Primary teachers' recommendations for the development of a teacher-oriented movement assessment tool for 4-7 year children

Abstract

To inform the development of a teacher-oriented movement assessment tool, this study aimed to explore primary school teachers' perceptions of assessing fundamental movement skills (FMS) within physical education (PE) lessons. Thirty-nine primary school teachers of PE, located in the United Kingdom, participated in an individual or group semi-structured interview. Findings signify that teachers perceive a need for an appropriate and effective movement assessment tool that is simple to use, quick to administer, and that provides valuable feedback to guide future teaching and learning. This is vital as teachers indicated that a lack of appropriate resources and a shortage of curriculum time restricts their use of assessment within PE. A movement assessment tool that aligned to the curriculum would be beneficial to teachers to better support children's learning and acquisition of FMS, as well as to enhance the teachers' own understanding of the process of assessing FMS.

Keywords: Fundamental movement skills, assessment, primary teachers, Physical Education

Introduction

Fundamental movement skills (FMS) are grouped into three sub-categories of skills: stability (e.g. one leg balance, walking along a line), object control (e.g. overhand throwing, kicking a ball) and locomotor (e.g. running, hopping, skipping) (Gallahue, Ozmun & Goodway, 2012). FMS are the foundation of more complex skills and movement patterns that are developed to use within organised and non-organised games and sports (Barnett, Stodden et al. 2016; Hands, 2012), and are considered to play an important role in the physical and social development of children through adolescence and into adulthood (Clark & Metcalfe, 2002). It is preconceived that children have the potential to be competent in performing FMS by the age of seven years old (Gallahue, et al., 2012; Payne & Isaacs, 2011), with children who are competent at performing FMS being considered to exhibit movement competence (Morgan et al., 2013). Seefeldt (1980) hypothesised that children who do not achieve a sufficient level of movement competence, failing to pass through the 'proficiency barrier', will be inhibited when engaging in sports and games. In recent years, a number of systematic reviews (Barnett, Lai et al., 2016; Catuzzo et al., 2016; Lubans, Morgan, Cliff, Barnett & Okely, 2010) have revealed a positive association between FMS competence and physical activity levels during childhood and adolescence. Of note, Foweather et al. (2015) reported that in early childhood (participants aged 3-5 years), FMS competence was positively associated with physical activity levels across the week. Similarly, in later childhood (participants aged 6-10 years), De Meester et al. (2018) found that children with high levels of FMS competence spent a greater amount of time each day being physically active. Thus, demonstrating that the 'proficiency barrier', described by Seefeldt (1980), may well exist and that an emphasis should be placed on developing FMS competence

from early childhood, to equip children with the skills to be physically active during childhood and into adolescence.

The need to address development of FMS competence within PE during early childhood is reflected in curriculum guidelines globally (Australian Curriculum Assessment and Reporting Authority, 2015; Department for Education, 2013; Ontario Ministry of Education, 2015; Society of Health and Physical Educators America, 2016). For instance, the most recent PE curriculum for the United Kingdom emphasises 'pupils should develop fundamental movement skills.... mastering basic movements including running, jumping, throwing and catching, as well as developing balance, agility and co-ordination' (Department for Education, 2013). It has also been recommended that primary school teachers become more involved in assessing children's FMS to subsequently support their development (Morley, Till, Ogilvie & Turner, 2015). Furthermore, assessing FMS in early childhood would highlight those children with low levels of movement competence and allow for appropriate curriculum guidance or interventions to be introduced to improve movement competence (Lopes, Rodrigues, Maia & Malina, 2011).

Assessment within education is categorised in two forms: summative assessment and formative assessment (Hay, 2006). Summative assessment is a broader term for the Assessment of Learning (AoL) and takes a more formal judgement to assess what has been learned through the application of a written and/or verbal assessment method (Hay, 2006). Formative assessment is generalised as Assessment for Learning (AfL) and is the measuring process used by the teacher to feedback and modify future teaching to address the needs of the learner (Black & Wiliam, 2010; Hay, 2006). According to Hay and Penney (2009) assessment within PE should be viewed as a process through which learning can be promoted, with AfL being the principal form of

assessment. Further, they state that an integral element of the assessment is that it aligns with the curriculum and pedagogy. It has long been understood that teacher-led assessment is a key element in the Teaching-Assessment-Learning cycle (Carroll, 1994; Roberton & Halverson, 1984) by providing a teacher valuable feedback to improve standards of learning (Black & Wiliam, 2010). Therefore, assessing children's FMS competence could help teachers to support and enhance the development of their pupils (Herrmann, Gerlach & Seelig, 2015; Stodden, Langendorfer & Roberton, 2009; Tidén, Lundqvist & Nyberg, 2015).

