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Start to Move (S2M): Measuring the feasibility of a teacher-led digital fundamental
movement skills assessment tool

Abstract

Purpose: This study evaluated the feasibility of the ‘Start to Move’ (S2M) digital assessment of children’s fundamental movement skills being implemented by primary school teachers within PE lessons. **Methods:** Nine primary school teachers in the United Kingdom trialled S2M weekly over a 6-week period. Post-trial surveys and interviews were used to ascertain responses.

Results: Feasibility was measured using seven dimensions of Bowen et al. (2009) framework; acceptability, demand, implementation, practicality, adaptation, integration and expansion. Acceptance and demand of S2M was high with participants feeling that its contents aligned to the PE curriculum. Participants were able to implement S2M within PE lesson times without assistance and stated that they would continue to use it within their teaching. They felt S2M would enhance their teaching and would recommend it to other teachers.

Discussion/Conclusion: S2M is feasible for primary teachers to implement within PE lessons and has the potential to heighten the use of assessment for learning within PE in primary schools.

Key words: Physical education, movement competence, measurement, primary school, assessment for learning

Start to Move (S2M): Measuring the feasibility of a teacher-led digital fundamental movement skills assessment tool

Fundamental movement skills (FMS) are developed and learnt movements that include stability (balance), object control, and locomotor skills (Goodway, Ozmun & Gallahue, 2019). Performing FMS underpins movement competence, which enables participation in sports (Barnett et al., 2016), and is positively associated with increased physical activity and health-related fitness in children (Holfelder & Schott, 2014; Robinson et al., 2015; Xin et al., 2020) and educational outcomes (Jaakola et al., 2015). A typically developing child has the requisite physical and psychological attributes to reach a maturational stage of FMS development by seven years of age (Goodway et al., 2019), with early-mid childhood (typically 4-7 years of age) being a critical period to develop competence in performing these skills (Payne & Isaacs, 2011).

It is recognised that primary (elementary) schools are ideal environments for children to learn and practise FMS (Morgan et al., 2013; Wick et al., 2017). Indeed, UNESCO (2015) states that FMS should feature within Physical Education (PE) curriculum as early as the first year of primary school and recent international guidelines and curricula for quality PE in primary schools emphasise the importance of young children developing competence in a broad range of FMS (Australian Curriculum Assessment and Reporting Authority [ACARA], 2015; Department for Education [DfE], 2013, European Physical Education Association, 2017; Society of Health and Physical Educators America, 2013). Specifically in the United Kingdom (UK), children aged 4-7 years should “be taught to master basic movements including running, jumping, throwing and catching, as well as developing balance, agility and

co-ordination” (DfE, 2013, p.2). Despite this, there is concerning evidence that some children have low levels of FMS appropriate for their age in the UK (Morley et al., 2015; Jarvis et al., 2018) and globally (Bolger et al., 2021).

Assessment within PE, specifically in the form of assessment for learning, is recognised as a key mechanism to promote learning as the results provide teachers with information to optimise instruction and practice (Dinan-Thompson & Penney, 2015; Tolgfors, 2018). There is evidence from Robinson et al. (2015) to suggest that further attention should be given to the assessment of children’s FMS in school to subsequently enhance children’s learning and development of these skills. There is a plethora of FMS assessment tools currently available, yet most of these are principally intended to be used in clinical and/or research settings (Burton and Miller, 1998; Cools et al., 2009), rather than in schools where additional factors (e.g., access to equipment; space and time constraints) can impact the feasibility of teachers using these assessments (Bardid et al., 2019; Eddy et al., 2020; Klingberg et al., 2019). In addition to the contextual challenges of implementing FMS assessments within PE lessons, the specificity of these tools can also mean that training is needed to accurately administer the assessment and a certain level of knowledge and understanding of FMS is required to interpret the outcomes and to modify practice and instruction (Logan et al., 2017) to facilitate learning of FMS. Whilst specialist PE teachers might have the requisite knowledge and understanding to assess FMS, generalist primary school teachers, who, in the UK, only receive approximately 6 hours of PE training during Initial Teacher Training (Harris, Cale, & Musson, 2012), report that they lack the requisite knowledge (Eddy et al., 2021; van Rossum et al., 2019) and confidence (Morgan & Bourke, 2008) to effectively implement FMS assessments without further support. These factors have contributed to calls for an enhancement of FMS assessment tools that are informed by input

from teachers so that their requirements, such as instructional content, are met (Chan et al., 2023; Lander et al. 2022).

Empowering primary school teachers to assess FMS is in line with current calls within the UK for schools to identify and address gaps in FMS more quickly (Ofsted, 2023). To facilitate the assessment of FMS in educational settings, school-based methods have been developed in recent years for both generalist and specialist teachers of PE to use (Eddy et al., 2021; Herrmann, Gerlach, & Seelig, 2015; Lander et al., 2016). The MOBAK (Herrmann, Gerlach & Seelig, 2015) is a product-oriented FMS assessment specifically to be used by teachers containing eight skills (locomotor n=4, object control n=4) aligned to the PE curriculum in Germany. The authors reported that there was a high level of acceptance of the assessment by teachers. However, the methods used to collect and evaluate teachers' acceptance were not reported, thus providing only a limited understanding of the suitability of the assessment method for teachers. Based on fidelity observations of teachers delivering the assessment, FUNmoves (Eddy, Preston et al, 2021) reports to be a feasible measure of FMS, yet has limitations as it requires two members of staff to assess a class of children and has a product-oriented assessment format, thus does not provide feedback to the teacher about the quality of the movement. The Canadian Agility and Movement Skills Assessment (CAMSA) is feasible, reliable and valid for use by secondary school teachers of Year 7 girls PE (Lander et al., 2016; Lander et al., 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.

When assessing FMS, movement competence has typically been quantified using standardised tools that measure specific features of a movement (Logan et al., 2017). For

example, product-oriented assessments (e.g. Athletic Skills Track; Hoeboer et al., 2018) measure competency based on the accuracy of achieving certain outcome-goals (e.g., time taken to complete a circuit of skills). Process-oriented assessments (e.g. TGMD-3; Ulrich, 2020) measure the accuracy of movement-production against pre-defined behavioural criteria (e.g. two-handed catch = arms are extended and held in front of the body). This form of assessment can be complex, yet it provides evaluative feedback on how the movement was performed, akin to assessment for learning. A small number of assessment tools combine product- and process- oriented scoring (e.g., CAMSA; Lander et al., 2016) to measure movement competence.

Due to the limited time provided for PE within primary school timetables, and lack of appropriate resources and training on FMS for primary school teachers, a tool to be used by teachers to assess FMS should be simple and quick to administer and have the functionality to help assess and inform teaching and learning of these skills (van Rossum et al., 2019). Providing teachers with appropriate resources and tools that they can incorporate within their curriculum delivery are likely to require planning and understanding of what is appropriate for teachers (Tompsett et al., 2017). Consistent with previous work (Casey, Goodyear & Armour, 2017; Graham, Holt-Hale & Parker, 2013) and our own recent work (van Rossum et al., 2019) it is considered that an FMS assessment housed on a digital platform would be favourable to teachers. This would allow information and instructions (e.g., video and audio) to be integrated to help the user (i.e. teacher) access information to understand how to assess, provide feedback from an assessment, and to provide instructions on how to enhance children's learning of FMS (Lander et al., 2022).

To this end, the purpose of this study was to assess the feasibility of primary school teachers using a new digital FMS assessment tool called 'Start to Move' (S2M) within PE lessons to assess children aged 4 to 7 years old. This is an important step in the development

and expansion of S2M to be used in schools as the effectiveness of FMS assessment tools for teachers is reduced if they are not feasible to use in the time and space afforded to PE in school or require extensive training and specialist knowledge to administer them (Klingberg et al., 2019).

Methodology

Research design

This study used a mixed-methods research approach to investigate the feasibility of S2M being used by primary school teachers in PE lesson time. The principles of design-based-research (Anderson and Shattuck, 2012) were drawn on to explore how well S2M could be implemented and adopted in a PE lesson setting. For this reason, feasibility was measured using a modified version of a framework proposed by Bowen et al. (2009) consisting of seven dimensions of feasibility; acceptability, demand, implementation, practicality, adaptation, integration and expansion (see Table 1 for further description). An eighth dimension of feasibility, efficacy, will be the focus of a future study using a controlled experimental research design. A convergent design (Cresswell & Plano Clark, 2018) was used, in which data from surveys and semi-structured interviews were collected independently at the same time and then brought together to provide a more complete understanding of the teachers' perspectives and experiences of using S2M over a six-week trial period. To converge the data, the findings have been integrated and reported in a joint visual display (Guetterman, Fetter, & Creswell, 2015) constructed around the previously mentioned dimensions of the modified feasibility framework (Bowen et al., 2009).

[Insert Table 1]

Start to Move app

S2M is housed within a digital app to be used on an Apple iPad tablet and contains 14 fundamental movement skills grouped within sub-categories of stability [4 skills], object control [5 skills] and locomotor [5 skills] (see Figure 1 for complete list of skills contained within the assessment). The steps taken to establish the arrangement of skills and format of the assessment via consensus from teachers and academic and practitioner experts have previously been reported (Morley et al., 2019; van Rossum et al., 2019; van Rossum et al., 2021).

[Insert Figure 1]

In accord with Goodway et al. (2019) that FMS development is age-related, not age-dependent, and following expert perspectives for the format of a teacher-led assessment of FMS (van Rossum et al., 2021), within S2M, children's competence to perform each skill is assessed on a continuum of development stages (emerging, developing and established). A process-oriented scoring approach is used with the assessment framework for each skill having been adapted from previous movement frameworks and development sequences. Each skill has three aspects of observation (focused on head, arms, legs and/or body) providing the teacher with a holistic perspective on how the movement is performed (See Table 2 for an example of the assessment criteria).

[Insert Table 2]

van Rossum and Morley's (2018) practical principles for the development of digital platforms for assessing children's movement informed the design and development of the

app. A demonstration of the skill to be assessed by the teacher is provided via the video integrated within the app (See Figure 2 for examples of content). The skills in the assessment require equipment that would typically be found in a school PE department (e.g. basketball, tennis ball, gym mat) and space of no more than 8 x 5 metres is needed. The app contains instructions for how to set up each skill to be assessed and the equipment needed (see Figure 2) along with a library of 56 videos which provide a 10-20 second demonstration of each skill being performed as well as examples of children at each of the three stages of development. An advisory panel of five academics with expertise in assessing children's FMS was used to determine the videos to include for each stage of development through consensus agreement.

[Insert Figure 2]

Participant sample and recruitment

A purposeful sampling strategy (Creswell & Plano Clark, 2018) was employed to recruit participants from a group who had contributed to a previous study (van Rossum et al., 2019) that elicited teachers' perceptions of assessing FMS. The participant sample consisted of six schools and nine teachers, with the following characteristics: gender (female, n=5, male, n=4), length of teaching experience (Mean 10.4 years, SD = 7.1 years), teaching role (PE specialist, n=3; Early Years Foundation Stage (EYFS) teacher = 1, Year 1 teacher = 1, Year 2 teacher = 2), and school status (state, n=8; and independent, n=1). All schools were located in England; five were in the North of the country, and one in the South-West. Ethical approval for the study was obtained from the research ethics committee of Liverpool John Moores University and informed consent was gained from each participant prior to the study commencing. To protect their anonymity, participants have been given a pseudonym during the reporting and discussion of the findings.

197

198 **S2M trial period**

199 Immediately prior to the commencement of the trial period, the lead author provided
200 one hour of training in each school to participants on how to set up the S2M app and
201 administer the assessment, which included instruction on how to access the assessment pages
202 for each activity, enter and view assessment scores, and record and playback video. At the
203 end of the training session, participants verbally confirmed that they understood how to use
204 the app and that they felt ready to begin the trials. Participants were given the contact details
205 of the lead author to discuss any questions or issues that they had using the app during the
206 trials. No communication was received during the trials.

207 Each participant trialled S2M for six weeks, spanning a half term in school, within
208 their timetabled PE lessons. Participants selected a half term period between February and
209 June to conduct the trials which would be most suitable for S2M to fit within their planned
210 PE learning programme and mitigated for interruptions such as holidays and events in school.
211 Participants were asked to use S2M in a minimum of one lesson per week (ranging from 45
212 minutes to 1 hour). The primary school PE curriculum in England provides a framework of
213 the learning content and standards that children should meet but schools and teachers have
214 the freedom to develop their own schemes of learning and configure the lesson content (DfE,
215 2013). Thus, no instruction was provided to participants on how to incorporate the S2M
216 assessment within their schemes of learning or how to practically implement the assessment
217 during the lessons. It was intended that providing teachers with the autonomy to decide how
218 to incorporate the S2M assessment within lessons would elicit greater insight of the potential
219 ways in which the resource could be used and highlight pedagogical issues that may arise.
220

221 **Measures**

222 *Surveys*

223 Upon completion of the trial period, each participant completed a survey to provide a
224 quantifiable and generalised perspective of their experiences of using S2M. The seven
225 feasibility dimensions described in Table 1 (Bowen et al., 2009) were used to frame the
226 scaled response questions to establish teachers' response to using S2M in PE lessons. The
227 survey contained 18 items, including introductory questions to gather process information
228 from the participant (e.g. class they teach and number of occasions that they administered
229 S2M) and scaled response statements such as; *The content of S2M was appropriate to the PE*
230 *curriculum at EYFS and Key Stage 1*. A Likert scale of 0-10 (0 = strongly disagree – 10 =
231 strongly agree) was used to capture responses.

232

233 *Semi-structured interviews*

234 Semi-structured interviews were used with each participant to explore their experiences of
235 implementing S2M (Berg, 2009). The interview schedule was constructed around the same
236 seven dimensions of feasibility (Bowen et al., 2009) that informed the survey design.
237 Individual interviews were offered, but due to time constraints in school, some participants
238 asked for group interviews to take place at lunch time. In total, four individual interviews
239 (ranging between 25-40 minutes) and two small group (group one n=2, group two n=3)
240 interviews (ranging between 36-37 minutes) were conducted at convenient times for the
241 participants during the school day. To reduce the risk of hierarchical factors impacting on the
242 data, the group interviews were conducted with staff who had the same role in school. To
243 encourage participation within the group interviews, participants were informed that they
244 were free to contribute at any point (Fontana & Frey, 2008) and the discussion was

moderated by the interviewer to mitigate a dominant voice taking over (Berg, 2009). All interviews were conducted by the lead author within one week of the participants' trial ending. The individual and one group interview were conducted face-to-face at the participants' school and the other group interview was conducted via Skype video-conferencing software due to the geographical distance between the school and the research team.

Data analysis

The survey responses were analysed using standard descriptive statistics, collated and tabulated to align with the seven dimensions of the modified version of Bowen et al. (2009) feasibility framework (acceptability, demand, implementation, practicality, adaptation, integration and expansion) (see Table 3). All interviews were digitally recorded, transcribed verbatim and a deductive approach (Patton, 2002) was then used to systematically code each transcript with quotes extracted and positioned within a qualitative thematic framework (Braun & Clark, 2006) based on the same seven dimensions of Bowen's (2009) feasibility framework. Upon completion of the initial analysis of each of the interview transcripts by the lead author, the transcripts and coding table were shared with the authorship team to reflexively consider (Smith & McGannon, 2018) the themes and corroborate the coding patterns. During the analysis process, some quotes converged across multiple dimensions of the feasibility framework. For example, some quotes were initially placed within both the "implementation" and "practicality" dimensions. In these cases, the authorship team discussed and agreed upon a position of 'best fit' for the results and the quotes were re-positioned accordingly. This clarification of quotes allowed axial coding to be conducted more accurately to avoid duplication and strengthen the connectedness with the data.

In accordance with the procedure of the convergent design (Creswell & Plano Clark, 2018), analysis of the findings from the surveys and interviews took place at the same time and brought together so that the data could be combined and compared. During this process, the findings of both methods were converged in a joint visual display (Guetterman et al., 2015) involving a similar arrangement as used in a previous study in a related field (Morley et al., 2018).

Results

Findings are represented within a joint visual display constructed upon the dimensions of the modified feasibility framework (Bowen et al., 2009). Merging the data from the surveys and interviews in this way is a hallmark of mixed-methods research (Morse, 2010) and assisted in drawing new insights of teachers' experiences of using S2M to establish its feasibility (Guetterman, Feters, & Creswell, 2015). Here, we 'show' the data and invite readers to construct their own knowledge and explore the ways and extent to which these data resonate with them (Smith, 2018), before we move onto the analytical 'tell' in the Discussion.

Teachers' experiences and perspectives of using Start to Move

[Insert Table 3]

Discussion

This study aimed to evaluate the feasibility of the S2M assessment tool, used across 6 weeks by primary teachers in PE lessons. Overall, the experiences of specialist PE teachers and generalist teachers, who identified as having not received specialist PE training, were similarly positive. High levels of demand and acceptability for S2M were evident which is reflective of the paucity of digital teacher-oriented FMS assessment tools and the

acknowledgment from teachers for the need for resources to support their use of assessment of FMS (van Rossum et al., 2019). S2M provided teachers with a greater understanding of the skills to assess and the level of detail required to observe and provide feedback for each skill. This is important considering that primary school PE in the UK is typically delivered by generalist teachers who cite a lack of confidence and understanding in the subject as a barrier to assessing FMS more frequently (Eddy et al., 2021; van Rossum et al., 2018). The results of the post-trial survey indicated that all but one teacher reported an increase in their confidence in their ability to assess FMS. It is encouraging, that the one teacher who reported having the lowest confidence in being able to assess FMS praised S2M for offering her the direction and support that she had not had before to assess the FMS of her class of children.

With regards to implementation of S2M within lessons, almost all participants felt they were able to administer the assessment within the lesson time and in the space they had available, which are key indicators of the feasibility of FMS assessments for use in school settings (Eddy et al., 2020; Klingberg et al., 2019). Traditionally, the assessment of children's FMS has involved conducting measures in a clinical, engineered environment such as a medical setting (Burton & Miller, 1998; Cools et al., 2009). These existing assessments typically require the child to perform a variety of skills (ranging between 8 and 16 skills depending on the assessment battery being used) in a circuitous manner whilst being observed by the assessor, with little or no feedback given to the child during the assessment. In recent years, Morley et al. (2019) proposed that in the context of a FMS assessment being delivered by teachers, there is reason to consider assessing children performing skills in a more natural, ecologically framed environment. Teachers involved in this present study had the freedom to implement S2M within the lesson in a format that they wished. This meant, for example, that the teacher could select a single skill, or multiple skills, to assess within a lesson and provide feedback and instruction immediately, informing their pedagogy during

the lesson. Prior research has suggested that teacher-led FMS assessment tools should include pedagogical content knowledge and instructional content (Lander et al., 2022), particularly if intended for generalist teachers (Tompsett et al., 2017). The S2M app provides some direction for use as the 14 skills are grouped within the sub-categories of FMS (stability, object control and locomotor) and listed in the order that they should be learnt. Yet, in the trials, the teachers had autonomy to create their own lesson plans and decide how to integrate the assessment within their lesson. It could be suggested that allowing teachers to use their own pedagogical awareness to integrate the assessment in ways that suited their children and the environment they work within enabled a more authentic assessment environment that is encouraged by Hay and Penney (2009). Empowering the teacher to implement more authentic forms of assessment is recognised as a key mechanism to promote learning (Dinan-Thompson & Penney, 2015; Tolgfors 2018) and has been shown to be an effective pedagogical tool for secondary school teachers to assess FMS in lessons (O'Brien et al., 2023). This autonomous approach offered by S2M for teachers to integrate the assessment within their primary PE lessons differs to some other FMS assessments (Eddy, et al., 2021; Hoeboer et al., 2018), that require a precise process to set up and administer the assessment which limits one child being able to take part at one time. Thus, S2M could become a tool to empower primary teachers to construct assessment practices with a more considered pedagogical approach (Kim and Lee, 2021) which in turn could enable them to create more supportive and impactful learning experiences for children to develop FMS. However, there is risk that a lack of pedagogical instruction could negatively influence implementation of an FMS assessment by teachers (Chan et al. 2023).

Drawing on the work of Scheuer et al. (2019) and Klingberg et al. (2019), the implementation of an FMS assessment is seen as a key indicator of its feasibility for use by teachers in lesson time. Thus, it is encouraging that almost all participants reported that they

could use S2M within their lesson without assistance. The responses from participants who used S2M on a greater number of occasions demonstrated that they had greater confidence using it within lessons, indicating that some brief, initial familiarisation of S2M is beneficial. Specifically, participants drew attention to the time it took to become familiar with navigating and using the assessment features on the digital platform. This emphasises the assertion that digital literacy, that is possessing the knowledge and understanding to use digital technology as is it intended (Greve et al., 2022), and technological pedagogical knowledge (Koekoek & van Hilvoorde, 2018) are both critical factors to consider when establishing new digital technology for use by teachers of PE. In this study, the experience of Vince exemplifies this as he found that he initially felt that having the iPad in his hands was a distraction during the lesson, yet, over a short period of time he was able to adjust his teaching to incorporate the use of the app. To remedy this, further development of S2M is warranted to enhance navigation within the app and include more tuition and guidance of how to interact with its digital features.

Despite some distraction caused by the video content in the early use of S2M, participants were able to use the embedded videos and felt this feature greatly supported their understanding and expectations of how children should perform each movement task at each stage of development. This has positive ramifications as the effects of FMS interventions have been found to be stronger when delivered by more knowledgeable assessors (Tompsett et al., 2017). It is noteworthy that the value of video recording and playback within S2M to enhance feedback opportunities corroborates prior research (Chan et al., 2023). This is suggestive that the functionality allowed by digital technology to integrate video demonstrations and video recording features could be used as tools to better inform the teacher, subsequently enhancing their knowledge, and could provide more meaningful results in supporting children's development of FMS (Dinan-Thompson & Penney, 2015; Tolgfors,

2018). This is recognised by students who felt that use of digital technology in PE increased their motivation and enhanced their learning (Wallace et al., 2023).

In relation to the feasibility dimension of adaptation, importantly, all participants reported that the S2M assessment aligned with the primary PE curriculum (DfE, 2013), which is considered essential for demonstrating curricular validity (Scheuer et al., 2019). Furthermore, at the end of the trial period, teachers reported that S2M had increased their confidence in assessing children's FMS and felt that it would enhance their teaching of FMS. This is particularly significant as previous research has highlighted that low confidence has limited primary teachers use of assessment in PE (Eddy et al., 2020; van Rossum et al., 2018). Unlike other FMS assessment tools recently developed for use in primary schools which have adopted product-oriented scoring (eg. Athletic Skills Track [Hoeboer, 2018]), teachers reported that the process-oriented assessment scoring within S2M provided them usable feedback in relation to the quality of the children's movement. This suggests that S2M is well-suited for use in schools as research about best practises of assessment in PE (Ní Chróinín & Cosgrave, 2013; Tolgfors, 2018) advocate assessment for learning being integrated to enhance delivery and promote learning in teaching environments.

With regards to integration, the survey responses indicate that all participants would recommend S2M to other teachers, suggesting that encouraging colleagues in school to adopt the assessment would not be difficult. There is further promising evidence from a national survey of primary teachers (Eddy et al., 2020) that reported that Senior Leaders in school would be very supportive of teachers wanting to adopt FMS assessments within school. Further responses provided in the interviews in this present study emphasise that adopting the platform across the school would allow knowledge to be transferred between staff and for parents to be given more detailed information about the progress of their child in PE. Thus, drawing on the recommendations of Ma et al. (2021), the success of S2M to develop

children's FMS could be heightened if it was integrated across the whole school, enabling progression of learning as children transition through school.

Whilst it is recognised in the UK that minimal training is provided in Physical Education Teacher Education for generalist primary school teachers (Harris, Cale & Musson, 2012), there is a drive to provide more expansive and innovative Continuous Professional Development (CPD) opportunities to develop primary teachers' PE confidence and subject knowledge (Lander et al., 2022; Tannehill et al., 2020) and create digitally supported tools to support their teaching (Morley et al., 2019). The responses from teachers using S2M indicate that as well as being a suitable method of assessment, it is an instructional tool that can directly develop teachers' knowledge and understanding of assessing FMS, and over time could influence their pedagogical practise. Further integration of pedagogical content knowledge is required to maximise the potential of assessment on digital platforms to enhance teaching and learning (Chan et al. 2023). One participant suggested that S2M could be used as a training tool to inform and enrich PE CPD delivered to other teachers in school. These finding supports those of others who have suggested that teachers' professional learning should move away from traditional forms of training (i.e. courses and manuals) (Keay, Carse & Jess, 2018) and utilise opportunities presented by digital technology (Lander et al., 2022). Thus, further consideration could focus on expanding S2M to include features and activities to improve training opportunities and support teachers in developing their curriculum and pedagogical knowledge.

Despite its contribution, the study does have limitations. Due to the relatively small number of participants within this study, it is recognised that the findings are not generalisable for all teachers. However, the depth of detail and understanding gained from the perspectives of each participant and the lessons learned from each individual may be applicable in a variety of situations (Bennett, 2010). In this respect, the findings provide

evidence from teachers of the feasibility of S2M, as well as highlight suitable recommendations to make further improvements to S2M to meet the needs of teachers.

Conclusions and implications for practice

Overall, the in-depth perspectives and experiences of teachers using S2M reported within this study add further clarification around the feasibility of a teacher-led FMS assessment being used in primary school settings (Klingberg et al., 2019; Scheuer et al., 2019). This study has demonstrated that S2M, a digital app based, process-oriented assessment of FMS is feasible for teachers to use in primary school PE lessons. Furthermore, it provides evidence to suggest that an FMS assessment utilising digital technology can be an effective approach to support teachers (Lander et al. 2022). Although efficacy was not a measured outcome of this study, findings suggest that S2M has potential to enhance the teaching of FMS, thus further work is now warranted to measure its effectiveness over a sustained intervention period.

To our knowledge, this is the first digital app-based FMS assessment that has been designed specifically for primary school teachers to use in PE. Of particular significance, these findings demonstrate that S2M can be administered by teachers with minimal assessment training. As a result of using S2M over the trial period, teachers within this study reported improvements in their understanding and awareness of assessing children's FMS competence. Integrating the FMS assessment on a digital platform and enabling video content to be provided, has shown in this study to increase teachers' confidence and perceived understanding of what to assess. We recommend S2M and other digital FMS assessments provide clear instruction of how to navigate and implement the assessment (i.e. support pedagogical content knowledge) to enhance further enhance teaching and improve children's FMS.

Overall, the findings of this study suggest that S2M has the potential to enhance the use of assessment, specifically in the form of assessment for learning, within the teaching of FMS within primary schools. In turn, this could strengthen primary teachers' ability to teach and evaluate children's learning in line with PE national curriculum requirements. Positively impacting on children's learning and development of FMS in this way may then help children to break through the proficiency barrier (Seefeldt, 1980) during this critical period of their physical development (Wick et al., 2017). Considering the positive association between FMS competence and physical activity and health related fitness through childhood and adolescence (Holfelder & Schott, 2014; