equally important and provide the building blocks for a physically active life (Roetert, Ellenbecker & Kriellaars, 2018).

The affective domain is deemed to include confidence and motivation with reference to PA. Within existing physical literacy literature at the time, the affective was the most frequently referred to domain (Edwards et al., 2107), with research consistently referring to motivation and confidence (Whitehead, 2013; Dudley, 2015; Longmuir et al., 2015; Edwards et al., 2017). Motivation is understood by Whitehead to be the drive, willingness and eagerness to take part in a particular action, in the case of physical literacy; the desire to be active (2010). Motivation is a correlate and potential determinant of PA and understanding the motivation to engage in and adhere to health-conducive behaviours is of vital importance for the maintenance and improvement of people's health (Ng, Ntoumanis, Thøgersen-Ntoumani, Deci, Ryan, Duda, & William, 2012). As described by Whitehead, confidence refers to an individual's perception of their physical abilities and their capacity to engage in a variety of physically active situations (2010). This can include confidence in one's own physical abilities, a positive attitude toward participation, and an expectation of successful participation, which closely relates to perceived competence (Longmuir et al., 2015). In line with this, in the first systematic review of the literature to explore core concepts of physical literacy, the affective domain was found to relate to: a) confidence b) motivation, and c) self-esteem (Edwards et al,. 2017). Self-esteem and

self-confidence have been positioned as both antecedents and determinants of physical activity, Whitehead proposed that engagement and interaction with the physical environment will stimulate positive self-esteem and self-confidence, and individuals with high self-esteem are more prone to engage fully with physical activity (2010). Despite the ongoing development in the understanding of physical literacy, it is generally accepted that children who are confident in their abilities to be active and those who are more intrinsically motivated are more likely to perceive their movement experiences as positive, and as a result, more likely to go on to pursue physical active lives (Dudley, 2015), aligning with competence motivation theory (Harter 1978).

Physical competence is the third element included in the definition of physical literacy and, as the name suggests, falls within the physical domain (Whitehead, 2010). However, this term in itself is complex and not definitively defined, thus, making it challenging to operationalise in a research and practice context (Ennis, 2015). Specifically, Whitehead (2007,pg. 44) refers to a hypothetical individual who is 'physically competent' as being able to "move with poise, economy and confidence in a wide variety of physically challenging situations" while elaborating that this is inclusive but not limited to body management, moving with grace or poise and coordination and control. Critically, Whitehead views physical competence as effective interaction with the world, and that practice should reflect this (Whitehead, 2019). It should be acknowledged there is some overlap between Whitehead's articulation of physical competence and the terminology used within other well-established research fields, i.e., motor competence, motor control, motor proficiency, health and skill related fitness (Longmuir et al., 2015; Lounsberry & McKenzie, 2015; Edwards et al., 2018; Robinson & Randall, 2017; Keegan et al., 2019). Whitehead has

expressed some concern in the physical domain being the primary and/or sole concern in some interpretations of physical literacy, as addressed in her most recent book (2019). Although this is not surprising given the strength of evidence given to these related areas of the physical domain, compared to the affective and cognitive domains of physical literacy. Throughout this thesis, the term 'sub-element' will be used to refer to components of physical literacy not acknowledged within Whitehead's definition of physical literacy (2019) but recognised in other research as relating to the concept. For example, the sub-elements within the physical domain include locomotor, object control, balance and stability skills, are well documented in the literature as being essential for a child's growth and physical development, while also reported to be strongly associated with participation in physical activity throughout the lifespan (DinanThompson & Penney, 2015).

Finally, the cognitive domain refers to the knowledge and understanding of factors necessary to enable an individual to be active for life (Whitehead, 2019). This includes knowledge and understanding of movement (how to move), performance (evaluation of movement), as well as health and fitness (value of exercise, need for relaxation and sleep, etc. (Longmuir et al., 2015). This domain has been expanded to include specific aspects such as purpose and reasoning, content knowledge, rules and tactics (Keegan et al., 2019). In the first systematic review of the literature to explore core concepts of physical literacy, the cognitive domain was found to relate to: a) knowledge and understanding of activities, b) knowledge and understanding of health and active lifestyles, and c) to value and take responsibility for physical activity (Edwards et al., 2017). The cognitive domain and subsequent element of *knowledge and understanding* is complex and multi-faceted and understanding of the domain is developing. Within wider sport psychology literature, the cognitive domain has been

deemed to consist of perception, recognition, attention, memory, language, knowledge and expertise, and judgement in relation to the context of physical activity (Tenebaum, Eklund & Kamata, 2018). Longmuir et al. (2018) stated that knowledge and understanding 'encompassed movement (how to move), performance (evaluation of movement) and health and fitness (value of exercise, need for relaxation and sleep etc.)'. Further research has also suggested that the cognitive domain of physical literacy may also relate to rules, tactics and strategies of movement (Edwards et al., 2107); the ability to apply knowledge, and use knowledge for innovation (Ennis, 2015); and the application of creativity and imagination in a range of environments (Whitehead, 2010). The knowledge and understanding of the why, how, where and with whom in terms of movement and health, is thought to be fundamental for engagement in lifelong physical activity (Cale & Harris, 2018).

In recent years, as research and understanding of the concept has developed, scholars have begun to debate the definition to explore alternative approaches (Keegan et al., 2019). It has been suggested that two differing approaches to physical literacy have emerged: a holistic approach, encompassing cohesive developmental processes and outcomes; and a performance-driven approach, focused largely on physical competencies and performance (Allan, Turnidge & Coté, 2017). Whilst the differences in approaches has encouraged scholarly debate (Edwards et al., 2017, 2018), it has resulted in difficulty when making evidence-based decisions regarding physical literacy in practice. The lack of clarity regarding the definition has the potential to undermine the assessment and operationalization of physical literacy. For that reason, if physical literacy is to fulfil the claims of its advocates, research is needed to identify, articulate, and compare the various approaches of each group and

any future research done in the name of physical literacy should clearly identify which definition has underpinned their work.

*2.3 Physical literacy philosophy*

Whitehead proposed an interweaving of *phenomenology, existentialism* and *monism* as the foundation of physical literacy (2001, 2007). In simple terms, *monism* is the belief that the mind and body are interdependent and indivisible (Whitehead, 2007). For example, thinking, feeling, moving and talking, are all interwoven, rejecting the dualistic notion that the body and mind are separate (Pot et al., 2018). *Existentialism* proposes that every person is an individual as a result of their interactions with the world (Whitehead, 2001, 2007). The richer and more varied these interactions are, the more fully an individual may realise their potential (Pot et al., 2018; Merleau-Ponty, 1968). Similarly, *phenomenology* proposes that individuals are formed through their experience of these interactions, and suggests that perception, through our embodied nature, forms unique perspectives in how individuals view the world (Whitehead, 2007). In terms of physical literacy, embodiment is the potential an individual has to interact with the world via movement. Embodiment therefore provides the foundation for a wide range of human capabilities (Pot et al., 2018; Whitehead, 2010). As a result, physical literacy is seen as an additional concept in the field of PA that identifies the core purpose and value of movement- the fundamental importance in embodiment for human existence. Physical literacy purports to identify the intrinsic value of PA, in an inclusive and lifelong way (Whitehead, 2010). As a result, those working to promote physical literacy have attempted to overcome the perception that the body and movement should be viewed as merely functional and separate from the mind. It has been proposed that Whitehead's most important contribution to the concept has been to recast physical literacy with a philosophical

perspective (Cairney et al., 2019). However, critics have suggested that Whitehead's view of physical literacy sits solely within existentialism, and as such, rejected alternative systems of knowing, and suggested that a multi-disciplinary approach is needed to develop physical literacy (Cairney et al., 2019). The 'abstract and inaccessible' explanation of the philosophy of physical literacy has been seen to complicate in the understanding of the concept (Jurbala, 2015). Edwards et al.'s (2017) systematic review identified *philosophical underpinnings of physical literacy* as a higher order theme and Whitehead's 1990 paper on meaningful existence, embodiment and PE as the philosophical basis for the development of physical literacy. Ultimately, authors of the review went on to question if those unfamiliar with this philosophical underpinning are well placed to study and test physical literacy, or if it is acceptable to expect individuals working in the area to engage with detailed philosophy and ontology (Edwards et al., 2017). Although it is outside of the scope of this literature review to explore this in detail, the implication of this balance will evidently impact future physical literacy promotion. In the review, 33% of included papers relating to physical literacy did not acknowledge any philosophical considerations. Yet at the time of publication, the focus of many of these papers was not physically literacy but PA and/or the specific domains. Future work done in the name of physical literacy should place the affective, physical and cognitive domains as equally important, appreciate a person's individual journey and advocate a lifelong approach (Whitehead, 2010).

### *2.4 Physical literacy in young children*

Despite being presented as a lifelong concept, the majority of existing physical literacy research has focussed on school aged children and physical education (Edwards et al., 2017; Lounsberry & McKenzie, 2015). By simply focussing on this

phase, the longitudinal value of physical literacy is potentially neglected (Whitehead, 2019). Yet by focussing on this period, researchers and practitioners can adopt a positive and proactive approach to promote lifelong PA. Throughout this thesis, young children will be referred to as those aged 3 to 7 years old. It is thought that intrinsically motivated children who are confident in their abilities to be active, are more likely to perceive their movement experiences as positive, and as a result, are more likely to go on to pursue physical active lives (Dudley, 2015). Therefore, supporting physical literacy in young children has the potential to increase lifelong PA (Cairney et al., 2018). In line with this, research has identified the role of early childhood education and care services as providers of social and physical environments that support children's PA and outdoor play opportunities. This includes exposing children to new movements, environments, active, outdoor, unstructured and risky play (Houser et al., 2019). Although research often relates to school aged children, there are considerations that should be given to children in the early years as they progress through key movement behaviour milestones such as sleep consolidation, initial interests in screen time and initiation of ambulation (Kuzik et al., 2017). However, existing evidence of the relationship between physical literacy and related characteristics and behaviours is somewhat limited in this age group. In young children, for example, the cognitive domain is often not considered developmentally appropriate (Cairney et al., 2018). In addition, even in recent research into 'physical literacy', consideration of the affective domain is not included in relation to the early years (e.g. McConnell-Nzunga et al., 2020; Gu et al., 2019). Evidence for young children in the physical domain is more well established. Kuzik and colleagues' (2017) systematic review of the relationships between combinations of movement behaviours and health indicators in the early years (age 0–4 years)

illustrated that the most ideal combination of PA and sedentary behaviour were favourably associated with motor development and fitness in pre-schoolers. Foulkes et al. (2017) identified the preschool years as opportune for developing fundamental movement skills as children in this age group experience rapid brain growth and neuromuscular maturation, as well as high levels of perceived competence. A recent large-scale study examining fundamental movement skills in Irish primary school aged children highlighted the low proficiency levels in this group, significant sex differences, and a decline in proficiency from the age of 10 (Behan, Belton, Peers, O'Connor & Issartel, 2019). This suggests that focus should be placed in developing skills related to the physical domain from an early age. However, given the importance of the holistic approach to physical literacy, research appreciating all domains is warranted in this age group if we are to understand how best to aid the development of physical literacy in the early years.

In England, from birth to five, standards for learning, development and care are outlined in the Early Years Foundation Stage statutory guidance framework for schools and childcare providers (EYFS, Department for Education, 2017). The EYFS demonstrates the importance of early years education in developing physical literacy, as even before the age of five, 'children must also be helped to understand the importance of PA and make healthy choices in relation to food' (Department for Education, 2017, p.8). From the age of five to seven the National Curriculum for Key stage one outlines four main aims for physical education; the need to develop competence in a broad range of physical activities, the need for children to be physically active for sustained periods of time, the need to engage in competitive sports and activities and the ideal that pupils will lead healthy active lives (Department for Education, 2013). The final aim reinforces the notion that the long-

held goal of physical education is to enable children to become active for life. However, many would argue the physical education sector are yet to successfully achieve that aim (Kirk, 2013; McEvoy, Heikinaro-Johansson, & MacPhail, 2017).

Although all children should be receiving quality movement experiences within school, traditionally primary school PE has been delivered through a multi-activity approach, resulting, according to Rainer et al. (2011), in isolated learning with an emphasis on the sport, and not on the learning experience. The proliferation of 'physical education as sport techniques' hinders any real change to PE (Kirk, 2010). The current multi-activity sports-based curriculum is also said to fail in addressing the motivational needs required to develop and sustain, a healthy and physically active lifestyle (Haerens et al., 2011). As such, PE is perhaps limiting its unique ability to contribute to an individual's holistic development (Whitehead, 2001). Many in the field of physical education have highlighted the need for change, with current practices seemingly outdated and lacking in authentic learning experiences (Ennis, 2013). Researchers have called on physical education to be authentic, relevant and holistic in nature (Haerens et al., 2011; Kirk, 2010; Jess, McEvilly, & Carse, 2017). An additional concern to the issues within PE has been the increase in early sport-specialisation and a greater focus on elite sport programmes (Roetert, Ellenbecker & Kriellaars, 2018).

Physical literacy has been proposed as the goal of PE, a goal that can be articulated and defended with confidence to reveal the intrinsic value of physical activity (Whitehead, 2013). 'High quality PE' has emerged as a term that represents this aspiration, as a way to help young people make informed lifestyle choices and encourage lifelong participation in physical activity (Kirk, 2005). High quality PE can be achieved when the curriculum, pedagogy and assessment are successfully

integrated and aligned (Bernstein, 1977). However, there are many barriers to achieving high quality PE in primary school; lack of knowledge/ training/ skills/ qualifications (Blair & Capel, 2008; Fletcher & Mandigo, 2012); lack of teacher confidence (Jess, McEvilly & Carse, 2017; Morgan & Hansen, 2008); lack of time (Jess, McEvilly & Carse, 2017; Morgan & Hansen, 2008; Fletcher & Mandigo, 2012); equipment (Tsangaridou, 2016); facilities (Morgan & Hansen, 2008); subject marginalisation (Jess, McEvilly & Carse, 2017; Tsangaridou, 2016); lack of leadership support (Morgan & Hansen, 2008; Fletcher & Mandigo, 2012); class size (Morgan & Hansen, 2008). When these barriers are faced, teachers are less likely to deliver high quality PE, and therefore less likely to positively impact on children's physical literacy (Taplin, 2013). Whilst assessment of physical literacy could assist the development of physical literacy by identifying areas in need of support, many of the aforementioned barriers could also relate to the implementation of assessment in primary PE, although more research is needed in this area. For physical literacy and any potential assessment to have a more positive impact than existing approaches to PE, these barriers must be considered.

Whilst primary PE may be seen at a crossroads (Carse, Jess & Keay, 2017) physical literacy is a potential future way to ensure children are receiving high quality physical education and achieve meaningful movement experience. However, researchers should be wary of physical literacy becoming just another well intentioned 'PE movements' (Hyndman & Pill, 2018). Meaningful engagement in PE has the potential to influence quality of life at an existential level (Kretchmar, 2006), and a recent review exploring meaningful PE identified five themes as central influences to young people's experiences: (i) social interaction; (ii) fun; (iii) challenge; (iv) motor competence; (v) personally relevant learning (Beni et al 2016). Evidently,

there are many similarities between physical literacy and meaningful PE. Whilst researchers have argued that meaningful engagement should be given a priority in PE (Beni et al., 2016), physical literacy perhaps represents a method of doing so, and the ultimate end goal.

Whitehead placed physical literacy as a potential way to ensure children are receiving high quality physical education and achieve meaningful movement experience guided by the concept's philosophical principles (2010). Though Hyndman and Pill (2018) called for caution as physical literacy could fall into being just another well intentioned 'PE movement'; others have warned that physical literacy may be being used within PE may be to increase the credibility and legitimacy of subject in schools rather than it being of value in itself (Harvey & Pill, 2018; Lounsberry & McKenzie, 2015). Despite government policy and curriculum, more support is needed to ensure schools are successfully implementing changes, and evidence should continue to be collected to attest to the positive impact of these changes (Wainwright, Goodway, Whitehead, Williams & Kirk, 2018).

In physical literacy specific research, findings suggest that a teacher's own knowledge of the concept is a major barrier to promoting physical literacy in children (Edwards et al., 2019). In a North American context, Castelli et al. (2015), prioritised five recommendations to assist teachers in overcoming barriers to implementing physical literacy initiatives within school, suggesting: (a) whole of school approach, (b) effective, differentiated pedagogy, (c) integration of technology for individualized tracking of progress, (d) supportive school climate, and (e) alignment of local efforts with national initiative. This is supported by earlier suggestions from Sprake and Walker (2013), who suggested in order to re-define teachers' day-to-day practice, the link between pedagogy and philosophy must be made to ensure physical literacy can

be seen in tangible and realistic way. To achieve this in practice, a flexible approach should be adopted when working with teachers and schools, as every individual teacher and school context is different (Edwards et al., 2019).

To maximise potential impact and implementation, those involved in primary PE should be involved in formative stages of research concerning physical literacy assessment in this context. This participatory approach has been recommended as an effective and sustainable way to engage key stakeholders and existing research has adopted a variety of approaches (Cosgrave, Chen & Castelli, 2018; Tolgfors, 2018). Until recently, despite being widely encouraged to use physical literacy, teacher's beliefs regarding the concept had not been examined (Roetert, Kriellaars, Ellenbecker & Richardson, 2017). However, in a recent study aiming to operationalize physical literacy, a three-month needs assessment phase was seen to have a crucial role in the successful design of an intervention (Edwards et al., 2019). Further research on formative assessment in primary PE used focus groups to explore teacher's perspectives on assessment (Ní Chróinín & Cosgrave, 2013). Results supported the inclusion of assessment in PE as findings suggested assessment provided structure and focus to the planning, teaching and learning processes, which positively impacted on both the teacher and children's learning (Ní Chróinín & Cosgrave, 2013). Semi-structured interviews have also been utilised with teachers and their students to explore assessment for learning (Tolgfors, 2018). Tolgfors identified five versions of assessment for learning used in PE; empowerment, physical activation, constructive alignment, grade generation, and negotiation, but that these varied across individual teachers and students' experiences (Tolgfors, 2018). Meanwhile 'experts' are often consulted in the development of new assessment methods (Keegan et al., 2019; Morley, Van Rossum, Richardson & Foweather, 2019). Although Keegan et al. (2019)

conceded that defining an 'expert' can be problematic, and therefore criteria to be considered 'expert' should be clearly communicated in future research.

Despite the increase in teachers and 'experts' involvement in the research process, the children's voice is often neglected (Noonan, Boddy, Fairclough & Knowles, 2016). It is often perceived that there are significant barriers to involving children in research, for example validity and reliability of responses, interaction preference, linguistic and cognitive ability (Jacquez, Vaughn & Wagener, 2013). Research that involves children can be empowering and increases the likelihood that results will be accepted, meaningful and valid (Jacquez et al., 2013). However, children's involvement in assessment research is often limited to face-validity checks for understanding. There is an apparent lack of research that explores children's perceptions of assessment, and specifically assessment in PE and of physical literacy. Within a primary science context in the UK, research found the majority of children appreciated the usefulness of science assessment and value frequent, non-SATs testing for monitoring and improving progress (Murphy, Lundy, Emerson & Kerr, 2013). In Australia, focus group discussions with children indicated testing in primary schools had an impact on well-being, although this was not necessarily negative (Howell, 2015). Participatory research guidance suggests any stakeholder with a vested interest in promoting health and activity in children can be a change agent and should had a voice in the collective effort to improve children's health (Cosgrave et al., 2018). This indicates that the perspectives of a variety of potential stakeholders, including both teachers and children, should be considered in the development of a feasible assessment tool.

*2.5 Evidence to support physical literacy*

Jurbala (2015) argued that in order for physical literacy to succeed as a new approach in promoting PA, advocates must provide substance to their claims. As an emerging area of research, there is currently limited empirical evidence to support physical literacy, and therefore the development of effective research, regarding assessment or otherwise, will require robust planning, development and methodology. The lack of empirical research and the prevalence of 'academic opinionating' (p.1) has been a criticism of the physical literacy field in general (Harvey & Pill, 2018). A recent study proposed a conceptual framework of physical literacy linking existing empirical evidence regarding PA correlates and determinants to health (Cairney et al., 2019). The paper sought to draw on existing evidence from fields outside of physical education, which has long been the common context for physical literacy research. Authors also proposed that by viewing physical literacy as a determinant of health, this would provide conceptual direction for empirical physical literacy research (Cairney et al., 2019). Whilst this is one of the first steps to highlight the role physical literacy may play in promoting health behaviours, the model itself draws heavily from motor competence research (Stodden et al., 2008) and there is no direct evidence to support the relationship with physical literacy. In order for research to continue in this area, there needs to be direct, empirical evidence for physical literacy. Primary data was presented from Cairney et al. (2019) representing motor competence, predilection towards PA, enjoyment of PE and perceived competence within a latent model of physical literacy, but this neglects the cognitive domain of physical literacy and offers a narrow view of the elements. However, a further primary study identified that within a large sample (n=2956) of Canadian children aged 8-12 years old, knowledge and understanding of PA principles was not related to PA or sedentary

behaviour guideline adherence as measured by the Canadian Assessment of Physical Literacy (CAPL), pedometers and self-report questionnaires (Belanger et al., 2018). Whilst there are many published articles in the form of commentaries, opinion pieces, and recommendations, there is a lack of primary empirical evidence to support physical literacy. Little research has been published to demonstrate the impact of physical literacy intervention and policy, and ultimately little evidence is available to directly link physical literacy to lifelong physical activity (Longmuir & Tremblay, 2016; Lundvall, 2015). It is clear the further empirical research is needed. To provide this empirical evidence, a physical literacy assessment tool is needed. However, a variety of factors, outlined throughout this chapter, should be considered to develop an appropriate tool.

### *2.6.1 Assessment*

Assessment is acknowledged as a critical aspect of pedagogical practice and accountability systems (Dinan-Thompson & Penney, 2015). Yet according to López-Pastor et al. (2012), assessment is one of the most fraught and troublesome issues physical educators have had to deal with in recent years. The purpose of assessment can be divided into two main categories: accountability and learning (Hay & Penney, 2013). Whilst assessment of learning and summative techniques may suit the purpose of accountability, the potential for assessment for learning and formative techniques to promote learning has been widely discussed as enabling authentic learning experiences (Black & William, 1998; Hay & Penney, 2013). These authentic assessments require individuals to effectively and elaborately communicate an in-depth understanding. This may particularly pertinent to physical literacy as authentic assessments provide accessible learning experiences that are connected to the world in which these individuals live (Shepard, 2000). As a result, the assessment

experience itself can promote valued learning (Hay & Penney, 2013). Though, assessment alignment and validity are contestable as a result of the varied views and expectations regarding the topic to be assessed (Hay & Penney, 2013). For an assessment to be effective, the desired outcomes of the assessment should be considered (Hay & Penney, 2013).

As the concept of physical literacy has increased in popularity in recent years, so too has the need to be able to assess the concept. Exploring how to effectively monitor physical literacy has been identified as a crucial next step within the field (Longmuir & Tremblay, 2016). Historically, Whitehead (2013) strongly advised against the idea of 'assessing' physical literacy, yet this stance appears to have mellowed as in 2013, Whitehead stipulated that assessment of physical literacy should be a motivational tool and that comparison to others was 'seldom relevant'. Others have argued the benefits of accountable data in order to alter policy and practice at a societal level (Longmuir & Tremblay, 2016).

In the first systematic review to explore assessment of physical literacy, as of 2017, 32 assessments were identified in relation to this area; 61% of included papers related to the physical domain, 22% the affective domain, 14% the cognitive domain, and 3% combined all three domains (Edwards et al., 2018). This again demonstrates the disparity between the domains, and the lack of combined, holistic assessment tools. Few existing assessments encompass the broad range of factors that contribute to physical literacy (Longmuir & Tremblay. 2016), and as understanding of the concept develops, these factors continue to increase. As a multi-dimensional concept, any assessment should also be considered as multi-dimensional, allowing for the inclusion or exclusion of sub-elements as appropriate. This appropriateness could be determined via empirical research or by the needs of the assessment user.

The review by Edwards et al. (2018) also highlighted that the majority (66%) of assessments were conducted in children under 12 years of age. However, this period represents a rapid stage of development, and with the purpose of the current thesis in mind, it was unclear how many assessments were available in children aged seven and under. Given the focus on assessment within education in this age group, more specific scrutiny is warranted. Whilst, Edwards et al (2018) presented the first systematic review of physical literacy assessment, the methodology and subsequent findings are reflective of the lack of empirical research is this area. Qualitative synthesis was used to describe included assessment and the quality of the included studies was not assessed, and no risk of bias of the reported studies was presented. In addition, the appraisal process did not consider the psychometric properties of included assessments or the feasibility of included assessments in context. Readers should be presented with this information to be able to make informed judgements. Although this was outside of the scope of the first systematic review, future research should look to provide this information in detail.

In line with updates to the Australian definition of physical literacy, a recent paper was published detailing potential approaches to assess physical literacy within Australian PE (Barnett et al., 2019). The nine-step selection process was explained in detail, considering factors such as context, purpose, cost and number of participants. However, it is unclear whether this decision-making guide would be used by researchers or teachers themselves. For example, external researchers may not be aware of the teacher's interest in the assessment, whilst teachers may not be aware of the most suitable assessment methods available. This again demonstrates the importance of engaging all stakeholders in the assessment process. In addition, recommendations regarding specific instruments were not given in this paper

(Barnett et al., 2019). It also demonstrates the need for an audit of available assessments and recommendations regarding specific tools used to measure physical literacy. Results of which will assist researchers, practitioners and teachers in making informed decisions.

It is clear that any future physical literacy assessments need to provide evidence for their use with published, peer-reviewed research. Existing literature provides the first steps in exploring physical literacy measurement with findings highlighting many points of consideration and debate (Edwards et al., 2018; Robinson & Randall, 2017; Tremblay & Longmuir, 2017; Corbin, 2016; Tremblay & Lloyd, 2010). In particular, an assessment should provide evidence of validity and reliability, consider factors, which may affect feasibility and implementation, and authentically respect the holistic and multidimensional nature of the concept. These concepts are explored further below.

### *2.6.2 Measurement properties*

Fundamentally, information collected within an assessment needs to be reproducible and accessible to the administrator and participant (Hay & Penney, 2013). One way to ensure confidence in the assessment and its findings are by displaying evidence of measurement properties (Robertson, Kremer, Aisbett, Tran, & Kerin, 2017). Measurement properties refer to quality aspects of an assessment. For example, validity (the degree to which something measures what it purports to measure), reliability (the proportion of the variance in the measurements being down to true differences), or responsiveness (the ability of an assessment to detect change over time in the construct being measured), are the three domains of measurement property identified in a Delphi poll conducted by Mokkink et al. (2010). This study

included 43 international experts with a background in epidemiology, statistics, psychology, and clinical medicine and aimed to clarify and standardize terminology and definitions of measurement properties (Mokkink et al., 2010). A more recent Delphi poll involving sport and exercise scientists and academics, conducted by Robertson et al., (2017) identified ten items deemed to be of the highest importance when considering evaluation in exercise and sport specifically (see Table 2.1). However, these items may have been generated on more traditional views of assessment and may not lend themselves to the key evaluation properties of more novel approaches. For example, qualitative tools may not lend themselves to validity and reliability evaluation but could be assessed for rigour (the intellectual precision, robustness, appropriateness, sufficiency, and cohesiveness of concepts, methodologies, epistemology, ontology, and methods deployed in the research process and output) (Smith & McGannon, 2017). In addition, the relative importance

Table 2.1 *Measurement properties, adapted from Robertson et al. (2017).*

| | Level 1 | Level 2 |
|---|---|---|
| Reliability | Re-test reliability | Stability |
| | Intra-rater reliability | Internal consistency |
| | Inter-rater reliability | |
| Validity | Content | Convergent |
| | Discriminant | Concurrent |
| | | Predictive |
| Responsiveness | Responsiveness/sensitivity | Floor and ceiling effects |
| | Minimum important difference/ smallest worthwhile change | |
| Feasibility | Interpretability | Scoring complexity |
| | Familiarity required | Completion complexity |
| | Duration | Cost |

of any measurement property may differ depending on the intended use of, or context for the assessment.

Little is known about the validity and reliability of existing methods of assessing physical literacy (Longmuir & Tremblay, 2016) and this was outside of the scope of previous systematic review exploring physical literacy assessment (Edwards et al., 2018). However, the robust examination of a range of measurement properties of assessments is needed to improve the selection of assessments within research and practice. The use of validated guidelines within this process would be of benefit to minimise researcher bias and allow for clear comparison between assessments.

### *2.6.3 Feasibility*

Though not commonly considered in measurement literature, feasibility issues were viewed as important by experts within the Delphi poll conducted by Robertson et al. (2017). Feasibility is defined by eight areas of focus: acceptability, demand, implementation, adaptation, integration, expansion and limited efficacy testing (Bowen et al., 2009). Studies of feasibility can determine whether ideas, research and findings are, or can become, relevant and sustainable in a real-world context (Bowen et al., 2009). In this thesis, the real-world context for typical PA settings for younger children could include school, home, childcare, or extra-curricular clubs. As researchers call for a philosophically aligned physical literacy assessment tool which can be implemented in a primary school context (Corbin, 2016; Lundvall, 2015), the specific contextual factors and needs of this setting should be considered. In the existing systematic review relating to physical literacy assessment Edwards et al. (2018) did include a description of the methodological approaches used in these

assessments. Still, in depth consideration of the feasibility of implementing these assessments in practice was outside the scope of the study. Robinson and Randall (2017), did include usability in their conceptual critique of physical literacy tools used in Canada. The paper used a subjective starring system and a narrative review of each assessment's ease of use and usefulness, potentially limiting the strength of this review as this may be open to bias in interpretation.

Time, administrator expertise, complexity of the concept, resources, and environmental variables (such as seasons and weather) are barriers for real world physical literacy assessment (Longmuir and Tremblay, 2016). Within the existing literature related to physical literacy assessment, most work relates to education (Edwards et al., 2017). In schools, teachers themselves have cited challenges such as the amount of time needed to plan, the difficulty in accessing sample assessments and differentiating assessments for different class years and abilities, as significant barriers when implementing formative assessment in PE (Ní Chróinín & Cosgrave, 2013). Furthermore, the significance placed on other subject's means they are prioritised overspending time on specific PE assessment (Harris, Cale & Musson, 2012). It is also acknowledged that teachers have varied beliefs and understandings of assessment, and that this will affect how and why they engage with an assessment process (Hay & Penney, 2013). These findings attest to the many factors that can influence the effectiveness of assessments in practice. However, many studies do not consider or present factors relating to the feasibility of assessment in detail and future studies should endeavour to do this (Klingberg et al., 2018).

### *2.6.4 Alignment*

Authenticity has previously been discussed in reference to authentic assessment as an alternative, formative, assessment for learning (López-Pastor et al., 2013). Furthermore, authenticity can also be considered in terms of alignment to the concept of physical literacy. That is, that any assessment appropriately represents the users' understanding of the concept. Herein lies a source of potential tension, as understanding of the concept varies, so too does the understanding of assessments (Keegan et al., 2019 Cairney et al., 2019; Edwards et al., 2018).

It has also been acknowledged that previous attempts to assess physical literacy may have relied on existing assessments related to psychological, physical and cognitive tools or combinations of such (Tremblay & Lloyd, 2010). Therefore, these assessments may have limited effectiveness in appreciating contemporary understanding of physical literacy; a factor that is pertinent given physical literacy is an ever-developing concept. In contrast, Edwards et al. (2018 systematic review inclusion was potentially limited by its specific focus on physical literacy, resulting in many assessments being excluded. This may have neglected assessments of existing related terms (such as enjoyment, self-esteem, fundamental movement skills etc.) that could facilitate the development and operationalisation of the assessment of physical literacy. It is therefore apparent that a balance should be struck between learning from existing, relevant literature, whilst maintaining an open mind for contemporary approaches that represent the current understanding of physical literacy. This again attests to the importance of transparency in research regarding defining, operationalizing and assessing physical literacy in order to help fellow researchers in achieving this (Edwards et al., 2017).

Despite philosophy being a key feature of the concept, little is known about whether existing assessment tools are aligned to the philosophical underpinnings of physical literacy as detailed by Whitehead (2010). Within a review of physical literacy conducted by Robinson and Randall (2017), fidelity to Whitehead's conceptualisation of physical literacy was included. This consisted of a three-star rating system and a narrative review. However, it is inappropriate to subjectively make a judgement on the philosophical assumptions of an assessment. It should also be noted that Robinson and Randall (2017) used an outdated version of the physical literacy definition to judge this fidelity (Tremblay & Longmuir, 2017). Edwards et al. (2018) did report on the adopted philosophy of each assessment, referring to 'no philosophy' or 'holistic philosophy', but it was not clear how this was judged. Any exploration of this should be transparent and acknowledge any potential conflicts of interest. In a written response to the Robinson & Randall's (2017) critique, the authors of one of the included assessments (CAPL- Canadian Assessment of Physical Literacy) identified that the authors were members of Physical and Health Education Canada, who own one of the other assessments appraised in their critique and therefore might be a conflict of interest (Tremblay & Longmuir, 2017). Tremblay & Longmuir (2017) also took issue with the equality given between peer-reviewed evidence and self-made claims of trustworthiness. Given the importance of the philosophy to the concept, and the subsequent criticisms of existing measures, to allow for comparison of assessments a pragmatic evaluation of physical literacy alignment is warranted. This will enable researchers and practitioners to make informed judgements. In addition, by reporting this evaluation process in precise detail, any future assessments developed can also be appraised using these methods.

Whitehead (2010) originally proposed physical literacy as an alternative to linear, simplistic and reductionist approaches to PA promotion and adoption of linear approaches to assess the concept are therefore at odds with the notion that physical literacy is a fluctuating individual journey. Progress in physical literacy is a dynamic and non-linear process (Green et al., 2018). Yet practitioners who use assessment without acknowledging this principle are at risk of contradicting the key purpose of physical literacy (Edwards et al, 2018). As a result, advocates of this understanding would deem conventional, linear measurement assumptions to be inappropriate, and have proposed the used of creative, nonconventional methods of assessing physical literacy that allow for more in-depth understanding of an individual's physical literacy journey (Green et al., 2018). For example, the use of qualitative methods of assessment may give more information regarding the context of scores, which in turn may also allow for a greater understanding of how to intervene to develop physical literacy. Another significant aspect to consider is how, where, when and why assessment methods are applied (Longmuir & Tremblay, 2016; Green et al., 2018; Barnett et al., 2019). With specific reference to existentialism, individuals should be given the opportunity to develop activity experience in a range of environments, and this should be represented within an authentic assessment (Whitehead, 2019). These factors should influence any decisions made regarding physical literacy assessment and will provide support for the justification of a selected approach.

Whilst the concept of assessment presents a challenge, it has been claimed that appropriate measurement has the potential to improve standards, expectations, and the profile of physical education, which will lead to more physically literate children, and subsequently, more active adults (Tremblay & Lloyd, 2016). This challenge in part relates to confusion around the international differences in defining physical

literacy, and the subsequent differences in interpreting and operationalising assessment and practice. Future research should seek to objectively identify these differences and highlight core similarities, to enable those working in the field to overcome any potential barriers. The development of an effective assessment has the potential to enable researchers and practitioners to monitor children's physical literacy and identify those in need of intervention, to provide evidence to assist policy makers, and it could improve credibility of the concept by presenting physical literacy in an accessible and feasible manner. Yet it is unclear what assessments are currently available that could be used to assess the related domains and elements of physical literacy, how these relate to the concept of physical literacy, the validity and reliability of these assessments, and how feasible they are in practice. The potential positive implications of developments in this area demonstrate the pressing need for a robustly developed, feasible and authentic physical literacy assessment tool. However, future research should identify these methods of monitoring physical literacy considering the needs of the user in its proposed context of use. More research is needed to consider the needs of those involved in using an assessment of physical literacy in young children. Feasible and tangible suggestions of how to conduct a physical literacy assessment in context are needed to facilitate the implementation, long term use, and subsequent benefits of a physical literacy assessment for young children.

### *2.7 Aims and objectives*

The specific aims of the thesis are to:

a) To identify, articulate, and compare the various international approaches to physical literacy.

i. To identify existing international groups working within physical literacy

ii. To critically review common themes and issues regarding these approaches

b) To conduct a systematic review of existing physical literacy assessment tools used with young children.

i. Identify existing instruments used to assess factors related to the affective, physical and cognitive domains of PA used in children aged 3-7 years' olds

ii. To critically appraise the measurement properties, feasibility and alignment of included assessments

b) To explore and understand the views of relevant stakeholders, in terms of both current practice, and future directions for assessment and effective implementation of a physical literacy assessment for young children.

i. To identify how physical literacy is currently assessed

ii. To explore current perceptions regarding physical, cognitive and affective assessment in young children

iii. To identify any common themes, examples of good practice, or points of concern regarding assessment

iv. To explore potential solutions to overcomes common barriers to assessing physical literacy in schools

v. To discuss the how the implementation of physical literacy assessment in schools be improved with young children

c) To provide recommendations for the development of future assessments of physical literacy, suitable for use in young children.

*2.8 Research structure*

Given my pragmatic outlook, emphasis was placed on the research problem. This outlook guides that all available and feasible research methods should be considered to understand a problem (Creswell & Creswell, 2018). This enabled a freedom of choice to identify the most effective methods, techniques and procedures of research to meet the needs and purposes of the research objective (Tashakkori & Teddlie, 2010). As a result, mixed methods were adopted throughout this thesis, informing the data collection, analysis and interpretation of data. Mixed methods research involves the collection of both quantitative and qualitative data, which enables additional insight beyond the scope of either approach in isolation (Creswell & Creswell, 2018). As a result, it is hoped that data collected throughout this thesis is rigorous and the application of this knowledge is feasible in a real work context.

Due to the confusion and complexity surrounding the understanding and operationalisation of physical literacy, there is a need for a clear and objective description of current international approaches that have adopted physical literacy. Study One (Chapter Three) presents a narrative review highlighting and commenting on international approaches to physical literacy, giving context to potential issues regarding assessment. A narrative review was utilised considering the reported confusion regarding international approaches (Jurbala, 2015) and reflective of the quality of published research available regarding these approaches at the time.

The findings from Study One (Chapter Three) informed Study Two (Chapter Four), which was an extensive, rigorous and detailed systematic review of assessments related to physical literacy used in younger children. The use of previously established appraisal protocols will enable an objective but thorough

overview of previously under researched areas such as study quality, measurement properties, feasibility, and physical literacy alignment (Klingberg et al., 2018; Beattie et al., 2015; Mokkink et al., 2018; Prinsen et al., 2018). COSMIN was selected for the appraisal of measurement properties as it has been extensively developed and validated for use in health-based research (Mokkink et al., 2018; Prinsen et al., 2018). Klingberg et al. (2018) and Beattie et al (2015), provided the framework for the appraisal of feasibility, but this was adapted by the research term to be relevant, comprehensive and appropriate for the assessment of physical literacy in a school-based context. The physical literacy alignment checklist was a novel approach to address the calls for the assessment of physical literacy to be authentic and aligned to the concept (Green et al., 2018). The checklist approach was utilised to be transparent and objective, but to give indication of how existing assessments align with the current conceptualisations of physical literacy.

Study Three (Chapter Five) is a qualitative examination of stakeholders' perceptions of current and future physical literacy assessment. Stakeholders in this context included teachers, physical literacy academics/ practitioners, and children. To enable discussion within homogenous groups, focus groups were selected as the most appropriate form of data collection (Kitzinger, 1995). This allowed groups to develop their understanding of physical literacy, reflect on their own experiences and share and develop their ideas for future assessment. These focus groups were conducted concurrently due to the complexities of collecting data within the school environment. Questions were developed based on a framework provided by Bowen et al. (2009), which presented comprehensive guidance on factors to consider in the design of feasibility studies. Findings were triangulated across stakeholder groups and presented in pen profiles to illustrate key themes regarding the implementation

of a physical literacy assessment in this context. The use of such visual representations has been cited as a key characteristic of mixed methods research (Tashakkori & Teddlie, 2003). Furthermore, the use of qualitative data to expand upon quantitative results in this way enabled a more in depth understanding of the data as it provided insight into context, perceptions and relevance (Creswell & Creswell, 2018). Finally, Chapter Six, provided ten recommendations based on empirical research conducted within and outside of this thesis. These recommendations were presented as a narrative synthesis, enabling them to be easily understood and actionable by potential assessment users (i.e. teachers and researchers).

# Chapter Three

# Study One:

# Global Interpretations

# of Physical Literacy

The main outcomes of this study have been published in: Shearer, C., Goss, H. R., Edwards, L. C., Keegan, R. J., Knowles, Z. R., Boddy, L. M., ... & Foweather, L. (2018). How is physical literacy defined? A contemporary update. *Journal of Teaching in Physical Education*, *37*(3), 237.

*3.1 Thesis study map*

| | |
|---|---|
| Study One (Chapter Three): Global interpretations of physical literacy | Objectives:<br>• To collate, compare, and critically review existing international definitions of physical literacy |
| Study Two (Chapter Four): A systematic review of assessments related to physical literacy among young children | Objectives:<br>• To systematically review the academic literature for tools to assess the domains of physical literacy within children aged 3-7.9 years |
| Study Three (Chapter Five): Stakeholder perceptions of a physical literacy assessment for young children | Objectives:<br>• To explore key stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups |
| Recommendations for a physical literacy assessment tool for young children | Objectives:<br>• To draw on research findings from within this thesis and externally, to identify common themes and provide evidence-based recommendations for a physical literacy assessment tool, suitable for use in young children |

*3.2 Introduction*

Over the past 20 years, the invigoration of research regarding physical activity and physical education has generated a greater understanding of both their importance and how they should be promoted (Allan, Turnnidge, & Côté, 2017). "Physical literacy" has subsequently emerged as a concept that captures the desire both to participate in physical activity as well as gain meaningful, fulfilling experiences through doing so. The concept was initially proposed by Whitehead (2001, 2010) in

response to concerns about the direction of physical education and the alarming levels of physical inactivity across the lifecourse (Hallal, Andersen, Bull, Guthold, Haskell & Ekelund, 2012). Physical literacy has been presented as a "longed for" approach that values our physical existence (Lundvall, 2015, p. 116). Crucially, it re-positions how physical activity is understood and places importance on the holistic development of an individual's physical potential (Whitehead, 2010). This approach appears to have wide appeal (Jurbala, 2015; Tremblay & Lloyd, 2010), with nations from across the world embracing physical literacy to better promote the health, productivity, and happiness of their citizens. However, the concept of physical literacy is often interpreted differently between and within these countries (Edwards et al., 2017), leading to concerns that the concept is becoming lost, is confusing, or is being implemented in ways that are inconsistent with its own core tenets (Jurbala, 2015). As such, researchers have endeavoured to elaborate on what the concept means and how it can be applied in practice.

### *3.3 The origins of physical literacy*

According to Whitehead (2001), physical literacy is derived from the philosophical concepts of monism, phenomenology, and existentialism. "Monism" is the belief that the mind and body are interdependent and indivisible (Whitehead, 2007). "Existentialism" proposes that every person is an individual as a result of their interactions (Whitehead, 2007). Similarly, "phenomenology" proposes that individuals are formed through their experience of these interactions and suggests that perception, through our embodied nature, forms unique perspectives in how individuals view the world (Whitehead, 2007). As such, under these assumptions, at the core of physical literacy, individuals will have: (a) a unique interpretation of the physical world; (b) embodiment within this world based on their own experiences

and perceptions; and (c) their physical and mental being viewed as an indivisible, mutually enriching whole. It should be noted, however, that each of the philosophical concepts of monism, existentialism, and phenomenology were originally proposed as self-contained approaches to the philosophy of science and not intended for mixing (Grix, 2002).

Whitehead's intention (cf. Whitehead, 2010), by invoking these stances, was to transform physical literacy into an inclusive and holistic concept, focused on the individual in the world and her/his experiences. Whitehead (2010) argued that one cannot fully understand or appreciate the true nature of physical literacy without first grasping its philosophical concepts. Yet for many, the detailed and complex philosophical groundings of physical literacy present a barrier to clarity and understanding (Jurbala, 2015). For researchers seeking to explain the concept, some understanding of the philosophical assumptions is required to validate predictions, and this should be articulated. Recent analysis in the related domain of sport and exercise psychology has suggested that the lack of willingness to discuss and consider philosophical underpinnings is the cause of many current discrepancies, disagreements, and plateaus in progress (Hassmén, Keegan, & Piggott, 2016).

A definition is, or should aim to be, inextricably linked to its underpinning philosophical assumptions (Dennett, 1995). Whitehead has been proactive in seeking to refine and improve the definition of physical literacy since she first proposed the concept in 1993 (Whitehead, 1993), often through consensus-seeking exercises within the International Physical Literacy Association (IPLA). For example, in 2010, physical literacy was defined as: "appropriate to each individual's endowment, physical literacy can be described as the motivation, confidence, physical competence, knowledge, and understanding to maintain physical activity throughout the

lifecourse" (Whitehead, 2010, p. 11). In 2013, Whitehead had described physical literacy in the International Council for Sport Science and Physical Education bulletin as "the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for maintaining purposeful physical pursuits/activities throughout the lifecourse" (p. 29). Following discussions and refinements, the definition was recently changed on the IPLA website, to read as follows: "the motivation, confidence, physical competence, and knowledge and understanding to value and engage in physical activity for life" (IPLA, 2017). While there have been three iterations of the definition since 2001, Whitehead and her colleagues at the IPLA have always retained the elements of motivation, confidence, physical competence, knowledge, and understanding. Another constant throughout Whitehead's definitions is the notion that the concept is applicable throughout the lifecourse. Nevertheless, the evolving nature of the definition may be a pivotal consideration in illustrating how individuals who approach physical literacy as a new/novel concept may be left bewildered in their search for a definitive definition as, arguably, none exists at this time.

Generally, good science is embodied by debate, discussion, and a willingness to evolve and progress ideas (Popper, 1957), and in this respect, physical literacy is thriving. The following sections will demonstrate that while there may not be a correct or true definition, as both consensus and evidence are currently lacking (Jurbala, 2015), instead there are—or should be—transparent approaches (Edwards et al., 2017). This study aims to collate, compare, and critically review existing definitions of physical literacy from leading organizations implementing physical literacy agendas around the world. This process will thus facilitate the positioning and contextualization of various policy frameworks, measurement and assessment

approaches, and intervention data and results. Each will be discussed with respect to its specific underlying definition and conceptualization. Common themes and differences will then be discussed, as well as origins for these differences. While other papers have sought to critically appraise varying concepts (Robinson & Randall, 2017) or offer their own interpretations (Chen, 2015), the aim of this paper is to clearly identify, articulate, and compare the various approaches of each group, united under the label of physical literacy.

*3.4 Methods*

Members of the IPLA (n = 4) were contacted via e-mail in Spring 2017 and asked to identify leading organizations/groups working within the physical literacy community. Physical literacy is a relatively novel concept, with almost all organizations/groups using freely available online platforms to share research and express definitions and interpretations. Working with these experts allowed access to definitions produced both inside and outside of the traditional academic publishing distribution channels. In tandem, the references of a recent systematic review of definitions, foundations, and associations of physical literacy (Edwards et al., 2017) were also checked to ensure all relevant organizations/groups and resources were identified. The websites and publicly available material from each organization/group were searched to capture information regarding the definitions and theoretical/conceptual underpinnings of physical literacy being operationalized internationally.

*3.5.1 Results*

We identified that there are seven prominent groups currently working to promote and develop physical literacy, each operating with at least one identifiable definition.

The groups included research teams, government organisations (national or state), not-for-profit and corporate groups, or multi-sector partnerships spanning all of these. These organisations/groups use online platforms to share research and present definitions and interpretations of the concept and these were used to gain insight. Definitions and interpretations of physical literacy from each of these seven groups are presented according to country of origin in Table 3.1.

Table 3.1 *International Definitions of Physical Literacy.*

| **Group** | **Country of Origin** | **Reference/ Web Link** | **Adopted Definition of Physical Literacy** |
|---|---|---|---|
| International Physical Literacy Association (IPLA) | United Kingdom | IPLA (2017) https://www.physical-literacy.org.uk/ | Physical literacy can be described as the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life |
| Sport Wales | Wales (United Kingdom) | Sport Wales (2017) http://physicalliteracy.sportwales.org.uk/en/ | Physical Skills + Confidence + Motivation + Lots of opportunities = Physical Literacy |
| Physical and Health Education (PHE) Canada | Canada (Montreal) | PHE Canada (2017) http://www.phecanada.ca/programs/physical- | Individuals who are physically literate move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the |

Table 3.1 *International Definitions of Physical Literacy.*

| Group | Country of Origin | Reference/ Web Link | Adopted Definition of Physical Literacy |
|---|---|---|---|
| | | literacy/what-physical-literacy | healthy development of the whole person |
| Canadian Sport for Life (CS4L) | Canada (Toronto) | CS4L (2017)<br><br>http://sportforlife.ca/qualitysport/physical-literacy/ | Physical literacy is the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life |
| Society of Health and Physical Educators (SHAPE) | United States | Mandigo et al. (2012)<br><br>http://www.shapeamerica.org/events/physicalliteracy.cfm | Physical literacy is the ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person |
| Sport New Zealand | New Zealand | Sport New Zealand (2015)<br><br>http://sportnz.org.nz/about-us/who-we-are/what-were-working-towards/physical-literacy-approach | The motivation, confidence, physical competence, knowledge, and understanding required by participants that allows them to value and take responsibility for engaging in physical activity and sport for life |

Table 3.1 *International Definitions of Physical Literacy.*

| **Group** | **Country of Origin** | **Reference/ Web Link** | **Adopted Definition of Physical Literacy** |
|---|---|---|---|
| Australian Sport Commission | Australia | Australian Sports Commission (2017)<br><br>http://ausport.gov.au/physical_literacy | Four defining statements:<br>1. Core/process: Physical literacy is lifelong holistic learning acquired and applied in movement and physical activity contexts<br>2. Components/constructs: It reflects ongoing changes integrating physical, affective (subsequently renamed "psychological"), cognitive, and social capabilities<br>3. Importance: It is vital in helping us lead healthy and fulfilling lives through movement and physical activity<br>4. Aspiration/product: A physically literate person is able to draw on their integrated physical, affective, cognitive, and social capacities to support health promoting and fulfilling movement and physical activity—relative to their situation and context |

### *3.5.2 United Kingdom*

The IPLA is a leading advocacy group for physical literacy in the United Kingdom, having been established as a U.K. charity in 2014, whereupon Margaret Whitehead was appointed as the president. The IPLA was formed with the purpose of providing guidance, clarity, and consistency regarding physical literacy. At the time of this study, the IPLA promoted their definition of physical literacy through their website (www.physical-literacy.org.uk), as well as delivering training programs to practitioners and hosting an annual conference. Nonetheless, there was a lack of research published by the association, and despite being named the "International Physical Literacy Association," the group is predominantly connected with U.K. partners and focused on promoting physical literacy within the United Kingdom.

Despite the establishment of the IPLA, different definitions and interpretations of physical literacy had been utilized across U.K. countries (England, Wales, Scotland, and Northern Ireland). The importance of physical literacy for children and young people was first affirmed within national government policy and strategy in England in "Sporting Future: A New Strategy for an Active Nation" (Sport England, 2016). In response, Sport England—a nondepartmental public body tasked by the Department for Culture Media and Sport with increasing population levels of participation in physical activity in England—had identified "increasing the percentage of children achieving physical literacy" as a key performance indicator within their 2016–2021 strategy (Sports England, 2016, p. 20). The Youth Sport Trust, in partnership with Sport England, Association for Physical Education, Sports Coach UK, and County Sports Partnership Network, created a Primary School Physical Literacy Framework that detailed the role of school physical education, extracurricular activities, and competitive sports. Within this framework, physical literacy was defined as the

"motivation, confidence, physical competence, knowledge, and understanding that provides children with the movement foundation for lifelong participation in physical activity" (Youth Sport Trust, 2013, p. 1). Although similar to the previously discussed Whitehead definition, the additional outcome of movement foundation implied a movement focus within the physical literacy framework. Notably, the IPLA are also not listed as collaborating or endorsing this framework.

In Wales, the devolved Welsh government (Llywodraeth Cymru) prioritized physical literacy at a policy level considerably earlier than England, with physical literacy highlighted as an opportunity to enable lifelong participation in sport and physical recreation. As such, recommendations to raise the status of physical education to become a core subject in Wales—alongside mathematics, English, Welsh, and science—were proposed (Schools and Physical Activity Task and Finish Group, 2013). At the time of publication, the physical literacy definition adopted by Sport Wales displayed similarities to the definition put forward by Whitehead and the IPLA, but instead it was articulated in the form of an equation: "Physical Skills + Confidence + Motivation + Lots of opportunities = Physical Literacy" (Sport Wales, 2017). In turn, the Sport Wales definition was an attempt to translate the complex physical literacy concept into one that the general public could easily interpret. In line with Whitehead's approach, Sport Wales advocated the notion of physical literacy as a journey throughout life through their interactive website (http://physicalliteracy.sportwales.org.uk/en/), which displayed physical literacy in relation to different life stages. Furthermore, in 2014, approximately £1.78 million ($2.3 million) was invested by the Welsh government into the "Physical Literacy Programme for Schools." The program was a targeted intervention program that aimed to develop young people along their physical literacy journey. The program

had a political agenda of improving young people's engagement and confidence in secondary schools and reducing the impact of deprivation on academic attainment (Sport Wales, 2017). More recently, upcoming curricular changes in Wales were implicitly aligned with the concept of physical literacy, whereby physical education will be part of the "health and well-being area of learning and experience" that aims to develop "healthy and confident individuals" (Donaldson, 2015, pp. 45–46).

### *3.5.3 Canada*

As a nation, Canada is often praised for being a strong advocate and leader of physical literacy through its implementation of well-funded programs and strategies within national sport systems (Allan et al., 2017). There are many groups across Canada's provinces and territories using the term physical literacy, with varying definitions and interpretations of the concept. Two leading government-funded groups that work to promote physical literacy on a national scale are Canadian Sport for Life (CS4L) and Physical and Health Education Canada (PHE Canada). There are also regional groups dedicated to physical literacy research, such as the Healthy Active Living and Obesity group and the Pacific Institute for Sporting Excellence.

Initially, a range of physical literacy definitions were developed in Canada, often adapted from Whitehead's (2010) original definition to suit the needs of specific organizations. The Whitehead (2010) physical literacy definition is—in some capacity—recognized or endorsed by each research team or organization. Nevertheless, in 2015, discourse within the physical literacy community—surrounding concerns for the divergence in approaches and foci of programs—prompted the creation of a consensus statement within Canada. The purpose of the statement was to provide clarity for the development of policy, practice, and research.

The consensus statement was a collaborative process, and authors of the statement included: ParticipACTION, Sport for Life Society, the Healthy Active Living and Obesity Research Group at the Children's Hospital of Eastern Ontario Research Institute, PHE Canada, Canadian Parks and Recreation Association, and the Ontario Society of Physical Activity Promoters in Public Health (CS4L, 2015). The IPLA definition (IPLA, 2017) informed by Whitehead (2013a) (the motivation, confidence, physical competence, knowledge and understanding to value and engage in physical activity for life) was endorsed within the consensus statement as the definition of physical literacy (CS4L, 2015, p. 1).

Despite the generation of this consensus statement, the previous definitions from these organizations were often referred to in practice and were the primary sources available to interested parties searching the Internet (Hyndman & Pill, 2017). The prevalence of these competing approaches leads to the continued confusion and disagreement within the physical literacy community (Robinson & Randall, 2017). For example, in 2009, PHE Canada, a leading professional organization for physical education teachers, released a physical literacy positioning paper using the following working definition: "Individuals who are physically literate move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person" (Mandigo, Francis, Lodewyk, & Lopez, 2012, p. 6). This definition was displayed on the PHE Canada (2017) website (http://www.phecanada.ca/programs/physical-literacy); however, at the same time, the IPLA definition was also endorsed, with reference to the consensus statement.

In addition to PHE Canada's approach, the Sport for Life Society (previously Canadian Sport for Life) endorses the IPLA definition of physical literacy, alongside the description: "Physical literacy is the mastering of fundamental movement skills

and fundamental sport skills" (The Sport for Life Society, 2017). In 2016, the Sport for Life Society registered "60 Minutes Kids Club," which became "Physical Literacy for Life" (PLFL, 2017). PLFL aimed to advance physical literacy in the health, recreation, and education sectors, with the aspiration "to develop physical literacy in all Canadians" (PLFL, 2017, p. 1). Again, the materials accompanying this site reiterated the IPLA 2014 definition of physical literacy, alongside the full 2015 consensus statement, although it has been debated whether this acknowledgment was translated in practice (Robinson & Randall, 2017). For example, in 2014, physical literacy was adopted as one of the 10 key factors influencing the CS4L model of Long-Term Athlete Development (CS4L, 2015). This model became a popular and influential approach, often deployed in relation to physical literacy in Canada (Robinson & Randall, 2017). The model evolved to try to acknowledge the wide variety of factors that influence physical literacy, and in turn athletic development, including a range of skills and environments. As an internationally recognized talent development model, this performance-driven approach to physical literacy received global attention (Allan et al., 2017). Nevertheless, although CS4L adopted the IPLA definition of physical literacy, strategies intended to promote physical literacy within the Long-Term Athlete Development model largely focused on physical skills and motor development (Allan et al., 2017), and as the popularity of this model grew, so too did criticisms regarding whether the model truly acknowledges the holistic nature of physical literacy (Robinson & Randal, 2017).

#### *3.5.4 United States*

At the time of our sampling, physical literacy in United States was supported by the Society of Health and Physical Educators (SHAPE America) as a part of the National Standards and Grade Level Outcomes for K-12 Physical Education (Moreno, 2013). In

2013, SHAPE America defined physical literacy as "the ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person" (Mandigo et al., 2012, p. 6; SHAPE America, 2014, p. 4). This definition was the same as that utilized by PHE Canada, and physical literacy was outlined as the goal for both physical and health education, highlighted through the campaign 50 Million Strong, which reflected SHAPE America's commitment to put all children on the path to health and physical literacy by 2029 (Jefferies, 2016).

In 2015, the Aspen Institute (an education and policy studies organization) was commissioned by SHAPE America to produce the document: "Physical literacy in the United States: A model, strategic plan, and call to action" (The Aspen Institute, 2015). Alongside the SHAPE America website, the Aspen Institute developed further resources via their "Physical Literacy: Project Play" website, which defined physical literacy as "the ability, confidence, and desire to be physically active for life" (The Aspen Institute, 2013), thus deviating quite significantly from the SHAPE America definition. Crucially, this wording removed the element of knowledge and understanding from Whitehead's definitions, although it could be argued that this was in an attempt to simplify the definition to engage youth populations. Both Physical Literacy: Project Play (The Aspen Institute, 2013) and SHAPE America are initiatives for school-aged children, so will undoubtedly focus on children and young people.

SHAPE America asserted that physical education "develops the physically literate individual through deliberate practice of well-designed learning tasks" (SHAPE America, 2017, p. 1). In 2014, the term "physically educated" was replaced with "physically literate" in the National Standards and Grade Level Outcomes for K-

12 Physical Education (SHAPE America, 2014). This was critiqued by Lounsbery and McKenzie (2015), and it was reported that this change occurred without the consultation of the physical education profession. It was also argued that there appeared to be little difference between the definitions of physical education and physical literacy. This argument was echoed by Hyndman and Pill (2017), who argued that the substitution and interchangeable use of physical education for physical literacy has led to "definitional blurring."

### *3.5.5 New Zealand*

Sport New Zealand is a government-funded agency that supports and funds local, regional, and national organizations working to promote grassroots and elite sports throughout New Zealand. The 2015–2022 Community Sports Strategy (Sport New Zealand, 2015), which followed the first national strategy published in 2009, highlighted physical literacy as a key focus area for young people within New Zealand. To guide this focus area, Sport New Zealand (2015) published a document titled Physical Literacy Approach—Guidance for Quality Physical Activity and Sport Experiences, wherein they used Whitehead's (2013a) definition of physical literacy: "the motivation, confidence, physical competence, knowledge and understanding required by participants that allows them to value and take responsibility for engaging in physical activity and sport for life" (Sport New Zealand, 2015, p. 1). Sport New Zealand reasoned that although they wanted to be a successful sporting nation, they required a participant-focused physical literacy approach to community sport. This approach took a holistic view of the participant, considering their physical, social and emotional, cognitive, and spiritual needs (Sport New Zealand, 2015). The inclusion of a spiritual aspect to their interpretation of physical literacy reflected the important spiritual facets of the Maori culture, which is specific to, and has great

importance within, New Zealand culture and society. Furthermore, Sport New Zealand outlined their vision, provided information regarding physical literacy, and considered the needs and considerations of various life stages. This document (Sport New Zealand, 2015) gave significance to the "lifecourse," in line with Whitehead's (2010) definition, through a section called "traveling through life," wherein physical literacy was considered in regard to each life stage (i.e., from early years through to seniors), thus promoting a holistic and inclusive approach to physical literacy. The most recent annual report from Sport New Zealand targets improving physical literacy in children between 2017 and 2020 (Sport New Zealand, 2016).

#### *3.5.6 Australia*

The first Australia-wide curriculum for Health and Physical Education was released to Australia's states and territories and their respective education systems in 2015. Although the Health and Physical Education documents did not make an explicit reference to physical literacy, there were strong alignments between particular interpretations of physical literacy and aspects of the Health and Physical Education curriculum; for example, the aim of the curriculum is to provide the basis for developing knowledge, understanding, and skills for students to lead healthy, safe, and active lives (Australian Curriculum, Assessment and Reporting Authority, 2016). The concept of physical literacy was specifically mentioned in the document titled Getting Australia Moving, which was commissioned by the local state government in the Australian Capital Territory (Keegan, Keegan, Daley, Ordway, & Edwards, 2013). During this time, the University of Canberra's physical literacy research group was arguably the leader of physical literacy within Australia (The Aspen Institute, 2015), aiming to improve the physical literacy of Australian children through school physical

education and sport, community linkages, and the development of resources such as web apps and task-cards for teachers.

In May 2016, the Australian Sports Commission recruited a team of researchers to produce for Australia a physical literacy definition, standards framework, assessment guidelines, and implementation guidelines. The core researchers in the team conducted a wide-ranging literature review of physical literacy, followed by expert panel meetings, and a Delphi consultation process involving three rounds of Delphi surveys to pursue consensus (Australian Sports Commission, 2017). Following this process, it was agreed that physical literacy should be theoretically separable from physical activity, a so-called double dissociation wherein a person could be high or low in both, separately, or together. The group agreed on a set of defining statements, making it clear that each individual has the potential to learn through participation in physical activity and that potential can be developed to a level where it is self-perpetuating. In the end, there were four defining statements issued by the Australian Sports Commission, with between 94% and 100% consensus recorded from an expert group of 18 leading researchers. The four defining statements were: (a) Physical literacy is lifelong holistic learning acquired and applied in movement and physical activity contexts (core/process; 94% consensus); (b) It reflects ongoing changes integrating physical, affective (subsequently renamed psychological), cognitive, and social capabilities (components/constructs; 94% consensus); (c) It is vital in helping us lead healthy and fulfilling lives through movement and physical activity (importance; 100% consensus); and (d) A physically literate person is able to draw on their integrated physical, psychological, cognitive, and social capacities to support health promoting

and fulfilling movement and physical activity—relative to their situation and context—throughout the lifespan (aspiration/product; 94% consensus).

Central to these defining statements was the clarification that whole-person, holistic development spans four key learning domains: the physical, affective, cognitive, and social (Australian Sports Commission, 2017). The physical domain included physical competence, motor skills, health- and skill-related fitness, techniques, and psychomotor skills. The affective (subsequently "psychological") domain concerned itself with one's experiences of internal signals such as fatigue and exertion, as well as motivation, confidence, self-esteem, and engagement. The cognitive domain covered conscious and unconscious knowledge and understanding, including problem-solving and decision-making, awareness of rules and tactics, appreciation of healthy and active lifestyles, and processing of feedback and reflection. The social domain included leadership; understanding ethical principles; working with peers, coaches, and teachers; and treating others with sensitivity and effective communication. The group emphasized that development and learning must be "integrated across" all four domains and not merely focus on the physical. It is early days for this new approach, using defining statements rather than a singular definition, but the work has been well-received in stakeholder focus groups and has support from the Federal government, including ongoing funding of the Australian Sports Commission's work in this area across Australia.

### *3.6.1 Discussion*

This study has endeavoured to collate, compare, and critically review the current understandings of physical literacy internationally. We have identified seven established and prominent groups and have provided an overview of those groups

operating with the term physical literacy. The following discussion will critically review these by identifying common themes and issues regarding the definitions used by these groups, exploring potential reasons for these issues, and pointing out the implications this has for the future of physical literacy.

### *3.6.2 Global differences*

In articulating her views on the concept of physical literacy, Whitehead (2010) was clear that there are good reasons to expect different approaches to physical literacy. The underlying philosophy (or philosophies) she argued as being central considerations denoted that the unique personal experience, unique personal capabilities at any point in time, and unique social and environmental contexts all necessitate a context-specific approach. International differences in the interpretation and operationalization of physical literacy are expected, indeed needed, to create meaning and cultural relevance. The influence of culture was extensively discussed by Whitehead (2010), who identified that "specific expression (of physical literacy) … will be particular to the culture in which they live" (p. 12). Although physical literacy is proposed to be a universal and inclusive concept, there is a debate as to how much tailoring the sociocultural context should need, and this is referred to throughout Whitehead's book (2010). Initially, it was assumed that the differences in interpretation could stimulate the implementation of physical literacy in practice and allow it to flourish within a variety of settings, ultimately leading not only to different approaches to applied practice, but also different definitions of physical literacy. As a consequence, however, some have argued that this diversity in definitions has generated a level of inconsistency and conflict within the physical literacy community (Dudley et al., 2017; Jurbala, 2015; Tremblay & Lloyd, 2010).

Each of the seven organizations, discussed above, has adopted its own definition(s) of physical literacy. With the exception of SHAPE America, these groups are nongovernmental public sports bodies. While the growing interest from international organizations aiming to promote physical literacy is promising, it should be noted that these organizations each have their own specific purposes, philosophies, expertise, and funding priorities to promote the concept within their communities. These contextual constraints then influence associated characteristics, descriptors, objectives, methodologies, programs, and evaluations of physical literacy, perhaps perpetuating the issues that form the focus of this paper.

The Canadian consensus statement (CS4L, 2015) aimed to decide on a single definition, as even within one country, the interpretations of physical literacy were notably different across provinces. The Canadian consensus statement went some way toward unifying a physical literacy approach, yet there is a marked difference between endorsing a definition and appropriately operationalizing said definition (Edwards et al., 2017). It is unclear, however, what meaningful difference this consensus achieved in terms of changes to practice and approaches, with conflicting definitions presented alongside the "agreed" one. More substantive, transparent, and scientific processes may be required to develop and agree on a robust working consensus regarding the definition and meaning of physical literacy.

### *3.6.3 Philosophy within the definition*

The philosophy underpinning the physical literacy concept and its holistic nature is arguably what makes the concept unique. Whitehead (2001, 2007, 2010, 2013a) has consistently noted that philosophy is the vital foundation behind physical literacy, and one cannot truly understand physical literacy without embracing its

philosophical roots. Nevertheless, the philosophy surrounding physical literacy programs was often ill-aligned or simply missing, both in research and practice (Edwards et al., 2017). For example, SHAPE America (2017) and Sport Wales (2017) may have neglected the lifelong experience in their materials, as their focus at the time was on school-aged populations. Likewise, having historical associations with talent development pathways, The Sport for Life Society (2017) and Sport New Zealand (2016) may have placed higher importance on movement skills rather than valuing the diverse and holistic construction of physical literacy. Yet despite the emphasis on philosophy, Whitehead has never successfully included an acknowledgment of philosophy within the definitions she has developed or helped to stimulate. This may be a potential reason for the confusion and misinterpretations surrounding the concept.

### *3.6.4 Defining the core elements*

While making the concept culturally relevant, some organizations may have deviated from the original Whitehead (2001) definition, which included the four elements of confidence, physical competence, motivation, and knowledge and understanding. For example, CS4L (2015) and PHE Canada (2017) expressed the physical literacy elements as "fundamental movement and sport skills" (CS4L, 2015, p. 1) and "competence and confidence" (PHE Canada, 2017, p. 1). In each case, some of the physical literacy core elements described in Whitehead's definition are omitted; therefore, is the term physical literacy appropriate? Whitehead's definition has taken different forms over the 10 years preceding this analysis; however, it remained consistent in the sense that all four elements (motivation, confidence, physical competence, and knowledge and understanding) were included. Sport Wales (2017) replaced the element "physical competence" from the Whitehead definition with

"physical skill." This was seemingly an attempt to translate the core elements into language that can be easily understood by the general population, thus making it possible to implement within local and education sectors.

Sport Wales (2017, p. 1) added an additional core element, "a range of opportunities," referring to facilities available and the environment facilitating physical activity. By adding this element into the definition, Sport Wales emphasized that physical literacy was not only the responsibility of the individual, but also of parents, teachers, council members, and the community as a whole. Similarly, CS4L (2015), PHE Canada (2017), and SHAPE America (2014) also added this element, referring to it as "multiple environments." This aspect was discussed extensively by Whitehead (2001), who sought to clarify what constituted a physically challenging environment and how a physically literate individual would read the environment. By contrast, however, interacting with the environment was not featured in Whitehead's subsequent definitions (2001, 2007, 2010, 2013a, 2013b; IPLA, 2017). Recent research by Dudley et al. (2017) identified movement contexts as a significant consideration for policy makers, so much so as to suggest the Whiteheadian definition could beneficially be adapted further to incorporate this crucial element. Interestingly, and in contrast to other groups, Australia's new approach does not mention the four elements of motivation, confidence, competence, and knowledge and understanding. Instead, it has included the components/constructs of physical, affective (subsequently psychological), cognitive, and social capacities (Australian Sports Commission, 2017). The research group reached a consensus that it would be more inclusive and engaging to specify the broader domains as there were concerns that concepts such as motivation and confidence held different meanings to different cultures, between researchers, and versus the wider stakeholder group. This presents

an alternative interpretation in approaching physical literacy which warrants consideration.

### *3.6.5 A lifelong journey*

Whitehead (2001, 2010) consistently argued that physical literacy represents a lifelong journey. A recent systematic review of the definitions of physical literacy conducted by Edwards et al. (2017) found "throughout the lifespan" as a core category in defining physical literacy. Within existing literature, they reported the existence of three categories: throughout the lifespan, unique journey, and the Long-Term Athlete Development model. Nonetheless, the systematic review also highlighted physical education as a core category, alluding to the focus that has been placed upon school-aged populations.

Despite most of the groups reviewed advocating Whitehead's definition (2001, 2007, 2010, 2013a, 2013b; IPLA, 2017) to some degree, many groups that have operationalized physical literacy in practice have predominantly focused on school-aged children and young people. This is not surprising, especially as PHE Canada and SHAPE America are organizations formed within the physical education sector. Many of these organizations have received funding from governments who wish to invest in children's health. Particularly within policy, where cost versus benefit must be evidenced, the lack of research to support physical literacy across the lifecourse presents a major barrier. At the time of writing, much of the published literature relating to physical literacy concerned school-aged populations. Within the 2013 special issue on physical literacy published in the Journal of Sport Science and Physical Education, authors admitted many of the articles were school focused (Weinburg, 2013). Likewise, within the current special issue, articles also focus on

physical education, as is the mission of the Journal of Teaching in Physical Education. Therefore, to generate evidence throughout the lifecourse, relevant and appropriate research from the established contexts of physical education and physical activity should be considered. Nevertheless, physical literacy has only been adopted by policymakers in recent years, and the youth population has evidently been the easiest to access and impact. Perhaps it is too early to comment on the focus of applied practice. We would suggest that a more holistic approach needs to be taken to consider physical literacy across the lifecourse.

#### *3.6.6 Process versus product*

An apparent difference when comparing global organizations became the choice of some groups to define a physically literate person as opposed to defining physical literacy. For example, achieving physical literacy in children is a key performance indicator in Sport England's (2016) strategy for physical activity in the United Kingdom. Similarly, PHE Canada (2017) described a person who is physically literate in their definition, whereas SHAPE America identified that physical education is the means "to create the conditions for all youth in the United States to be physically literate by the middle school years" (The Aspen Institute, 2015, p. 11). This process (journey) versus product (outcome/goal) debate became apparent in the work of Keegan et al. (in review), and has led to a core point of difference in the work produced from Australia. The Australian Sports Commission's (2017) defining statements differentiate between physical literacy as a process (Statement 1—core/process) versus physical literacy as the product/outcome (Statement 4—aspiration/product). Different approaches to physical literacy have emphasized an inherent, ongoing potential to learn and develop through movement (process), which has been contrasted against some kind of current physical literacy status (product),

which is presented as a desirable level of being physically literate. Concerns remain, however, that discussing physical literacy as an end state also implies that someone may be physically illiterate, which has been a particular source of contention; Whitehead (2013b) argued that physical illiteracy cannot occur in a living being, as human movement potential is necessary for life. Nonetheless, in the book Physical Literacy: Throughout the Lifecourse, Whitehead refers openly to "physically illiterate individuals" (2010, p. 7). In a recent personal communication, Whitehead has expressed frustration at the process versus outcome (vs. both) debate. Whitehead has attempted to clarify her view that although a journey is a process in the interests of seeking a goal, progress on a physical literacy journey depends on the accumulated processes in which the individual is involved (Whitehead, personal communication, August 14, 2017). Separately, the ongoing process versus outcome (vs. both) debate is another core source of disagreement and inconsistencies in definitions, viewpoints, and approaches. Robust and contemporary research on this topic should be published in publicly accessible peer-reviewed journals to engage and render transparent the current debate, thus also stimulating the development of understanding of physical literacy.

### *3.6.7 Future implications*

This review of the current approaches to defining physical literacy, while not exhaustive, has identified several distinguishable approaches between and within different countries. For example, in conducting this review, we have been made aware of physical literacy programs being conducted in Singapore, Scotland, China, India, Taiwan and Ireland. At the time of writing, these programs were neither sufficiently developed nor distinguishable from other programs to warrant a separate analysis. Nonetheless, a common issue experienced by both established and emerging

groups working on physical literacy is a lack of empirical evidence (Giblin, Collins, & Button, 2014; Jurbala, 2015). This paucity of evidence was a limiting factor in this paper, as we were able to include only established organizations, all of which existed in English-speaking developed countries. Yet even in these groups, many had an online presence without a peer-reviewed, published evidence base. Conducting peer-reviewed research and robustly evaluating programs throughout policy and practice should therefore be a key focus for organizations moving forward.

Crucially, however, when presenting this empirical evidence, understandings of and assumptions regarding physical literacy should be clearly presented to provide a frame for interpretations of findings. While the concept and topic of physical literacy appears to hold strong potential—particularly the notion of reemphasizing the holistic, integrated nature of personal development through movement experiences—researchers within the area have increasingly recommended that academics need to focus on clearly articulating aligned definitions, philosophical assumptions, and conceptual frameworks (Dudley et al., 2017; Edwards et al., 2017). Furthermore, with this research transparency, there is also a need for tolerance for differing approaches of physical literacy to permit collaborations, sharing, and critical discussions while operationalizing the concept (Edwards et al., 2017). This paper demonstrates that different approaches have been adopted toward physical literacy by different groups. Some advocates, often from a specific group promoting a specific approach, are troubled by this divergence in meanings, calling for alignment to agreed core elements of definitions. While this paper recognizes that there will be different interpretations of physical literacy, it also urges all authors and researchers to clearly articulate their definition, assumptions, and core values when they deliver and report their findings in relation to physical activity and physical literacy.

### *3.7 Conclusion*

A number of international groups, and numerous papers, chapters, and books, have focussed on physical literacy in the recent years. Such is the perceived benefit of physical literacy that within the UK, Canada, USA, New Zealand, and Australia, the term physical literacy has been recently cited within recent national policies. Nonetheless, in order for physical literacy to develop, robust evidence-based research is needed. Within such research, a level of clarity, transparency is needed; and through such clarity and clear evidence, consensus may be pursued regarding the "what and for what" questions (Edwards et al., 2017). To be clear, we do not advocate that each group adopts the same definition *a priori*, but it must be possible to compare different interpretations and evaluate the effectiveness of measurement/assessment attempts, intervention programmes, and policies internationally. Opportunities for cooperation in promoting physical literacy should continue to be developed, as open discussions could help determine the importance of physical literacy in research and practice (Corbin, 2016). As such, all stakeholders, throughout both academia and applied practices, should seek to clearly and coherently articulate their approach to physical literacy in order to make meaningful differences that stand a chance of significantly advancing the field.

# Chapter Four

# Study Two (Chapter Four):

# Systematic Review of Assessments Related to Physical Literacy in Young Children

*4.1 Thesis study map*

| | |
|---|---|
| Study One (Chapter Three): Global interpretations of physical literacy | Objectives:<br>• To collate, compare, and critically review existing international definitions of physical literacy<br>Key Findings:<br>• Seven prominent international groups were identified as currently working within the field of physical literacy<br>• Definitions, approaches, understandings, and philosophies differ between these groups<br>• Margaret Whitehead's definition of physical literacy is consistently referred to as the basis for international definitions |
| Study Two (Chapter Four): A systematic review of assessments related to physical literacy among young children | Objectives:<br>• To systematically review the academic literature for tools to assess the domains of physical literacy within children aged 3-7.9 years |
| Study Three (Chapter Five): Stakeholder perceptions of a physical literacy assessment for young children | Objectives:<br>• To explore key stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups |
| Recommendations for a physical literacy assessment tool for young children | Objectives:<br>• To draw on research findings from within this thesis and externally, to identify common themes and provide evidence-based recommendations for a physical literacy assessment tool, suitable for use in young children |

Within Study Two (Chapter Four), I conceived and designed the methodology and analysis in agreement with the supervisory team. Data collection was conducted evenly with Cara Shearer who was completing the corresponding PhD with participants aged 7-11 years old. I performed analysis, leading on affective and cognitive domains, and was second reviewer on data relating to the physical domain. Cara Shearer mirrored this, leading in the physical domain and acting as second reviewer for data relating to the affective and cognitive domain. For the purpose of this thesis, data is presented in relation to children aged 3-7 years old. Writing and preparation of the tables and figures in this chapter was completed independently.

### *4.2 Introduction*

As shown in Study One (Chapter Three), there are many interpretations of physical literacy that have sparked differing approaches embraced internationally. However, what remains consistent is that Whitehead's definition (2001) has been utilised or expanded upon within these approaches. This presents the rationale for anchoring the work included within this thesis to Whitehead's conceptualisation of physical literacy. Throughout international definitions, physical literacy encompasses the interrelated affective, physical and cognitive domains that enable an individual to be physically active for life (Whitehead, 2019).

Using Whitehead's (2019) defining elements, the affective domain is deemed to include confidence and motivation in reference to physical activity. The physical domain includes physical competence and associated areas such as movement capacities, motor skill competence and purposeful physical pursuits (Edwards et al., 2017). The cognitive domain refers to the knowledge and understanding of factors necessary to enable an individual to be active for life (Longmuir et al., 2015;

Whitehead, 2019). As identified in Study One (Chapter Three), research and practice have related the concept of physical literacy to other sub-elements not included within Whitehead's definition (2019). For example, work in Australia has expanded the cognitive domain to include specific aspects such as purpose and reasoning, content knowledge, rules and tactics (Keegan et al., 2019). Each of these sub-elements, when nurtured in young children, has the potential to provide a foundation for the development of physical literacy throughout life (Maude, 2010). This places a substantial importance on assessing these sub-elements within childhood, as it is crucial to allow researchers and educational practitioners to support, facilitate and gain a deeper understanding of children's engagement with physical activity.

Although advocated as a lifelong concept, Whitehead (2001), has acknowledged the critical role of PE on both current and lifelong physical activity. Indeed, PE was recognised as a higher order theme in a recent systematic review of the definitions of physical literacy, with many of the studies that have attempted to operationalise physical literacy in practice, predominantly focussing on children, outside of the home environment (Edwards et al., 2017). As highlighted in the opening chapters, key themes of physical literacy are already embedded in the current EYFS framework and National Curriculum in England (Department for Education, 2017; Department for Education, 2013; Cale & Harris, 2018), and internationally (Lounsberry & McKenzie, 2015). Yet there is little guidance on how to assess or chart an individual's physical literacy development in this and wider contexts.

This thesis, in line with Edwards et al. (2018), uses the term *assessment* as it is widely used and understood within these educational and physical activity contexts. The term assessment should be taken to include measurement, charting, monitoring,

tracking, evaluating, characterising, observing, or indicating physical literacy. Whilst there has been debate as to whether the concept of physical literacy can or should be assessed within PE and beyond (Whitehead, 2010, Robinson & Randall, 2017), it is acknowledged that assessment is a critical aspect of pedagogical practice and accountability systems (DinanThompson & Penney, 2015). For example, researchers exploring the fostering of knowledge and understanding emphasised the importance of monitoring the acquisition of knowledge to establish that progress is being made (Cale & Harris, 2018).

According to Longmuir and Tremblay (2016), an authentic physical literacy assessment should reflect the holistic, multi-dimensional and inclusive nature of the concept, providing results that should be meaningful at both an individual and population level. Whilst, commendably, there have been some attempts to assess physical literacy and its domains and elements (Edwards et al., 2018), little is known about whether existing assessment tools are aligned to the philosophical underpinnings of physical literacy and, importantly, whether these tools have robust measurement properties. Robinson and Randall (2017) presented a narrative review of physical literacy assessments solely developed within Canada, although they utilised a subjective rating system Moreover, the objectivity of this study has been further criticised as the authors did not disclose a potential conflict of interest (Tremblay & Longmuir, 2017). Within the first systematic review of physical literacy assessments, authors appraised philosophical alignment in binary terms of whether the tools made 'reference to holistic philosophy' or, as was more frequently the case, 'no philosophy' (Edwards et al., 2018). However, the precise methodological process of appraising the philosophy of each assessment was unclear. Thirty-two assessments were identified in this review; twenty-two assessed the physical domain, five

affective, one cognitive, and one represented all three domains, and these were described using thematic analysis in relation to age group, environment and philosophy (Edwards et al., 2018). Notably, 66% of assessments were used in children under 12, suggesting this age group as a key area in existing research. However, this systematic review did not examine the measurement properties of identified assessments despite validity and reliability of physical literacy assessments being criticised (Longmuir & Tremblay, 2016). The lack of information regarding these measurement properties limits the ability to make judgements regarding the quality, coherence and interpretation of the evidence collected by these assessments. In addition, it was outside the scope of this systematic review to examine the feasibility of assessments in practice. In this age group, physical literacy development is often associated with PE, however numerous barriers have been cited regarding PE effectiveness and feasibility such as teacher confidence, competence, and time (Edwards et al., 2018; Ní Chróinín & Cosgrave, 2013). As a result, a more in-depth focus on physical literacy related assessments in young children that considers both measurement properties and feasibility is warranted. In addition, Edwards and colleagues (2018) may have perhaps missed relevant assessments as their search terms were limited to 'physical literacy'. While previous tools may not have been developed based on the philosophical assumptions of physical literacy, exploring existing measures related to the physical, cognitive and affective domains, physical activity and health could facilitate the development and operationalisation of the assessment of physical literacy. As such, searching and identifying tools which relate to sub-elements of each domain (e.g. attitude, perceived competence, motor skills, etc.) could provide information to support the development of a broader assessment of cognition. Given these considerations and the building momentum of research

related to physical literacy, it may be timely to update this area, by completing a more recent and in-depth systematic review.

### 4.3 Aims and research questions

The aim of this systematic review was to present a comprehensive summary of existing tools used to assess elements related to physical literacy within children aged 3-7.9 years old. The review will explore and critically discuss each assessment tool in relation to its:- (a) measurement properties; (b) feasibility for use within a primary school setting; and (c) alignment to the physical literacy concept. As the search strategy used was part of the wider physical literacy assessment project, the inclusion criteria relate to children aged 3-11.9 years old. For the purpose of this thesis, this chapter will focus on assessments of physical literacy used in children between 3-7.9 years old, and these specific assessments will be separated and identified within the results section.

#### 4.4.1 Methods

This study was registered with PROSPERO: the international prospective register of systematic reviews (REF: CRD42017061010) and adhered to the reporting guidelines of the preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) (Moher et al., 2015).

#### 4.4.2 Inclusion criteria

Studies identified through the literature search were included if they:

1. Included typically developing children (including overweight and obese children and children from deprived areas), with a mean age between 3 and 11.9 years old

2. Reported the use or development of a field-based assessment (qualitative or quantitative), used in the context of physical activity, sport, physical education, active play, exercise or recreation; with an outcome relating to physical literacy
3. Were cross-sectional, longitudinal or experimental study design
4. Reported a measurement method relevant to an element of physical literacy
5. Reported an aspect of measurement testing or theoretical development
6. Published in English and in a peer-reviewed journal

*4.4.3 Exclusion criteria*

Studies identified in the literature search were excluded if:

1. Assessment tool is not use in the 3-11.9-year child population
2. Included special populations (i.e. children with DCD, diagnosed with learning difficulty)
3. Lab-based assessment
4. Book chapters, case studies, student dissertations, conference abstracts, review articles, meta-analyses, editorials , protocol papers and systematic reviews
5. Not published in English and not in a peer reviewed journal
6. Aspect of measurement testing or theoretical development not reported
7. Full text articles were not available

*4.4.4 Information sources, search strategy and study selection*

Six electronic databases were searched: MEDLINE (via PubMed), ScienceDirect, SPORTDiscus, Scopus, PsycINFO, and Education Research Complete, to identify relevant evidence. 'English' and 'peer reviewed' filters were marked on all searches.

The search strategy was informed by literature regarding physical literacy (Whitehead, 2010; Whitehead, 2007; Edwards et al., 2017; Corbin, 2016; Tremblay & Lloyd, 2010; Whitehead, 2013; Dudley et al., 2017; Keegan et al., 2017), and through four themed workshops conducted with the research project team (HG, CS, LF, EDM, ZK and LB), relating to each element of physical literacy (motivation, confidence, physical competence, and knowledge and understanding). A Boolean logic combinations search strategy was then developed, incorporating the relevant terms (see appendix). The first search was conducted on 12th May 2017, with a final search conducted on 10th January 2019. All records were exported to Covidence for screening (Covidence systematic review software, Veritas Health Innovation).

A fellow PhD student and I (CS) independently assessed the eligibility of studies. Following title and abstract screening, full-text copies of potentially relevant studies were obtained and screened for full inclusion. Where necessary, authors were contacted for full text articles. This was again conducted independently by two reviewers (HG and CS) and verified by a third (LF). The reference list of all articles included for data extraction were manually searched and the authors were consulted to ensure that no relevant articles were overlooked. Title and abstract screening were performed independently by HG and CS. In the case of disagreement, LF was contacted for discussion until consensus was reached. This method is in keeping with evidence supporting the reproducibility and reliability of decision-making by more than one reviewer (Beattie, Murphy, Atherton & Lauder, 2015).

### *4.4.5 Data collection*

A data extraction form was developed in line with the aims of the study and previous systematic reviews (Edwards et al., 2017; Edwards et al., 2018; Keegan et al., 2017;

Klingberg et al., 2018) of a similar nature, and piloted using a subset of the included studies. Two authors (CS and HG) extracted study data relating to: study information (authors, publication date, country and study design), sample description, purpose of study, physical literacy element being assessed (motivation, confidence, physical competence, knowledge and understanding), measurement technique (i.e. interviews, questionnaires, practical trial), outcome variables, quantitative measurement testing results (COSMIN risk of bias checklist and utility information (Mokkink et al., 2018; Prinsen et al., 2018). Study authors were contacted, where possible, for missing or incomplete data. Both reviewers (HG and CS) performed the data extraction process independently with any discrepancies were resolved through discussion with a third reviewer (LF).

### *4.4.6 Quality appraisal*

HG and CS independently scored all assessments throughout this quality critique process and resolved disagreements through consensus. The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklist was used to evaluate the methodological rigour of assessments (Prinsen et al., 2018). The checklist was designed and validated for use in evaluating the rigour of measurement studies of healthcare instrument (Terwee et al., 2018) is of a modular design, and enables flexibility to suit the needs to the current systematic review. The COSMIN guidelines were recently updated and according to the updated guidelines if the original study, associated paper or tool manual does not adequately describe the PROM (Patient Reported Outcome Measure) development process and or aspects of content validity then the tool should not be appraised further (Prinsen et al., 2018). However, to utilise the research already conducted within this review process, this review reports on all 10 measurement properties included within the original

guidelines (PROM development, content validity, internal consistency, reliability, measurement error, structural validity, hypothesis testing, cross-cultural validity, criterion validity and responsiveness). In line with the updates to COSMIN, assessments were scored as 'not reported' as opposed to 'inadequate' if the included papers did not directly report specific measurement properties (Prinsen et al., 2018). The COSMIN process includes three main steps, firstly, a risk of bias check. If a paper reporting an assessment reports an adequate or excellent score for risk of bias, it is then appraised against a quality criteria judgement (see table 4.1 for specific criteria). Finally, if information is presented from multiple papers, results can be summarised and judged as high, moderate, low or very low using GRADE (Grading of Recommendations Assessment, Development, and Evaluation).

The measurement properties reviewed through COSMIN correlate with recent a Delphi poll, highlighting content and discriminant validity, and inter, intra and test re-test reliability as some of the most important factors to consider when evaluating in assessments used in exercise and sport (Robertson et al., 2017). Detailed description of the measurement properties, definitions and thresholds in relation to COSMIN are detailed in Table 4.1.

*Table 4.1* Detailed description of rating of measurement properties, adapted from Mokkink et al. (2018); Prinsen et al., (2016); Terwee et al., (2007)

| **Psychometric properties** | **Definition** | **Rating** | **Quality criteria** |
|---|---|---|---|
| **Content validity** | The extent to which the domain of interest is comprehensively sampled by the items in the measurement instrument | + | The target population considers all items in the measurement instrument to be relevant AND considers the questionnaire to be complete |
| | | - | The target population considers all items in the measurement instrument to be irrelevant OR considers the questionnaire to be incomplete |
| | | ? | No target population involvement |
| **Structural validity** | The degree to which the scores of a measurement instrument are an adequate reflection of the dimensionality of the construct to be measured | + | Factors should explain at least 50% of the variance |
| | | - | Factors explain <50% of the variance |
| | | ? | Explained variance not mentioned |
| **Internal consistency** | The degree of the interrelatedness among the items | + | (Sub)scale unidimensional AND Cronbach alpha >0.70 |
| | | - | (Sub)scale not unidimensional OR |
| | | ? | Cronbach alpha <0.70 |

| | | | |
|---|---|---|---|
| | | | Dimensionality not known OR Cronbach alpha not determined |
| **Cross-cultural validity/ measurement invariance** | The degree to which the performance of the items on a translated or culturally adapted measurement instrument is an adequate reflection of the performance of the items of the original version of the measurement instrument | +<br><br><br><br><br><br><br>-<br><br><br><br>? | No important differences found between group factors ( such as age, gender, language) in multiple group factor analysis OR no important DIF for group factors (McFadden's $R^2$ <0.02)<br>Important differences between group factors OR DIF was found<br>No multiple group factor analysis OR DIF analysis performed |
| **Reliability** | The proportion of the total variance in the measurements which is due to 'true' differences between participants | +<br><br>-<br><br>? | ICC OR weighted Kappa *r* >0.70<br>ICC OR weighted Kappa *r* <0.70<br>ICC OR weighted kappa not reported |
| **Measurement error** | The systematic and random error of a participants score that is not attributed to true changes in the construct to be measured | +<br><br>-<br><br>? | Area under ROC curve is >0.5<br>Area under ROC curve is <0.5<br>Area under ROC curve not determined |

| | | | |
|---|---|---|---|
| **Criterion validity** | The degree to which the scores of an assessment is an adequate reflection of a 'gold standard' | +<br><br><br><br><br><br><br>-<br><br><br><br><br>?<br><br><br><br> | Convincing arguments that gold standard is ''gold'' OR alternative measure has been previously validated AND correlation with gold standard OR alternative measure >0.70<br>Correlation with gold standard OR alternative measure <0.70 despite adequate design and method<br>No convincing arguments that gold standard is ''gold'' OR alternative measure has been validated OR doubtful design or method |
| **Hypothesis testing for construct validity** | The extent to which scores on a particular measurement instrument relate to other measures in a manner that is consistent with theoretically derived hypotheses concerning the concepts that are being measured | +<br><br><br><br>-<br><br><br><br>?<br><br> | At least 75% of the result is in accordance with the hypothesis<br><75% of the result is not in accordance with the hypothesis<br>No hypothesis defined (by the review team) |

| | | | |
|---|---|---|---|
| **Responsiveness** | The ability of a measurement instrument to detect important changes over time | +<br><br><br><br><br>-<br><br><br><br><br>?<br> | SDC OR SDC < MIC OR MIC outside the LOA OR RR > 1.96 OR AUC> 0.70<br>SDC OR SDC> MIC OR MIC equals or inside LOA OR RR <1.96 OR AUC <0.70, despite adequate design and methods<br>Doubtful design or method |

***(+ = positive rating; - = negative rating; ? = indeterminate rating)*** *Intraclass correlation (ICC) ; Receiver Operating Characteristic (ROC); Differential Item Functioning (DIF); Smallest Detectable Change (SDC); Minimum Important Change (MIC); Limits of Agreement (LOA); Relative Risk (RR); Area Under the Curve (AUC).*

In addition, based upon the challenges of implementing assessments in a school context (Edwards et al., 2018; Ní Chróinín & Cosgrave, 2013), utility was identified as a vital aspect of a successful field-based assessment. Booth et al. (2019) recently criticised established reporting guidelines for systematic reviews (i.e. PRISMA-P and PROSPERO) for neglecting context. Therefore, a utility matrix based upon previous systematic review methodologies was developed to appraise the feasibility of each assessment (Klingberg et al., 2018; Beattie et al., 2015). Within Beattie et al. (2015) cost efficiency acceptability and educational impact was rated on a four-point rating scale of 'excellent', 'fair', 'good', 'poor' or 'NR'. Within Klinberg et al. (2018), items relating to the feasibility of a fundamental movement skill assessment, such as time, equipment, space, and training, were scored on a three-point scale, with parameters set against previous literature, and in comparison with papers included in their results. Combining these approaches, the authors developed a matrix that considered key items and scoring criteria deemed to be relevant to the assessment of physical literacy in a primary school. Detailed description of this matrix is included in Table 4.2 (p.104).

Table 4.2 *Detailed description of the rating of criteria for the feasibility matrix.*

| | **** | *** | ** | * |
|---|---|---|---|---|
| How long does an assessment take to complete? | <15 min | <30 min | 30-60 min | >60 min |
| How much space is needed to administer an assessment? | Less than 6 metres, a corner of a room | 6-10 metres a standard room | 10-20m (primary school sports hall) | 20m+ (Secondary school sports hall requirement) |
| What equipment is required to administer an assessment? | Equipment likely to be present in a typical school | Some extra equipment or resource required would be additional to what is typically present (primary school) | Most of the equipment required would be additional to what is typically present (primary school) | All equipment required to would be additional to what is typically present (primary school) |
| What qualification is required to administer an assessment? | Able to be administered by any school staff | Able to be administered by qualified teacher | Able to be administered by PE/Sport specialist | Requires researcher with specific higher qualifications |
| What training is required to administer an assessment? | Little or no additional training required | Some additional training required (less than half a day) | Further additional training required (half a day to one and a half days) | Significant training required (more than one and a half days) |
| Is there evidence of participant understanding? | Investigation of participant understanding (evidence from participants) | Estimated evidence of participant understanding (evidence from source other than participant) | Participant understanding not explicitly stated but can be assumed | No evidence of subject understanding |
| How many assessments are not completed? | Low number of missing items (<10%) and adequate response rate (>40%) | High number of missing items (>10%) and an adequate response rate (>40%) | Low number of missing items or poor (<10%) and an adequate response rate (<40%) | High number of missing items (>10%) and poor response rate (<40%) |

Table 4.3 *Physical literacy 'sub-elements' identified from literature collated in Study One (Chapter Three)*

| Affective domain | Physical domain | Cognitive domain |
|---|---|---|
| Confidence | Object control | Benefits of physical activity |
| Motivation | Balance | Importance of physical activity |
| Emotional regulation | Locomotor skills | Effects of physical activity on body |
| Enjoyment/happiness | Movement skills- land | Opportunities to be active |
| Empathy | Movement skills-water | Sedentary behaviour |
| Persistence/resilience/ commitment | Moving using equipment | Ability to identify and describe and movement |
| Adaptability | Cardiovascular endurance | Creativity and imagination in application of movement |
| Willingness to try new activities | Muscular endurance | Decision-making (ability to think, understand and make decisions, knowing how and when to perform) |
| Autonomy | Coordination | Appropriate movement strategies that a situation or environment requires |
| Comfortable and connected with the world | Flexibility | Ability to reflect and improve own performance, including setting optimal challenges |
| Self-perception// self-esteem | Agility | Tactics, rules and strategy |
| Perceived physical competence | Strength | Action planning and outcome expectations |
| | Reaction Time | Safety considerations and risk |
| | Speed | |
| | Power | |
| | Rhythmic ability | |
| | Aesthetic/ expressive ability | |
| | Sequencing | |
| | Specific to an environment | |
| | Progression | |

*Adapted from Whitehead, 2010; Whitehead, 2013; Dudley, 2015; Longmuir et al., 2015; Longmuir & Tremblay, 2016; Edwards et al., 2017; Keegan et al., 2019)*

Finally, a novel physical literacy checklist was developed to highlight which areas of physical literacy each assessment appraised (see Table 4.3). The checklist was developed based on a review of the international physical literacy literature, as detailed in Study One (Chapter Three). The definitions adopted internationally were collated and cross-referenced, identifying distinct characteristics of physical literacy referred to across published research. These included elements referred to within Whitehead's definition of physical literacy (2019), and characteristics referred to in

wider research, termed sub-elements. This process ultimately included 12 affective, 20 physical and 13 cognitive sub-elements.

Each of the included studies were independently scored by two reviewers (HG and CS) using a standardised process to obtain consistent data across all studies. Conflicts (n=14) were resolved through discussion with the review team (HG, CS and LF) until consensus was reached.

*4.5.1 Results*

The PRISMA-P flow diagram for the process of searching and screening is represented in Figure 4.1. An overview of included studies is presented in Table 4.4. Table 4.5 provides an overview of the COSMIN appraisal scores for risk of bias of all included assessments. Based on scores across the domains, very few assessments reached the threshold level to be considered in subsequent COSMIN appraisal (quality criteria or GRADE). Judgements of quality criteria for assessment properties which did reach an adequate level of risk of bias are presented within the narrative based on the thresholds detailed in table 4.1. Table 4.6 details the feasibility scores for all included assessments. Tables 4.7, 4.8 and 4.9 provide an overview of the alignment of each assessment to the affective, physical and cognitive domain respectively. The following sections will discuss these findings in accordance with each domain.

Of the 7553 articles identified from six databases, 381 were eligible for full test screening. Of these, 124 were eligible for inclusion, and 27 of these assessment tools were used in children aged 3-7.9 years old: affective (n=7), physical (n=15), cognitive (n=6). One assessment was included in both the affective and cognitive domain (Lakes, 2013). The studies were conducted within the USA (n=9), Australia (n=7), Greece (n=2), UK (n=1), Canada (n=1), Spain (n=1) and Germany (n=1), Sweden

(n=1), Belgium (n=1), Netherlands (n=1), Finland (n=1), Norway (n=1). The Physical Literacy Assessment in Youth (PLAYfun) is marketed as physical literacy assessment but is only considered in relation to the physical domain as the available literature only presents information related to movement skills (Cairney et al., 2018).

*Figure 4.1* PRISMA-P Flow diagram

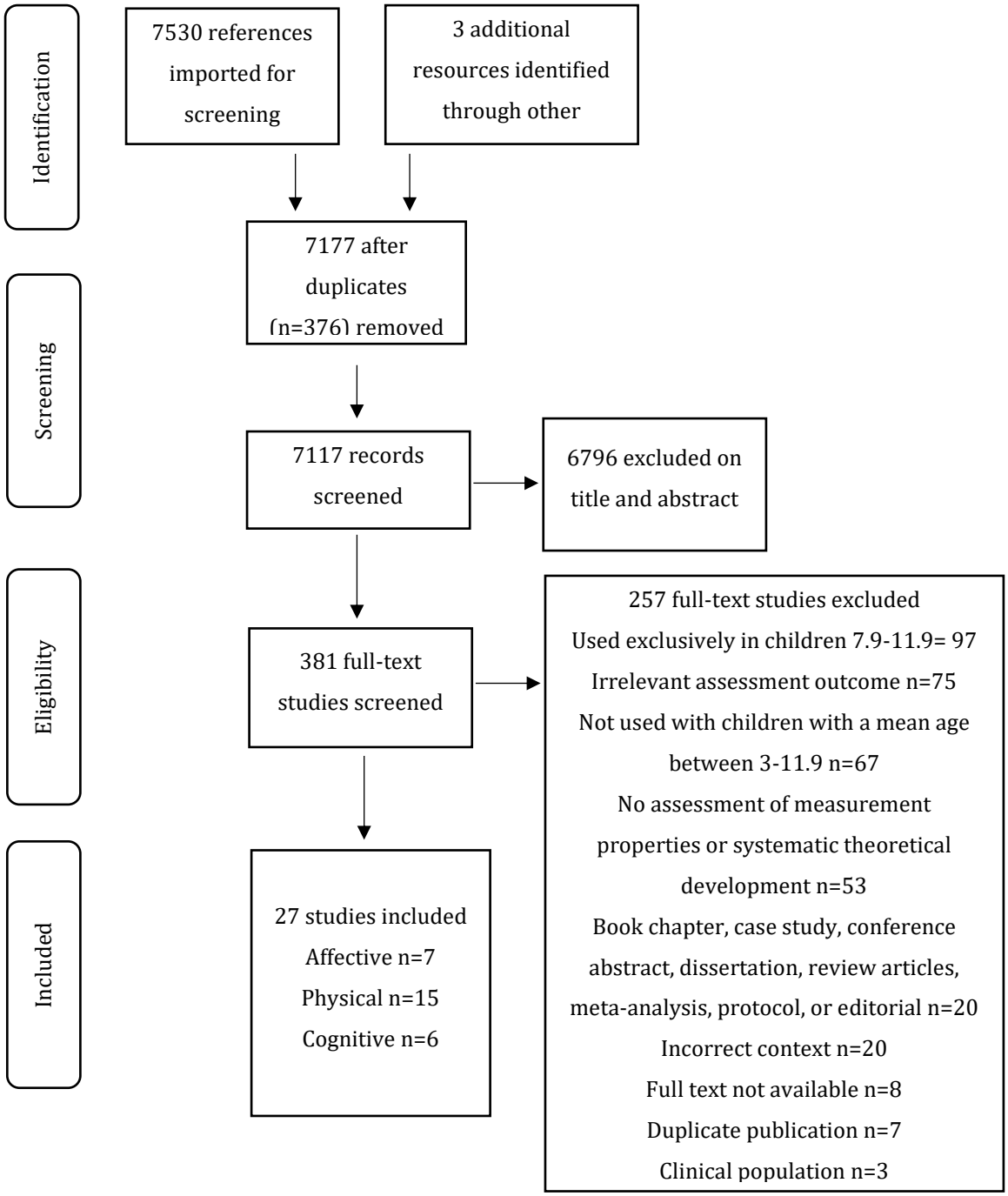

Table 4.4 *Overview of the study characteristic information for each included assessment .*

| **Assessment and country of origin** | **Participant n, gender (%) (age range; mean age)** | **Related domain and purpose of assessment** | **Mode of Assessment** | **Scale Design** | **Scale Scoring** |
|---|---|---|---|---|---|
| Social Cognitions (Araújo-Soares, Sniehotta, Laing, Gellert, Jackson, & Speakman, 2015) *UK* | N=147, 48.6% female, (4-6, 5.98±5.1) | Affective Assess reasoned action approach as a predictor of PA | Photo sorting activity | 8 photographic cards, displaying 4 physically active and 4 sedentary scenes. Cards sorted in accordance with a) attitude b) subjective norm c) perceived behavioural control d) intention | Measures of reasoned action approach were computed as a mean rank of four sedentary options |
| PMSC (Barnett, Vazou, Abbott, Bowe, Robinson, | N=303, 47% female (4-5, 4.7±.46) | Affective Assess perceived motor competence | One on one interview with pictorial structured alternate | 12 pictures of skills, 6 locomotor, 6 object control. Children given dichotomous | If children select the competent picture, asked 'Are you really good' (score 4) or |

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| Ridgers, & Salmon, 2016)<br>*Australia* | | | | choice between a picture of a competent child and a picture if a not so competent child, then asked to pick again between 2 choices 'Which child are you like?' | 'good' (3). If the child picks the not so competent picture they are asked 'Are you sort of good (2)' not that good' (1). Overall scores 12-48 higher score reflecting higher perceived comp |
| ASK-KIDS Inventory (Bornholt & Piccolo, 2005)<br>*Australia* | N=76, 43% female (4-13.5, 8.1±2.3) | Affective<br>Assess self-concept in relation to physical movement, natural talent, effort, difficulty, personal identity and social identity. | Self-report inventory | Dot-point rating scores 1 (low) to 5 (high) | Scores averaged from (1) low to (5) high |

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| Feelings about physical movement (Bornholt & Piccolo, 2005) *Australia* | N=56 , 43% female (4-11, 8.0±2.1) | Affective Assess feelings about physical movements | One to one interview | Diagram (stick figures running and catching) researcher reads accompanying paragraph and the child ticks as many words as needed in relation to five general feelings | Responses scaled from 1 (low) to 7 (high) |
| RCS (Lakes, 2013) *USA* | N=112, 51% female (NR, 4-11) | Affective Assess children's self-regulatory abilities in physically active context | Observation of physical activity challenge course | 16 items and three subscales: Cognitive Self-Regulation (6 items, including "control over emotions-uncontrolled emotions") | Bipolar adjectives (e.g., "attentive – inattentive") are used for each item, and raters were asked to rate the child using a 7-point scale. |

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| CMPI (Pérez & Sanz, 2005) *Spain* | N=495 50% female (4-6; NR) | Affective Assess young children's perceptions of gross and fine motor competence in PE | Picture choice activity | Picture booklet showed children performing or not performing diverse basic perceptual-motor tasks in a bipolar fashion. Three subscales: general, gross and fine motor competence. | Children shown 22 scenes and asked which child they identified with most |
| Playform (Sturgess & Ziviani, 1996) *Australia* | N=72 61% female (4-7; NR) | Affective Assess perception of play skills | Questionnaire | 20 questions about a range of skills. 1 question related to having a sibling so was removed for a lot of analysis as | Children indicated what they felt they could do well, quite well, or not very well by posting a card into one of three posting boxes (of |

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| | | | | many children did not report a sibling | descending size). A score out of 60 was calculated by summing the score out of 3 for each question |
| ALPHA (España-Romero et al., 2010) *Spain* | N=58, NR (6-11; NR) | Physical Fitness assessment | Physical test battery | Pubertal status<br>Weight and Height<br>Waist circumference<br>Skinfold thickness (triceps and subscapular)<br>Hand grip strength<br>Standing long jump<br>4x10m shuttle run test<br>20m shuttle run test | Individual scores for each test: if the student would not perform the task by selecting a reason: 1=shyness, 2=lack of motivation |

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| APM<br>(Livonen, Sääkslahti, Mehtälä, Villberg, Soini, & Poskiparta, 2016)<br>*Finland* | N=53, 54.7% girls<br>(NR; 4.07±0.32) | Physical<br>FMS | Physical test battery | Stability<br>Dynamic balance<br>Locomotor skill<br>Throwing and catching<br>Throwing at a target | Mean total skill score (0–6 points), calculated based on the cut-point scores of the six |
| AST<br>(Hoeboer, De Vries, Krijger-Hombergen, Wormhoudt, Drent, Krabben & Savelsbergh, 2016)<br>*Netherlands* | N=463, NR<br>(6-12; NR) | Physical<br>FMS | Physical test battery | The tracks consisted of a series of fundamental motor tasks (n = 10) | Time taken to complete each track |
| EUROFIT<br>(Fjørtoft, 2000)<br>*Norway* | N=75, 49.3% girls<br>(5-7; 6.1± NR) | Physical<br>Fitness assessment | Physical test battery | 6 minute run test<br>Arm pull(or hand grip)<br>Standing broad jump (or vertical jump) | Highest score for each assessment recorded |

| | | | | | |
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| | | | | Bent arm hang<br>Sit-ups<br>Sit and reach<br>Plate tapping<br>Shuttle run (10x5 meters) (or 50m sprint)<br>Flamingo balance | |
| FG-COMPASS<br>(Furtado & Gallagher, 2012; Calatayud, Martín, Colado, Benavent, Martínez, & Flández, 2017)<br>*USA* | N=133, NR<br>(6-11; NR) | Physical<br>FMS | Physical test battery | Hop, Horizontal jump, Leap, Skip, Side slide, Batting, Catch, Kick, Side arm strike, Stationary dribble, Overhand throw | Composite decision trees used for each skill resulting in classification of (1) Mature (2) Elementary (3) Initial |
| GSPA<br>(Barnett, Hardy, Brian & Robertson, 2015) | N=43, NR<br>(6-10; 7.8) | Physical<br>FMS | Physical test battery | Skill<br>Materials<br>Directions | Scores for both skills were summed for each child resulting |

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| *Australia* | | | | Golf Swing Performance Criteria | in a potential score range of 0-24 |
| HS Test (Derri, Tsapakidou, Zachopoulou & Kioumourtzoglou, 2001; Weikart, Schweinhart, & Larner, 1987) *Greece* | N=77, 47% girls (5-7; 6.1) | Physical Rhythm | Physical test battery | Four test items: 1) patting knees with both hands at the same time in seated position 2) patting knees with alternating hands in seated position 3) walking in place from standing position 4) toe-tapping pad with alternating feet. The students are required to | A three-point scale (0-2) is applied for the evaluation |

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| | | | | synchronize the a aforementioned task to the steady beat of two musical selections that are comprised of different tempos: (a) 132 beats/minute and (b) 120 beats/minute. | |
| KTK (Vandorpe et al., 2011) *Belgium* | N=2470, 47% girls, (6-12; NR) | Physical Motor skills | Physical test battery | Body control Walking backwards Hopping for height Jumping sideways Moving sideways | The raw test scores from each of the four tests can be transformed into motor quotients |

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| MOBAK-3<br>(Hermann, Gerlach & Seelig, 2015; Hermann & Seelig, 2017)<br>*Germany* | N=317, 55% girls<br>(NR; 7.04) | Physical<br>Motor skills | Physical test battery | 10 test items:<br>Throwing/ throwing and catching,<br>Bouncing, dribbling, balancing, rolling, rope skipping and moving variably | Test items are dichotomously scaled (0 =failed, 1 = passed, both attempts passed = 2 points) |
| MUGI<br>(Ericsson, 2007; 2008)<br>*Sweden* | N=25, NR<br>(6-7; NR) | Physical<br>Motor skills | Physical test battery | 9 gross motor tasks measuring two components of motor skills;<br>Balance/bilateral coordination<br>Hand eye coordination | Three levels are used for evaluation of motor skills 0, 1 and 2 |
| PARAGON<br>(Myers & Well, 2015)<br>*USA* | N=65, 59% girls<br>(5-9; NR) | Physical<br>Gardening movements | Observed gardening movements | Gardening motions (bending, carrying, | For each time interval the observer chooses 1 of the 7 PA |

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| | | | | lifting, stretching, watering) | codes and 1 of the 9 garden tasks |
| PLAYfun (Cairney, Veldhuizen, Graham, Rodriguez, Bedard, Bremer & Kriellaars, 2018) *Canada* | N=215, 48% girls (7-14; NR) | Physical Physical literacy | Physical test battery | 18 different movement tasks within five domains that assess different aspects of a child's movement skills. The five domains are as follows:<br>1)running<br>2)locomotor<br>3) object control—upper body<br>4) object control—lower body | Children are assessed using a visual analogue score that is 100 mm in length and divided into four categories |

| | | | | | |
|---|---|---|---|---|---|
| | | | | 5) balance, stability, and body control | |
| TGMD-3 (Ulrich, 2013) *USA* | N=1460, 50% girls (5-10; 8.4) | Physical FMS | Physical test battery | The TGMD-3 assesses 13 fundamental motor skills, subdivided into two subscales: Locomotor: run, gallop, hop, leap, horizontal jump, slide Ball Skills: two-handed strike, stationary dribble, catch, kick, overhand throw, underhand roll | Each skill is evaluated on three to five performance criteria, 2- trials summed per skill 0 = if a criterion was not performed 1 = if a criterion was performed |

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|---|---|---|---|---|---|
| OTAGM<br>(Rosa, Ridgers & Barnett, 2013)<br>*Australia* | N=18, 33.3% girls<br>(NR; 6.1) | Physical<br>FMS | Physical test battery | Skill component<br>Body movement<br>Task engagement | Momentary time sampling technique (10 second observation period followed by a 10 second recoding period) |
| YBT<br>(Faigenbaum, Bagley, Boise, Farrell, Bates & Myer, 2015)<br>*USA* | N=188, NR<br>(6.9-12.1; NR) | Physical<br>Balance | Observation of balancing | N/A | A total composite score was based on the sum of performance in three directions |
| Pre-FPQ<br>(Wiseman, Harris & Downes 2017)<br>*Australia* | N=86, 48% female,<br>(NR; 4,25±0.6 months) | Cognitive<br>Food and activity knowledge and preferences | Electronic questionnaire | Four subscales: food knowledge (Score out of 10), physical activity knowledge (8), food preference (10) and physical | Sum of healthy choices made (healthful choice= 1-point, unhealthful choice/ sedentary behaviour = 0) |

| | | | | | |
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| | | | | activity preference (8) | |
| BONES-PAS (Economos, Hennessey, Sacheck, Shea & Naumova, 2010) *USA* | N=41, 63% female, NR; 7.1±0.8) | Cognitive, Participation in and knowledge of weight-bearing PA | Picture sorting activity | Children given 10 different physical activity pictures, and 3 coloured placemats with "yes", "no", "I don't know"; "yesterday", "the day before yesterday"; "good for building bones", "not good for building bones", "don't know" | Each correct response scored as 1 and all incorrect scores including "don't know" responses were scored as 0 |
| RCS (Lakes, 2013) *USA* | N=207, 51% female (NR; 4-11) | Cognitive | Observation of physical activity challenge course | 16 items and three subscales: Cognitive Self-Regulation (7 | Bipolar adjectives (e.g., "attentive – inattentive") are |

| | | | | | |
|---|---|---|---|---|---|
| | | Self-regulatory abilities in physically active context | | items, including "attentive – inattentive") | used for each item, and raters were asked to rate the child using a 7-point scale. |
| PHK (Manios, Moschandreas, Hatzis, & Kafatos, 1999), *Greece* | N= 4171, NR (6-10; NR) | Cognitive, Knowledge of diet, food products, and physical activity before and after 3-year intervention | Questionnaire | Multiple choice questionnaire | NR |
| KPDPA Scales (Calfas , Sallis & Nader, 1991) *USA* | N=81 59% female (3-8; NR) | Cognitive, Knowledge and preference for diet and PA behaviour | Picture sorting activity | 15 photo pairs, including health and unhealthy food (8)/physical activity (7) (5 of each were retained in final scale) | Responses of 'healthful' or 'unhealthful', then asked to point to the activity they liked best, and rate from 1 (happy face-like a |

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|---|---|---|---|---|---|
| | | | | | lot) to 3 (sad face-don't like very much) |
| KAH (Santos-Beneit et al., 2015) *Spain* | N=348, (6-7; NR) | Cognitive, Evaluate a multi-level intervention targeting diet, physical activity, understanding the body and heart and management of emotions | Questionnaire | 4 items on each domain (Knowledge, Attitudes, Habits) and each component (diet, physical activity, human body, emotions). Total of 48 items, 12 per component | Multiple choice answers scoring 2,1,0 |

*Not Reported (NR); Physical Activity (PA); Physical Education (PE); United Kingdom (UK); United States of America (USA); Fundamental Movement Skills (FMS); Pictorial Scale for Perceived Movement Skill Competence for young children (PMSC); Response to Challenge Scale (RCS); Children's Perception of Motor Competence Scale (CMPI); Assessing the Levels of Physical Activity and Fitness (ALPHA); Alle kouluika¨isten lasten PsykoMotoriset taidot (AMP); Athletic Skills Track (AST); Furtado-Gallagher Computerized Observational Movement Pattern Assessment System (FGCOMP); Golf Swing and Putt skill Assessment (GSPA); High/Scope beat competence analysis test (HS Test); Körperkoordinationstest für Kinder (KTK); Motorische Basiskompetenzen in der 3 (MOBAK-3); Motorisk Utveckling som Grund för Inlärning (MUGI); Physical Activity Research and Assessment tool for Garden Observation (PARAGON); Test of Gross Motor Development-3 (TGMD-3); The Observation Tool of Active Gaming and Movement (OTAGM); Y Balance Test (YBT); Preschool Physical Activity and Food Questionnaire (Pre-FPQ); Beat Osteoporosis Now-Physical Activity Survey (BONES-PAS); Pupil Health Knowledge Assessment (PHKA); Scales to measure knowledge and preference for diet and PA (KPDPA Scales); Knowledge, Attitudes, Habits (KAH)*

Table 4.5 *An overview of the COSMIN risk of bias scores for each assessment with children aged 3-7.9 years old.*

| **Assessment Tool** | **PROM Development** | **Content Validity** | **Structural validity** | **Internal consistency** | **Cross cultural validity** | **Reliability** | **Measurement error** | **Criterion validity** | **Hypothesis testing** | **Responsiveness** |
|---|---|---|---|---|---|---|---|---|---|---|
| Social Cognitions | D | IN | NR | NR | NR | A | NR | NR | NR | NR |
| PMSC | A | D | VG | VG | VG | A | NR | NR | NR | NR |
| ASK-KIDS | IN | IN | D | IN | NR | NR | NR | NR | NR | NR |
| Inventory | | | | | | | | | | |
| Feelings About | IN | IN | NR | VG | NR | NR | NR | NR | NR | NR |
| Physical | | | | | | | | | | |
| Movement | | | | | | | | | | |
| RCS | D | D | NR | NR | NR | A | NR | NR | VG | NR |
| CMPI | IN | D | VG | VG | NR | NR | NR | NR | VG | NR |
| Playform | D | D | NR | VG | NR | IN | NR | NR | NR | NR |
| ALPHA | IN | NR | NR | NR | NR | IN | NR | NR | NR | NR |
| AMP | IN | IN | NR | NR | NR | A | NR | NR | NR | NR |
| AST | IN | NR | NR | NR | NR | A | NR | IN | NR | D |
| EUROFIT | D | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| FG-COMPASS | D | NR | NR | IN | NR | A | NR | NR | NR | NR |
| GSPA | A | NR | IN | NR | IN | A | NR | IN | IN | IN |
| HS Test | NR | NR | NR | VG | NR | A | NR | NR | IN | IN |
| KTK | NR | NR | VG | IN | NR | A | IN | IN | IN | NR |
| MOBAK-3 | A | A | A | NR | NR | A | NR | NR | NR | NR |
| MUGI | IN | NR | A | D | NR | IN | NR | NR | NR | NR |
| PARAGON | NR | NR | NR | NR | NR | A | NR | NR | NR | NR |
| PLAYfun | NR | NR | A | A | NR | A | NR | NR | NR | NR |
| TGMD-3 | A | NR | VG | VG | VG | A | NR | IN | NR | NR |
| OTGAM | D | D | NR | NR | NR | A | NR | IN | NR | NR |
| Y Balance Test | NR | NR | NR | NR | NR | A | IN | NR | NR | NR |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-FPQ | D | D | NR | VG | NR | A | NR | NR | NR | NR |
| BONES-PAS | IN | IN | NR | NR | NR | IN | NR | NR | NR | NR |
| RCS | D | IN | NR | NR | NR | A | NR | NR | VG | NR |
| PHKA | IN | IN | NR | NR | NR | IN | NR | NR | NR | NR |
| KPDPA Scales | D | IN | NR | D | NR | IN | NR | NR | NR | NR |
| KAH | VG | VG | NR | VG | NR | A | NR | NR | NR | NR |

**(NR= not reported, IN=inadequate, D= doubtful, A=adequate, VG= very good)**
*Physical Activity (PA); Physical Education (PE); United Kingdom (UK); United States of America (USA); Pictorial Scale for Perceived Movement Skill Competence for young children (PMSC); Response to Challenge Scale (RCS); Children's Perception of Motor Competence Scale (CMPI); Assessing the Levels of Physical Activity and Fitness (ALPHA); Alle kouluika¨isten lasten PsykoMotoriset taidot (AMP); Athletic Skills Track (AST); Furtado-Gallagher Computerized Observational Movement Pattern Assessment System (FGCOMP); Golf Swing and Putt Skill Assessment (GSPA); High/Scope beat competence analysis test (HS Test); Körperkoordinationstest für Kinder (KTK); Motorische Basiskompetenzen in der 3 (MOBAK-3); Motorisk Utveckling som Grund för Inlärning (MUGI); Physical Activity Research and Assessment tool for Garden Observation (PARAGON); Test of Gross Motor Development-3 (TGMD-3); The Observation Tool of Active Gaming and Movement (OTGAM); Y Balance Test (YBT); Preschool Physical Activity and Food Questionnaire (Pre-FPQ); Beat Osteoporosis Now-Physical Activity Survey (BONES-PAS); Pupil Health Knowledge Assessment (PHKA); Scales to Measure Knowledge and Preference for Diet and Physical Activity (KPDPA Scales); Knowledge, Attitudes, Habits (KAH)*

Table 4.6 *Feasibility scores for each included assessment.*

| **Assessment Tool** | **Time** | **Space** | **Equipment** | **Qualification** | **Training** | **Participant understanding** | **Incomplete assessments** |
|---|---|---|---|---|---|---|---|
| Social Cognitions | NR | *** | *** | * | * | ** | ** |
| PMSC | **** | **** | **** | * | NR | NR | NR |
| ASK-KIDS Inventory | **** | **** | **** | NR | NR | NR | NR |
| Feelings about Physical Movement | NR | *** | **** | NR | NR | NR | NR |
| RCS | NR | ** | ** | * | *** | NR | NR |
| CMPI | NR | *** | **** | NR | NR | NR | NR |
| Playform | *** | **** | **** | NR | NR | **** | NR |
| ALPHA | ** | * | ** | ** | *** | NR | NR |
| AMP | *** | *** | *** | *** | *** | NR | NR |
| AST | *** | ** | *** | ** | *** | NR | NR |
| EUROFIT | ** | * | *** | ** | *** | NR | *** |
| FGCOMP | *** | ** | *** | ** | *** | NR | NR |
| GSPA | **** | * | * | ** | * | NR | NR |
| HS Test | *** | **** | *** | **** | **** | NR | NR |
| KTK | *** | ** | ** | ** | ** | NR | NR |
| MOBAK-3 | *** | ** | *** | ** | *** | NR | NR |
| MUGI | ** | ** | *** | ** | ** | ** | NA |
| PARAGON | ** | ** | * | *** | ** | NR | NR |
| PLAYfun | *** | *** | *** | ** | *** | **** | NR |
| TGMD-3 | ** | *** | **** | ** | ** | NR | NR |
| OTAGM | ** | *** | * | **** | *** | NR | NR |
| YBT | **** | **** | **** | ** | *** | NR | NR |
| Pre-FPQ | **** | **** | *** | NR | NR | **** | NR |
| BONES-PAS | NR | **** | *** | NR | NR | **** | NR |
| RCS | NR | ** | ** | * | *** | NR | NR |
| PHKA | NR | **** | *** | **** | ** | NR | * |
| KPDPA Scale | **** | **** | *** | NR | NR | NR | NR |
| KAH | *** | **** | *** | * | NR | **** | NR |

******excellent, ***good, **fair, *poor**

*Physical Activity (PA); Physical Education (PE); United Kingdom (UK); United States of America (USA); Pictorial Scale for Perceived Movement Skill Competence for young children (PMSC); Response to*

*Challenge Scale (RCS); Children's Perception of Motor Competence Scale (CMPI); Assessing the Levels of Physical Activity and Fitness (ALPHA); Alle kouluika¨isten lasten PsykoMotoriset taidot (AMP); Athletic Skills Track (AST); Furtado-Gallagher Computerized Observational Movement Pattern Assessment System (FGCOMP); Golf Swing and Putt Skill Assessment (GSPA); High/Scope beat competence analysis test (HS Test); Körperkoordinationstest für Kinder (KTK); Motorische Basiskompetenzen in der 3 (MOBAK-3); Motorisk Utveckling som Grund för Inlärning (MUGI); Physical Activity Research and Assessment tool for Garden Observation (PARAGON); Test of Gross Motor Development-3 (TGMD-3); The Observation Tool of Active Gaming and Movement (OTGAM); Y Balance Test (YBT); Preschool Physical Activity and Food Questionnaire (Pre-FPQ); Beat Osteoporosis Now-Physical Activity Survey (BONES-PAS); Pupil Health Knowledge Assessment (PHKA); Scales to Measure Knowledge and Preference for Diet and Physical Activity (KPDPA Scales); Knowledge, Attitudes, Habits (KAH)*

#### *4.5.2.1 Affective results*

Seven assessments related to the affective domain were identified within the 3-7.9 year old age range (Araújo-Soares, et al., 2015; Barnett et al., 2016; Bornholt & Piccolo, 2005; Lakes, 2013; Pérez & Sanz, 2005; Sturgess & Ziviani, 1996). See Table 4.4 for all study characterises. It was found that the studies were conducted within Australia (n=4), UK (n=1), USA (n=1) and Spain (n=1). Assessments were typically administered via a pen and paper questionnaire, with picture/photo support. Assessments use Likert scale rating systems to score responses. One assessment, which is appraised in both the affective and cognitive domains, consisted of the observation of the completion of a physical activity obstacle course, where observers were asked to score the child using a 7-point bipolar adjective scale (Lakes, 2013). Typically, assessments were administered in a school setting, with Perceived Movement Skill Competence for young children (PMSC) also conducted in the home (Barnett et al., 2016). Notably, all tools included in this domain (n=7) were validated in children under the age of five years old, but no tools in the age group were validated with participants under four the age of four.

#### *4.5.2.2 Measurement properties; Affective*

Table 4.5 provides the COSMIN risk of bias ratings of each assessment. The Pictorial Sale of Perceived Motor Competence (PMSC) scored adequately for PROM

development (Barnett et al., 2016). All other studies were deemed to report PROM development and content validity to a doubtful or inadequate level. Six assessments reported internal consistency, with five achieving a very good rating on the COSMIN Risk of Bias checklist (Barnett et al., 2016; Bornholt & Piccolo, 2005; Pérez & Sanz, 2005; Sturgess & Ziviani, 1996). The ASK-KIDS Inventory received an inadequate score for internal consistency risk of bias, as it did not present data from all sub-scales (Bornholt & Piccolo, 2005). Four studies also reported structural validity, with three to a very good level (Barnett et al., 2016; Pérez & Sanz, 2005; Sturgess & Ziviani, 1996). The ASK-KIDS inventory scored doubtful, as the sample size were not adequate for the number of items in the scale (Bornholt & Piccolo, 2005). Against the COSMIN criteria, PMSC and Children's Perception of Motor Competence Scale (CMPI), reported results exceeding the threshold to be considered a good measurement property across both internal consistency and structural validity (Barnett et al., 2016; Pérez & Sanz, 2005). Although receiving a very good score for risk of bias for internal consistency, Playform reported a Cronbach alpha of 0.69, which just falls below the acceptable threshold (see Table 4.1, p.101) and did not report any data regarding structural validity, which is required in COSMIN guidance (Sturgess & Ziviani, 1996). Four studies reported reliability, with the three studies receiving adequate risk of bias scores (Araújo-Soares et al., 2015; Barnett et al., 2016; and Lakes, 2013) as little information was given on assessment conditions, therefore stability and similarity could only be assumed. No studies reported measurement error, criterion validity or responsiveness in enough detail to be appraised.

#### *4.5.2.3 Feasibility: Affective*

All assessments were embedded into the utility matrix to enable an easy overview of the feasibility of each assessment (see Table 4.6). Information regarding equipment

and space were the most widely reported area of feasibility. The Response to Challenge Scale (RCS), as a physical activity challenge course, required the equivalent space of a standard school sports hall and more equipment, resulting in a fair rating across both of these feasibility areas (Lakes, 2013). However, most of this equipment would be typically available in a standard primary school, for example; skipping ropes, gym mats, cones, balls etc. All other affective assessments, as questionnaire based, could be completed in a classroom or smaller space, with minimal extra equipment.

PMSC and The ASK-KIDS Inventory rated as excellent for time as they reported to take less than 15 minutes to complete (Barnett et al., 2016; Bornholt & Piccolo, 2005),Playform reported to be completed in up to 30 minutes, scoring as good (Sturgess & Ziviani, 1996). All other assessments within this domain failed to report information regarding completion time.

The reporting of the qualification level and training required to deliver the affective assessments was generally poor. The Assessment of Social Cognitions required 'extensive' training to ensure reliability, although little detail was provided on this training (Araújo-Soares et al., 2015). Each observer undertook 30 minutes of training before scoring the RCS assessment leading to a good rating (Lakes, 2013). PMSC was administered by research assistants, resulting in a poor rating (Barnett et al., 2016).

Only two affective assessment reported details of participant understanding, The Assessment of Social Cognitions reported subject understanding as 92.5%, but it was unclear how this was determined, resulting in a fair rating (Araújo-Soares et al., 2015). Playform scored as excellent as it gave detailed information regarding the

piloting process (Sturgess & Ziviani, 1996). Only the Assessment of Social Cognitions provided information regarding the number of incomplete assessments and received a fair score as it was explained how this was accounted for in analysis (Araújo-Soares et al., 2015).

Table 4.7 *An overview of the alignment of each assessment to the affective domain*

| **Assessment Tool** | **Confidence** | **Motivation** | **Emotional regulation** | **Enjoyment/happiness** | **Empathy** | **Persistence/resilience/ commitment** | **Adaptability** | **Willingness to try new activities** | **Autonomy** | **Comfortable and connected with the world** | **Self-perception/ self-esteem** | **Perceived physical competence** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Cognitions | | • | | | | | | | | | | |
| PMSC | | | | | | | | | | | | • |
| ASK-KIDS Inventory | | | | | | • | | | | • | • | |
| Feelings about Physical Movement | | | • | | | | | | | | | |
| RCS | | | • | | | | | | | | | |
| CMPI | | | | | | | | | | | | • |
| Playform | | | | • | | • | | | | | • | |

*Physical Activity (PA); Pictorial Scale for Perceived Movement Skill Competence for young children (PMSC); Response to Challenge Scale (RCS); Children's Perception of Motor Competence Scale (CMPI)*

#### *4.5.2.4 Physical literacy alignment: Affective*

Each tool within the review assessed one of the twelve suggested sub-elements of the affective domain of physical literacy (see Table 4.6). One assessment referred to *motivation* (Araújo-Soares et al., 2015) while no assessment explicitly referenced *confidence,* which was differentiated from *perceived physical competence* when identifying the sub-elements checklist. *Perceived physical competence* (n=3) and *Emotional regulation* (n=3) were most frequently assessed sub-elements. No assessments referred to *empathy, adaptability, autonomy* or *willingness to try new activities*. Playform (*enjoyment, persistence* and *self-esteem*), and The ASK-KIDS inventory each assessed three sub-elements (*emotional regulation, persistence* and *self-esteem*), the most of any assessment within the affective domain (Sturgess & Ziviani, 1996; Bornholt & Piccolo, 2005).

#### *4.5.3.1 Physical results*

Fifteen assessments related to the physical domain were identified within the 3-7.9 year old age range (España-Romero et al., 2010; Livonen et al., 2016; Hoeber et al., 2016; Fjørtoft, 2000; Furtado & Gallagher, 2012; Derri et al., 2001; Vandorpe et al., 2011; Hermann et al., 2015; Ericsson, 2007; Myers & Well, 2015; Cairney et al., 2018; Ulrich, 2013; Rosa, Ridgers & Barnett, 2013; Faigenbaum et al., 2015). Table 4.4 includes the study characteristics and details information relating to geographical location, setting, age range and scoring each relate to study characteristics. It was found that the studies were conducted within the USA (n=3), Australia (n=3), Canada (n= 1) and Europe (n=8). Assessments were typically administered within the gym hall or an onsite sports facility within the school setting. All of the included tools assessed an aspect of movement skills on land; no tool considered movement skills in

water. Assessments utilised forms of numerical scoring, such as time taken to complete the assessment, awarding levels and distance covered. OTAGM also used observations to assess task engagement (Rosa et al., 2013). Notably, the majority of tools included in this domain (n=12) reported a crossover between age ranges and could be considered across both EYFS and key stage one (3-7 years) and key stage two (7-11 years) children. Only one assessment was used in participants under the age of four (Livonen et al., 2016).

#### *4.5.3.2 Measurement properties: Physical*

Table 4.5 provides the COSMIN ratings of each assessment included within the physical domain. Reliability was the most widely reported measurement property reported within the physical domain (n=14). Twelve assessments achieved an adequate rating for methodological risk of bias (Livonen et al., 2016; Hoeber et al., 2016; Furtado & Gallagher, 2012; Derri et al., 2001; Vandorpe et al., 2011; Hermann, Gerlach & Seelig, 2015; Myers & Well, 2015; Cairney et al., 2018; Ulrich, 2013; Rosa, Ridgers & Barnett, 2013; Faigenbaum et al., 2015). Six assessments reported internal consistency (Furtado & Gallagher, 2012; Derri et al., 1987; Ericsson, 2007; Vandorpe et al., 2011; Cairney et al., 2018; Ulrich, 2013), with two achieving a very good rating COSMIN rating (Derri et al., 1987; Ulrich, 2013). Test of Gross Motor Development-Third Edition (TGMD-3) also received a very good risk of bias rating for structural validity (Ulrich, 2013), as did The Körperkoordinationstest für kinder (KTK, Vandorpe et al., 2011). TGMD-3 also reported cross-cultural validity to a very good level, the only assessment to do so within the physical domain. Three other assessments achieved adequate ratings for structural validity (Hermann et al., 2015;

Ericsson, 2007; Cairney et al., 2018). No other study reported a measurement property exceeding an adequate rating for risk of bias.

#### *4.5.3.3 Feasibility: Physical*

As with the affective domain, participant understanding and incomplete assessments were poorly reported across the physical domain, as highlighted in Table 4.6. Only EUROFIT provide information regarding incomplete assessments, resulting in a good score (Fjørtoft, 2000). MUGI (Motorisk Utveckling som Grund för) scored fair for participant understanding (Ericsson, 2007), whilst PLAYfun scored excellent as it provided direct evidence of understanding from the participants themselves (Cairney et al., 2018).

All studies provided adequate levels of detail to be scored for feasibility in relation to time, space, equipment, qualification and training. Assessment timing ranged from under 15 minutes (Barnett et al., 2016; Faigenbaum et al., 2015), 47% of assessments took up to 30 minutes (España-Romero et al., 2010; Livonen et al., 2016; Hoeber et al., 2016; Furtado & Gallagher, 2012; Derri et al., 2001; Vandorpe et al., 2011; Hermann, et al., 2015; Cairney et al., 2018), with 40% of assessment lasting to up to an hour, scoring as fair (Fjørtoft, 2000; Ericsson, 2007; Myers & Well, 2015; Ulrich, 2013; Rosa et al., 2013). Most (67%) assessments received a good or excellent score for equipment, as they required relatively little extra equipment to what would typically be available in a primary school. The majority of assessments (60%), also received a good score for training required, as this could be undertaken in less than half a day. However, it was found that most assessments only achieved, at most, a fair score for qualification (73%), as they required a high skill level to administer and score the assessment. Although The HS Test scored as excellent in both training and

qualification needed as it could be completed by a teacher in school (Derri et al., 1987).

#### *4.5.3.4 Physical literacy alignment: Physical*

As shown in Table 4.8, each tool within the review assessed one of the twenty suggested sub-elements of the physical domain of physical literacy. No included assessments in this age group tested the sub-elements of *aesthetic/expressive movement, sequencing, progression, application of movement specific to environment* and *movement skills water*. All of the tools included within this review were conducted on land and therefore provided assessments for land-based movement skills; none of the tools assessed water-based activities despite swimming being the only compulsory physical activity within UK (Department for Education, 2013). *Movement skills land* (n=15), *balance* (n=12), *coordination* (n=11), *object control* (n=10) and *locomotor skills* (n=10) were most frequently assessed sub-elements. Assessments referred to a minimum of three sub-elements included within the physical domain (Barnett et al., 2015), with MOBAK-3 referencing the most sub-elements of any included assessment across all domains, including 11 of the 20 sub-elements (Furtado & Gallagher, 2012).

Table 4.8 *An overview of the alignment of each assessment to the physical domain.*

| Assessment Tool | Object control | Balance | Locomotor skills | M.S (land) | M.S (water) | Moving using equipment | Cardiovascular endurance | Muscular endurance | Coordination | Flexibility | Agility | Strength | Reaction Time | Speed | Power | Rhythmic ability | Aesthetic/ expressive | Sequencing | Specific to an environment | Progression |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALPHA | | | | • | | | • | • | • | | • | • | | • | | | | | | |
| AMP | • | • | • | • | | | | | • | | | | | | | | | | | |
| AST | • | • | • | • | | | | | • | | | | | | | | | | | |
| EUROFIT | | • | | • | | | • | • | | • | | • | | • | | | | | | |
| FGCOMP | • | • | • | • | | | | • | • | | | | | | | | | | | |
| GSPA | • | | | • | | | | | • | | | | | | | | | | | |
| HS | | | • | • | | | | | • | | | | | | | • | | | | |
| KTK | | • | • | • | | | | | • | | | • | | | | | | | | |
| MOBAK-3 | • | • | • | • | | • | | | • | • | • | • | | | | | | • | | |
| MUGI | • | • | • | • | | | | | • | | | | | | | • | | | | |
| OTAGM | • | • | • | • | | | | | | | | | | | | | | | | |
| PARAGON | • | • | | • | | | | | | • | | | | | | | | | • | |
| PLAYfun | • | • | • | • | | | | | • | | • | | | | | | | | | |
| TGMD-3 | • | • | • | • | | | | | • | | | • | | | | | | | | |
| YBT | | • | | • | | | | | | • | | | | | | | | | | |

*Physical Activity (PA); Movement skills (MS); Assessing the Levels of Physical Activity and Fitness (ALPHA); Alle kouluika¨isten lasten PsykoMotoriset taidot (AMP); Athletic Skills Track (AST);; Furtado-Gallagher Computerized Observational Movement Pattern Assessment System (FGCOMP); Golf Swing and Putt Skill Assessment (GSPA); High/Scope beat competence analysis test (HS Test); Körperkoordinationstest für Kinder (KTK); Motorische Basiskompetenzen in der 3 (MOBAK-3); Motorisk Utveckling som Grund för Inlärning (MUGI); Physical Activity Research and Assessment tool for Garden Observation (PARAGON); Test of Gross Motor Development-3 (TGMD-3); The Observation Tool of Active Gaming and Movement (OTAGM); Y Balance Test (YBT)*

#### *4.5.4.1 Cognitive results*

Of the 124 included studies in the wider project, seven of these papers, detailing seven distinct assessment tools, were deemed to fall into the cognitive domain, with all but one being used in children aged 3-7.9 years old. The general characteristics of these assessments are shown in in Table 4.4. Three studies were conducted in the USA (Economos et al., 2010; Lakes, 2013; Calfas et al., 1991), with the remaining studies from Australia (Wiseman et al., 2017), Greece (Manios et al., 1999), and Spain (Santos-Beneit et al., 2015). The eligible studies had sample sizes ranging from 41(Economos et al., 2010) to 4171(Manios et al., 1999). Reporting of ages varied between mean and ranges, and information provided in included studies did not allow for consistency in reporting. Wiseman et al. (2017) targeted pre-school children (mean age 4.25); Calfas et al. (1991) also included children from 3-8 years old. Five of the studies were used within a primary school (Economos et al., 2010; Santos-Beneit et al., 2015), whilst one study was conducted in a kindergarten/childcare centre (Wiseman et al., 2017).

Five studies detailed an assessment as part of a wider intervention (Wiseman et al., 2017; Economos et al., 2010; Lakes, 2013; Manios et al., 1999; Santos-Beneit et al., 2015), whilst Calfas et al. (1991) presented the development of the assessment tool as the focus of the study. Two studies used a questionnaire (Manios et al., 1999; Santos-Beneit et al., 2015), two studies utilised a photo pairs activity (Wiseman et al., 2017), Manios et al., 1999), one study observed the completion of a physical activity obstacle course (Lakes, 2013) and one study used an interview with a picture sorting activity relating to weight bearing physical activity choices (Economos et al., 2010).

#### *4.5.4.2 Measurement properties: Cognitive*

Results of the appraisal of the measurement properties of assessments included within the cognitive domain are shown in Table 4.5. Across all the domains, only Knowledge, Attitudes, Habits (KAH) scored 'very good' with a high quality of evidence for PROM development and content validity as it reported an extensive development process (Santos-Beneit et al., 2015). Other studies reported these properties inconsistently. Reliability was the most widely reported measurement property. However, many cognitive assessment studies failed to report measures of reliability such as intraclass correlation coefficient's, Kappa, or weighted Kappa, which is reflected in their low rating (Economos et al., 2010; Manios et al., 1999; Santos-Beneit et al., 2015). Only the Preschool Food and Play Questionnaire (Pre-FPQ), RCS and KAH achieved an 'adequate' risk of bias score for reliability (Wiseman et al., 2017; Lakes, 2013; Santos-Beneit et al., 2015). No study reported structural validity. As a result, following COSMIN guidance, despite achieving a very good risk of bias rating for internal consistency, neither Pre-FPQ nor KAH meet the threshold the reported internal consistency to be considered 'good'(Wiseman et al., 2017; Santos-Beneit et al., 2015). None of the included studies reported criterion validity, cross-cultural validity, measurement error or responsiveness in enough detail to be considered.

#### *4.5.4.3 Feasibility: Cognitive*

Table 4.6 details the feasibility ratings of the cognitive assessments. Only three assessments specified an approximate participant completion time. The scales to measure knowledge and preference for physical activity assessment could be administered in under 5 minutes (Calfas et al., 1991), Pre-FPQ 10 minutes (Wiseman et al., 2017); and KAH took 20 minutes (Santos-Beneit et al., 2015).

As with the affective domain, most assessments were questionnaire based, and as a result could be administered individually in a small area, for example, in a quiet area of a classroom, with little extra equipment. The only exception to this was the RCS (Lakes, 2013). The Pre-FPQ could be administered in paper or iPad format (Wiseman et al., 2017).

Three assessments did not specifically mention the level of qualification needed to administer the assessment (Wiseman et al., 2017; Economos et al., 2010; Calfas et al., 1991). The KAH assessment was administered one to one by a qualified paediatric psychologist (Santos-Beneit et al., 2015). An associated paper reported the RCS assessment to be administered by psychology students, both graduate and advanced undergraduate and one trainer with extensive experience with children (Lakes & Hoyt, 2004). As the administration of these assessments required higher qualifications, they were rated as poor. The wider intervention that included the Pupil Health Knowledge Assessment was intended to be administered by class teachers, resulting in a good rating (Manios et al., 1999). As a result of the Pupil Health Knowledge Assessment being intended for use by class teachers, teachers were required to attend four three-hour long training sessions, resulting in a fair rating. However, it is not clear how much of this training related to specific cognitive assessment, or wider intervention training (Manios et al., 1999). Raters undertook 30 minutes of training before scoring the RCS assessment leading to a 'good' rating (Lakes, 2013).

Pre-FPQ, BONES-PAS and KAH achieved a rating of excellent for participant understanding (Wiseman et al., 2017; Economos et al., 2010; Santos-Beneit et al., 2015). Pre- FPQ piloted the assessment with 10 children, before making modifications to the final assessment (Wiseman et al., 2017). BONES-PAS used focus

groups, literature reviews and consulted physical education specialists, and in final assessment administration, each picture card was preceded by a discussion to ensure understanding of the activity (Economos et al., 2010). KAH underwent a pre-pilot, testing and fine-tuning process involving experts and children (Santos-Beneit et al., 2015). The remaining three assessments did not report any information regarding participant understanding (Lakes, 2013; Manios et al., 1999; Calfas et al., 1991). Reporting from The Pupil Health Knowledge Assessment was unclear (Manios et al., 1999). The remaining assessments did not report any information regarding low response rates or missing items.

#### *4.5.4.4 Physical literacy alignment: Cognitive*

Each tool within the review assessed one of the eleven suggested sub-elements of the cognitive domain of physical literacy and this alignment is detailed in Table 4.9. All assessments bar the RCS (Lakes, 2013) covered *knowledge and understanding of the benefits of physical activity*. This was in fact the only sub-element included in the Pupil Health Knowledge questionnaire (Manios et al., 1999). Whilst RCS only related to the sub-element of *decision-making,* which is not an intended outcome of this assessment (Lakes, 2013). KAH covered five sub-elements (Santos-Beneit et al., 2015), whilst Pre-FPQ included four (Wiseman et al., 2017). Results of the checklist indicated a lack of assessments relating to the sub-elements relating to *creativity and imagination in application of movement and knowledge* and *understanding of tactics, rules and strategy.*

Table 4.9 *An overview of the alignment of each assessment to the cognitive domain.*

| **Assessment Tool** | **Benefits of physical activity** | **Importance of physical activity** | **Effects of physical activity on body** | **Opportunities to be active** | **Sedentary behaviour** | **Ability to identify and describe and movement** | **Creativity and imagination in application of movement** | **Decision making** | **Appropriate movement strategies for a situation or environment** | **Ability to reflect and improve own performance** | **Tactics, rules and strategy** | **Action planning and outcome expectations** | **Safety considerations and risk** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre-FPQ | • | • | • | | • | | | | | | | | |
| BONES-PAS | • | • | • | | | | | | | | | | |
| RCS | | | | | | | | • | | | | | |
| PHKA | • | | | | | | | | | | | | |
| KPDPA Scales | • | • | • | | | | | | | | | | |
| KAH | • | • | • | • | • | | | | | | | | |

*Physical Activity (PA); Preschool Physical Activity and Food Questionnaire (Pre-FPQ); Beat Osteoporosis Now-Physical Activity Survey (BONES-PAS); Response to Challenge (RCS); Pupil Health Knowledge Assessment (PHKA); Scales to measure Knowledge and reference for Diet and Physical Activity (KPDPA Scales); Knowledge, Attitudes, Habits (KAH)*

### *4.6.1 Discussion*

The aim of this systematic review was to present a comprehensive summary of existing tools used to assess elements related to physical literacy within children aged 3-7.9 years old. Specifically, this review explored the measurement properties, feasibility and physical literacy alignment of included assessments. For simplicity, assessments (n=27) were described separately within the three domains of physical literacy: affective (n=7), physical (n=15), cognitive (n=6). Though no assessment represented all three domains of physical literacy (affective, physical and cognitive). Across all domains, most assessments scored poorly for risk of bias across all reported measurement properties. Consistently, cross-cultural validity, criterion validity, hypotheses testing, measurement error and responsiveness were not reported. Furthermore, approximately 37% of feasibility items were not reported. This is the first systematic review to focus on physical literacy assessments validated in young children context, and the first to offer rigorous and in-depth analysis of measurement properties, feasibility and theoretical alignment.

### *4.6.2 Measurement properties*

A key criterion for inclusion in this review was the reporting of a measurement property. Studies tended to either test or report on one or two measurement properties in detail but did not address all aspects of COSMIN risk of bias checklist, suggesting a lack of rigour in reporting. Across all domains, reliability (n=23) internal consistency (n=14) and structural validity (n=8) were the most widely reported measurement properties. No study achieved a very good rating for risk of bias for reliability reporting, however, three affective assessments (Barnett et al., 2016; Araújo-Soares et al., 2015; Lakes, 2013), eleven physical assessments (Livonen et al.,

2016; Hoeboer et al., 2016; Furtado & Gallagher, 2012; Barnett et al., 2015; Derri et al., 2001; Vandorpe et al., 2011; Hermann et al., 2015; Myers & Well, 2015; Ulrich, 2013; Rosa et al., 2013; Faigenbaum et al., 2015) and three cognitive assessments (Wiseman et al., 2016; Lakes, 2013; Santos-Beneit et al., 2015) achieved an adequate rating. Eight studies achieved a very good rating for risk of bias for internal consistency reporting (Barnett et al., 2016; Bornholt & Picollo, 2005; Pérez & Sanz, 2005; Sturgess & Ziviani, 1996; Derri et al., 1987; Ulrich, 2013; Wiseman et al., 2016; Santos-Beneit et al., 2015). PMSC, CMPI, KTK, TGMD-3, Pre-FPQ and KAH all achieved a very good rating for risk of bias for internal consistency reporting (Barnett et al., 2016; Pérez & Sanz, 2005; Vandorpe et al., 2011; Ulrich, 2013; Wiseman et al., 2016; Santos-Beneit, 2015). Considering the quality of these three most widely reported measurement properties, PMSC (Barnett et al., 2016), TGMD-3 (Ulrich, 2013) and Pre-FPQ and KAH (Santos-Beneit et al., 2013) were rated most highly across the affective, physical and cognitive domains, respectively.

Given the priority COSMIN places on PROM development and content validity, the lack of reporting of these may be of some concern, as assessments are not proven valid for use within the targeted population. Across all domains, only KAH reported 'very good' for both PROM development and content validity (Santos-Beneit et al., 2015), whilst MOBAK-3 achieved an adequate rating (Hermann et al., 2015; 2017). Most included assessments failed to provide adequate detail on concept elicitation, i.e., the methods used to identify relevant items and/or how these items were piloted and refined. This has also been found to be the case in other systematic reviews that have used COSMIN, where the lack of validation precluded any further completion of the COSMIN checklist (Craxford, Deacon, Mynt & Ollivere, 2019; Gondivkar, Gadbail, Sarode, Gondivkar, Yuwanati, Sarode, & Patil, 2019; Speyer et al., 2019). Future

assessment development research should consider comprehensively reporting this information, and the COSMIN appraisal protocol could be used to provide guidance and structure to this process (Mokkink et al., 2018).

Future research should also consider the involvement of participants and a range of professional in the formative stages of development, as COSMIN requires. However, the difficulties in involving participants of younger age groups in research (Noonan et al., 2016; Parker, MacPhail, O'Sullivan, Ní Chróinín, & McEvoy, 2018). Amd the subsequent difficulties in effective assessment in general in this age group (Brown, Andrade & Chen, 2015), are well documented. This is reflected by the relative lack of assessments in children aged seven and under compared to the total number of studies identified to be used with children aged 7-11.9 years old. Again, this reiterates the potential for the younger age groups to become particular focus for future research. However, even with reviews concerned with adult populations, content validity of assessments has been scored as indeterminate, as it is unclear if participants and experts were consulted in development (Gondivkar et al., 2019).

Many of the included assessment studies were conducted in samples with substantial age ranges. Only two studies, both within the cognitive domain, were conducted in children under the age of four, and reporting of measurement properties were weak (Calfas et al., 1991; Wiseman et al., 2016). This may also suggest the importance of reporting measurements by age group or the need for more appropriate assessment differentiation methods. Clearly more consideration of assessment in this younger age group is needed, and perhaps a new approach is needed that considers the adoption of more novel and creative approaches.

### *4.6.3 Feasibility*

Assessments across the affective and cognitive domains scored highly for feasibility as many were pen and paper questionnaires, requiring space and equipment typically available in a primary school. Physical assessments typically required larger areas, such as a sports hall, and as a result scored slightly lower, but again, these facilities would still be available within a typical British primary school. Generally, assessments within the physical domain were more likely to report information regarding the training and qualifications required to administer an assessment. Within the matrix, a total of 28 starring points was available. The highest rating assessment across all domains in terms of feasibility was PLAYfun, which achieved 18 stars, despite not reporting the number of incomplete assessments (Cairney et al., 2018). Within the affective domain, Playform, PMSC, Social Cognitions, and The ASK-Kids inventory all scored highly across the included feasibility factors (Sturgess & Ziviani, 1996; Barnett et al., 2016; Araújo-Soares et al., 2015; Bornholt & Piccolo, 2005). KAH and Pre-FPQ both achieved 15 stars, despite neither of these assessments reporting training requirements or the number of incomplete assessments (Santos-Beneit et al., 2015; Wiseman et al., 2018).

As with similar systematic reviews exploring feasibility (Lander et al., 2018) findings indicate a lack of detailed reporting, which makes it difficult to draw conclusions, Approximately 37% of feasibility items were not reported. Therefore, it was not possible to determine the feasibility of many of the included assessments. This is an important finding as it demonstrates the lack of importance given to feasibility issues within research and publication, which can have significant negative consequences for real-world impact. In particular, 93% of assessments did not report the number incomplete assessments, suggesting the risk of bias of the study is

unclear. 82% of assessments did not report participant understanding, however, assessments should be relevant, comprehensive, and comprehensible with respect to the study population, and direct evidence of this should be provided from the participants (Prinsen et al., 2018). Participant understanding is particularly important if an assessment is to be considered as Assessment for Learning, as feedback is a crucial part of the assessment process (Tolgfors, 2019). The lack of information regarding engagement with children suggests that feedback does not currently form part of existing assessment processes included within this review.

Across the affective and cognitive domains, many assessments utilised similar questionnaire based approaches, which made the comparison of the feasibility of these assessments especially difficult, as the rating system used within the matrix is not sensitive enough to detect subtle differences between assessments. Across all assessments, results highlight many studies did not report how long each assessment would take, making it very difficult for any potential users to make informed decisions. This is especially pertinent considering time is often cited as a major barrier to teachers within schools (Jess, et al., 2017) and as a result, future studies should include this information as a priority. Within the current study, eight assessments were rated as excellent, as they reported to take less than 15 minutes to complete (Barnett et al., 2016; Bornholt & Piccolo, 2005; Barnett et al., 2015; Faigenbaum et al., 2015; Wisemen et al., 2017; Calfas et al., 1991).

Despite all assessments being conducted within a primary school environment, the majority of assessments were conducted by researchers. Although this may be suitable for some purposes (i.e. research grade approach), there are questions over the usefulness and sustainability of this long term. However, the alternative of positioning teachers as the administrators of an assessment will need

serious consideration of training needs. Yet findings in this chapter suggest that there is little attention given to the expertise, confidence and competence required to administer assessments, particularly in assessments within the affective and cognitive domains, and little opportunity given for generalist class teacher to administer these physical literacy related assessments.

### *4.6.4 Physical literacy alignment*

Of the 45 sub-elements identified from existing international literature collated in Study One (Chapter Three), The ASK-KIDS inventory (Bornholt & Piccolo, 2005) assessed three sub-elements, the most of any assessment within the affective domain; MOBAK-3 referred to the most sub-elements of any included assessment across all domains, including 11 of the 20 physical sub-elements (Furtado & Gallagher, 2012); within the cognitive domain, KAH covered five sub-elements (Santos-Beneit et al., 2015), whilst Pre-FPQ included four (Wiseman et al., 2017). Which may suggest these assessments would be most useful in assessing relation to physical literacy. In line with this, KAH and MOBAK-3 achieved at least adequate ratings for all reported measurement properties (Santos-Beneit et al., 2015; Furtado & Gallagher, 2012). However, The ASK-KIDS inventory performed poorly across all areas of COMSIN appraisal, indicating that although it might assess the highest frequency of sub-elements, it may not be a valid measure (Bornholt & Piccolo, 2005). Playform reported very good internal consistency, but doubtful (PROM development, content validity) and inadequate (reliability), in other reported measurement properties, again casting doubt over the validity of this measure (Sturgess & Ziviani, 1996).

As these results indicate, the affective domain is perhaps the least well represented domain of physical literacy within existing published assessments.

Within the definition of physical literacy, confidence and motivation are specifically referenced as elements (Whitehead, 2019). Yet within the current review, focussing on young children, only one assessment referred to *motivation* (Araújo-Soares et al., 2015) while no assessment explicitly referenced *confidence.* This may relate to perceived issues regarding self-report, self-awareness, cognitive ability and validity in this age group (Jacquez, Vaughn & Wagener, 2013). However, given the importance Whitehead places on these elements, development and validation of assessments of both confidence and motivation are needed within this age group to enable the assessment of physical literacy. Findings may also suggest the need for clarification between the differences between *confidence* and *perceived physical competence* which were separated in the current checklist.

Results across all domains highlighted 10 sub-elements that were not assessed by any of the assessments included in this review. However, this is not surprising given the majority of these tools were not designed to assess physical literacy. Considering the feasibility issues discussed, it is not appropriate or realistic for an assessment to align to all 45 sub-elements currently conceptualised to be in relation to physical literacy. In a pragmatic approach to overcome this very issue, there has been recent guidance published, detailing how teachers and practitioners may be able to choose the most appropriate method of assessing physical literacy (Barnett et al., 2019). For example, it may be that in a particular situation, a teacher may require specific information regarding one domain of physical literacy, and practically, this method may be preferable to an extensive assessment battery. Although admittedly, this method views the elements and domains as separate entities, therefore neglecting the (perhaps idealistic) notion that the domains of physical literacy should be viewed with a holistic viewpoint, and should not be isolated during the assessment

process (Jurbala, 2015). The guidance does however allow for contextual differences, as practitioners are able to select the method that best fits their own intention, needs and resources (Barnett et al., 2019). However, the philosophical approach of monism would suggest all elements are equal (Whitehead, 2007), recent national level research has indicated that certain sub-elements of physical literacy (i.e. enjoyment) are greater predictors of physical activity in this age group than others (i.e. knowledge and understanding) (Sport England, 2019). More research may be needed to identify the most relevant sub-elements to be assessed within this context, for example, both Robertson et al. (2017) and Prinsen et al. (2018), used Delphi Polls to develop taxonomy of measurement properties. It may be that this method is utilised in future physical literacy assessment research.

It should be considered that despite swimming being the only compulsory physical activity in the UK National Curriculum (Department for Education, 2013), all of the physical assessments included within this review were conducted on land and considered land based movement skills; none of the tools assessed water-based activities. In addition to this, very few assessments related to rhythm or aesthetic/expressive sub-elements despite the National Curriculum in Key Stage One in England specifically stating children should be taught to 'perform dances using simple movement patterns' (p.2, Department for Education, 2013). Appropriate assessment should align with curriculum needs (O'Sullivan, 2013). Although research within this area has warned that without a concerted effort to invite teachers to engage in discussion regarding the interrelatedness of assessment, curriculum and pedagogy, any assessment policy and initiatives may not enhance the meaningful and educative process as hoped (Ennis, 2013).

A further key consideration in the development of future physical literacy is the development of assessment of sub-elements that are not already represented within existing assessments (e.g. *empathy, creativity and imagination in application of movement, water-based movement skills, tactics, rules and strategy, and, safety considerations and risk*). However, this approach should be proactive. Recent publications have found consensus (among participants with an interest in promoting physical activity, physical education, sport participation, or sporting performance) for using the periodic table of elements as a metaphor to explain physical literacy standards in Australia (Keegan et al., 2019), i.e. that new elements may emerge in future understandings of the concept. A multi-dimensional, flexible and adaptive approach to assessment should therefore be developed, to allow any assessment to be modified in light of any future developments.

### *4.6.5 Strengths and limitations*

The present study represents a large scale, rigorous, and transparent representation of current methods used to assess elements related to physical literacy. The development and use of existing protocols and checklist (Prinsen et al., 2018; Terwee et al., 2018; Klingberg et al., 2018; Beattie et al., 2015) aimed to minimise bias in reporting and clarify alignment and feasibility, which have both been perceived as potential barriers to the development of physical literacy assessment. Findings suggest the consideration of the pragmatic implications of the context where the assessment is used is often neglected in research concerned with assessment development research. The novel feasibility matrix may therefore be of particular interest by researchers and practitioners wanting to develop, compare and select assessments. However, although necessary, the strict inclusion criteria required assessments to have been published in peer-reviewed journals. Anecdotally, we are

aware of some assessments used in practice that do not fit these criteria that may still be beneficial to consider outside the remit of this review.

In addition, the appraisal of measurement properties scored consistently poorly. COSMIN was selected as it had extensive research to support its development and provided in-depth detail concerning its use. Yet, it may be that the level of detail and rigour required by COSMIN, which was created for health-based instruments, may be too stringent given the quality of available research related to physical literacy assessments. On the other hand, it may suggest that physical literacy assessment research need more rigour. Although this was also found to be the case in systematic reviews of other research areas that utilised the updated COSMIN guidelines (Craxford et al., 2019; Gondivkar et al., 2019; Speyer et al., 2019), and did not affect the number of areas that were simply not reported by studies.

Only one assessment within the review claimed to assess physical literacy, and subsequently it was found only to relate to the physical domain (Cairney et al., 2018). This demonstrates that it was not appropriate to exclude assessments that have not been developed with the sole purpose of assessing physical literacy at this time, or to exclude those that do not holistically represent all domains. In line with Edwards et al., (2018) we also recommend caution if considering using these assessments solely for the purpose of assessing physical literacy. To transparently represent these assessments and their alignment to physical literacy, the current study attempted to map the potential relationship with a novel sub-element's checklist. It should be acknowledged that this checklist is not a final and exhaustive list of the sub-elements of physical literacy, but a presentation of the current conceptualisations of physical literacy represented in peer-reviewed literature, based on Study One (Chapter Three), Chapter Three. With increasing empirical research, understandings of

physical literacy will develop over time and these sub-elements may evolve (Keegan et al., 2019). Occurrence of these sub-elements does not automatically mean the assessment of this sub-element was aligned with the underpinning philosophy of physical literacy, or the concept as outlined by Whitehead (2010).

Results indicated that 50% of assessments were only conducted with children over the age of six (affective n=1, physical n= 10, cognitive n= 3). As detailed in Chapter Two, early childhood presents a key period of physical literacy development, but have very particular 'characteristics and needs' (Whitehead, 2019). As indicated by the lack of assessments in the younger stages of this age group, assessment in this stage is complex. Future research should be flexible to acknowledge the complexities of working with young children. This was perhaps not afforded by the strict protocol of the current systematic review, as assessments had to report measurement properties and/or theoretical development to be included within the study. As a result, there was a lack of qualitative assessments included within this review. It should be considered that assessments conducted within this age group may have fallen outside of the inclusion criteria to be included in this review, (for e.g. not published in peer-reviewed literature) but may still be of value, and future research should look to explore the measurement properties, feasibility and alignment of these assessments.

#### *4.6.6 Future recommendations*

It is clear that more research needs to be done in this area before definitive conclusions can be made. Considering the specific tools identified within the cognitive domain, KAH (Santos-Beneit et al., 2015), and Pre- FPQ (Wiseman et al., 2016), may be a useful starting point for the assessment of the cognitive domain within this age

group, as both demonstrated good reporting of measurement properties, feasibility, and represented a range of cognitive sub-elements. The use of an electronic questionnaire in Pre-FPQ suggests that the use of technology is a feasible method in this age group (Wiseman et al., 2016). However, more information is needed regarding the level of expertise and/or training needed by a teacher to administer both of these assessments. With regards to measurement properties, future studies should look to improve the reporting of reliability by including details such as the time interval, test conditions and stability of participants between assessments, and calculating intraclass correlation coefficients. Furthermore, items relating to the physical literacy sub-elements that have emerged from recent research in Canada and Australia (Dudley, 2015; Cairney et al., 2018; Keegan et al., 2019), such as tactics and safety knowledge, should be incorporated into question guides.

Within the affective domain, PMSC (Barnett et al., 2016), demonstrated good reporting of measurement properties, and appeared feasible considering time, space and equipment requirements. But issues relating to participant understanding and training required were not reported, and the assessment only related to *perceived competence.*

Within the physical domain, evidence of feasibility and measurement properties were more well established and TGMD-3 (Ulrich, 2013), and MOBAK-3 (Herrmann, & Seelig, 2017), could be incorporated within a physical literacy assessment protocol. Although sub-elements related to Whitehead's conceptualisation of the physical domain, i.e. *rhythm* and *aesthetic/expressive,* should be incorporated within the assessment of physical literacy (Whitehead, 2010). PLAYfun achieved the highest feasibility rating (Cairney et al., 2018), as it reported evidence of participant understanding. However, no assessment within this domain

clearly reported information on incomplete assessments, and this should be detailed in future publications.

Across all domains, the relatively small number of assessments used within children under seven demonstrates the need for more work within this area. In particular, the number of assessments used in children under the age of four presents this age group as a particular focus for development. Whilst many studies provided adequate detail regarding reliability, internal consistency and structural validity, higher quality of reporting is needed for these to be considered as good measurement properties. In addition to this, future studies should give focus to wider measurement properties such as criterion validity, measurement error and responsiveness. The lack of reporting of responsiveness is a particular issue if the purpose of a physical literacy assessment is to detect change over time, i.e. the lifelong physical literacy journey.

In general, information regarding administration was limited, making it difficult to comprehensively appraise the feasibility of assessments. As a minimum, an approximate time needed for a child to complete an assessment should be given. Many assessments related to the affective and cognitive domains, as pen and paper questionnaires, could be conducted in a small area with minimal equipment. However, as there was no date exclusion of included studies, many of these older assessments could be developed to incorporate the use of technology, and further improve the feasibility of assessment implementation. Assessments across all domains often-required little extra space/equipment to what would be readily available in a primary school. In addition, the high levels of training and qualification needed by assessment administrators in these studies presents a major barrier to their feasibility in a school context. With a view to implementing sustainable,

formative and effective assessment, the role of teachers in relation to physical literacy assessment in young children needs to be considered.

In light of the feasibility issues discussed, it is not appropriate or realistic for an assessment to align to all 45 sub-elements currently conceptualised to be in relation to physical literacy. To assist assessment users (i.e. teachers) in selecting which assessments are most suitable to use in their context, future research may look to develop a taxonomy of physical literacy sub-elements for this age group. There are also other issues related to the alignment of physical literacy, detailed in Study One (Chapter Three), that were outside of the scope of the developed sub-element checklist. For example, the appreciation of each individual's unique physical literacy journey, the consideration of process versus product, and the development of longitudinal tracking.

### *4.7 Conclusions*

The aim of this systematic review was to present a comprehensive summary of existing tools used to assess the elements related to physical literacy within children aged 3-7.9 years. This is the first to provide a systematic review of assessments available in the literature to assess Whitehead's articulation of the domains with an in-depth appraisal of measurement properties and feasibility issue. The comprehensive search strategy also established links between the assessment of similar constructs, related to physical literacy, within wider physical activity research. Of the 124 studies included in the wider project, 27 assessments were included in this chapter as they related to children aged 3-7.9 years old. As evidenced by the various stages of appraisal, there is no existing assessment, which scores positively across all measurement properties, utility and physical literacy alignment.

The review does however provide specific and detailed evidence across these areas, which will enable individuals to select the most suitable assessment for their purpose from the research currently available.

More attention needs to be given to criterion validity, measurement error and responsiveness in assessment development across all domains. Furthermore, while questionnaire based assessments could be considered feasible within a school context, further empirical research is needed to consider the role of the teacher in delivering effective physical literacy assessments. It also remains imperative that information regarding measurement properties, feasibility and alignment are presented to enable both researchers and practitioners to make informed judgements regarding physical literacy assessment. Users should consider all of these appraisal areas, as our findings suggest whilst an assessment may score highly in one area, it may not in others. It is hoped this review has achieved this in part and will subsequently inform the future development and use of physical literacy assessment tools.

# Chapter Five

# Study Three:

# Stakeholder Perceptions of a Physical Literacy Assessment Tool for Young Children

*5.1 Thesis study map*

| | |
|---|---|
| Study One (Chapter Three): Global interpretations of physical literacy | Objectives:<br>• To collate, compare, and critically review existing international definitions of physical literacy<br>Key Findings:<br>• Seven prominent international groups were identified as currently working within the field of physical literacy<br>• Definitions, approaches, understandings, and philosophies differ between these groups<br>• Margaret Whitehead's definition of physical literacy is consistently referred to as the basis for international definitions |
| Study Two (Chapter Four): A systematic review of assessments related to physical literacy among young children | Objectives:<br>• To systematically review the academic literature for tools to assess the domains of physical literacy within children aged 3-7.9 years<br>Key Findings:<br>• 27 assessment tools used in children aged 3-7.9 years old were included; affective (n=7), physical (n=15), cognitive (n=6).<br>• Studies often failed to comprehensively consider/report measurement properties and feasibility issues |
| Study Three (Chapter Five): Stakeholder perceptions of a physical literacy assessment for young children | Objectives:<br>• To explore key stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups |

| | |
|---|---|
| Recommendations for a physical literacy assessment tool for young children | Objectives:<br>• To draw on research findings from within this thesis and externally, to identify common themes and provide evidence-based recommendations for a physical literacy assessment tool, suitable for use in young children |

Within Study Three (Chapter Five), I conceived and designed the methodology and analysis in agreement with the supervisory team. Data collection was conducted with Cara Shearer who was completing the corresponding PhD with participants aged 7-11 years old. I conducted 20 out of the total of 30 focus groups. Including seven focus groups with key stage two children (aged 10-11 years old) which are not included within this thesis as data presented in the following chapter focuses on children in key stage one (aged 6-7 years old). However, a paper is currently in preparation for publication, which includes the entire age range. I performed data analysis, leading on key stage one and expert/practitioner data, and acted as second reviewer on data relating to key stage two and teacher participants. Cara Shearer mirrored this process leading on key stage two and teacher data analysis and acting as second reviewer for key stage one and expert/practitioner data. Writing and preparation of the tables and figures in this chapter was completed independently.

### *5.2 Introduction*

Results from Study Two (Chapter Four) highlighted a lack of assessments used in the lower end of the 3-7.9-year-old range. As such, children under the age of five attending preschool would have extremely limited experience of physical literacy assessments. As a result, the following chapter focused on early primary school-aged children, and in particular children aged 6-7 years old. Chapter Two, Three and Four highlight that measurement properties, feasibility, and authenticity and alignment to the underlying concept of physical literacy are specific areas of focus that may affect the suitability, implementation and effectiveness of an assessment. Yet these factors, and the weight of the influence of these factors, are all dependent on the assessment user, e.g. a teacher, coach, or researcher. COSMIN recommendations (Mokkink et al., 2018) note that in order for an assessment to be judged as having acceptable content validity, tool development should involve relevant professionals and participants in the formation of the development of an appropriate and comprehensive assessment (Mokkink et al., 2018). This approach places the assessment user as a central tenet/focus within assessment development.

To date, the majority of physical literacy research and practice has focussed on childhood (Edwards et al., 2018; Hyndman & Pill, 2018; Whitehead, 2019). This places teachers and children as likely potential 'assessment users', and PE as a potential context for assessment. The assumed pedagogical benefits and the growing need for accountability within schools further illustrate a need for a 'suitable' assessment of physical literacy in this context (Edwards et al., 2018; Green et al., 2018; Robinson & Randall, 2017; DinanThomspson & Penney, 2015; Whitehead, 2010). Nevertheless, according to Barnett et al. (2019) the aim of policy and assessment in PE should be that of empowering children to live healthy and fulfilling

lives. However, research has long established a number of barriers when implementing high quality physical education in primary schools, for example; teacher confidence (Morgan & Bourke, 2008), lack of training (Paine, 2013); curriculum expectations (Dyson, Cowan, Gordon, Powell & Shulruf, 2018); and issues with 'traditional' PE and a focus on physical skills (Kirk, 2009). With particular reference to physical literacy assessment in primary PE, a lack of physical literacy knowledge in teachers seemingly exists (Edwards et al., 2019; Foulkes, personal communication). With this context in mind, there is a need to consider feasibility to establish a physical literacy assessment's sustainability and relevance (Klingberg et al., 2018). It has been proposed that there are eight general areas that could be considered by feasibility studies: (i) demand; (ii) acceptability; (iii) implementations; (iv) practicality; (v) adaptation; (vi) integration; (vii) expansion; (viii) limited-efficacy testing (Bowen et al., 2009). Based on recommendations from Bowen et al., (2009) research conducted into the feasibility of a physical literacy assessment should identify the most appropriate factors and methodology considering the setting, community, or population under study.

Whilst the importance of the issues faced by primary PE and teachers should not be underestimated, there has been a recent call for proactive and positive research to improve primary physical education (Jess et al., 2016; Carse, Jess, & Keay, 2018). As such, any primary PE research involving physical literacy and assessment should aim to have a positive impact on PE and focus on solutions to perceived barriers (Griggs, 2012). To maximise potential impact, those involved in primary PE should be involved in formative stages of research concerning assessment (Jess et al., 2016). As identified within the systematic review appraisal process, assessment users

should therefore be consulted regarding the comprehension, relevance and comprehensibility of assessments.

In the following paper, assessment users were deemed to include teachers (those who regularly deliver primary PE), academics/practitioners (those with an interest in physical literacy) and children themselves. This participatory approach has been recommended as an effective and sustainable way to engage key stakeholders in research focussed on improving primary PE (Castelli & Chen, 2018; Tolgfors, 2018). While previous research has used 'experts' through Delphi poll methodologies in relation to physical literacy development (Longmuir & Tremblay, 2016; Barnett et al., 2019), to my knowledge, no formative research into physical literacy assessment in children has involved that of the children themselves. It has been acknowledged that within the wider research area of children's physical activity, children's voices are largely under-represented (Jacquez et al., 2013; Noonan, et al., 2016). Traditionally, it was extremely rare ask primary school aged children to express their perspectives on physical education, physical activity, and physical literacy (Parker et al., 2018). However, in recent years focus groups have been used successfully with children to explore their perceptions of childhood PE and physical activity (VanRossum, Foweather, Richardson & Morley, 2019; McWhannell, Triggs, & Moss, 2019; Domville, Watson, Richardson & Graves, 2019; Parker et al., 2018; Noonan et al., 2016). However, due to differences in interaction preference, linguistic and cognitive ability, creative methodologies are often utilised to explore children's perspectives (Noonan et al., 2016). There has been a shift to doing research 'with' children rather than 'on' children (Angell, Alexander & Hunt, 2015). As a result, in the following research, focus groups with creative, interactive tasks were used to involve and empower children and adult participants (teachers, experts and practitioners) to

encourage free and open discussion. However, findings from Study Two (Chapter Four) highlighted a lack of assessments used in the lower end of the 3-7.9 year old range. In consideration of these findings and the desire to include children within the research process, it was thought that children in UK year 2 (aged 6-7) would have a better ability to contribute to discussion relating to existing and future physical literacy assessment, and this specific age range was chosen as the target population within this study.

### *5.3 Aim*

The aim of this study was to explore key stakeholders (academics/practitioners, teachers, and children) views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups, with a view to informing the development of a rigorous, authentic, and feasible physical literacy assessment for use with young children.

#### *5.4.1 Study design*

Focus groups including academics/practitioners with an interest in physical literacy, teachers who regularly deliver primary PE (PE co-ordinators, general primary teachers, teaching assistants) and 5-7-year-old children were conducted concurrently between summer and winter 2018. Focus groups in older children, representing Key Stage 2 (KS2) were also conducted as part of the wider project; these findings will be reported separately. All focus groups were conducted by myself or a female PhD researcher (CS), both with training and experience in managing and facilitating focus groups. The research was granted ethical approval by the Research Ethics Committee of Liverpool John Moores University (Ref. 18/SPS/037) and adheres to the COREQ

(Consolidated Criteria for Reporting Qualitative studies) checklist of reporting for qualitative studies (Tong, Sainsbury & Craig, 2007).

### *5.4.2 Participants and settings*

A convenience sample of sixteen focus groups were concurrently conducted between June and December of 2018. One academics/practitioner group was conducted at a university and the further two academics/practitioner focus groups conducted at the 2018 IPLA conference. The remaining focus groups were conducted at seven participating schools across the United Kingdom (teacher focus groups=6, children focus groups=7). Schools varied in size, pupil demographic and socio-economic status. Fourteen focus groups presented within this thesis were conducted by myself with the remaining two conducted by a fellow PhD student (CS). This included three academics/practitioner groups, six teacher groups (one of which became a paired interview due to practical constraints) and seven child groups. I also conducted seven focus groups with children aged 10-11 years old, which are presented in the wider project. Focus groups were audio recorded, transcribed verbatim and analysed using thematic analysis in an inductive and deductive manner, with key themes organised into pen profiles. Pen profiles have been used in similar studies to represent themes via a diagram (Mackintosh, Knowles, Ridgers & Fairclough, 2011; Hilland, Ridgers, Stratton, Knowles & Fairclough, 2018; Noonan et al., 2016; Foulkes et al., under review).

#### *Physical Literacy Academics/Practitioners*

Physical literacy 'experts' included practitioners (N=8) and academics (N=13) who self-identified as having an interest in physical literacy assessment. Two focus groups were recruited as a convenience sample at the 2018 IPLA conference, whilst the third

focus group was recruited via publicly available email addresses of academics and practitioners known to work within physical literacy. Participants were informed that their involvement would be anonymous throughout the study and signed informed consent was obtained from each participant prior to commencement. A total of 21 participants were included in the academic/practitioner focus groups, including eleven females and ten males with ages ranging from 25 to 65 and above. All participants classified themselves as working within education (n=11), sport (n=5), research (n=2) or a combination of these sectors (n=3), with a minimum of one years' experience of working within that field. Two participants self-identified their physical literacy experience level as 'expert', seven as 'proficient', eight considered with themselves as 'competent' and four further participants identified as 'beginner'.

*Teachers*

Fourteen primary schools were contacted via publicly available email addresses, explaining the purpose of the study and requesting any staff who deliver PE at least once a week to take part in a focus group. This included teachers with a PE specialism, general class teachers and teaching assistants. As this study was conducted as part of the wider project exploring the assessment of physical literacy in primary school aged children, participants had experience of working with children aged 5-11 years old (considered both KS1 and KS2 in England). In total, approximately 135 teachers and 115 teaching assistants were invited to take part. Initial emails included a participant information sheet providing details of the study and a gatekeeper consent form for the head teacher to complete and return. The participant information sheet noted that participating members of staff would receive a £20 shopping voucher for taking part in focus groups. Written informed consent and brief demographic information of participants was obtained by the researcher prior to commencement of each focus

group. A total of 24 teachers (female, n=20; male, n=4) who regularly delivered PE (including eight teaching assistants) agreed to take part (approximately 10% response rate), and six focus groups were conducted across eight different schools throughout the UK (see Table 5.1). Due to unforeseen circumstances during the data collection phase, one of these teachers became subsequently unavailable. Reasons for non-participation were not collected.

*Children*

Involvement was also requested via email to the same fourteen schools from pupils from years two and/or six to take part in separate focus groups. Initial emails included a gatekeeper consent form for the Headteacher to complete and return. Following gatekeeper consent, information packs containing child and parent/guardian information sheets, consent and assent forms were distributed to all eligible child participants at recruited schools. The participant information sheet noted that participating children would be entered into a randomised prize draw to be in chance of winning £100 of vouchers to be used on PE and sporting equipment for their school. For the purpose of this study and in line with time constraints when working in a school context, a maximum of seven consenting children from each school were randomly selected to take part in each focus group. Fifty-one children returned completed consent forms, with 39 children (n=21 males) ultimately selected to participate in six focus groups.

From the eight schools who agreed to participate, in all but one both a teacher and child focus group was conducted.

Table 5.1 *Demographic description of participating schools.*

| | School 1 | School 2 | School 3 | School 4 | School 5 | School 6 | School 7 | School 8 |
|---|---|---|---|---|---|---|---|---|
| Area and Country | Scotland | Scotland | North West England | West Midlands England | North West England | West Midlands England | North Wales | West Midlands England |
| School Type | Publicly funded | Publicly funded | Voluntary Aided | Academy | Community School | Foundation | Welsh Establishment | Academy |
| School Inspection Grade (OFSTED/ Estyen/ Education Scotland) | Very good | Very good | Good | Good | Requires improvement | Outstanding | 2 | Good |
| Total Number of Pupils | 828 | 363 | 232 | 325 | 401 | 288 | 248 | 121 |
| Gender | 55% female | 45% female | 49.6% female | 47.7% female | 45.9% female | 50.3% female | NR | 49.6% female |
| % of Pupils classified as Special Educational Needs | 15% | 35% | 0% | 2.2% | 0.7% | 0.3% | NR | 3.3% |
| % of Pupils with English not as first language | 5% | 5% | 2.5% | 2.7% | 38% | 3.1% | NR | 0% |
| % eligible for free school meals | 5% | 35% | 43.1% | 19.1% | 43.9% | 13.5% | 5.9% | 8.1% |

*Table 5.2 Participant description.*

| | Total number of participants | Total number of focus groups | Mean time (minutes) |
|---|---|---|---|
| Children | 39 | 7 | 31 |
| Teachers | 23 | 6 | 40 |
| Experts | 21 | 3 | 65 |

### *5.4.3 Data collection*

A semi-structured focus group guide was developed based on recommendations from Bowen et al. (2009) which suggested several areas of focus when exploring feasibility of new assessments. Three areas were deemed to be of particular importance in line with the aims of the present study; (a) acceptability (to what extent is a new assessment judged as suitable?), (b) demand (to what extent is a new assessment likely to be used?), (c) implementation (to what extent can an assessment be successfully delivered to intended participants?). Whilst all questions aligned with the overarching research aims and the broad themes of demand, acceptability and implementation. In line with the wider project, the teacher and practitioner focus groups were prompted to discuss physical literacy assessment across primary school aged children aged 5-11 years old. The wording of questions was altered slightly for different participant groups (see appendix). Wording of questions for children was checked by member of my supervisory team who are experienced in conducting research in this age group (LF, LB) and a Health and Care Professions Council Registered Practitioner Psychologist (ZK).

To stimulate engagement, all focus groups involved interactive tasks aimed to stimulate interest and discussion. For the children, this included an adaptation of the Write, Draw, Tell, Method (Noonan et al., 2016). At the start of each focus group, as an icebreaker, children were asked to write or draw about ‘a time they knew they had

done well in PE' and were then invited to talk about their drawings to prompt further discussion. The use of this creative and novel method prompted children to recall and relate to their own experience while also participating in an engaging, creative task relevant to the focus group topic (Noonan et al., 2016). The question guide then prompted the children to think outside their experiences in PE to other assessment methods they are familiar with, and positives and negatives. After this point, the facilitator (re)introduced the concept of physical literacy using a series of handouts. These handouts included images of children displaying various characteristics of physical literacy, with descriptions underneath with the stem 'this person is…'. For example, a picture of child jumping into the deep end of a swimming pool with the stem 'this person is brave when swimming' to indicate confidence, or an image of a child looking hot and tired 'this child tries really hard when playing games' to represent fitness and physical competence. Approximately four images and descriptions were given for each domain (physical, affective, cognitive). The facilitator read aloud each characteristic description and discussed these with the group. Children were then invited to ask questions around these characteristics and physical literacy in general and the discussion was deemed to reach saturation when no more questions were being asked. The facilitator then prompted the focus group to discuss different ways participants could asses these characteristics.

Within the adult (academics/practitioner and teacher) focus groups, questions followed similar themes. As this study was conducted as part of the wider project exploring the assessment of physical literacy in primary school aged children, participants referred to experiences of working with children aged 5-11 years old (considered both KS1 and KS2 in England). Firstly, participants were encouraged to discuss current experiences of assessment of physical literacy and/or in PE, and

positive and/or negative aspects. At this point, participants were given a sheet of paper or listing common barriers faced by when assessing in PE. Participants were asked to rank these barriers by perceived importance, and to talk aloud about their reasoning. The facilitator then prompted the group to explore potential ways to overcome these barriers and to discuss what an 'ideal assessment' would look like. Throughout the focus groups, participants were provided with pens and large sheets of paper to write down/draw any ideas they may have, and were prompted to use these at various points if they felt the need to.

The focus group guide was piloted once in relevant and appropriate participant groups. The ordering and wording of questions was then refined based upon recommendations. For example, the drawing task became the first activity within the final protocol as it prompted discussion and built rapport, and duplicate questions regarding each of the domains (affective, physical, cognitive) were combined within 'physical literacy' for brevity. Typically, focus groups conducted in a school setting were facilitated within the staff room, or other quiet spaces within the school (e.g. a spare classroom) and children's focus groups were organised to be safeguarding compliant. On average, each focus group lasted 45minutes. All focus groups were audio-recorded using a digital Dictaphone (resulting in 652 minutes of data) and transcribed verbatim.

#### *5.4.4 Data analysis*

Transcripts were imported into NVivo 12 (QSR International) for data handling. Transcripts were initially analysed through a deductive process using Bowen et al. (2009) as a thematic framework, which reflected the underlying research objectives. An inductive process was also used, enabling additional themes to be generated

(Braun & Clarke, 2006; 2019). This process initially required the reading of individual transcript in order to assign broad thematic codes. These broad codes were then subsequently organised into higher and lower order themes. Similar to previous studies in related areas (Morley et al., 2019; Ní Chróinín & Cosgrave, 2013), the use of focus groups allowed for deep and meaningful insight into the perspectives of participants, which subsequently allowed for the construction on meaningful themes. Verbatim quotations were also taken directly from the transcripts in order to expand upon these themes within the findings. To maintain confidentiality, these are quotes are presented with identifiers relating to the participant number, stakeholder grouping, and focus group number, e.g. P1EFG1(Participant 1 Expert Focus Group 1).

Recent research in children's physical activity has adopted a pen profile approach. Pen profiles are considered appropriate for representing analysis outcomes from large data sets via a diagram of themes (e.g., Mackintosh et al., 2011). Self-defining and verbatim quotations and frequency data are used to expand the pen profiles. For profile inclusion, the threshold was set at a minimum of 25% in consensus within a particular theme, with themes not reaching consensus reported within the narrative (Foulkes, personal communication). For transparency, the total number and percentage of individual participants who spoke in relation to a theme is therefore presented. In the present paper, data from different participant groups is presented separately

*5.4.5 Methodological rigour*

Recommendations made by Smith and McGannon (2018) regarding qualitative methodology guided data collection and analysis. Specifically, as theory free knowledge is not possible, the second author (CS), acted as a critical friend (Smith &

McGannon, 2018). CS independently back-coded the data analysis process from pen profiles to themes, codes and transcripts, which then allowed for dialogue between the two first authors (HG and CS) regarding the acknowledgement of multiple truths, perspectives and results to emerge from the research process. The first author then presented the pen profiles and verbatim quotations to the research group, as a further means of cooperative triangulation (Mackintosh et al., 2011). The authors critically reflected their engagement with the analysis and cross-examined the data providing opportunity to explore, challenge and extend interpretations within the data (Ní Chróinín and Cosgrave, 2013; Braun & Clarke, 2019). Methodological rigour, credibility and transferability was achieved via verbatim transcription of data and triangular consensus procedures. Dependability was demonstrated through the comparison of pen profiles with verbatim data and triangular consensus processes.

### *5.5.1 Findings*

Stakeholder's perceptions of physical literacy are presented within three higher order deductive themes: acceptability, demand and implementation. In order to offer a more comprehensive and detailed insight into perceptions of physical literacy assessment, the findings will be presented across the academics/practitioner, teacher, and child narratives.

### *5.5.2 Academics/practitioners*

Figure 5.1 presents a pen profile representing the higher and lower order themes conceptualised in the academics/practitioner focus groups. The most commonly cited higher order themes by frequency were *demand* (n=21, 100%) and *implementation* (n=21, 100%), followed by *acceptability* (n=19, 90%).

Figure 5.1 presents representative verbatim quotes alongside the lower order themes. The most commonly cited lower order themes by frequency were *success or failure of execution* (n=18, 86%), *perceived demand* (n=17, 81%) and *perceived appropriateness* (n=17, 81%). The inductive lower order themes of *existing assessments* n=15, 71%) was recognised within *demand.*

## Acceptability

*Perceived appropriateness*

Academics/practitioner participants highlighted several barriers to physical literacy assessment. Namely, the concept of physical literacy itself.

> *Physical literacy doesn't lend itself readily…to being assessed* P4EFG1

Despite this, other academics/practitioner participants spoke of the need to overcome this barrier

> *We (those working within physical literacy) have to find a middle ground…we don't want to go too far down the assessment route that we've lost the philosophy (of physical literacy) and similarly we don't want to sit too fair in the philosophy camp and nothing gets done* P21EFG3

*Acceptability*

Participants also cited barriers in reference to their perceptions regarding traditional assessment methods and how an appropriate assessment may challenge this.

> *We (those working within physical literacy) have a kind of fixed idea of what assessment is at the moment…or are we talking about a different type of assessment?* P21EFG3

*Perceived demand*

The majority of academic/practitioners agreed that there is a need for physical literacy assessment. Many participants had strong views about why an assessment was needed, often relating this to wider policy change.

> *To get governments involved they want something tangible don't they?...and the only way you can do that is by assessing in some way* P4EFG1

> *(Assessment is) not just for governments, it's just to communicate something in meaningful terms* P1EFG1

*Expressed interest or intent to use*

Participants expressed views on their interest and/or intent to use an assessment, often relating to individual and school level factors.

> *Developing a tool that allows us (teachers) to measure progress in PE will allow us to assess the methodologies that we employ in class* P10EFG2

> *My ideal assessment would be…an on-going summative assessment done by the teachers throughout the curriculum* P11EFG2

**Demand**

*Existing assessments*

The inductive lower order theme of existing assessments highlighted that academics/practitioners were aware of existing physical literacy tools. Some participants even spoke of their own experiences developing an assessment.

> *We (physical literacy academics) have designed an assessment tool which no one's used…no teachers that we know, that we're aware of, that we've given this to, have adopted it* P10EFG2

Some academics/practitioners advocated that teachers would already implicitly and informally make judgements.

> *If I'm looking at it from a teaching perspective, we (practitioners) are assessing all the time because we are observing our children* P21EFG3

Whilst others spoke of the advantages and disadvantages of current assessment methods.

> *We (practitioners) quite often use sort of questionnaires and online questionnaires…you don't get the (whole) side of things, it (the questionnaire) doesn't get used by everyone, and it's easy not to use it….it comes to time and it's not realistic for everybody* P7EFG1

**Implementation**

Over the course of the focus groups, all academics/practitioner participants referenced factors that related to the implementation of a physical literacy assessment.

*Factors affecting implementation ease*

Consistently, participants referred to a range of potential difficulties faced by generalist primary school teachers in conducting a physical literacy assessment.

> *Teachers themselves often don't have very good physical literacy. So, it then makes it difficult for them to make a judgement on a child… teachers don't get a lot of training on the physical literacy stuff which is an issue* P9EFG1

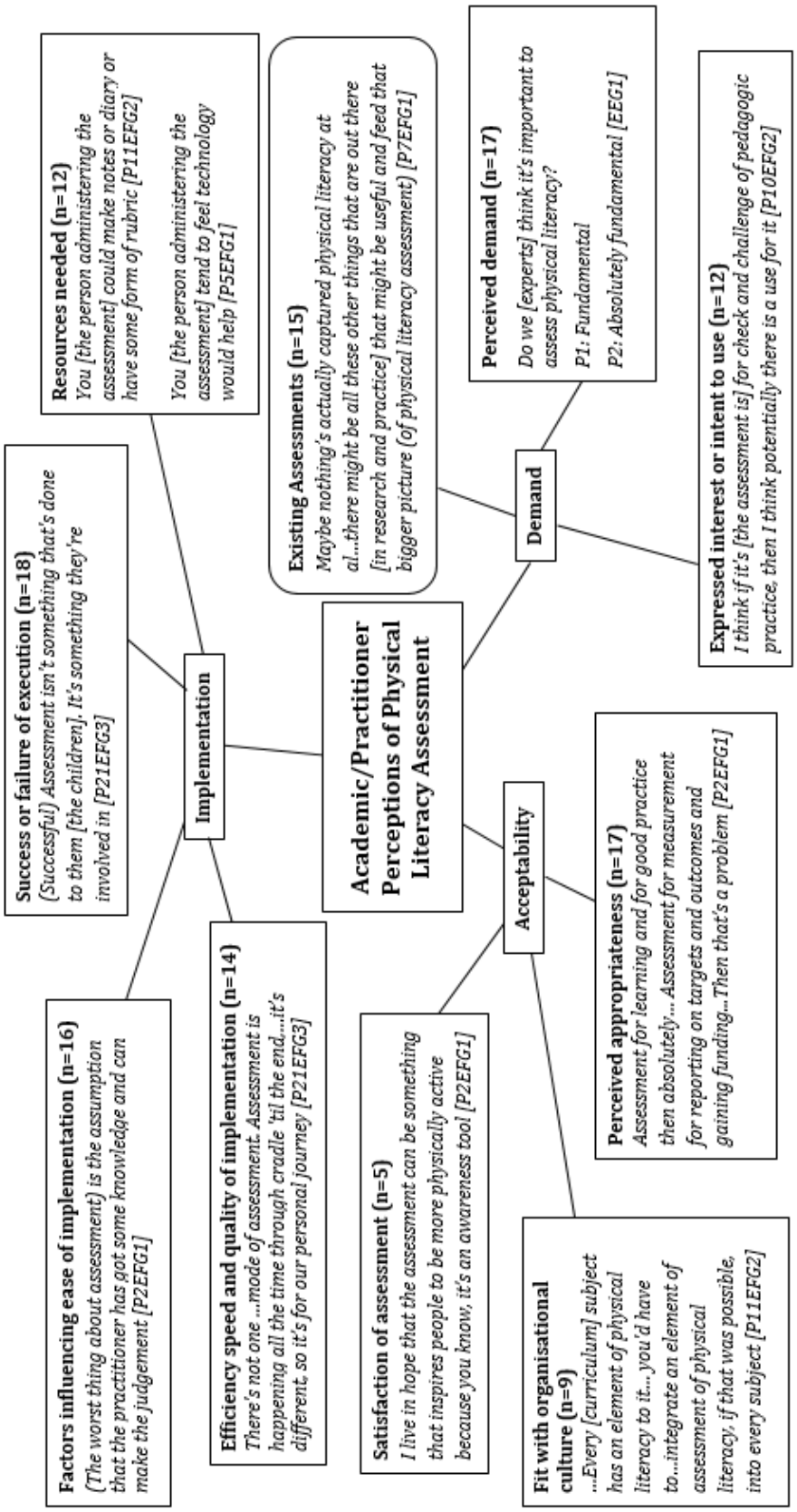
> *You might get people who aren't as aware (of physical literacy) and find it harder to reflect* P13EFG3

*Resources needed*

Academics/practitioners also referred to issues that were not necessarily specific to physical literacy assessment, but indicative of the challenges faced in implementing *any* assessment such as space, equipment, lack of training, and lack of teaching assistants present in PE lessons. Time, however, was by far the most prevalent challenge faced by teachers.

> *The issue (with assessment) is we're talking about reflections, it's the sheer number of 30 children in your class and having time to reflect with them (in the lesson)* P3EFG1

*Figure 5.1* Pen Profile representing academic/practitioner perceptions of physical literacy assessment.



*5.5.3 Teachers*

Figure 5.2 presents a pen profile representing the higher and lower order themes conceptualised in the teacher focus groups. The most commonly cited higher order themes by frequency was *acceptability* (n=17, 74%), followed by *implementation* (n=16, 70%), and *demand* (n=15, 65%). Figure 2 presents representative verbatim quotes alongside the lower order themes. The most commonly cited lower order themes by frequency were *efficiency, speed and quality of execution* (n=14, 61%), *fit with organisational culture* (n=12, 52%) and *perceived demand* (n=9, 39%).

**Acceptability**

*Fit within organisational culture*

Most teachers could recognise how an appropriate physical literacy assessment would fit in with their existing school process.

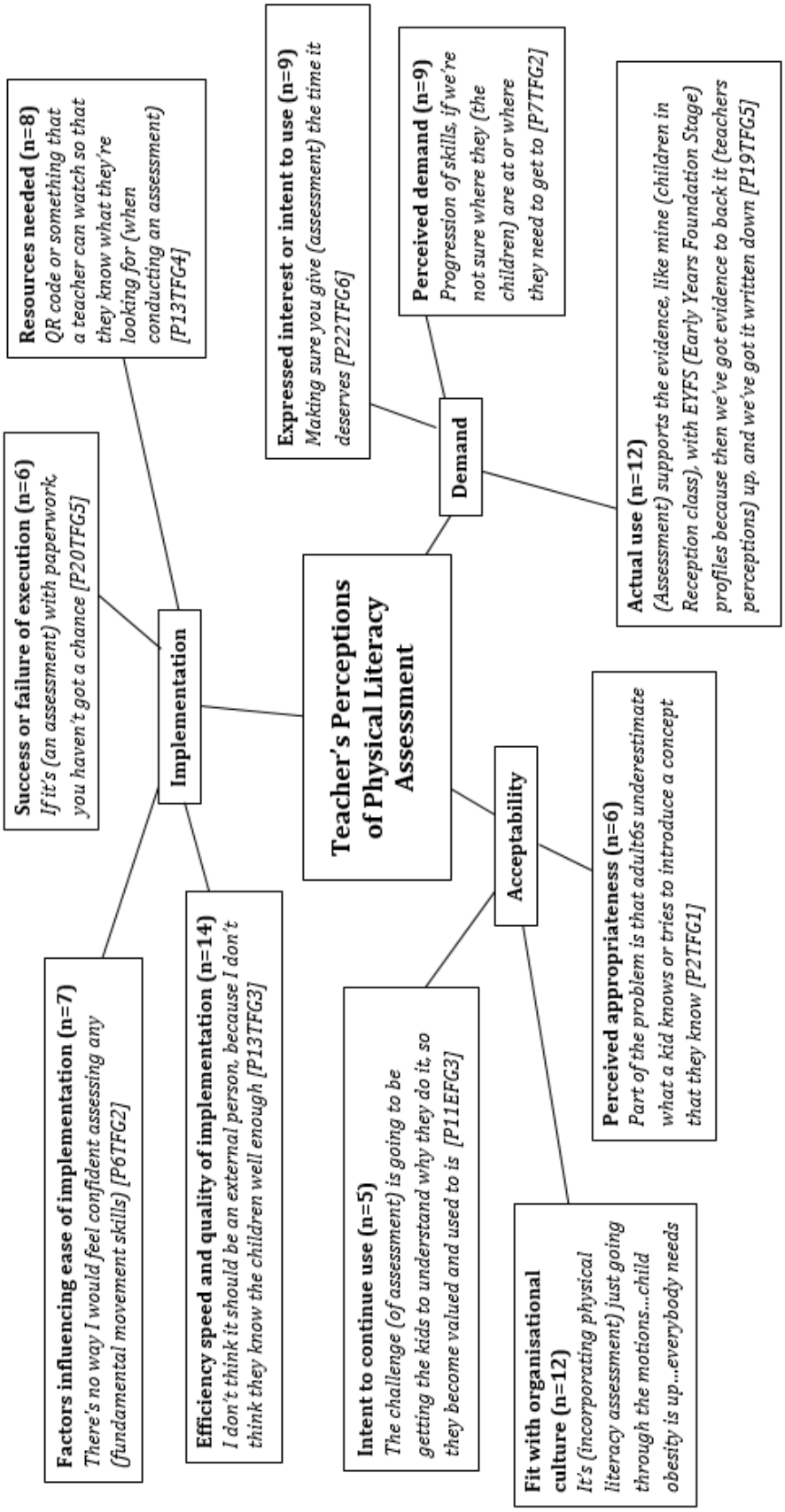
> *It supports the evidence, like mine, with the EYFS (Early Years Foundation Stage) profiles, because then we've got evidence to back up, and we've got it written down* P21TFG6

*Perceived appropriateness*

In addition to this, teachers often spoke of their own and their colleagues lack of confidence and/or ability in delivering physical education, let alone a physical literacy assessment. This was attributed to a lack of training and guidance.

> *I think that's because teachers generally, when they're at university, they just do...is it six hours or something (or physical education training)? That's all* P5TFG2

*Figure 5.2* Pen Profile representing teacher's perceptions of physical literacy assessment.



### Demand

*Perceived demand*

Most teachers recognised how an assessment could improve their pedagogy and subsequent pupil learning.

> *(Assessment helps) those progression of skills, if we're (the teachers) not sure where they're (the children) at or where they need to get to* P10TFG3

*Expressed interest or intent to use*

Nevertheless, many teachers cited 'time' as a factor that affected their intent to use an assessment.

> *It's (the assessment is) going to be more accurate if we sit and spend those hours doing it, but then we (the teachers) don't have those hours to do it* P19TFG6

### Implementation

*Efficiency, speed, and quality of implementation*

Many of the teachers cited experience of external agencies coming into school in recent years to deliver PE. However, all of the schools involved now internally delivered curriculum PE. This was something many felt strongly about in the administration of a physical literacy assessment

> *I don't think it should be an external person, because I don't think they know the children well enough… And they don't have that whole view of the child* P5TFG2

In line with this, they stressed that if they were to administer an assessment

> *I like it (an assessment) just short, simple, that it's easy for everybody to understand* P17TFG5

*Factors that affect implementation ease*

However, others cited their lack of confidence and ability in their ability to administer an assessment effectively

> *I'm not a sports coach in any way, shape or form, and do a PE lesson once a week with the class. There's no way I would feel confident assessing any (fundamental movement skills)* P6TFG2

It was also identified in a number of focus groups that children themselves could be a part of the assessment implementation process. It was felt that this could be an important part of children's learning and also a potential opportunity to ease the burden on the teachers themselves. This often incorporated the use of technology to gather evidence.

*Resources needed*

Teachers suggested they would require training and support in order to deliver an assessment effectively. In addition, they suggested the potential benefit of resources such as videos and QR codes to support student learning.

> *Say you had like this game or activity card, you've (the teacher) got a video of children playing it with a QR code or something that the teacher can watch, so that they know what they're looking for (in terms of progression of skills)* P11TFG3

*5.5.4 Children*

Figure 5.3 presents a pen profile representing the higher and lower order themes conceptualised in the KS1 focus groups. The most commonly cited higher order themes by frequency were *implementation* (n=38, 97%), followed by *acceptability*

(n=23, 59%), *demand* (n=23, 59%). Figure 5.3 presents representative verbatim quotes alongside the lower order themes. The most commonly cited lower order themes by frequency were the inductive themes of *role of others* (n=21, 54%), *self-awareness* (n=21, 54%), and *equipment* (n=18, 45%). The most frequently cited deductive themes were *satisfaction* (n=18, 46%) and *factors affecting implementation ease* (n=17, 44%).

### Acceptability

*Satisfaction*

Within the higher order theme of *acceptability* only the lower order theme of *satisfaction* reached consensus. Within this, many of the KS1 children described how they would enjoy an assessment of physical literacy, how they would know they were being successful, and what this would look like.

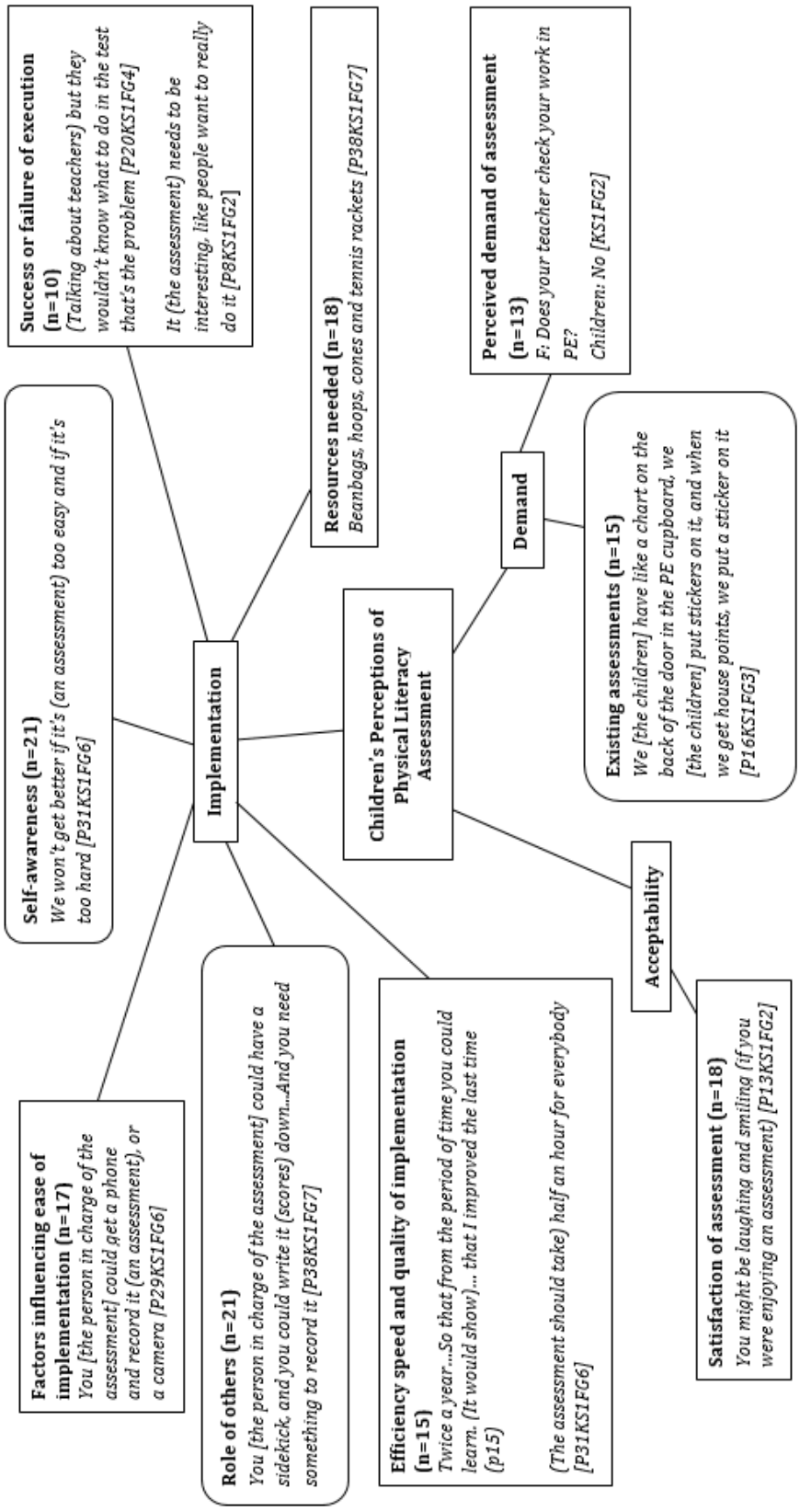
> Facilitator *'How did you know you were doing well in PE?'*
>
> P40: *'…Because I was enjoying myself'* KS1FG7

### Demand

*Perceived demand*

KS1 participants could not recall experiences of assessment of physical literacy, yet when probed further they also struggled to recall specific times of formal assessment in the wider context PE. However, they could explain why they thought an assessment of physical literacy would be important, for themselves and for their teachers.

*Figure 5.3* Pen Profile representing children's perceptions of physical literacy assessment.



Facilitator: *Why would your teacher find it useful to know this information?*

P29: *Because I'm getting healthy, getting good at it*

(KS1FG6)

*Existing assessments*

Many of the KS1 participants were able to readily recall assessments used in their day to day school life, in parallel curriculum examples (i.e. spelling, grammar, multiplication) and understood why an assessment was important.

P15 *You can practice words, so you know how you spell them.*

P18 *Because when you're older, you want to be able to spell anything.*

(KS1FG3)

Responses varied across schools, but most commonly, children noted receiving stickers and certificates for PE and sport, but not as a result of an experience they recognised as assessment, and these were often not given for sporting achievement/outcomes, but for wider, holistic achievements and effort.

Facilitator: *Can you tell me about the certificates in PE?*

P38: *Well, they're all multi-coloured, because there's a few different ones. There's (a certificate awarded for being) inspiring...There's (a certificate awarded for being) encouraging…There's (a certificate for) all of them (all of the holistic skills) put together*

(KS1FG7)

## Implementation

*Efficiency, quality and speed of implementation*

KS1 children gave a variety of suggestions in response to how long an assessment should take and how often it should be conducted, and were able to give insightful reasons to explain this.

> *Twice a year…So that from the period of time you could learn. (It would show)… that I improved (from) the last time* (P15KS1FG3)

*Self-awareness*

Within the higher order theme of *implementation,* a number of inductive themes were identified. Interestingly, even at a young age, children in the focus groups gave reference to high levels of awareness of themselves and that of others. Participants recognised how an assessment could help them learn, how they themselves could be involved in the assessment process, and how any assessment should have the right level of challenge. One participant explained this further, and spoke about why they thought it would be important for an assessment to be differentiated for children of different ages and abilities.

> Facilitator: *If I was doing a test for Year Sixes, would that test be different as well?*
>
> P31: *Yes, because we're a tiny bit older and they're a tiny bit younger.*
>
> Facilitator: *And why is that important, that it's not too difficult and it's not too easy?*
>
> P31: *Because we won't get better if it's too easy, and if it's too hard*
>
> (KS1FG6)

*Some people have something about them that's not perfect like everyone else (talking about SEND pupils), and need more help than everyone else*

(P24KS1FG6)

*Role of others*

Participants identified the class teacher as the person most suitable to be put 'in charge' of the assessment, and identified barriers and potential solutions to this. This aligns with previous research that found children lacked confidence in their teachers' ability to effectively deliver PE, which subsequently negatively affected upon children's sense of competence and enjoyment (Domville et al., 2019). Children in the present study suggested that teachers' knowledge of physical literacy, having a teaching assistant able to help with an assessment, and the recording of an assessment could improve implementation.

Facilitator: *Who would be in charge of the assessment?*

P22: *A teacher!*

Facilitator: *Ok a teacher-*

P20: *-But they wouldn't know what to do in the test that's the problem*

Facilitator: *Ok so as long as the teacher knows what they're doing are they ok to be in charge?*

All children: *Yeah!*

(KS1FG4)

Participants spoke about their own ability to administer an assessment. Children recognised how this would be, in some ways, a position of responsibility, that would

require an individual to be 'kind' and 'fair', but many happily discussed positive ways they already helped their friends and classmates in PE.

> *You should count (all the scores from the test), and you could have a sidekick (assistant), and you could write down it on...And you need something to record it*
>
> (P38KS1FG7)

### *5.6.1 Discussion*

The aim of this study was to explore stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, with a view to inform the development of a rigorous, authentic, and feasible physical literacy assessment. To the best our knowledge, this is the first study to qualitatively investigate stakeholders' perceptions of physical literacy assessment, the first study to include children as stakeholders and the first study to detail this formative stage of assessment development. All stakeholder groups viewed the assessment of physical literacy as important, but despite this, findings from participating schools suggest an identifiable gap in the assessment of the affective and cognitive domains of physical literacy. All stakeholders proposed using technology and self-assessment/reflection as part of an assessment process, with a number of other factors suggested by different stakeholder groups to improve the feasibility of a potential physical literacy assessment tool. The following discussion is sectioned to show the higher order themes identified, triangulating perspectives across the three stakeholder groups.

#### Acceptability

Within this theme, no lower order theme reached consensus across all participant groups. Both teacher and academics/practitioner participant responses indicated that *fit within organisational culture* and *perceived appropriateness* were of importance. In research exploring headteacher and PE-co-ordinator perceptions, at an organizational level, headteacher's beliefs and values greatly influence a school's PA opportunities (Domville, Watson, Richardson & Graves, 2018). Whilst those in leadership roles also recognised that school policies (e.g. availability of facilities, senior leadership and time) were a barrier to high quality PE provision, yet they explained these were often challenges out of their control, for example, government targets (Rainer, Griffiths, Cropley & Jarvis, 2015). A 'whole school approach' to physical activity has been popularised where a comprehensive and consistent approach to physical activity and health is embedded into school life (Lewallen, Hunt, Potts-Datema, Zaza & Gilels, 2015). However, research recommends careful planning, implementation and evaluation to ensure this whole school approach is effective (Rooney, Videto & Birch, 2015). Findings from the current study reflected this, with teachers citing both good and bad examples of organisational culture in relation to PE in their schools. This included support to attend CPD, curriculum time dedicated to PE, and support in extra-curricular activities.

Whilst children and academics/practitioners reached consensus for *satisfaction,* only teachers reached consensus for *intent to continue use.* Academics/practitioners were often wary of introducing another assessment, particularly if there was a risk of the assessment not being useful.

> *Don't you guys get evaluation fatigue? I just get 'ugh not another evaluation form'. It comes everywhere you go and it becomes a pain and I'm bored of it* (P1EFG1)

Participants in the academics/practitioner focus group stressed that although the majority of work regarding physical literacy to date has taken place in a PE context (Edwards et al., 2017), it should not be limited to this area of the curriculum. With specific regards to the current primary PE curriculum in England, many participants in the teacher and academics/practitioner focus groups spoke of the lack of guidance, which many academics/practitioners perceived could lead to 'just another assessment for assessment's sake'.

> *'What is the purpose of assessing physical literacy?' Should drive how we assess it* (P10EGD2)

For many academics/practitioners and teachers, the purpose of assessing physical literacy could be classified into two main areas: the need for evidence, and the potential to improve physical literacy development and thus align with wider research regarding assessment (Hay & Penny, 2013). Within the literature, potential of assessment for learning and formative techniques has been widely discussed as a method to enable authentic learning experiences (Black & William, 1998; Hay & Penny, 2013), and many of the participants in the academics/practitioner focus groups advocated a new approach to traditional, linear and summative assessment of learning. Although idealistic, more creative assessment practices can pose potential issues for teachers. In an international review of PE assessment practices, 'alternative' assessment was viewed as more complex, requiring teachers who have the time, resources, and academic/practitioner expertise to construct worthwhile tasks, embed those tasks into the teaching and learning process, and implement them in valid and equitable ways (López-Pastor et al, 2013). According to Ní Chróinín and Cosgrave, this is at variance with current teachers' realities when implementing formative assessments in primary PE (2013). Time, confidence and competence are

however well documented barriers faced by teachers in relation to primary PE (Kirk, 2009; Taplin, 2013), and results from teachers within the current study reinforced and extended this, by identifying potential solutions to overcome these issues. These barriers pose difficulty when considering academics/practitioner participants who stressed the importance of physical literacy assessment as an authentic and holistic measure, which is again, reflected in the wider physical literacy literature (Longmuir & Tremblay, 2016). Findings across the participants in the current study overall indicate the need for the 'right balance' between the ideal authentic assessment and the realistic time pressures faced in primary PE.

A prevalent factor that influenced the children's perceptions of *satisfaction* regarding an assessment's *acceptability* was the need for an assessment to be a fun and enjoyable experience. This was also identified in the academics/practitioner focus groups.

> *You (the practitioner) can be quite clever with the assessment as well and actually make them fun* (P13EFG3)

Findings from the previous chapter highlighted that enjoyment was the most frequently assessed sub-element within the affective domain. Research has continually linked enjoyment to motivation and more autonomously regulated behaviour in relation to PE and PA (Haerens, Aeiterman, Vansteenkiste, Soenens & VanPetegem, 2015; Domville et al., 2019). Beni, Fletcher and Ní Chróinín (2017) detailed this relationship further stating that individuals are more likely to commit to physical activity based on intrinsic factors such as meaningfulness, satisfaction, pleasure and joy, and that these factors should be directly relevant for PE. Findings from the recent national Active Lives survey in England identified enjoyment as the

'biggest driver' in activity (Sport England, 2019). This however, this should not mean that an assessment should not be challenging and indeed many children spoke candidly of the importance of providing the correct assessment difficulty at an individual level. This notion of appreciating an individual's own capability rather than comparing to age related norms is continually referred to throughout Whitehead's work (2010; 2019). As an extension of this, the term 'stage' is often preferred by Whitehead to describe progression throughout the life course. Progression through stages is determined in relation to an individual's own developmental capabilities rather than chronological age (Whitehead, 2019). Although without norms, it is difficult to determine progression throughout the various different stages of life. Adopting a stage rather than age related approach to assessment would have complex implications for practice. Those involved in assessment will need to understand developmental stages and various factors to be considered in relation to progression through these stages. Research examining children's perceptions of enjoyment in PE indicated that children often felt teachers found it difficult to progress skills to a level that challenged their ability, and this could lead to limited enjoyment and engagement (Domville et al., 2019). Although Whitehead (2019) has provided some stage specific physical literacy values (p.42), more guidance would be needed to enable teachers to identify and develop children through physical literacy stages, although this would need to be wary of being interpreted as age related norms/benchmarks.

In the present study, children would be considered in the children were cognisant with the process of assessment, and valued how assessment could help their learning albeit in different areas of the curriculum,

P15: *You (a child) can practice words, so you know how to spell them*

P18: *Because when you're older, you want to be able to spell anything*

*(KS1FG3)*

In one school in particular, 'growth mind set' regarding assessment and learning was a term and concept the children spoke about with fluency.

> *I wouldn't feel bad if I got a red (a low mark), because mistakes help you learn* (P40KS1FG7)

This aligns with exiting research regarding children's experiences in relation to SATS science testing within the UK (Murphy et al., 2013. )Although this attitude to assessment demonstrates that for some children within the study they find it possible to frame lower marks as a positive, learning experience, this it is not always the case (López-Pastor et al, 2013). As such, it also demonstrates that creating a needs supportive environment around assessment is crucial aspect (Black & William, 2009; Tolgfors, 2018). In order for the assessment to have both educational impact and inspire learning, participants should feel empowered (Tolgfors, 2018; López-Pastor et al, 2013). Taking this further, one academics/ practitioner participant spoke of the assessment itself being something that could 'inspire people to be active' (EFG1P2). Whilst this might seem optimistic considering the state of current assessment in primary PE, across the focus groups many children spoke of how an assessment would motivate them to improve their scores. In other words, an appropriate assessment has the potential to create a motivational climate whereby children can become autonomously motivated to improve their own lifelong physical literacy (Hay & Penney, 2013). An empowering assessment for learning environment allows the child to take responsibility for their choices, gives opportunity for them to influence individualised subject content, uses problem based exercises to allow for creative

engagement, and uses a broad spectrum of experiences in assessment practice (Tolgfors, 2018). As recognised by Barnett et al., (2019), the environment, the climate created, and the pedagogy used are future crucial considerations for effective assessment. The current study offers support for the consideration of these factors from assessment users themselves. Stakeholder responses identified specific factors relevant to assessment development such as motivation and the production of meaningful information. Both of these factors are critical to contributing to meaningful experiences in PE, which have long been identified as a key objective for teachers to strive towards (Beni et al., 2017). This highlights the potential for assessment to align with pedagogy and curriculum to provide authentic learning and developmental experiences. The potential implications of which go wider than the PE context alone and could influence an individual's physical literacy throughout the life course.

### Demand

Within this theme, both lower order themes of *perceived demand* and *existing assessments* reached consensus across all participant groups. Teacher and academics/practitioner focus groups also reached consensus for *expressed interest of intent to use.*

*Perceived demand* codes indicated that all participant groups recognised the potential benefits of an appropriate physical literacy assessment. Participants in the academics/practitioner focus groups spoke of the importance of tangible evidence to provide accountability for physical literacy, and the potential for this to convey meaningful messages to policy makers; a prevalent factor in wider research (Hay & Penney, 2013; Ní Chróinín & Cosgrave, 2013; López-Pastor et al., 2013; Tolgfors,

2018). Findings from the current study demonstrate this with specific reference to a physical literacy assessment being useful for macro level accountability, with specific examples including support for funding, established and protected curriculum time for PE, and evidence for the value of PE and physical literacy. Responses from potential assessment users clearly state that any future physical literacy assessment should provide evidence that is useful and this should be a guiding principle in assessment development. Teachers recognised how assessment would enable them to document evidence in similar ways to which they are already required to do so for other subjects and how this information would be useful to guide their practice. Although research has highlighted that whilst teachers want to engage in this reflection, critical awareness in practice can be limited (Lierhaug, MacPhail & Annerstedt, 2016). Children again demonstrated their familiarity with assessment, recalling how it was important for them to show a teacher how they are progressing, as it will help the teacher to aid their (the pupils) learning. With particular reference to physical literacy, the children in this study could make the connection that this would, in effect, show the children 'getting healthy'.

Although there was *perceived demand* across groups for an appropriate physical literacy assessment, participants were also probed to recall their experiences of *existing assessments,* which is presented as an inductive lower order theme. Whilst KS1 children could not readily recall formal assessment in PE, they spoke of how normal it was to receive stickers or certificates in other subjects for effort and attainment, but that this was more unusual in PE. This finding is supported in recent applied research, which showed that **t**eachers did not naturally transfer well that of the recognised pedagogical and assessment practices from the classroom into the PE context (Edwards et al., 2019). In the current study, teachers indicated that

existing PE assessments they were familiar with were often skill based and resulted in children being sedentary for prolonged periods of a lesson and therefore the opposite of what they were trying to achieve in a PE and something to be mindful of when considering the development of future assessment tools. The academics/practitioner focus groups were the only group able to recall specific physical literacy assessment tools. They recognised that these assessments varied in content and consistency, and often had limited success in an applied context.

Findings in this study suggest that although participants indicated *demand* for an appropriate physical literacy assessment, current *existing assessments* do not meet the needs of the teachers wanting to use the assessment. In summary, a physical literacy assessment tool for this context should consider existing successful pedagogical and assessment processes that can be transferred into a PE context, that an ideal assessment should not result in excessive sedentary behaviour and that results should be useful for both accountability and learning.

### Implementation

All focus groups spoke of factors that would affect the *implementation* of a physical literacy assessment. All stakeholder groups reached the consensus threshold regarding *efficiency, speed and quality of implementation; factors affecting implementation ease; resources needed; and success or failure of execution.* Children in this study produced data which was grouped into two inductive lower order themes; *role of others and self-awareness.*

Across all participant groups, it was recognised that the successful *implementation* of a physical literacy assessment would be mediated by the competence and confidence of the person administering the assessment. For the

teachers, this was also deemed to be included in the higher order theme of *acceptability.* Across all stakeholders, it was suggested that the class teacher was best placed to administer the assessment, but that generalist class teachers vary in confidence, ability and knowledge of physical literacy.

The findings from this study are in agreement that there is a current pressing need to support primary school teachers to operationalise physical literacy (Edwards et al., 2019), and by extension, for any potential physical literacy assessment to have long-term positive impact, teachers must be given appropriate training and continuous professional development to ensure ongoing effectiveness (Lander, Eather, Morgan, Salmon & Barnett, 2017). In research relating to the feasibility of fundamental movement assessment in pre-schoolers, it has been suggested that training of less than half a day is preferable (Klingberg et al., 2019). However, a systematic review of teacher training programs suggested training of less than a day, comprehensive subject and pedagogy content, ongoing support, and a measure of teacher satisfaction with training (Lander et al., 2017). Given the findings in the present study, suggestions such as online resources, short but regular CPD, and tailord support to support the individual teacher and school's needs, should be considered as potential solutions to overcome the common barriers found by teachers.

In addition to this training, schools may also benefit from the use of other resources. Technology was consistently mentioned as a way to provide evidence and ease the burden on teachers 'you tend to feel technology would help'. Children often found themselves talking about technology ('a phone or camera') and other things ('pen and paper') that may help the recording of an assessment. However, it has also been suggested that technology may interfere and increase complexity of the

feedback process, and teachers should reflect on its use (Koekek & Hilvoorde, 2018). Nevertheless, within the assessment process, technology may have the potential to facilitate authentic assessment opportunities by enabling teachers and students to share the experience via platforms such as app based software (VanRossum & Morley, 2018). In the present study however, children often stopped themselves from mentioning technology when they realised it challenged their current perceptions of PE. For example, many of the children questioned if they would be allowed to use technology such as iPad's in PE, or that;

> *If you used a pencil and paper, that wouldn't be something that you need to do in PE* (KS1FG6P33)

Although this would be commonplace in all other lessons, it was not seen as something that could be done in PE. This echoes the perceptions of teachers who, as previously mentioned, often do not transfer their practices from other subjects into PE (Edwards et al., 2019).

It was standard practice across our participating focus group sites that PE was delivered by one adult, with many teachers and children suggesting that there should be at least a second person to assist during an assessment. Whilst this could be a teaching assistant or a researcher, it was also suggested that the children themselves could be involved in the assessment process. This aligns with the wider philosophy of physical literacy, in that the process should be person-centred (Green et al., 2018). Self-assessment in children has also been found to promote self-regulated learning and self-efficacy (Panadero, Jonsson, & Botella, 2017). Research of self and peer assessment in primary PE is limited. In a Norwegian sample of secondary school aged pupils, 50% of participants had experience of assessing their own work in PE, but

limited experience of peer assessment (Leirhaug & Annerstedt, 2016). In addition, several teachers in this study expressed their scepticism about facilitating peer assessments, reflecting that it might be difficult for students to be honest about their peers (Leirhaug & Annerstedt, 2016). This was echoed in the present study by academics/practitioner focus groups, who questioned whether this could affect the validity of results. In a meta-analysis, self-assessment components were significant moderators on self-efficacy and could be used to promote student's autonomous use of learning strategies (Panadero, 2017).

In practical terms, children were conscious they did not want an assessment to take up a whole PE lesson (typically less than an hour).

*(The assessment should take) about half an hour for everybody* (P31KS1FG6)

Previous research into assessment feasibility has also recognised time taken to administer an assessment as a crucial factor to consider. Klingberg et al., (2018) suggested that a 'good' assessment of fundamental movement skills in pre-schoolers should take less than 10 minutes, whilst Beattie et al., (2015) considered anything less than 30 minutes to be 'good' and less than 15 minutes 'excellent'. However, considering an average class would contain 30 pupils, it is clear that assessing a whole class individually in one lesson is not appropriate. Adults however seemed to feel that an ideal assessment would allow them to administer and provide feedback during a lesson, removing the potential of further 'paperwork' outside of class time. Members of the academics/practitioner group were consistent in suggesting that the assessment should be a regular process, over time, to build up a longitudinal picture of an individual's physical literacy journey. This was also recommended by the children, who were aware they would need an appropriate length of time between

assessments to allow for any improvement. As a result, any future assessment should consider the burden on the child and teacher versus the potential benefit of a comprehensive and time-consuming assessment process.

### *5.6.2 Strengths and limitations*

Within the available literature to date, this is the first study to qualitatively investigate stakeholders' perceptions of physical literacy assessment and one of few studies in wider PE/PA assessment research study to consider children as stakeholders. As a result, this study gives unique insight into perceptions regarding physical literacy assessment, allowing for a rich understanding of how researchers and teachers may be able to assess physical literacy effectively. Findings indicated a number of actionable recommendations that could influence the feasibility of implementing a physical literacy assessment in context. This a novel area of physical literacy development, that will have important implications for future research and practice. Conclusions will be enable researchers to provide evidence based justification for assessment development, which could support the use and sustainability of a physical literacy assessment in young children within a school. Although admittedly, this study only focussed on physical literacy assessment in this context. In line with the aims of the study (i.e. to explore experiences of existing assessments) children aged 6-7 years old were included, as Study Two (Chapter Four) indicated a lack of validated tools in younger ages, and it could be assumed experiences within this younger age group would be minimal. However, the participants within the teacher focus groups did include those with experience of the EYFS framework (Department for Education, 2017) and these responses could be applied to younger children. Future research is needed to consider the perceptions of these younger children, with stage appropriate methodology.

Focus groups were conducted across England, Wales and Scotland, in a range of demographic settings, allowing insight into these different contexts. The findings however do not necessarily allow for generalisation for different age groups, or assessments conducted outside of the UK school environment. Interestingly, after conducting focus groups in sites across England, Scotland and Wales, participants did not disclose major differences in experiences with assessment in PE, despite differences in curriculum and funding models. However, in depth analysis of comparisons of experiences across the United Kingdom was outside of the scope of the current study and could warrant further exploration. Future research could look to compare findings across these contexts to identify strengths and weaknesses of the different approaches adopted throughout the UK.

It should also be noted that despite contacting 14 schools, approximately only 10% of teachers agreed to take part in the present study. It is important to acknowledge that those who agreed to take part may have more positive experiences with physical literacy, PE and assessment, and are therefore more willing to engage in research in this area. Reasons for non-participation were not collected. In line with COREQ (Tong et al., 2007), future research should look to gather information regarding non-participation to improve future study design.

Whilst it is generally agreed that assessment of physical literacy is important beyond school PE and should be considered across education, sporting, recreation, and health contexts (Barnett et al., 2019), this was also outside the scope of the current project, and we would encourage further research across these areas. In particular, study findings suggested that parents/guardians should also be considered stakeholders in this age group, and as a result, future research should look

consider the perceptions of parents concerning their child's physical literacy assessment.

### *5.7 Conclusions*

The aim of this study was to explore key stakeholders (academics/practitioners, teachers, and children) views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups, with a view to informing the development of a rigorous, aligned and feasible physical literacy assessment for use with children aged 5-7 years old.

Findings in this study suggest that although participants indicated *demand* for an appropriate physical literacy assessment, current *existing assessments* do not meet the needs of all stakeholders wanting to use them. Any future assessments of physical literacy should consider existing successful assessment methods that can be transferred into a physical literacy context. There are numerous factors that can influence *implementation* and *acceptability* of an assessment, and those developing an assessment should consider the balance between the purpose of the assessment and the potential burden on all those involved in the assessment process, represented in the current study. This should include the consideration of logistical issues such as time, training and resources needed, as well as the theoretical and philosophical implications of assessing physical literacy. As called for by the stakeholders within this study, for an assessment to have a lasting positive impact, results from an assessment should be meaningful at individual and population level, providing evidence for both accountability and learning purposes. Future work should synthesise these findings with that of wider relevant literature, to produce actionable

and informative research to inform the development and piloting of a physical literacy assessment tool in this context.

Fundamentally, the findings in this study provide support for previous recommendations in assessment, physical literacy, and content validity research (Hay & Penny., 2013; Edwards et al., 2018; Green et al., 2018; Mokkink et al., 2018; Barnett et al., 2019). The current study extends on this, by presenting the intentions, needs, values and resources of various assessment users (Edwards et al., 2018; Barnett et al., 2019). Findings indicate key issues that should be considered regarding the feasibility of a physical literacy assessment in this context. To the best my knowledge, this is the first study to qualitatively investigate stakeholders' perceptions of physical literacy assessment. It is also one of few studies to consider children as stakeholders, and involve children in research regarding the development of an assessment for children. The present study provides extensive detail of this formative stage of assessment development and a rich and in-depth insight into the perceptions of children, teachers, and physical literacy academics/practitioners. As such, it is hoped that this research may provide the foundation for the development of a future physical literacy assessment tool for this context.

# Chapter Six:

# Recommendations for a Physical Literacy Assessment Tool for Young Children

*6.1 Thesis study map*

| | |
|---|---|
| Study One (Chapter Three): Global interpretations of physical literacy | Objectives:<br>• To collate, compare, and critically review existing international definitions of physical literacy<br>Key Findings:<br>• Seven prominent international groups were identified as currently working within the field of physical literacy<br>• Definitions, approaches, understandings, and philosophies differ between these groups<br>• Margaret Whitehead's definition of physical literacy is consistently referred to as the basis for international definitions |
| Study Two (Chapter Four): A systematic review of assessments related to physical literacy among young children | Objectives:<br>• To systematically review the academic literature for tools to assess the domains of physical literacy within children aged 3-7.9 years<br>Key Findings:<br>• 27 assessment tools used in children aged 3-7.9 years old were included; affective (n=7), physical (n=15), cognitive (n=6).<br>• Studies often failed to comprehensively consider/report measurement properties and feasibility issues |
| Study Three (Chapter Five): Stakeholder perceptions of a physical literacy assessment for young children | Objectives:<br>• To explore key stakeholders' views of current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups<br>Key Findings:<br>• All stakeholders indicated demand for an assessment |

| | |
|---|---|
| | • Existing assessments do not meet the needs of all stakeholders wanting to use them<br>• Implementation ease affected by the balance between the purpose of the assessment and the potential burden on those involved in the assessment process |
| Recommendations for a physical literacy assessment tool for young children | Objectives:<br>• To draw on research findings from within this thesis and externally, to identify common themes and provide evidence based recommendations for a physical literacy assessment tool, suitable for use in young children |

### *6.2.1 Introduction*

Historically, the debate about whether physical literacy should and could be assessed has been anchored to the philosophical underpinnings that characterise the 'Whiteheadian' approach to physical literacy. In her most recent publication, specific reference is given to 'charting the journey', which is Whitehead has preferred term for assessment (p. 74, 2019), and it is acknowledged as a crucial part of developing physical literacy (Whitehead, 2019).

Throughout this thesis, the needs, barriers, existing research and implications regarding physical literacy assessment in young children have been explored. In line with the aims and objectives of the project, the methods adopted have allowed detailed, pragmatic, and transparent research regarding physical literacy assessment in this context to be collected. In awareness of criticisms from Harvey and Pill (2018), Jurbala (2015), and Cairney et al. (2019) regarding the lack of empirical evidence for physical literacy, this chapter draws on rigorous research, both within and outside the thesis, to identify and synthesise common themes. Ten specific recommendations are presented, in no particular order, for consideration in the assessment of physical literacy in young children.

*Table 6.1* Recommendations for a physical literacy assessment tool for young children

| | |
|---|---|
| Who | A trained class teacher should administer summative assessment. The child and teacher should be involved in formative assessment. Stakeholders (e.g. academics/practitioners, teachers, parents and children) should be involved throughout the assessment development process |
| What | Should be holistic and conducted in a range of environments (e.g., land and water). Multiple assessments should be conducted throughout childhood to contribute to a longitudinal assessment. Involve a combination of formative (e.g., informal daily feedback) and summative assessment which could include adapted versions of: KAH (Santos-Beneit et al., 2015), Pre- FPQ (Wiseman et al., 2016), PMSC (Barnett et al., 2016), TGMD-3 (Ulrich, 2013), MOBAK-3 (Herrmann, & Seelig, 2017), PLAYfun (Cairney et al., 2018) |
| Where | Conducted in a school setting, considering equipment, time, and feedback protocol of the individual school |
| When | Informal formative assessment should form part of a teacher's daily practice. Summative assessment, involving all domains, should be completed at least every term, with feedback provided to each individual child also within this time period |
| How | Assessment pedagogy should be engaging and empowering for both the child and assessment administrator. Stage appropriate self-assessment should be incorporated. Technology should be used to support physical literacy assessment |

### 6.2.2 RECOMMENDATION 1: A physical literacy assessment should represent all domains holistically.

Whilst the definition and understanding of physical literacy is still developing, there remains difficulty in developing an accurate physical literacy assessment (Edwards et al., 2018; Barnett et al., 2019). It is suggested that a physical literacy assessment aligned with a monist view, in any age group, should give the affective, physical and cognitive domains of physical literacy equal status (Whitehead, 2019). However, Study Two (Chapter Four), identified that the majority (n=15) of assessments in this age group were related to the physical domain. Jurbala (2015) offered caution with regard to the conflation of physical literacy with practical physical tests undermining conceptual meaning. This caution relates to the reductionist misconception that physical literacy and fundamental movement skills are indeed the same thing (Almond, 2013; Giblin et al., 2014; Green et al., 2018; Hyndman & Pill, 2018). Within Study Three (Chapter Five), participants recalled only physical assessments, indicating that as such these assessments are most prevalent in practice. Future physical literacy assessments should be holistic in their approach, and *equally represent* and include assessment of the physical, affective and cognitive domains.

Based on the international literature sources identified in Study One (Chapter Three) (Chapter Three), 45 sub-elements (n=12 affective, n=20 physical, n=13 cognitive) were identified relating to current understandings of physical literacy (see Table 4.3, p.106). Incorporating all these sub-elements within one assessment would be extremely time consuming. Time was cited as one of the biggest barriers to assessment and it may be more appropriate to have a *series* of assessments than one comprehensive assessment protocol. It may also be possible to allow users to *select* which sub-elements would be most beneficial to assess for a specific individual or

group, as suggested in guidance by Barnett et al. (2019). According to Barnett et al. (2019), this in itself can promote teacher confidence, autonomy, and increase the usefulness of the assessment. The relevance of which sub-elements to consider may be dependent on a variety of factors, including age, and this is an area that warrants further research. Although it should be clear that unless all domains are represented equally, the assessment and subsequent results do not represent physical literacy, but a specific sub-element and/or domain of physical literacy.

### 6.2.3 RECOMMENDATION 2: Physical literacy assessment pedagogy should be engaging and empowering for all involved in the process.

The findings within this thesis suggest a child-centred assessment should be a *challenging and fun experience* for each individual. Whilst the assessment of physical literacy should not exclusively sit within PE, and this recommendation is applicable for any assessment of physical literacy throughout the lifecourse, pedagogical strategies already employed by teachers can be of benefit to the successful implementation of physical literacy assessment. The ability of a teacher to get to know a child's abilities, listen to their needs, and tailor accordingly can have significant impact on children's enjoyment, engagement, and motivation in primary PE (Domville et al., 2019). The assessment of physical literacy itself should be an enjoyable and motivating learning experience and could be seen as 'Assessment as Learning' opportunity, that is assessment is integrated with learning implicitly (William & Thompson, 2017). Almond (2013) offered three pedagogical strategies to support the development of physical literacy. If the purpose of a physical literacy assessment is to support development, these recommendations can and should be applied to the pedagogy of assessment. Almond (2013) suggested that when instructors adopt a pedagogy of engagement, a relational pedagogy, and an

autonomy-supportive pedagogy that empowers participants to express their "voice", opportunities for the development of physical literacy will emerge. These strategies also relate to the five key features identified in relation to Assessment for Learning within a PE context: (i) Empowerment, (ii) Physical Activation, (iii) Constructive Alignment, (iv) Grade Generation, (v) Negotiation (Tolgfors, 2018). The assessment administrator has a key role in creating a positive environment that supports a child's psychological need for autonomy, competence and relatedness (Domville et al., 2019). In line with findings from Study Three (Chapter Five), and existing research (Almond, 2013; Tolgfors, 2018) with specific reference to physical literacy assessment in practice, this could manifest in a range of ways, for example:

- Children should feel valued and supported
- Children themselves should be included within the assessment process to support autonomy
- Stage appropriate peer assessment should be included
- All children should receive regular feedback and be supported to act on it
- Assessment should focus on empowering children as lifelong participants in physical activity

Relating this to recent research exploring meaningful PE, features such as social interaction, fun, challenge, motor competence and personally relevant learning can provide guidance for a teacher's planning and instructional decisions and the enactment of particular pedagogical strategies (Beni, Chróinín, & Fletcher, 2019). Many specific suggestions such as 'offer opportunities for solo, partner, small group and teamwork at varying times' (p. 629) were given that could influence the development of an meaningful physical literacy assessment (Beni et al., 2019). In addition, children also reported increased enjoyment when they perceive their

teacher is involved, engaged and showing interest (Domville et al., 2019). The assessment experience should therefore be a positive experience for the teacher administering the assessment, which relates to wider recommendations regarding CPD, ease of implementation, and the usefulness of the assessment.

Although participants within Study Three (Chapter Five) spoke positively of a potential physical literacy assessment, they were also wary of the academic, stress and pressures placed on children and schools by assessment in core subjects. Careful consideration of Recommendation 2 is vital to avoid this negative association with the implementation of a physical literacy assessment

### 6.2.4 RECOMMENDATION 3: Physical literacy assessment(s) should be conducted in a range of environments.

Whitehead (2019) suggested that in line with existentialism, a wide range of situations and environments, 'in which it is feasibly possible' (p. 75), should be utilised within an assessment to enable varied physical interaction and richness of experience (Whitehead, 2019). However, this may not be practical, and it may be that separate assessments are conducted within *different environments*, or one environment (i.e. land) is more suitable for assessment within a school context. This may also relate to cultural context. For example, within Canada, snow and ice are much more common and this is reflected in their inclusion as movement environments with CAPL-2 (Longmuir et al., 2018). It should be considered that within the National Curriculum in England, swimming instruction must be provided in key stage one or two (Department for Education, 2013) and swimming is considered to be a 'lifelong physical activity' (Hulteen et al., 2015). This suggests that there may be a demand for some water-based assessment of physical literacy within

an English cultural context in this age group. Within Study Two (Chapter Four), despite the inclusion of international literature, all assessments related to land-based activities. This presents the need to develop an aquatic based assessment within this age group. In a further systematic review of assessments of lifelong physical activities conducted by Hulteen et al. (2015), only two assessments were found to relate to swimming (Erbaugh, 1978; Zetou, Nikolaos, & Evaggelos, 2014) and only one of these was validated in the children aged four to six years old (Erbaugh, 1978). Although these were not included in the current review, they could be useful for future assessment development. In addition, it may be appropriate to consider other lifelong physical activities identified by Hullteen et al., (2015), such as dance and cycling, in the development of a physical literacy assessment tool.

In conclusion, this recommendation should be guided by the principles of what is practical and feasible. For example, the inclusion of any specific aquatic assessment would form a small part of a wider physical literacy assessment protocol. Yet crucially, there needs to be more assessment within different environments to fully capture physical literacy. However, this may be difficult to operationalise in practice.

### 6.2.5 RECOMMENDATION 4: A physical literacy assessment should involve a combination of assessment for learning (formative) and assessment of learning (summative).

Stakeholders within Study Three (Chapter Five) recognised that assessment should be useful for both *accountability* and *learning* purposes for children aged 5-7 years old. Summative assessment is considered to be a more formal measure of what has been learnt (Hay & Penny, 2013). Information gathered through summative assessment may be powerful for accountability at a macro level to communicate

information at a systemic level (Hay & Penny, 2013). In the UK for example, this information can be useful for providing evidence for school inspections, funding, and monitoring of trends and such assessment is widely integrated into educational practice accepted as a necessary part of education. However, this is not without tension, with many teachers having difficulty with the pressures of the testing instruments used to satisfy demands for accountability (Black, 2015). In addition, within physical literacy, research has suggested that principles such as 'empowerment and embodiment' cannot be assessed mechanically and summative (p. 116, Lundvall, 2015), and that conventional, linear measurement assumptions are inappropriate for the assessment of physical literacy (Edwards et al., 2017; Green et al., 2018). As a result, physical literacy assessment should always include some aspects of assessment for learning as this formative information can be used to evidence a child's journey, develop teaching effectiveness, assist wider curriculum development and most importantly, aid the development of a child's physical literacy.

Within Study Three (Chapter Five), however, academics and practitioners agreed that the assessment should not be something that is 'just done to them (children)', linking this to assessment for learning, rather than assessment of learning (Tolgfors, 2019). Nonetheless, researchers have stated that Assessment for Learning can be both formative and summative, as long as the purpose is to support children's learning (Lierhaug & MacPhail, 2015). As such, it is appropriate for physical literacy assessment to include both formative and summative aspects.

In Whitehead's view, phenomenologically aligned assessment will treat the individual as unique, be based upon the child's own data, with no comparison to others (2019). This will allow the appreciation of an individual's unique journey. As a result, this third recommendation suggests the use of separate assessments to fulfil

the many purposes required by a physical literacy assessment. For example, smaller, more informal formative assessments should become part of the teacher's daily practice. For example, this could include talking about a child's mood in relation to physical activity, observing and feeding back on movement technique, asking a child about their knowledge and understanding of sedentary behaviour. These informal assessments could also be completed by family, friends, coaches and other childcare professionals such as nursery workers, childminders etc.

More formal, summative assessments should be conducted at regular intervals to produce more *rigorous data* that can be impactful on a macro and systemic level. Results from Study Three (Chapter Five) suggest that a teacher is the preferred administrator of the assessment, but depending on the purpose of the assessment, for example if the assessment is being used for research purposes, a different type of expertise or training may be necessary. Findings from Study Two (Chapter Four) suggest that KAH (Santos-Beneit et al., 2015), and Pre-FPQ (Wiseman et al., 2016), may be a useful starting point for the assessment of the cognitive domain with children aged 3-7 years old, as they reported good measurement properties, feasibility, and represented a range of cognitive sub-elements. Within the affective domain, PMSC (Barnett et al., 2016), scored highly across appraisal. However, significant research needs to be done within this domain to establish measurement properties and feasibility and consider the appropriate measurement of confidence and motivation within this age group. Within the physical domain, evidence of feasibility and measurement properties are more well established and TGMD-3 (Ulrich, 2013), MOBAK-3 (Herrmann, & Seelig, 2017) and PLAYfun (Cairney et al., 2018) could be incorporated within a physical literacy assessment protocol. However, future work would be needed to consider the sub-elements not assessed within these

existing assessments, and how these assessments could be administered and used in practice to evidence physical literacy in a holistic sense.

### 6.2.6 RECOMMENDATION 5: Physical literacy assessment should involve stage appropriate self-assessment.

Findings throughout this thesis suggest young children should be involved in the assessment process, in a stage appropriate way, with a view that this will lead to self-awareness, self-reflection and peer-assessment in the future. *Self-assessment* has been promoted within education in recent years, with little attention given to the issues of accuracy and validity that could undermine this process (Brown, Andrade & Chen, 2015). This was reflected within Study Three (Chapter Five), where teachers and academic/practitioners were reluctant to involve children in the assessment, referring to validity and feasibility of the assessment and children's self-awareness. The reliability of assessment is necessary for the validity of assessment interpretations, particularly at a systemic level (Brown & Harris, 2014). In line with previous recommendations, self-assessment could contribute towards formative rather than summative assessment. For many teachers, this approach to formative self-assessment could remain difficult as formative self-assessment involves a radical change in the way in which many teachers relate to their students and the ways they behave in the classroom (Black, 2015). Although the pitfalls of self-assessment are complex (i.e. validity, reliability, cognitive and linguistic ability), reliability issues can be addressed by incorporating the use of teacher ratings alongside, keeping self-assessments private and confidential to promote accuracy, and minimising social response bias by encouraging students to be honest and accurate (Brown et al., 2015)

Children in Study Three (Chapter Five) showed insightful awareness of the assessment process; many were familiar with the term 'growth mind set' and the view that an assessment was there to help them learn. They were enthusiastic when asked how they could be involved in the assessment process, offering to help classmates and record activities. They also spoke about how they would have to be 'fair', 'responsible' and 'kind' to be able to do this properly. Examples of this could include setting out equipment, filming activities, and structured reflection on their own assessment and learning. These again align with research from Beni et al., (2019) exploring *meaningful and authentic experiences* in PE. Meta-analyses have highlighted that interventions to improve self-regulated learning that include planning, monitoring and evaluating were the most successful in improving motivational outcomes and academic performance in primary school children (Dignath, Büttner, & Langfeldt, 2008). It has been proposed that taking into account children's views, needs and perspectives will have significant implications for education and specifically physical education (Quennerstedt, 2019). The consistent implementation of developmentally appropriate versions of self-assessment will enable individuals to develop life-long skills (Brown & Harris, 2014), which aligns with the longitudinal philosophy of physical literacy. Ultimately, it is hoped that stage appropriate self-assessment will lead to *self-awareness, responsibility and motivation* to enable long-term engagement in physical activity.

### 6.2.7 RECOMMENDATION 6: The class teacher should lead a physical literacy assessment within a primary school but should be supported by appropriate training and resources.

Study Three (Chapter Five) highlighted that stakeholders believed the generalist class teacher should be in charge of physical literacy assessment in children aged 5-7 years

old, as they are best placed to understand the children in their class. Across the assessments specifically mentioned within Recommendation 4, (KAH, Santos-Beneit et al., 2015; Pre-FPQ, Wiseman et al., 2016; PMSC, Barnett et al., 2016; TGMD-3, Ulrich, 2013; MOBAK-, Herrmann, & Seelig, 2017; PLAYfun, Cairney et al., 2018), most studies reported that these assessments were delivered by research assistants. To be useful in context, all training and resources should be designed at a level to be understood by generalist primary school teachers, and this process should be a co-design process between researchers and teachers themselves, to improve the usefulness. This could include written guidance for how to administer questionnaires, model videos of how to score physical competence assessments, and the creation of communities of practice to support the ongoing development of physical literacy assessment.

In the UK, primary school teacher confidence and competence regarding PE has often been viewed as a potential barrier to children's lifelong physical activity. Morgan and Bourke (2008) highlighted teacher's lack of confidence in teaching primary school physical education. Taplin (2013) highlighted that this lack of confidence often resulted in teachers being less likely to deliver high quality PE, ultimately limiting the positive impact on pupils' physical literacy. This is an issue which, according to Paine has been amplified by the reduction in hours devoted to PE training for generalist teachers (2013), and a misalignment between the reality of teaching and the expectations of the PE National Curriculum in a New Zealand context (Dyson et al., 2018). However, teacher behaviour was identified as a key influence on children's enjoyment and engagement in primary PE (Domville et al., 2019). Given these factors, it was not surprising that teachers within Study Three (Chapter Five) called for specific training regarding the implementation of a physical literacy

assessment. A recent paper examining the effects of CPD on teacher's and teaching assistant's self-efficacy in relation to PE found that CPD can be of benefit in the short term, but in the long term this benefit is confounded by age, gender, years of experience, perception around the quality of course and initial efficacy beliefs (Maopoulou, Neville, Ntoumanis, & Thomas, 2019). Results from the Study Two (Chapter Four), indicated that many published studies do not report the level of expertise needed by someone to administer an assessment, or the level of training required. The importance of this is amplified when considering the demographic backgrounds of teacher participants within Study Three (Chapter Five). Within the participant group, experience and expertise ranged from school PE co-ordinators, PE specialists, generalist class teachers and teaching assistants. Therefore, assessment guidance should be suitable across all these groups, or stipulate the level of expertise required to lead an assessment. This was also an issue identified by Van Rossum et al. (2019); ultimately, if the purpose of an assessment is to be used in the real world to influence practice, this information has to be considered and included in reporting in the scientific literature. Based on the findings of Makapolou et al. (2019) it was suggested that personalised and tailored approaches to CPD should be adopted to ensure learning is maximised for all teaching staff involved. Crucially, allowing teachers to offer their own ideas and solutions regarding CPD is an autonomy supportive process. A review of teacher training in school-based PE interventions highlighted the importance of reviewing teacher satisfaction and fidelity to CPD, and suggested measurement of this should be incorporated into the development of training to improve effectiveness (Lander et al., 2017).

The teacher participants within Study Three (Chapter Five) gave specific recommendations for CPD regarding physical literacy assessment. For example,

teachers identified that they would like practical examples, whether in person or online.

> *Some of the video examples that you get on YouTube and things, of sessions… to give us an example of what would be good practice…what you'd be looking for the child being able to do*
>
> P16TFG5

Bridging the gap between theory and practice is a key feature of effective CPD in PE (Lander et al., 2017; Armour et al., 2017; Harris et al., 2015). Yet as discussed earlier the operationalisation of physical literacy has been critiqued (Jurbala, 2015). Teachers also wanted the CPD support to be *on going*, which also suggests the use of online resources in this process. Having *online and easily accessible resources* may also overcome some of the reported barriers associated with time and accessibility (Harris et al., 2012; Armour, Quennerstedt, Chambers & Makopoulou, 2017; Lander et al., 2017). In addition, according to the feasibility matrix, to be considered 'good' training should last for approximately half a day. This aligns with the thoughts uncovered in the focus group about the difficulty in finding time to attend CPD training. In line with findings from Harris et al. (2012), CPD in the primary PE context should engage with teachers, not rely primarily on resources and have regular and continuing follow-up support. Crucially, CPD should target negative perceptions associated with PE and physical literacy to improve teacher confidence and competence (Domville et al., 2018). This CPD should be co-created with teachers to identify in more detail how they would want to learn, for example Edwards et al., (2019) adopted a needs assessment phase when developing previous physical literacy CPD. CPD regarding physical literacy assessment should be embedded within

PE CPD, contextualised, dynamic and continuing to be effective (Armour et al., 2017). Specific examples of physical literacy assessment CPD could include in-school training, observations. The development of networks/communities of practice, and follow up interviews with teachers to facilitate CPD feedback and improve sustainability.

### 6.2.8 RECOMMENDATION 7: Physical literacy assessment should be embedded in a school context, considering equipment, time and feedback processes.

In terms of resources, many of the assessments included within the systematic review included equipment typically available within a primary school, with the majority scoring 'excellent' or 'good' within the usability matrix developed in Study Two (Chapter Four), The usability matrix suggested an 'excellent' assessment would take no longer than 15 minutes. This may not be realistic when conducting a summative assessment and may indicate the need to split assessments into separate protocols, potentially by domain, or alternatively by sub-element. Whilst many of the children in Study Three (Chapter Five) were enthusiastic about the potential of a physical literacy assessment. Some participants suggested entire assessment days, while others suggested that they would not want a whole PE lesson devoted to an assessment. Teachers consistently referred to wanting an assessment to be *quick and easy to use*. Some teachers spoke of an online 'traffic light' style system that could be completed whilst children were getting changed. As opposed to 'traffic lights' but with similar effects, terminology such as 'initial, emerging, competent, proficient' (Cairney et al., 2018), 'beginning, progressing, achieving, excelling' (Longmuir et al., 2015), 'exploring potential, developing potential, consolidating potential and maximising potential' (Whitehead, 2019) have been used. The use of more traditional style 'levels'

has endured despite the fact that Whitehead has criticised approaches that have used normative standards, developmental milestones/expectations, and objective/absolute standards (Whitehead 2010; Green et al., 2018).

Teachers also spoke of the potential of focussing on small groups of children for ease of implementation. The number of participants within an assessment was one of eight of the considerations within the guidelines for selecting a physical literacy assessment method presented by Barnett el al. (2019). Academics/ practitioners in Study Three (Chapter Five), extended this idea, suggesting that by creating multiple 'snapshot' pictures of assessment with smaller groups could be compiled and tracked *longitudinally* over time. This aligns with suggestions from Green et al. (2018) that physical literacy assessment should be continuous and highly individualised. For many of the teachers, the benefit of creating this type of evidence was for their end of term reports, whereby they were required to give feedback but often struggled to recall detailed information at the end of an academic year. For teachers of the reception class, this also tied into the EYFS framework, for which various other outcomes needed to be evidenced. This again links back to the potential use of technology to collect, store and *use* data (VanRossum et al., 2019). The final point, that of use, being especially pertinent as fundamentally, the assessment should be useful and not just an assessment for assessment's sake. Within the 5-7-year-old age group, it may be appropriate that this feedback is a planned and structured conversation with the child, supported by the evidence collated in a shared area for the teacher, child and parent. The introduction and use of ePortfolios within an early year context saw a significant increase in the frequency and quality of formative assessment documentation (Hooker, 2017). Feedback can serve, through the specific use of interactive dialogue, as a necessary stage in learning, but this step in the

assessment process is often not given the prominence it deserves (Black, 2015). Teachers may need support to facilitate this feedback process; this may include questions prompts, example videos or potential progression steps. This conversation could provide richer detail and context for the child and to the assessment process.

### 6.2.9 RECOMMENDATION 8: Physical literacy assessment should be conducted, evidenced and feedback given to the child, at least once every term.

This recommendation is appropriate when conducting assessment of physical literacy with school-aged children as it considers the practical and logistical constraints of the school context. However, more research is needed to consider the implications of assessment timing in relation to physical literacy development, as well as the assessment in younger children outside of a formal school setting. There was debate between teachers in Study Two (Chapter Four) whether they felt they would want to complete an assessment every term (typically 12 weeks), every half-term (typically six weeks), or whether it could be a continual process that did not have to be regimented by a strict assessment period. For teachers stating an assessment every half term was warranted, this was often linked to their thoughts around completing an activity unit every half term and wanting to see progress via a summative assessment.

There is a lack of guidance regarding assessment frequency in the primary PE National Curriculum, and this has resulted in highly variable practice (VanRossum & Morley, 2018). The lack of curriculum guidance does, however, offer flexibility. Previous reviews have called for 'more work to be done' regarding the regularity of assessment in PE (López-Pastor et al., 2013). The use of multiple, shorter 'snapshot'

assessments to contribute towards a more complete physical literacy assessment process may be more feasible in practice. Although it is anticipated formative physical literacy assessment will happen more frequently, this process, incorporating all the domains, should be evidenced in some way (e.g. ePortfolio, reflective diary, recording etc.) and the teacher should feedback to each child at least once a term. Summative assessment, incorporating all domains of physical literacy, should be completed at least once every academic year. At a school level, focus should be on at an individual level to prevent comparison of themselves to others, but data collected could be powerful to provide accountability for macro level change. For example, it could allow for the identification of nationwide trends, provide evidence to influence policy development, and evaluate the impact of any systemic change. At a macro level within the UK, assessment developments have the potential to influence the development of primary PE national curriculum. Whilst as an individual level, the incorporation of a more holistic approach to assessment will hopefully lead to a greater appreciation of the affective and cognitive domains of physical literacy. At both levels, the assessments and the information gathered will have a specific purpose and use.

#### 6.2.10 RECOMMENDATION 9: Parents/guardians should be involved in physical literacy assessment.

Insight from teachers and academics/practitioners in Study Three (Chapter Five) suggested it is also be appropriate to engage parents/guardians in the physical literacy tracking process in this younger age group. As a result, in line with this thesis, this recommendation can be applied to children aged 3-7 years old. Examples of involvement in the formative assessment process could include the parent/guardian being able to; access *assessment feedback*, contribute to *evidence collection* (such as pictures and videos), *utilising resources* to facilitate physical literacy development.

This links to wider literature regarding PA in young children, who identify parents as a key influence on children's PA (Mitchell et al., 2012; Yao & Rhodes, 2015; Bingham, Costa, Hinkley, Shire, Clemes & Barber, 2016; Noonan et al., 2016; Domville et al., 2018). This recommendation looks to enable the co-operation, interest and engagement with a child's physical literacy from both home and school life. Whitehead (2019) suggested that parents/guardians should maximise movement opportunities, provide opportunities to interact with a range of settings, encourage exploration and be active with the young child (p.59). Further research has highlighted that family and community engagement should be a feature of school-based physical activity programs to increase physical literacy and that parental engagement in this process should be bidirectional and continuous (Castelli, Centeio, Beighle, Carson, & Nicksic, 2014). Meta-analyses examining the relationship between parental involvement and educational outcomes have indicated a strong positive relationship (Castro, Expósito-Casas, López-Martín, Lizasoain, Navarro-Asencio, & Gaviria, 2015; Ma, Shen, Krenn, Hu, & Yuan, 2016). Several factors influence this relationship, for example; consistent expectations of the child between school and parents, open communication, supervision of learning activities, home-school connection, the capacity to engage parents, respectful and effective leadership in relation to families and children, and the development of authentic partnerships (Castro et al., 2015; Ma et al., 2016). These factors should be considered with regard to the involvement of parents within the physical literacy assessment process and in the ongoing process to support a child's physical literacy development.

### 6.2.11 RECOMMENDATION 10: Technology should be used to support physical literacy assessment.

Technology can be used to support family *engagement*, as previously suggested, the use of ePortfolios in an early years setting allowed teachers to easily collate information and provide ready access to them for parents, family, other teachers and children simultaneously (Hooker, 2017). The use of technology such as this could also be beneficial to the *longitudinal* assessment of physical literacy throughout a child's school life. A factor which would presumably be welcomed by teachers, as within Study Three (Chapter Five) many were hesitant at the thought of more paperwork and time intensive assessment protocol. The use of technology could also be linked to the EYFS framework (Department for Education, 2017) and some schools experiences of using online tracking systems in other subjects, not yet introduced into PE. Within the systematic review, the majority of affective and cognitive assessments used pen and paper questionnaire-based approaches. Many of these were conducted on a one-to-one basis, which is time and labour intensive for administrators and participants, although this may have followed the research grade approach. The Pre-FPQ (Wiseman et al., 2016) was the only assessment to be completed on an iPad in this age group, although this may be due to the publication date of some of the assessments, some of which may be suitable to be updated into an interactive format. As a result of findings from Study Two (Chapter Four), Study Three (Chapter Five) and wider research evidencing the use of technology in this age group, this recommendation can be applied throughout the 3-7-year-old age range.

For the use of technology in assessment to be effective, it is crucial that teachers are digitally literate and possess knowledge of the existence, components and capabilities of various technologies as they are used in teaching and learning

(VanRossum & Morley, 2018). In PE in particular, technology has been deemed to have a future in the subject but needed to consider teachers' knowledge and professional development (Casey, Goodyear & Armour, 2017). Furthermore, digital technologies should not dictate how and what is assessed. Within physical literacy research, the incorporation of technology is currently extremely limited. The potential of active video games has been discussed as a way of developing the elements of physical literacy in a way that promotes a mind-body connection (Sun, 2015). Whilst the role of technology within physical literacy, PE and education more widely is still debated, this allows the opportunity for teachers, children and other stakeholders to inform and be involved in this developing area (Casey et al., 2017). Study Three (Chapter Five), presented examples of this involvement, whereby in all stakeholder groups referenced the use of technology positively. For example, it was suggested that children could film each other and watch it back and assess it together, and teachers and academics/practitioners perceived that this could be less formal, more social and potentially more motivating.

VanRossum and Morley (2018), suggested a three-stage process for the design of a technology based assessment, recommending that it should be conducted as a collaborative process. This development included (i) the paper-based storyboard design demonstrating key functions and assessment process; (ii) simple electronic design demonstrating process, flow and interaction between pages; (iii) professional concept design created by digital design company. Future research in this area could therefore be to follow this process to design, refine and develop a physical literacy assessment tool, incorporating technology and continuing the involvement of key stakeholders. If physical literacy is to have greater impact, there is a need for an assessment to produce larger data sets, and to examine trends and relationships.

Technology may be able to assist in this. At an individual and class level, assessment should primarily be based on a child's own previous assessment and concerned with learning. However, any data gathered in this process has the potential to be stored electronically (i.e. cloud storage, app, etc.) and could be used by other stakeholders, such as researchers and policy-makers, to provide evidence of wider physical literacy trends. Although the implications for privacy and anonymity of participants in this process, especially considering GDPR (General Date Protection Regulation) legislation, would need to be considered.

The use of technology in this age group should not be an area of concern, as many of the child participants in Study Three (Chapter Five) were familiar with a range of different technologies, citing, for example, cameras, tablets, phones, voice recordings, and tracking devices. This is in line with current research that has recognised the increase in the use of digital technologies in educational settings, although the implications of this are not always positive (Goodyear, Kerner & Quennerstedt, 2019; Casey et al., 2017). Nevertheless, with regards to assessment in PE, research has demonstrated the benefits of technology for recording, self-assessment, feedback, flexibility, and the potential to enhance motivation and performance (VanRossum et al., 2019; O'Loughlin, Chróinín, & O'Grady, 2013; Browne, 2015). More research should be done in the current age group to demonstrate the effect of using technology in PE in young children. In particular, research exploring how, both teachers and systems can use digital technologies to enhance assessment in ways that promotes learning, meets high stakes requirements and addresses feasibility (Penney, Jones, Newhouse & Campbell, 2012). In Study Three (Chapter Five), the use of technology in PE challenged some of the children's current views, as they saw a physical literacy assessment within PE, and PE typically

did not involve the use of technology or that in the school setting the teacher was in charge of using the technology, which has the potential to be autonomy thwarting. As discussed previously, an effective physical literacy assessment, which should incorporate the use of technology, should promote *autonomy and empowerment*, enabling the children to feel in control within the assessment process and in relation to their own physical literacy development.

### *6.3 Conclusions*

As highlighted throughout this thesis, there are numerous considerations to be made for how best to evidence physical literacy through assessment. The current chapter has consolidated these considerations into ten actionable recommendations. The development of effective assessment is about balancing the relative importance of these considerations. Ultimately, this is dependent on the context of use and the users of the assessment. Therefore, these evidence-based recommendations focus on how to assess physical literacy assessment in young children within a school-based context.

Physical literacy assessment should holistically represent the affective, physical and cognitive domains, feasibly utilise a variety of environments as appropriate, and be part of a longitudinal assessment process. The use of technology will be beneficial for the collection, sharing and use of this assessment data, and can assist in overcoming many perceived barriers such as time, evidence, family engagement. How the assessment is conducted will mediate the effectiveness of the assessment, and this should be considered in the development of teacher CPD, although more research is needed in this area. Crucially, there should be a combination of separate formative and summative assessment protocols to satisfy the

various demands for a physical literacy assessment, and specific considerations need to be given to each of these approaches.

Considering the finding within this thesis and the recommendations presented, there are many areas that require further research before definitive statements can be made. Whilst the original target age group of this thesis was children aged 3-7-year olds, due to factors previously discussed, many of the final recommendations were not applicable to younger children, particularly in those aged 3-4 years old. Further research is needed to consider this age group, and the assessment of physical literacy outside of a school context. Across all domains, more information is needed regarding the level of expertise and/or training needed by a teacher to administer existing assessments is needed. With regards to measurement properties, future studies should look to improve the reporting of reliability by including details such as the time interval, test conditions and stability of participants between assessments, and calculating intraclass correlation coefficients. In addition, validation of these assessments should look to report responsiveness, as this could be an important factor to consider in the development of physical literacy over time. Furthermore, items relating to the physical literacy sub-elements that have emerged from recent research in Canada and Australia (Dudley, 2015; Cairney et al., 2018; Keegan et al., 2019), such as *tactics* and *safety knowledge*, and those related to Whitehead's conceptualisation of physical literacy, such as *rhythm* and *aesthetic/expressive*, should be incorporated into question guides (2010).

The physical literacy checklist and experiences/perceptions of stakeholder's within Study Three (Chapter Five) suggest the affective domain is the least well represented domain by current existing assessment practice. Future research could use this as the rationale to develop a new assessment of the affective domain of

physical literacy, following the COSMIN guidance for PROM development and content validity.

This chapter has the potential to positively affect the development and use of a physical literacy assessment across both research and practice. Firstly, these recommendations have been developed based on empirical research evidence provided in Study Two (Chapter Four) and Three and the international work of other researchers working within the field, as identified in Study One (Chapter Three). These recommendations provide the foundation for the development of a pilot physical literacy assessment for in young children, for use within a school setting. Secondly, these recommendations were written to be both understood and actionable by teachers within a primary school context, as such, they should be used to guide teachers in the development of their own physical literacy assessment practice. Feedback in both of these areas is welcomed to further the development of physical literacy assessment.

# Chapter Seven:

# Synthesis

*71 Review of thesis*

The purpose of this thesis was to explore the assessment of physical literacy in children aged 3-7.9 years old. The objectives of this thesis were to:

a) Collate, compare, and critically review existing international definitions of physical literacy

b) Conduct a systematic review of existing assessments related to physical literacy among young children

c) Explore and understand the views of relevant stakeholders, in terms of both current practice, and future directions for assessment and effective implementation

d) Provide recommendations for the development of future assessments of physical literacy, suitable for use in young children

This synthesis will bring together findings from across the thesis to discuss strengths, limitations, implications and propose recommendations for future research. Finally, I will reflect on my own experiences of completing my PhD.

*7.3.1 Key findings*

Study One (Chapter Three) examined the approaches of seven international groups implementing physical literacy agendas around the world. Similarities and differences between these approaches were explored. Issues such as philosophy, definition of the core elements, and considering physical literacy as a process or product, were deemed to have implications across research and practice. Whitehead's definition (2001) was found to be utilised or expanded upon by the differing groups,

and this presented a rationale for anchoring the work included within this thesis to Whitehead's conceptualisation of physical literacy.

Study Two (Chapter Four) provided a comprehensive summary of existing tools used to assess the elements related to physical literacy within children aged 3-7.9 years old via a systematic review. A total of 27 of these assessment tools met the inclusion criteria: affective (n=7), physical (n=15), cognitive (n=6). These underwent a rigorous appraisal process. Measurement properties were appraised following COSMIN guidelines (Prinsen et al., 2018; Mokkink et al., 2018 Terwee et al., 2018). Feasibility was appraised via newly adapted usability matrix (based on research from Beattie et al., 2015 and Klingberg et al., 2018). Physical literacy alignment was judged against a novel physical literacy sub-element checklist developed based on the research collated in Study One (Chapter Three).

Results demonstrated inconsistencies with the reporting of measurement properties. Only KAH (Santos-Beneit et al., 2015) achieved a very good risk of bias rating for the reporting of PROM development and content validity, and in the early stages of physical literacy assessment development, these need to be evidenced in greater detail. Only Three assessments considered responsiveness, and all were considered to have doubtful and inadequate risk of bias ratings (Hoeboer et al., 2016; Barnett et al., 2015, Derri et al., 1987). This is an important measurement property to be considered in future assessment validation testing if a driving purpose for physical literacy assessment is to chart development over time. 37% of factors considered within the usability matrix were not reported, and as a result, it is difficult to make conclusions regarding the implementation of existing assessments in practice. Across each of the domains, The ASK-KIDS inventory (Bornholt & Piccolo, 2005), MOBAK-3 (Furtado & Gallagher, 2012), and KAH (Santos-Beneit et al., 2015), assessed the most

sub-elements within the physical literacy sub-element checklist. Suggesting these assessments would be most useful in assessing relation to physical literacy.

Study Three (Chapter Five) provided rich and in-depth insight into the perceptions of children, teachers, and physical literacy academics/practitioners regarding current practice, future directions and effective implementation of physical literacy assessment, through concurrent focus groups. Findings indicated the demand for a physical literacy assessment tool in this context, but identified a number of factors that should be considered regarding the acceptability and implementation of an assessment. Although results from all stakeholders indicated the *perceived demand* for a physical literacy assessment tool, *existing assessments* were not deemed *appropriate,* and were not incorporated into common practice. Specifically, our findings indicate the assessment of areas related to the cognitive and affective domains of physical literacy are currently not conducted. Factors such as time and expertise required should be considered in relation to the purpose of the assessment, and the specific context in which the assessment is being used.

Finally, ten recommendations were offered in Chapter Six for the assessment of physical literacy in young children within a school context. These were based on findings collected throughout this thesis and wider empirical research evidence. These recommendations provided specific but accessible guidance, including reference to philosophy, technology and the incorporation of both formative and summative assessment.

### *7.3.2 Physical literacy assessment:; theory to practice*

As detailed in chapters two and three, physical literacy philosophy can be a point of confusion and contention (Jurbala, 2015). Nevertheless, the philosophy should

ultimately influence what physical literacy looks like in practice, demonstrate how it is different to other approaches (Lounsberry & McKenzie, 2015) and guide how physical literacy could be assessed (Edwards et al., 2018). Based on the findings from Study One (Chapter Three), future work in relation to physical literacy assessment should be transparent in its philosophical approach and understanding of physical literacy.

Judgement regarding philosophical alignment is now a pertinent issue for researchers working within the field of physical literacy. In both Robinson et al. (2018) and Edwards et al. (2018) assessments were appraised based on their 'fidelity to Whitehead' and 'philosophical approach' respectively. Although such attempts to clarify fidelity and philosophical alignment are welcomed, the process followed within these studies to judge philosophical alignment has been somewhat unclear. In Study Two (Chapter Four), I and the supervisory team attempted to create a clear appraisal process that could stimulate engagement and discussion around this area.

In consultation with my supervisory team, it was recognised that we, and potentially no one, are not in a position to objectively judge an assessment's alignment based upon the philosophical underpinnings of monism, phenomenology and existentialism. As assumed within these philosophical approaches, every individual's experiences and perceptions will be different, resulting in different perceptions of assessment (Whitehead, 2007). However, it is possible to identify which tools are aligned with current understandings of the concept. This is exemplified by the physical literacy elements (motivation, confidence, physical competence and knowledge and understanding) assessed by different assessment tools. The term 'sub-element' was used to include elements not included within Whitehead's (2019) definition, but have been referenced in other literature for

example: safety considerations and risk; empathy; self-regulation; reaction time; rules, tactics and strategies of movement (Keegan et al., 2019; Dudley 2015). This was in attempt to be inclusive of the ever developing and multi-dimensional understanding of the concept. This appraisal process also enabled the author to identify which sub-elements of physical literacy are currently not assessed within existing literature, allowing the author to make recommendations for future assessment development.

It was not surprising that many sub-elements of physical literacy were not assessed, as the vast majority of assessment tools identified within the systematic review were created to assess a specific sub-element of physical literacy. This was in line with the purpose of the review, which was to identify if assessments in these related areas could to inform the development of a physical literacy assessment tool. The majority of included assessments related to the physical domain, a finding which was reflected by stakeholders' experiences of using an assessment in Study Three (Chapter Five) and supported the findings of the previous systematic review of physical literacy assessments (Edwards et al., 2018). This perhaps emphasises the philosophically misplaced focus on the physical domain, which has been a point of debate and criticism within the physical literacy discipline (Whitehead, 2010; 2019; Almond, 2013; Giblin et al., 2014; Green et al., 2018). As recommended throughout this thesis, current or future assessments that report to assess physical literacy should holistically represent all domains of physical literacy. Where possible, assessments should have the potential be able to be adapted to potential future understandings of the concept, perhaps suggesting the use of multiple, modular assessments (Barnett et al., 2019; Keegan et al., 2019). This would also enable multiple assessments representing various aspects of physical literacy to be taken at

different time points, to enable a longitudinal tracking of a children's physical literacy journey to be produced.

### *7.3.3 Young children*

This thesis also identified many barriers when conducting research with children aged 5-7 years old. Across the wider systematic review project, the overwhelming majority of assessments found in relation to the domains of physical literacy were conducted with children aged seven and older. Although it should be noted Pre-Play (Cairney et al., 2018), has been used in children between 18 months and 4 years, the mean age was outside the systematic review inclusion criteria and was therefore excluded. This indicates there is potential to assess physical literacy in children in the early years, and future assessment should look to bridge the gap between these age groups by assessing physical literacy continually throughout childhood. This again ties into the notion that physical literacy assessment should be a longitudinal process tracked throughout the life course (Whitehead, 2019; Green et al., 2018),

It was deemed inappropriate to include younger children to discuss their experiences of assessment within Study Three (Chapter Five), as within Study Two (Chapter Four), very few assessments were conducted with children under the age of five, suggesting the experience and ability to articulate key issues in this age group would be minimal. Therefore, children in year two within the UK (ages 6-7 years) were recruited. As a result, from this point on in the thesis, findings and recommendations related to children aged 5-7 years old. This study is the first to include children's perspectives in the development of a physical literacy assessment for children. Findings indicated that children were aware of the importance of a physical literacy assessment, and that assessment could help them develop their own

physical literacy. They indicated that a physical literacy assessment would need to be fun, but challenging, and that this would be different for each child. Findings triangulated across all stakeholder groups highlighted many perceived barriers to implementing a physical literacy assessment tool such as time and teacher expertise, and offered potential solutions to overcome these issues.

As detailed in Chapter Five, there are many perceived issues when including children in participatory research, for example linguistic and cognitive ability (Noonan et al., 2016). Conversely, the research experience and findings within Study Three (Chapter Five), do not reflect this. With specific reference to existing physical literacy assessment research, within Pre-Play, an assessment developed for children before school entry, the cognitive domain was not included, as it was not deemed developmentally appropriate as children were considered not to have the required and/or were able to demonstrate knowledge regarding the importance of PA (Cairney et al., 2018). However, within the wider cognitive results of the systematic review conducted with children aged 3-11.9 years old, all bar one assessment was used in children aged under seven. This indicated assessment of the cognitive domain, and knowledge and understanding and specifically, is possible in children aged 3-7 years old, but it is necessary for future research to clarify what is age and stage appropriate physical literacy in reference to the cognitive domain. Findings from Study Three (Chapter Five), also support this. Children in this study were able to articulate their thoughts to give rich insight into their perceptions regarding assessment, with *self-awareness* being identified as an inductive lower order theme across the children's focus groups. This contradicts recent research the view that children's cognitive and linguistic ability is a barrier to their involvement in research (Noonan et al., 2016). The failure to involve of children in the research process also became apparent in

Study Two (Chapter Four). Most research did not involve children in assessment development, resulting in poor or not reported PROM development, content validity and feasibility scores (Mokkink et al., 2018). It is hoped that the research processes used within this these can be replicated to ensure experiences of including younger children are encompassed within future research.

### *7.3.4 Considerations for assessment development*

Gaps in the research identified within the systematic review in Study Two (Chapter Four) and practical implications identified within Study Three (Chapter Five) highlight clear considerations for the process of developing a physical literacy assessment suitable for use in young children. Largely, feasibility issues regarding the implementation of an assessment are under reported. This supports findings from a similar systematic review that solely focussed on the feasibility of fundamental movement skill assessments, where a quarter of studies were excluded due to a lack of feasibility data (Klingberg et al., 2018). A further systematic review explored the feasibility of teaching training in school based physical activity interventions and results indicated teacher training as a specifically under reported and under researched area in relation feasibility (Lander et al., 2017). In guidance regarding physical literacy assessment in Australia, implementation was identified as an essential factor, but it was outside of the scope of the paper (Barnett et al., 2019). Future research into assessment development should not ignore these issues, and should include factors relating to feasibility and implementation in practice within their reporting in peer-reviewed literature.

As demonstrated in Study Three (Chapter Five), it is important that stakeholders are incorporated within the assessment development process. It is also

important that the view of stakeholders be taken seriously (Griggs, 2012). Positive, tangible, and actionable solutions are presented to overcome the perceived barriers to conducting a physical literacy assessment within a school. This links to recommendations that became apparent within the systematic review; that assessment users also have to be involved in assessment development to be considered positively across the most important measurement properties within COSMIN; PROM development and content validity (Mokkink et al., 2018). As identified in Study Two (Chapter Four), there were many issues related to the measurement properties of existing assessment tools. It may be that the level of detail and rigour required by COSMIN, which was created for health-based instruments, may be too stringent given the quality of available research related to physical literacy assessments.

### *7.4 Original contributions*

As identified in Study Two (Chapter Four), no assessment of physical literacy for use in young children (validated in children with a mean age between 3-7.9 years) exists in current published literature. In Study Three (Chapter Five) academics/ practitioners, teachers and children all recognise the importance of a physical literacy assessment in this context. Therefore, this thesis presents an original contribution to the field by presenting the foundation for the development of a future physical literacy assessment tool for use in this context.

A key feature of Study Two (Chapter Four) was the rigorous and detailed appraisal process followed through the systematic review, adding to the limited empirical research conducted within the field. Novel approaches to judging

assessments based on feasibility issues and physical literacy alignment were developed and presented.

The feasibility matrix, although based on previous relevant research (Klingberg et al., 2018; Beattie et al., 2015), was created based on the specific considerations given to conducting a physical literacy assessment with young children in a school based setting. This checklist will be useful for the appraisal of future physical literacy related assessments, and those that may be suitable for consideration, but did not meet the inclusion criteria to be included within Study Two (Chapter Four). As the first study to appraise the feasibility of assessments related to physical literacy, the findings from this review give unique insight into the potential impact of assessments in practice. They will enable potential assessment users to make informed decisions given the time, resources and expertise available in their own, unique contexts. Results indicated that feasibility was not a priority in the studies reporting these assessments. However, given the importance placed on the feasibility of assessment implementation by stakeholders within Study Three (Chapter Five), it suggests that future research should present this information for greater applied impact.

The physical literacy alignment checklists are the first to synthesis the sub-elements across different international conceptualisations of physical literacy. The use of these checklists enabled a novel, transparent and objective appraisal of existing assessments alignment to current understandings of physical literacy. It is hoped the appraisal process was presented in a clear and replicable way and can stimulate debate regarding the importance and judgement of these factors in relation to physical literacy assessment. Findings indicated that whilst the physical domain is fairly well represented by existing assessments used in this age group, assessment of

sub-elements related to the affective domain are much less established. The design of this checklist will also enable it to be adapted as the understanding of physical literacy continues to develop.

Study Three (Chapter Five) is the first study to involve a triangulation of multiple stakeholders in the formative stages of physical literacy assessment development, and one of the few studies in wider physical activity assessment research that has involved children within this process. Findings indicated the *demand* for a physical literacy assessment tool in this context, and specific factors to be considered regarding *acceptability* and *implementation.* Crucially, this is the first study to highlight this demand from teacher's and children, perhaps suggesting that the assessment of physical literacy within schools could have long-term impact. This is the first study to acknowledge that assessment is needed for both formative and summative purposes, as indicated by the stakeholders' calls for an assessment to be useful for learning and accountability purposes. The inclusion of, and results garnered from, the inclusion of children in this study indicated promising levels of self-awareness for the assessment of physical literacy, even within this young age-group.

Chapter Six synthesised the contribution to knowledge developed by this thesis by presenting findings alongside external evidence, as ten novel recommendations for a physical literacy assessment in young children. These recommendations were given considering the state of existing research (as identified in Studies One and Two) and perceptions of academics, practitioners, teachers and children. In light of existing research (Griggs, 2012; Jurbala, 2015), these recommendations were made to be tangible, actionable and hopefully effective, in creating an assessment that can enable the development of physical literacy.

### *7.5 Strengths*

As detailed in Study One (Chapter Three), as a concept that continues to receive increasing attention, there have been many criticisms of physical literacy, with limited empirical evidence to support its claims. Primarily, a lack of appropriate assessment of physical literacy had hindered the identification of correlates and determinants of physical literacy and the evaluation of interventions to promote physical literacy. However, the development of appropriate assessment has been stalled by the difficulties, debate and confusion regarding the definition of physical literacy. This PhD has therefore contributed to the evidence base by providing a simplified overview of the definitions of physical literacy, a rigorous systematic review of existing assessments related to the domains of physical literacy and empirical and pragmatic research regarding the development of a physical literacy assessment tool. The PhD drew upon a variety of research methods, which was seen as a strength.

Study One (Chapter Three), reviewed prominent international approaches to physical literacy and the origin and position of various international groups was identified and discussed. Whitehead's definition (2010) was found to be consistently credited, utilised or expanded upon internationally. As a result, within this thesis, Whitehead's conceptualisation of physical literacy provided the grounding for the subsequent exploration of assessment development. Study One (Chapter Three) also demonstrated the importance of objectivity, clarity and transparency within physical literacy research.

Study Two (Chapter Four), utilised positivist methods to identify and compare existing assessment methods. A rigorous protocol was followed to systematically

review existing assessments relating to the affective, physical and cognitive domains of physical literacy. This review comprehensive to ensure all assessments that met the predetermined criteria were included. Appraisal also followed a rigorous three-step process. The methodology aimed to minimise the potential for bias to enable accurate and reliable conclusions to be drawn, and comprehensively summarised the existing research available regarding physical literacy assessment in younger children.

Study Three (Chapter Five), presented an alternative, but complimentary, approach. The qualitative research process was exploratory and interactive, and provided rich, meaningful and contextually relevant data from multiple stakeholders who could be considered potential assessment users. Pragmatic, authentic findings from this study will hopefully assist the implementation and sustained use of a future physical literacy assessment tool.

### *7.6 Limitations*

As well as the specific limitations identified in each chapter, there are over-arching issues that should be discussed. It is apparent that empirical research is needed to advance the concept of physical literacy. Still, despite striving to be open and objective, Study One (Chapter Three) itself was a narrative review. Although this study gave context to the research area and is reflective of the state of existing research, it could be argued that this chapter is descriptive and continues the cycle of the lack of empirical research within this area. This process could have been improved by grounding the study in a methodological/theoretical framework, following a specified protocol, or pre-agreeing on a sampling or saturation process.

In addition, within Study One (Chapter Three), and Two (Chapter Four), potentially as a result of search criteria within both, the majority of international approaches to physical literacy, and assessments included within the systematic review were developed in Western countries. It may be that approaches/assessments from other cultures could offer different insights, although this was outside of the expertise of the current PhD project.

The focus of the thesis was young children, within Study Two (Chapter Four), this was deemed to include children aged three to seven years old. However, results indicated very few assessments were conducted with children under the age of five. As a result, within Study Three (Chapter Five), only children in year two within the UK (ages six to seven years) were recruited to participate, Subsequently, recommendations made in Chapter Six, based on the children's perspectives, may not be generalizable to children in the younger stages of young children.

Due to the scale and timeline of the systematic review in Study Two (Chapter Four), we were only able to include research that involved typically developing children. In contrast, children in Study Three (Chapter Five), were able to articulate their understanding of individual differences and the importance of an assessment being challenge appropriate for each child dependent on ability. Whitehead (2010; 2019) has continually referred to the importance of independent capabilities and stage appropriate assessment. Future research could and should adopt a more inclusive practice to include the assessment of and experiences of SEND (Special Educational Needs and Disability) pupils.

### *7.7.1 Implications of findings*

On the basis of the findings presented within this thesis, there are numerous consequences for research, policy and practice.

### *7.7.2 Research*

The feasibility and physical literacy alignment appraisal processes developed within Study Two (Chapter Four), provide a framework that can be applied to other relevant assessments in future research in this area. As demonstrated in Study Three (Chapter Five), the involvement of a range of stakeholders, and specifically children, is a methodologically novel and powerful part of the assessment development process. This provides a strong foundation for future assessment development research, and an example for future work that looks to involve children within the research process.

### *7.7.3 Policy*

The incorporation of the term 'physical literacy' within national policy and the findings of Study Three (Chapter Five) indicate the clear demand for a form of summative assessment of physical literacy. The assessment of physical literacy in young children should be therefore be embedded in primary PE curriculum. The incorporation of appropriate physical literacy assessment within curriculum policy would be the starting point to encourage schools to adopt a physical literacy approach to PE, and has the potential to inform and provide evidence for systemic changes within policy, for example; curriculum changes, alignment with national measurement programmes and funding. Still, this summative assessment should be done alongside formative assessment.

### *7.7.4 Practice*

The current thesis aimed to clarify and overcome some of the issues often cited around physical literacy to advance the concept, namely overcoming what are viewed as 'philosophical issues' and confusion regarding the concept. This has been a particular barrier to operationalising the concept within the UK. Actionable and tangible recommendations for assessment design and pedagogy were given in relation to the philosophy in practice. The terminology and phrasing of work done in the name of physical literacy needs to be accessible in order to change practice, and future research should consider this in order to operationalise physical literacy assessment in context.

The potential development and use of formative physical literacy assessment can influence pedagogy in practice. When implemented appropriately, formative assessment (as Assessment for Learning) should inform effective, meaningful and worthwhile instruction strategies to improve teaching and the subsequent student learning experience (Lierhaug & MacPhail, 2015).

As highlighted throughout the thesis, an holistic approach to physical literacy assessment should be operationalised in practice. Within Study Two (Chapter Four) and Study Three (Chapter Five), the affective and cognitive domains were less well represented. In practice, developing the motivation, confidence and knowledge and understanding of physical literacy in young children should be as much of a priority as developing physical competence.

A further key implication for practice that emerged from Study Three (Chapter Five), is the incorporation of technology and the development of CPD to empower teachers to feel confident and competent in assessing and developing children's

physical literacy. Findings indicated that this would be welcomed by teachers, but needs to be done effectively and empathetically to have lasting impact. It also became evident that there needs to be a whole school approach, led by senior management, to understand and advocate for physical literacy and physical literacy assessment. This will include dedicated and protected time for physical literacy assessment (which should be guided by curriculum policy change as previously mentioned), support for teachers to attend relevant CPD, and the opportunity for children to have a variety of positive and fulfilling physical literacy experiences.

### *7.8 Recommendations for future research*

Based on the findings of this thesis and the strengths and limitations identified, there are several recommendations for future research. Firstly, the findings of this thesis may inform the development of an assessment tool that can be piloted. It is advised that this could be conducted as a formative evaluation process, following COSMIN guidelines for content validity and PROM development (Prinsen et al., 2018; Mokkink et al., 2018). Both of these properties were highlighted within the systematic review as a poorly developed area across affective, physical and cognitive assessments in this age group, and researchers have identified these as the most important measurement properties (Mokkink et al., 2018). Whilst Study One (Chapter Three) (Chapter Three) highlighted debate around the definition of physical literacy, the COSMIN appraisal guidance may offer a solution to overcoming issues regarding content validity. Crucially, assessment users, in this case teachers and children, should be involved in the ongoing development of the assessment to score positively within COSMIN, as shown in Study Three (Chapter Five).

Assessment feasibility has also been highlighted as a key theme throughout this thesis. In order to have a positive impact on children's physical literacy and lifelong physical activity, an assessment must be feasible for long-term use in practice. Within the current project, stakeholders alluded to the balance between the purpose of the assessment and the potential burden on those involved in the assessment process being the crucial factor influencing uptake and long-term use. Currently, peer-reviewed research does not give enough attention to feasibility issues; these should be considered and reported. Transparent and objective reporting of feasibility, as shown in Table 4.2 (p.105), is recommended in future research. In addition, there are calls for research to explore the use of technology with the assessment process, as this could be a potential solution to overcome many implementation issues cited within Study Three (Chapter Five).

Finally, this thesis has identified a gap in existing literature regarding assessment related to physical literacy within children aged 3-5 years old. Within the UK, this age range represents children who will be encountering formal settings such as childcare and school, which will be guided by the EYFS framework (Department for Education, 2017). There is huge potential to link physical literacy to this policy and research could contribute to the knowledge and practice regarding physical literacy in this stage.

### *7.9 Reflections*

From a personal perspective, the PhD process has been a hugely challenging, but ultimately enjoyable experience. The systematic review in particular was a long and intensive process at an early stage of the overall research programme. Admittedly, during this, time I struggled with self-management and maintaining motivation as a

researcher. With hindsight, I can see how beneficial the process was for the understanding of issues surrounding physical literacy assessment, and hopefully when published, the results will benefit others too.

Throughout the PhD process, I have continued to develop my knowledge base, research skills and undertake new methodology. I have been supported to engage in a number of professional development opportunities, covering topics such as funding, impact, and publishing, which I hope has prepared me for my future career. Intellectually, my understanding of philosophy, measurement properties and physical literacy has increased incrementally over the course of the PhD although it has become apparent that the more I think I know about physical literacy, the more questions I realise I have. Happily, my interest in physical literacy will be something that I can continue with in the future. Alongside the PhD, I have become involved with the International Physical Literacy Association, which has led to a number of opportunities, including conferences, special interest groups and involvement in the development of a report, which underpinned the inclusion of physical literacy questions within the Children and Young People's Active Lives Survey (Sport England, 2019).

Over the last three years, I have been fortunate to attend a number of international conferences where I have been able to share my work and make valuable connections. I can now comfortably and confidently present to a range of audiences and teach in a variety of contexts. However, this was not always something I felt able to do. Particularly during my MSc, I suffered with severe anxiety when having to present, and I thought this would be a significant barrier to starting, let alone completing, a PhD. With the support of a lecturer at Cardiff Metropolitan University (that I will forever be grateful too) this has not been the case. I have been

able to take full advantage of a variety of experiences, including representing my Faculty in the university three minute thesis final, something I would not have dreamed of doing four years ago. This newly found passion for dissemination and engagement will be something I will take forward, and I am grateful for those at Liverpool John Moores who have inspired and encouraged my participation in these opportunities.

### *7.10 Conclusions*

This thesis has provided a unique exploration of physical literacy assessment in young children. Fundamentally, all children should have the opportunity to develop their physical literacy and to evidence their progress. This research provides a robust foundation for the ongoing development and use of an assessment tool for this context. It is crucial that research regarding physical literacy assessment continues to move forward in order to substantiate the claims made physical literacy advocates and ultimately, support children to develop physical literacy and be physically active for life. Future research should look to build on this evidence to pilot such an assessment tool, following the rigorous process and recommendations highlighted.

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# Appendices

Table 4.a PICO Table

| | **Include** | **Exclude** |
|---|---|---|
| **Population** | Typically developing children<br>Mean age between 3-11.9 years old | Special populations<br>Mean age outside 3-11.9 years old |
| **Intervention** | Studies will be included if they report an Assess* OR Measure* OR Test* OR Tool* OR Instrument* OR Battery* OR Method* OR Psychometr* OR Observ* OR Indicator* OR | |

| | | |
|---|---|---|
| | Evaluat* OR Valid* Or Reliab* | |
| **Context** | Physical literacy, physical activity, play, sport, physical education, exercise, recreation<br>Field Based | Lab based |
| **Outcomes** | Assessment of outcome(s) related to physical literacy.<br>Motiv* OR Enjoy* OR Confidence OR Self* Or "Perc* Competence" OR Affective OR Social OR Emotion* OR Attitude* OR Belief* OR Physical* OR Fitness OR Motor OR Movement* OR Skills* OR Technique* OR Mastery OR Abilt* OR Coordination OR Performance OR "Perceptual Motor" OR Knowledge OR Understanding OR Value OR Cogniti* OR Health OR Well* | |
| **Study design/publication characteristics** | Peer reviewed journal articles published in English | Studies published in a foreign language<br>Not published in a peer reviewed journal<br>Duplicate publication<br>They did not assess the psychometric properties of the relevant instrument<br>Full text articles were not available,<br>Studies that dealt with translated and culturally adapted versions of the measures<br>Book chapters, case studies, student dissertations, conference abstracts, review articles, meta-analyses and editorials , protocol papers, systematic reviews<br>Named and used in multiple studies |

*Table 4.b* Boolean logic combinations search strategy

| | | |
|---|---|---|
| | Assess* OR Measure* OR Test* OR Tool* OR Instrument* OR Battery* OR Method* OR Psychometr* OR Observ* OR Indicator* OR Evaluat* OR Valid* Or Reliab* | Title or Abstract |
| AND | "Physical* Activ*" OR "Physical* Liter*" OR Play OR Sport OR "Physical* Educat*" OR Exerci* OR Recreation | All Text |
| AND | Child* OR Youth OR Adoles* OR P$ediatric* OR Schoolchild* OR Boy* OR Girl* OR Preschool* OR Juvenile* OR Teenager | All Text |
| AND | Motiv* OR Enjoy* OR Confidence OR Self* Or "Perc* Competence" OR Affective OR Social OR Emotion* OR Attitude* OR Belief* OR Physical* OR Fitness OR Motor OR Movement* OR Skills* OR Technique* OR Mastery OR Abilt* OR Coordination OR Performance OR "Perceptual Motor" OR Knowledge OR Understanding OR Value OR Cogniti* OR Health OR Well* | All Text |

| *Table 5.a* Focus group question mapping | | | | | | |
|---|---|---|---|---|---|---|
| Research Objectives | Theme (Based on Bowen 2009) | | Overarching Aims | Stakeholder/ Teacher | 5-7 | 7-11 |
| I. To explore current perceptions regarding physical, cognitive and affective assessment in children between the ages of 3-11 years<br><br>II. To identify any common | **Acceptability**<br><br>How the intended individual recipients- both targeted individuals and those involved in implementing programmes- react to the intervention | Satisfaction<br><br>Intent to continue use<br><br>Perceived appropriateness<br><br>Fit within organizational culture<br><br>Perceived positive or negative | What are the positives and negatives of assessment?<br><br>Who and what is the assessment for? | **2. What aspects of assessment would you promote/ not think are useful?**<br><br>What are the positives and negatives of (use suitable example offered previously)/ existing assessments?<br><br>Why are these good/bad?<br><br>What would a great assessment look like? | **2. What's the best way your teacher tells you how you've done?**<br><br>How does it feel when a teacher tells you you've done well?<br><br>How does it feel when a teacher tells | **2. What parts of these tests did you like/not like?**<br>What would make a test better? Why? What are the worst parts of a test? Why? What would make a test better? Why? |

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|---|---|---|---|---|---|---|
| themes, examples of good practice, or points of concern regarding assessment<br><br>V. To explore potential solutions to overcomes common barriers to assessing physical literacy in schools | To what extent is a new idea, program, process or measure judged as suitable, satisfying or attractive to programme delivers/recipients? | effects on organization | | What are the most important aspects of assessment? Why? | you you've got something wrong?<br><br>What would make you feel better? | |

| | | | | | | |
|---|---|---|---|---|---|---|
| I. To identify how physical literacy is currently assessed<br>II. To explore current perceptions regarding physical, cognitive and affective assessment in children between the ages of 3-11 years | **Demand**<br><br>Demand for the intervention can be assessed by gathering data on estimated use or by actually documenting the used of selected intervention activities in a defined intervention population or setting<br><br>To what extent is a new idea, program, process or | Actual use<br><br>Expressed interest or intention to use<br><br>Perceived demand | What is your experience with assessment in education and specifically in physical education<br><br>Why do we have/need assessment in PE? | **1. Is it important to assess physical literacy?**<br><br>Is it important to assess in PE?<br><br>Is it important to assess to affective/cognitive/physical?<br><br>Who would find this information useful? Why?<br><br>What could this information be useful for?<br><br>4. **How is physical literacy currently assessed?** | **1. Can you draw me a picture about a time you knew you'd done well in PE?**<br><br>How do you know you are doing well?<br><br>What would it look like if you were not doing very well?<br><br>How often do you do something like this in PE? | **1. Can you draw me about a time you were assessed or tested in PE?**<br><br>How do you know you are doing well?<br><br>What would it look like if you were not doing very well?<br><br>How often do you do something like this in PE? |

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| | measure likely to be used? | | | Why did/didn't you do a physical literacy assessment?<br><br>Can you explain what an assessment you may have used looks like? (If not offered- pushed for what is assessed and how)<br><br>How often would you use this assessment?<br><br>How is the information fedback?<br><br>Who uses this information? Why? | Who else is in the picture?<br><br>Is there any way teachers check how good you are in PE?<br><br>Can you give me an example of how a teacher would tell you have done well in PE?<br><br>Do teachers ever check if you've had fun?<br><br>Do teachers ever check if you understand | Who else is in the picture?<br><br>What are the best parts about a test? Why?<br><br>What are the worst parts about a test? Why?<br><br>Is there any way teachers check how good you are in PE?<br><br>Can you give me an example of how a teacher would tell you |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | why you're doing PE?<br><br>What about in other types of games? | have done well in PE?<br><br>Do teachers ever check if you've had fun?<br><br>Do teachers ever check if you understand why you're doing PE?<br><br>What about in other types of games? |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| VI.<br><br><br><br><br><br><br><br>VII. | To explore potential solutions to overcomes common barriers to assessing physical literacy in schools<br><br>To discuss the how the implement ation of physical literacy assessmen t in schools be improved within the 5-11 age range | **Implementatio n**<br><br>This research focus concerns the extent, likelihood and manner in which an intervention can be fully implemented as planned and proposed, often in an uncontrolled design<br><br>To what extent can a new idea, program, process r measure be successfully | Degree of execution<br><br>Success or failure of execution<br><br>Amount, type of resources needed to implement<br><br>Factors affecting implementat ion ease or difficulty<br><br>Efficiency, speed, or quality of implementat ion | What do you think a PE assessme nt should look like?<br><br>Is self-assessme nt in primary PE appropria te? | **3. What do you think the ideal physical literacy assessment would look like?**<br><br>If you were watching from the side what would be going on?<br><br>How could an assessment relate to whole school plans/sport premium etc?<br><br>Who would be leading?<br><br>How would it be administered?<br><br>How long would it take? | **3. What test could we make that shows us these things?**<br><br>If you were watching from the side what would be going on?<br><br>Who would be in charge?<br><br>What equipment would you need?<br><br>How long would it take? | **3. What test could we make that would show us these things?**<br><br>If you were watching from the side what would be going on?<br><br>Who would be in charge?<br><br>What equipment would you need?<br><br>How long would it take? |

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|---|---|---|---|---|---|---|
| | delivered to intended participants in some defined, but not fully controlled, context? | | | How often would you do it?<br><br>How would you track information?<br><br>**5. Who should conduct the assessment? The teacher? Child? Parent? Someone else?**<br><br>Why do think this could/couldn't work?<br><br>What could this look like in practice?<br><br>What support/materials would the children need for this? | How often would you do it?<br><br>How would you keep track of all the information?<br><br>Who would find that information useful?<br><br>**4. How would you tell if you've done well being active without a teacher/a** | How often would you do it?<br><br>How would you keep track of all the information?<br><br>Who would find that information useful?<br><br>**4. How would you tell if you've done well being active without a teacher/a** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | What would be the strengths of this method?<br><br>Can you think of any limitations to this? | **dult to help?**<br>Do you ever think about how you've done in PE? How does it make you feel? Can this help you get better? | **dult to help?**<br>Do you ever think about how you've done in PE? How does it make you feel? Can this help you get better? |

*Example of Moderator Focus Group Guide for Practitioners/Academics*

**Introduction**

- Introduce self by name and role as researcher on the project.
- Thank the group for agreeing to attend and participate.
- Purpose of the project:

*This study is looking at perceptions of physical literacy assessment both in terms of current practice and future directions. We will be conducting a series of focus groups with academics, teachers, coaches and children throughout summer/autumn 2018. These workshops will form part of a programme of research about how best to assess physical literacy in children, with the next step being to develop a holistic assessment tool that can be easily used within a school setting. This research will be used in our PhD's, and will hopefully be published and presented in appropriate journals and conferences.*

*Key aims of the session:*

**To inform the design of an authentic, rigorous and feasible school-based assessment of children's physical literacy**

- Inform the group that the discussion will be recorded and that that this will only be available to the research team and used only for research purposes.
- Emphasise the importance of their perspectives and encourage them to discuss their ideas freely– there is no right or wrong answer.
- Emphasise Non-Disclosure of Information – ask the participants to keep any information shared within the group confidential.
- Emphasise confidentiality – remind the group that their names will not be used in any subsequent correspondence unless they state otherwise.
- Ensure that each participant has had the opportunity to read the participant information sheet and has signed the Consent form and completed their demographic information.

*In the following questions, I would like to understand your own opinions of assessment and physical literacy, please be as honest as possible*

1. Is it important to assess physical literacy? **5 minutes**
   Prompts:
   a. Is it important to assess to affective/cognitive/physical?
   b. Who would find this information useful? Why?
   c. What could this information be useful for?

*So we've just talked a bit about your views in the importance of physical literacy assessment, I now want to focus on the purpose and function of an assessment*

2. How can the assessment of physical literacy best support pedagogy, teaching and learning? **5 minutes**

*So we've just talked a bit about your views in why we should do it, but this doesn't always translate to what we're actually able to do in practice. So I'm now going to ask a little bit about that*

3. Do you have any experience of assessing physical literacy? **10 minutes**
    a. Can you explain what an assessment you may have used looks like? (If not offered-pushed for what is assessed and how)
    b. Are you aware of any physical literacy assessments?
    c. Who conducts the assessment? How long does it take? Does it need much equipment? How often would you use this assessment? Level of expertise required? What did the coaches/teachers/children think of the assessment?
    d. How is the assessment scored? How is the information fedback and to whom?
    e. Who uses this information? Why?
    f. What are the best and worst aspects of these assessments, and why?

*We know that there are many barriers to assessment to physical literacy in schools. These include time, lack of importance, space, lack of resources, lack of confidence. Rather than focussing on the barriers we know are there, The next question is focussing on solutions*

4. **Solutions task (See attached):** How can we overcome the barriers around physical literacy assessment? **10 minutes**

*So we've spoken about your positive and negative experiences of assessment, and how we may overcome some of the existing barriers. Now we'd like to start talking about the development of a new assessment of physical literacy for use with children*

**Tick sheet task 10 minutes**: *As part of our systematic review, we have identified a number of 'sub-elements' within each domain, that currently appear in existing assessments. In the table below, please rank your perception of the relative importance of these 'sub-elements' for both children aged 3-7 years old, and children aged 7-11 years old.*

**45-55 minutes**

**Design task 15 minutes-**What do you think the ideal physical literacy assessment would look like?

**To be introduced by HG and CS, but led my moderators on tables**

*Taking on those really valid positive and negative aspects of current assessments, In the next questions, I'd like to talk about an ideal assessment.*

*Please use the pens and flip chart paper to design this. After 10 minutes, each group will have 1 minute to present their ideas back to the group.*

a. What assessment approaches (Includes techniques, tools, strategies) could be used to effectively assess physical literacy?
b. What could this look like in practice?
c. Who would be leading **and why**? (teacher/peer/self/others)
d. How would it be administered and conducted?
e. What support/materials would the children need for this?
f. How long would it take?
g. How often would you do it?
h. How would you track information?
i. Feedback and results – how can they be easily accessed and understood by users?
j. How can technology be used to support this assessment of physical literacy?
k. What would be the strengths of this method?
l. Can you think of any limitations to this?

**HG and CS to give warning at 8.30**

**55-60 minutes: HG and CS to facilitate group feedback and Dot-mocracy**