FMS are typically developed during early childhood (Gallahue et al., 2012), with primary school potentially providing the optimal environment for this to take place (Morgan et al., 2013). However, typically, teachers of primary school physical education (PE) in the United Kingdom are generalist teachers, who receive minimal training during Initial Teacher Training (ITT) to teach PE (Harris, Cale and Musson, 2012). This results in teachers who lack expertise and confidence in assessing children within a PE setting (Harris et al., 2012; James, Griffin & France, 2005; Morgan & Bourke, 2008; Morgan & Hansen, 2007; Ní Chróinín & Cosgrave, 2013), with teachers' reporting this as one of the hardest aspects of their job (Morgan & Hansen, 2007). Some primary schools in the United Kingdom now employ external sport coaches and specialist PE teachers, who, unlike generalist teachers, have completed a minimum one-year training course for teaching PE. However, a study examining secondary school PE teachers' perceptions of teaching FMS reported that even subject specialist teachers are low in confidence and knowledge in assessing FMS (Lander, Barnett, Brown & Teldord, 2015).

The limitations of existing FMS assessments for use by teachers in school settings are well reported (Cools, de Martelaer, Samaey & Andries, 2008; Giblin,

Collins & Button, 2014). Traditional methods for assessing children's FMS were typically designed for physical therapists and researchers to measure movement deficiencies (Cools, et al., 2008), deeming them unsuitable for use by teachers of PE in a school setting (Giblin et al., 2014). Further, the composition of existing assessments of FMS competence, such as the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOTMP-2) (Bruininks & Bruininks, 2005) that assesses fine and gross motor control, leads to limited curricular validity for the PE syllabus of children aged 4-7 years old as they do not contain a component to assess competence of stability skills. The inclusion of a wide range of skills across existing assessments could be due to the initial purpose of each assessment and the context, and by whom, they are to be administered. For example, the Körperkoordinationstest für Kinder (KTK) (Schilling and Kiphard, 1974) was intended to assess gross motor co-ordination, thus does not contain any object control component. As Tompsett, Sanders, Taylor, and Cobley (2017) suggest, further investigation is required to define the format and content of an optimal FMS assessment for primary school teachers to use.

In recent years, a selection of movement assessment tools have been developed with teachers and practitioners in mind as the assessor (Canadian Assessment Movement Skill and Agility [CAMSA]: Longmuir et al., 2015; Motorische Basiskompetenzen [MOBAK]: Herrman et al., 2015). The CAMSA (Longmuir et al., 2015) is intended for children aged 6-14 years old and requires children to complete a movement based course including seven skills that reflect 'real world' abilities (Longmuir et al., 2015). The CAMSA is feasible, reliable and valid for use by Secondary school teachers of Year 7 girls PE (Lander, Morgan, Salmon, Logan and Barnett, 2016; Lander, Morgan, Salmon, Logan and Barnett, 2017). However, the feasibility and reliability of the protocol when administered by non-specialist teachers

of PE in primary schools has not yet been examined. Furthermore, the CAMSA's method of assessment, allowing only one child to be active at a time during the assessment process, poses a potential challenge for a primary teacher to conduct the assessment whilst managing a class of children. The MOBAK **(**Herrmann et al., 2015), an FMS assessment designed for teachers, aligns itself to the specifics of the primary PE curriculum, and reports to be a valid and appropriate movement assessment tools suitable for teachers (Herrmann et al., 2015). Despite these claims, it is not clear whether the design and validation of the assessment involved consultation with teachers, thus there is little understanding to the appropriateness of the selected assessment method for primary school teachers who have limited PE training and subject understanding. In order to provide teachers with a feasible FMS assessment tool, it was felt to be important to understand the challenges and issues faced by teachers to assess FMS in a school setting and to discover what their preferred method of assessment would involve.

Therefore, the purpose of this study was to examine the perceptions of primary school teachers in order to i) understand their existing practice of assessing FMS and ii) establish key recommendations for the development of a teacher-oriented FMS assessment protocol, aligned to the PE curriculum suitable for children aged 4-7 years old. This study formed part of a wider research programme to develop a movement assessment tool for primary school teachers in the United Kingdom.

Methodology

Design

Within this study, individual and group semi-structured interviews were conducted to explore primary school teachers' perceptions of assessing FMS within PE. Primary

schools predominantly in two large cities in the North of England were contacted to take part in this study, conducted between May and November 2015. Prior to commencing research activity, approval was granted by the ethics committee of (*institution and reference to be added following the review process).*

Recruitment and participants

A stratified purposeful sampling strategy (Patton, 2002) was used to recruit participants. Schools were identified from Local Authority contact lists of the two participating cities, and from information provided by the research partner (the Youth Sport Trust). Invitation packs, containing a letter and participant information sheet, were sent via email to the headteacher of each school (n=104), with the request to share with their teaching staff. Teachers were asked to respond directly to the lead researcher via email or telephone. The lead researcher made follow up telephone calls to each school if a response was not received from the initial invitation. Upon accepting the invitation, potential participants were asked to sign a consent form and provide demographic information (length of teaching experience, role in school and gender). Using this pre-determined stratification criteria, thirty-nine teachers of PE from twenty primary schools across two cities in the United Kingdom were interviewed. The participant sample comprised: gender (female, n=27, male, n=12), length of teaching experience (Mean 8.1 years, SD = 6.4 years), teaching role (PE specialist, n=8; PE co-ordinator, n=12; generalist teacher, n=19), school location (urban, n=32; and rural, n=7) and school status (state, n=34; and independent, n=5).

Due to early difficulties with recruitment (cited reasons from teachers included lack of time available, problems caused by examination periods, and absence through illness),

the study was divided into two phases separated by the schools' summer holiday period in 2015. Phase One interviews were conducted in June and July and involved 17 primary school teachers located in the North East (n=12) and North West (n=5) of England. Phase Two interviews were conducted between September and November 2015 and involved 22 primary school teachers located in the North East (n=12), North West (n=9) and South West (n=1) of England.

Semi-structured interviews

Semi-structured interviews were used to explore the thoughts and experiences of the interviewee (Berg, 2009; Kvale & Brinkmann, 2009). The interviews were structured to examine two key research questions: 1) What are primary school teachers' perceptions of assessment within PE? 2) What do primary school teachers consider the most suitable method of assessing children's movement within PE?

Using the style described by Berg (2009), the interview schedule was constructed around the key conceptual areas of interest that had been identified to investigate the research questions (see Table 1). The stages of the interview schedule centred on 'essential' questions, with 'informal' questions included at the beginning to build rapport and focus attention on the subject of the interview (Berg, 2009). Probes and prompts, such as 'can you explain in more detail why you think this?', were used to elicit more information if a respondent's initial answer was unclear or incomplete (Gillham, 2005). To assess the effectiveness of the interview schedule, Gillham (2005) recommends conducting pilot interviews with a real sample of participants. Three pilot interviews were conducted with primary school teachers. Analysis of the data from the pilot interviews, and feedback from the pilot participants, resulted in the reduction of the number of scripted questions from sixteen to twelve and amendments to the wording

of some questions to language more understandable for teachers. These revisions focused the interview schedule on the areas of most importance, specifically Stage 5, and provided additional time for extra non-scripted probing questions to be used to seek additional, unexpected information (Kvale & Brinkmann, 2009).

[Insert table 1 here]

Participants were offered the choice of individual interviews or group interviews using the identical interview schedule. Group interviews were conducted with members of staff from the same school, and allowed multiple participants to be involved at convenient times during their school day (for example, lunch times and after school). To encourage participation within the group setting, participants were informed that they were free to contribute at any point (Fontana & Frey, 2008) and the lead researcher moderated the discussion to mitigate a dominant voice taking over (Berg, 2009). Fourteen individual interviews (Mean duration = 35mins, range = 34mins and nine small group interviews (Mean duration = 36mins, range = 39mins) were conducted. Small group interviews comprised two (n=5), three (n=3) and six participants (n=1). Individual and group interviews were conducted face-to-face at the participant's school (n=33), via Skype with video (n=4) and telephone (n=2). Offering Skype and telephone interviews reduced personal inconvenience, for example, in one instance, a participant, preferred to be interviewed from her home as she worked part time. As previously discussed by Iacono, Symonds and Brown (2016), interviews conducted via Skype with video were deemed as effective as having face-to-face interaction.

Following Phase One data collection, an initial analysis was conducted and key recommendations from teachers for an assessment protocol were formed. Following this

analysis, a storyboard (See Figure 1 for a sample of the storyboard, see Appendix A for the full storyboard) was digitally created to provide a visual representation of the process and content of the movement assessment tool as recommended by teachers in Phase One. Subsequently the storyboard was shown on a laptop computer to teachers during interviews in Phase Two to provide focus and stimulate the discussion (Cross & Warwick-Booth, 2016). The storyboard was first introduced to participants during Stage 5 of the interviews, which focused on the format of the movement assessment tool. The preceding stages of the interview schedule remained unchanged from Phase One to retain consistency between the two phases and to allow comparisons across the interviews (Berg, 2009). Separating the interviews into two phases and creating the storyboard allowed the data collection in Phase Two to focus participants' attention (Hoepfl, 1997), which encouraged further recommendations for the appropriate design of the movement assessment tool.

[Insert figure 1 here]

Data analysis

All interviews were digitally recorded (Sony IC recorder ICD –PX140), transcribed verbatim and subsequently managed within NVivo analysis software. The transcripts were initially read by the lead author and deductively analysed (Patton, 2002) using a qualitative thematic approach (Braun & Clarke, 2006) founded on the framework of the interview schedule. Following this early analysis, the lead author re-read the transcripts, allowing new themes and sub-themes to develop inductively from the data (Patton, 2002). This deductive and inductive approach provided a thorough exploration and analysis of the research questions by comparing existing beliefs around teachers'

perceptions of assessment within PE with the new concepts that developed directly from the data (Boeije, 2010). Verbatim quotes have been included to provide contextual understanding and interpretation of the participants experiences and perceptions (Patton, 2002). Single comments, illustrating the participants' individual connection to the research questions (Braun & Clarke, 2006), were considered as important as those that were repeated or agreed by others.

Findings and discussion

The purpose of this study was to explore primary teachers' perceptions of assessing children's FMS to inform the development of a teacher-oriented FMS assessment. To better understand the context of primary teacher-led assessment of FMS, it was also important to examine how participants perceive assessment within PE and discover how they include assessment within their own teaching. Therefore, the findings are presented under the headings of the two key areas of investigation: i) Primary school teachers' perceptions of assessment within PE; and ii) Primary school teachers' recommendations for an appropriate movement assessment tool to use in primary schools, which consequently formed the key themes of the analytical framework. Within each of the key themes, participants' experiences and perceptions are discussed within the emergent sub-themes (See Table 2).

[Insert Table 2 here]

Primary school teachers' perceptions of assessment within PE

This section highlights the participants' perceptions of assessment within PE and discusses their current assessment practice within the subject. Participants' perceptions

were defined in the following areas; i) the role of assessment, and ii) access to assessments.

The role of assessment in PE

Teachers recognised the value of assessment to support children's development in PE, yet they were also aware that not all assessment has the same influence, *'I really do want to feel that it's making a difference. I wouldn't want it to become something, sort of just paperwork, and think 'Well actually, how much is that going to help?''* (PE specialist, male, 13 years' experience). Participants also recognised the value of assessment for recording children's progress. One participant explained '*we have a tick list with perhaps three different criteria on it, and we just look to see where they are over a few lessons, so to see if they move or if they stay the same'* (Year 2 teacher, female, 3 years experience). Additionally, it was also recognised that assessment within PE will become more important to justify budgetary spending in the subject, as one participant suggested:

> we need to get a focus on assessment in PE, again with Sports Premium funding, they want to know how the children are making progress and I think very soon we are going to be answerable for progress'. (PE co-ordinator, female, 30 years' experience).

Due to the absence of formalised or statutory assessment within PE (Department for Education, 2013), participants reported that, currently, the main purpose of assessment was to report to parents at the end of the year. Objective based mark sheets were used by teachers to assess competence in PE, with a number of participants using AfL strategies to evaluate and monitor children's development:

> We're really into AfL…, and making those judgements as we're going. We want to respond to what we see - not think about it afterwards, and that's really important to us. (PE specialist, male 7 years teaching experience).

> Crucial to observing these things is whether the children are able to do these things, that always tells me as a practitioner that developmentally something isn't right, which sometimes can mean there are actually implications. (EYFS teacher, female, 6 years experience).

The value placed by participants towards AfL indicates that a process-oriented scoring approach, measuring the quality of the child's movement, would be preferred for a teacher-oriented movement assessment tool. A number of previous studies have recommended this approach for enhancing children's learning (Black & Wiliam, 2008; Hay & Penney, 2009; MacPhail & Halbert, 2010; Tidén et al., 2015). Specifically, MacPhail and Halbert (2010) reported that secondary school teachers of PE improved the standard teaching, learning and assessment in their PE lessons after implementing AfL within their lessons. However, to be used effectively, this requires the assessor to have prior knowledge of what they are assessing (Tidén et al., 2015). Therefore, cautious steps must be taken when assessments focused on AfL are to be used by teachers who do not have in-depth knowledge of what they are assessing (Tidén et al., 2015).

Access to assessments

Participants indicated that they use a range of sources to access information to support their PE curricular knowledge, including training and resources offered by their Local

Authority, bought in resources (e.g. Real PE, Create Development) and online resources (e.g. Youtube). However, participants reported a shortage of assessment tools that they can access to assess FMS:

> We've got the PE coach doing a skills assessment at the end of each topic that he does, but in regard to tracking that across the school from Key Stage 2 anyway, or even maybe Key Stage 1, with the exception of Foundation Stage, possibly, I'd say there's something lacking. (Year 4 teacher, male, 3 years' experience).

> There is a gap in the market for this because it is, with assessment in general it's got to be simple. It's got to be effective and it's got to be a tool where you go back to it. And you say "yeah great I know that I need to now use that to help me plan". (Year 6 teacher, female, 10 years' experience).

These results are in agreement with the suggestion made by Giblin et al. (2014) that there are a shortage of FMS assessment tools available to primary school teachers. Considering that primary school should provide an optimal environment for children to develop FMS (Morgan et al., 2013), it is imperative that FMS assessment resources are designed for the specific needs of generalist teachers, who have lack confidence and understanding in assessing PE (Harris et al., 2012; James et al., 2005; Ní Chróinín & Cosgrave, 2013). Furthermore, the removal from the curriculum of national level descriptors (Department for Education, 2014), which were a guideline for assessing children's progress, leaves schools and teachers in a position requiring them to create their own assessment framework for children. These findings indicate that providing

teachers with more guidance and support in assessing PE may encourage more meaningful assessment to take place within the subject.

Recommendations for an FMS assessment tool

The previous findings revealed participants' experiences of assessing within PE, highlighting the need, and desire from primary teachers, for an appropriate method of assessing children's FMS. The following section discusses the key recommendations made for an appropriate method of assessing children's FMS in lesson time. This topic is discussed within the four emergent sub-themes that illustrated participants' perspectives for the movement assessment tool; i) available teaching time, ii) assessment functionality, iii) nature of the assessment, and iv) recording evidence of the assessment.

Available teaching time

A key issue raised by participants was that they feel pressured within school by the shortage of available curricular time for PE, '*time is of a massive issue as our lessons are only 40 minutes long for a single lesson'* (PE specialist, male, 16 years' experience). Typically, other subjects, such as English and Maths, are given higher importance and take priority, *'we track English and maths really well, and we track writing and reading, but then the other things almost fall at the wayside sometimes.'* (Year 4 teacher, female, 3 years' experience). These comments could be a result of assessment within core subjects, unlike PE, being a statutory requirement (Department for Education, 2013). To make assessment more attractive to primary school teachers to include within their current teaching of PE, participants stipulated that the movement assessment tool needs to follow a simple process and be quick to administer, with a

Year 1 teacher suggesting 'i*t just has to be easy. It has to not be time consuming and it has to tell staff what they are looking for. What they should be doing, what the children should be doing.' (*female, 30 years' experience).

Assessment functionality

Existing FMS assessment tools are restrictive for use by primary school teachers (Giblin et al., 2014) and the interviews provided insight into participants' perceptions to support the design of a movement assessment tool that suits their needs. It was suggested by participants that they want the movement assessment tool to provide valuable feedback that will facilitate a positive influence within their future lesson planning:

> I suppose having an assessment tool that takes that into account – that you're not just looking for the children you know. You're breaking the assessment down. For example, if they can't run straight or backwards, whatever it is, you have that process in place so the teacher can say 'Right, this child can't do this. I know to get them to here they need to do this, this and this'. (Year 4 teacher, male, 3 years' experience).

Participants indicated that a lot of the resources and assessments they currently use are paper-based. Yet, perspectives of this practice were negative, with one participant reflecting *'we need to get rid of paperwork, and I know that's what we're doing at the moment but we don't have any technological resources to help* us' (Year 1 teacher, female, 1 year experience). Using digital technology, such as an iPad, was recommended by another participant, who expressed *'it would be so much easier on a tablet for me, because it would be quicker to just sit there and just go through it' (PE co-ordinator, male, NQT).* Graham, Holt/Hale and Parker (2013) have previously

suggested that the popularity of tablet devices could revolutionise assessment practices by reducing paperwork and increasing efficiency.

It was suggested by participants that including video demonstrations of the skills to assess would be a valuable support to them. Notably, having the facility to show video clips demonstrating the skill to the children was deemed important, *'you could project that onto a wall or whatever and show the children, so you've got that demo and you can press play, this is your demonstration and everything, this is your performance mirrored next to it' (PE specialist, male, 16 years' experience).* Embedding audio-visual clips within a digital resource would also provide support and guidance to teachers, *'having that there with a clip of what's expected, and then saying "this is what you need, these are your teaching points"'* (Year 4 teacher, male, 3 years' experience). Some participants suggested that being low in confidence in the subject deterred them from providing demonstrations to their class or that their demonstrations were not adequate. Therefore, including video content in the assessment resource would both support teachers understanding in effectively administering the assessment, as well as offer an alternative demonstration method so that children can be shown the movement skill performed correctly, thus potentially enhancing their learning opportunities (Chan, Ha & Ng, 2016).

Nature of the assessment

Despite previous calls for teachers to be more involved in assessing FMS (Cools, et al. 2008; Morley et al., 2015), there is a shortage of research discussing how primary school teachers should assess children's FMS. The findings here describe teachers' recommendations for the outcomes of the assessment and the process that these would follow. Participants implied that the value of the movement assessment tool would be

improved if it positively impacted on their future teaching and the learning experience of their pupils. To achieve this, teachers indicated that they want to be able to record more than just the outcome of the assessment and that just saying 'yes' or 'no' for a child's outcome is not enough.

> I like it being able to just click on the name and say which criteria they've fulfilled so you've got a log next to each child saying what they've done and showing what level they are working at whether its above, at or below. (EYFS, female, 12 years' experience).

> Some sort of generic criteria that says their achievement is at this level, or they're achieving but their achievement is at a basic level. (PE specialist, male, 18 years' experience).

Furthermore, it is important that the objectives and expected outcomes in the assessment are related to the curriculum and clearly defined. One participant stated *'sometimes the objectives are quite broad. For instance, 'jumps off objects and lands appropriately.' Well what does 'lands inappropriately look like?' What do they need to do not to do it?''* (EYFS teacher, female, 6 years' experience).

Recording evidence of the assessment

A significant feature of the movement assessment tool recommended by participants is that it needs to provide evidence of what the child has achieved and that it establishes a record of their progress. Again, it was suggested that an app-based assessment, utilising a simple recording process would be attractive to teachers.

> Things I like are where it's there and it's almost quite clear and you go tick, so you almost have it recorded, you're not having to go away and process it or think about it. It can be within the lesson, it's not too onerous. (PE co-ordinator/Year 5 teacher, female, 9 years' experience)

Teachers believed that if the movement assessment tool displayed the assessment content and scores, this would reduce time-consuming paperwork. This is important to teachers as:

> [we] haven't got a way of recording that because you have to remember it and then write it down later on. If it was a case of you walking around with your iPad in your hand and you're thinking "let me show you how to do that" or "you're really good at that". (Year 5 teacher/PE co-ordinator, female, 9 years' experience).

In addition to using the visual recording as evidence, participants highlighted that being able to record and replay the videoed performance back to the child would be advantageous in supporting the child's development.

> The more different ways you can show how you want them to do it or if they haven't got it, to show them the right way to do it, then the more chance they have of picking it up because some will be happy watching me and some will be happy watching a video. (PE specialist, male, 11 years' experience)

> He [the child] knew straight away and he was able to fix it straight away. Whereas I'd said to him a couple of times before, I got the iPad and as

soon as he saw it [his movement] on the iPad he sorted it. (Year 5 teacher/PE Co-ordinator, female, 9 years' experience)

Hay and Penney (2009) suggested that in the domain of movement performance, feedback to students, supported by evidence, is vital to enhance learning. They further proposed that this evidence would best be provided in the form of a video recording of their performance, as well as written or verbal feedback. There is already acknowledgement that video recording is a useful tool to enhance learning (Graham, Holt/Hale & Parker, 2013), and using digital video for feedback and self-assessment in PE has been shown to enhance children's motivation and improve their skill performance (O'Loughlin, Chróinin & O'Grady, 2013). Furthermore, assessing movement skills from video can be simpler for an untrained assessor (Gard & Rösblad, 2009) and the hand-held nature of the tablet enables the teacher to be mobile during the assessment and record the performance from different angles. Research on the use of digital app based technology within schools is limited. However, in a recent study, Browne (2015) indicated the advantages that teachers reported with using tablet applications within their teaching of PE, including the value of using tablets to record and analyse children's performance. The findings within this theme and the themes discussed earlier, suggest that assessments utilising digital technology would be well received by primary school teachers. The additional functions provided by digital technology to record and capture evidence of children's FMS could encourage teachers to use the movement assessment tool more frequently. This method of assessment could also be adopted for wider curriculum areas within PE, where evaluating performance and recording children's progress is also required.

Conclusion

These findings indicate that primary teachers recognise the significant role that assessment has in enhancing children's learning. However, due to the shortage of movement assessment tools for primary teachers to use, participants in this study relied upon their own, sometimes limited, knowledge and expertise to implement assessment of FMS. In general, there is demand from primary school teachers for a movement assessment tool, so that they can enhance the learning environment for children and better support their development of FMS. Teachers recommended that an appropriate and effective movement assessment tool should be simple to use, quick to administer and provide valuable feedback to guide their future teaching and better support children's learning of FMS.

The suggestion from participants to embrace digital technology through the use of tablet devices, such as iPads, supports the recommendations made by Graham, Holt/Hale and Parker (2013) and O'Loughlin, Chróinin and O'Grady (2013), who highlighted the potential advantages of using digital technology to optimise assessment opportunities in PE. Importantly, participants reported that video content would assist teachers who require additional guidance to conduct the assessment. Furthermore, digital technology allows a simple method of scoring and recording data, and does not demand the same attention after the lesson that would be required to maintain paper-based records. A digital app, providing video content and video capture, may enhance the child's learning experience through the additional support provided to teachers to develop children's FMS.

Initially providing teachers with an instructive, mechanical way of assessing FMS may assist in developing their confidence and competence to assess, allowing them to modify their engagement and usage of the movement assessment tool over time. In this way, teachers would maintain their freedom to exhibit and develop their professional practice. This aligns with the notion of assessment in PE being authentic (Hay and Penney, 2009), enabling teachers to customise and refine how they incorporate the movement

assessment tool within their teaching to suit their children and the environment that they work within.

This study has assisted in developing a method for primary school teachers to assess children's FMS (Youth Sport Trust, 2017). Primary teachers have provided a comprehensive description of the processes and mechanisms of the assessment. However, due to their perceived low level of understanding of FMS and the shortage of literature discussing teacher-oriented assessment of FMS, seeking the opinion of experts of children's movement to generate the content of movement assessment tool (e.g. the number and type of skills required to assess FMS) is recommended to ensure the assessment provides a valid measure of FMS competence. If suitably aligned to the curriculum, this movement assessment tool could then be used by primary school teachers to enhance the learning environment for children to acquire and develop FMS, providing children with the skills they need to be more physically active throughout childhood and into adolescence (Barnett, Lai et al., 2016; Catuzzo et al., 2016; De Meester et al., 2018; Foweather et al., 2015; Lubans et al., 2010;). Subsequently, future research should look at the impact of the assessment on teacher-led assessment and the consequential evolution of teaching practice and patterns of change in children's FMS competence.

References

Australian Curriculum Assessment and Reporting Authority (2015). *Foundation – Year 10 Health and Physical Education.* Available online at: https://www.australiancurriculum.edu.au/f-10-curriculum/health-and-physical-education/

Barnett, L. M., Stodden, D., Cohen, K. E., Smith, J. J., Lubans, D. R., Lenoir, M., ... & Lander, N. J. (2016). Fundamental movement skills: An important focus. *Journal of teaching in physical education*, *35*(3), 219-225.

Barnett, L. M., Lai, S. K., Veldman, S. L., Hardy, L. L., Cliff, D. P., Morgan, P. J., ... & Rush, E. (2016). Correlates of gross motor competence in children and adolescents: a systematic review and meta-analysis. *Sports Medicine*, *46*(11), 1663-1688.

Berg, B. L. (2009). *Qualitative Research Methods for the Social Sciences. 7th Ed.* Boston, MA: Pearson International.

Black, P. & Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, *92*(1), 81-90.

Boeije, H. R. (2010). *Analysis in Qualitative Research*. London: Sage.

Braun, V. & Clarke. V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.

Browne, T. (2015). A case study of student teachers' learning and perceptions when using tablet applications teaching physical education. *Asia-Pacific Journal of Health, Sport and Physical Education*, *6*(1), 3-22.

Bruininks, R. H., & Bruininks, B. D. (2005). *BOT2: Bruininks-oseretsky test of motor proficiency*, Second Edition. AGS Publishing.

Carroll, B. (1994). *Assessment in Physical Education: A Teachers Guide to the Issues*, London: Falmer Press.

Cattuzzo, M. T., dos Santos Henrique, R., Ré, A. H. N., de Oliveira, I. S., Melo, B. M., de Sousa Moura, M., ... & Stodden, D. (2016). Motor competence and health related physical fitness in youth: A systematic review. *Journal of Science and Medicine in Sport*, 19(2), 123-129.

Chan, C., Ha, A., & Ng, J. Y. (2016). Improving fundamental movement skills in Hong Kong students through an assessment for learning intervention that emphasizes fun, mastery, and support: the A+ FMS randomized controlled trial study protocol. *SpringerPlus*, *5*(1), 724.

Clark, J. E., & Metcalfe, J. S. (2002). The mountain of motor development: A metaphor. *Motor development: Research and reviews*, *2*(163-190).

Cross, R., & Warwick-Booth, L. (2016). Using storyboards in participatory research. *Nurse researcher*, *23*(3), 8-12.

Cools, W., De Martelaer, K., Samaey, C., & Andries, C. (2008). Movement skill assessment of typically developing preschool children: A review of seven movement skill assessment tools. *Journal of sports science & medicine*, *8*(2), 154.

De Meester, A., Stodden, D., Goodway, J., True, L., Brian, A., Ferkel, R., & Haerens, L. (2018). Identifying a motor proficiency barrier for meeting physical activity guidelines in children. *Journal of science and medicine in sport*, 21(1), 58-62.

Department for Education (2013). *National curriculum in England: PE programmes of study*.

Department for Education (2014). *Physical Education Expert Group: Guidance on Assessment: National Curriculum.*

Fontana, A. & Frey. J. (2008). *The Interview: From neutral stance to political involvement.* Chapter 4 in *Collecting and Interpreting Qualitative Materials, 3rd edition,* edited by Denzin, N. K. and Lincoln, Y. S. Thousand Oaks, California: Sage Publications.

Foweather, L., Knowles, Z., Ridgers, N. D., O'Dwyer, M. V., Foulkes, J. D., & Stratton, G. (2015). Fundamental movement skills in relation to weekday and weekend physical activity in preschool children. *Journal of science and medicine in sport*, *18*(6), 691-696.

Gallahue, D., Ozmun, J. C. & Goodway, J. D. (2012). *Understanding Motor Development: Infants, Children, Adolescents, Adults. 7th Ed*. New York: McGraw-Hill Companies, Inc.

Gard, L., & Rösblad, B. (2009). The qualitative motor observations in Movement ABC: Aspects of reliability and validity. *Advances in Physiotherapy*, *11*(2), 51-57.

Giblin, S., Collins, D., & Button, C. (2014). Physical literacy: importance, assessment and future directions. *Sports Medicine*, *44*(9), 1177-1184.

Gillham, B. (2005). *Research Interviewing: The range of techniques: A practical guide*. McGraw-Hill Education (UK).

Graham, G., Holt/Hale, S. A, & Parker, M. (2010). *Children moving: a reflective approach to teaching physical education, 9th Ed.* New York, McGraw Hill.

Hands, B. P. (2012). How fundamental are fundamental movement skills?. *Active and Healthy Magazine*, *19*(1).

Harris, J., Cale, L., & Musson, H. (2012). The predicament of primary physical education: a consequence of 'insufficient 'ITT and 'ineffective' CPD? *Physical Education and Sport Pedagogy*, *17*(4), 367-381.

Hay, P. (2006) *Assessment for learning in physical education.* In: Kirk, D., Macdonald, D. and O'Sullivan, M. The Handbook of Physical Education. London: Sage, p312-325.

Hay, P., & Penney, D. (2009). Proposing conditions for assessment efficacy in physical education. *European Physical Education Review*, *15*(3), 389-405.

Herrmann, C., Gerlach, E., & Seelig, H. (2015). Development and validation of a test instrument for the assessment of basic motor competencies in primary school. *Measurement in Physical Education and Exercise Science*, *19*(2), 80-90.

Hoepfl, M. C. (1997). Choosing qualitative research: A primer for technology education researchers, *Journal of Technology Education*, 9, 47-63.

James, A. R., Griffin, L. L., & France, T. (2005). Perceptions of assessment in elementary physical education: A case study. *Physical educator*, *62*(2), 85.

Iacono, V. L., Symonds, P., & Brown, D. H. (2016). Skype as a tool for qualitative research interviews. *Sociological Research Online*, *21*(2), 12.

Kvale, S., & Brinkmann, S. (2009). Learning the craft of qualitative research interviewing. *Thousands Oaks: Sage Publications*.

Lander, N. J., Barnett, L. M., Brown, H., & Telford, A. (2015). Physical education teacher training in fundamental movement skills makes a difference to instruction and assessment practices. *Journal of Teaching in Physical Education*, *34*(3), 548-556.

Lander, N., Morgan, P. J., Salmon, J., & Barnett, L. M. (2016). Teachers' perceptions of a fundamental movement skill (FMS) assessment battery in a school setting. *Measurement in Physical Education and Exercise Science*, *20*(1), 50-62.

Lander, N., Morgan, P. J., Salmon, J., Logan, S. W., & Barnett, L. M. (2017). The reliability and validity of an authentic motor skill assessment tool for early adolescent girls in an Australian school setting. *Journal of science and medicine in sport*, *20*(6), 590-594.

Longmuir, P. E., Boyer, C., Lloyd, M., Yang, Y., Boiarskaia, E., Zhu, W., & Tremblay, M. S. (2015). The Canadian Assessment of Physical Literacy: methods for children in grades 4 to 6 (8 to 12 years). *BMC Public Health*, *15*(1), 767.

Lopes, V. P., Rodrigues, L. P., Maia, J. A., & Malina, R. M. (2011). Motor coordination as predictor of physical activity in childhood. *Scandinavian journal of medicine & science in sports*, *21*(5), 663-669.

Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents. *Sports medicine*, 40(12), 1019-1035.

MacPhail, A., & Halbert, J. (2010). 'We had to do intelligent thinking during recent PE': students' and teachers' experiences of assessment for learning in post-primary physical education. *Assessment in Education: Principles, Policy & Practice*, *17*(1), 23-39.

Morgan, P., & Bourke, S. (2008). Non-specialist teachers' confidence to teach PE: the nature and influence of personal school experiences in PE. *Physical Education and Sport Pedagogy*, *13*(1), 1-29.

Morgan, P., & Hansen, V. (2007). Recommendations to improve primary school physical education: Classroom teachers' perspective. *The journal of educational research*, *101*(2), 99-108.

Morgan, P. J., Barnett, L. M., Cliff, D. P., Okely, A. D., Scott, H. A., Cohen, K. E., & Lubans, D. R. (2013). Fundamental movement skill interventions in youth: a systematic review and meta-analysis. *Pediatrics*, 132, 1361-1383

Morley, D., Till, K., Ogilvie, P., & Turner, G. (2015). Influences of gender and socioeconomic status on the motor proficiency of children in the UK. *Human movement science*, *44*, 150-156.

Ní Chróinín, D., & Cosgrave, C. (2013). Implementing formative assessment in primary physical education: Teacher perspectives and experiences. *Physical Education and Sport Pedagogy*, *18*(2), 219-233.

O'Loughlin, J., Chróinín, D. N., & O'Grady, D. (2013). Digital video: The impact on children's learning experiences in primary physical education. *European Physical Education Review*, *19*(2), 165-182.

Ontario Ministry of Education. (2015). *The Ontario Curriculum, Grades 1-8: Health and Physical Education.* Available at http://www.edu.gov.on.ca/eng/curriculum/elementary/health.html.

Patton, M. Q. (2002). Qualitative interviewing. *Qualitative research and evaluation methods, 3rd Ed,* London: SAGE.

Payne, V. G., & Isaacs, L. D. (2011). *Human Motor Development: A Lifespan Approach. 8th Ed.* New York: McGraw-Hill.

Roberton, M. A. & Halverson, L. E. (1984). *Developing Children – Their Changing Movement: A Guide for Teachers.* Lea & Febiger, Philadelphia, USA.

Schilling, F., & Kiphard, E. J. (1974). *Körperkoordinationstest für Kinder: KTK*. Beltz.

Seefeldt, V. (1980). Developmental motor patterns: Implications for elementary school physical education. *Psychology of motor behavior and sport*, *36*(6), 314-323.

Society of Health and Physical Educators America (2016). *National PE standards.* Available at http://www.shapeamerica.org/standards/pe/.

Stodden, D., Langendorfer, S., & Roberton, M. A. (2009). The association between motor skill competence and physical fitness in young adults. *Research quarterly for exercise and sport*, *80*(2), 223-229.

Tidén, A., Lundqvist, C., & Nyberg, M. (2015). Development and initial validation of the NyTid test: a movement assessment tool for compulsory school pupils. *Measurement in Physical Education and Exercise Science*, *19*(1), 34-43.

Tompsett, C., Sanders, R., Taylor, C., & Cobley, S. (2017). Pedagogical approaches to and effects of fundamental movement skill interventions on health outcomes: a systematic review. *Sports Medicine*, 47(9), 1795-1819.

Youth Sport Trust. (2017) *Start to Move assessment tool*. Available at http://itunes.apple.com/gb/app/movement-assessment-tool/id1253503754?mt=8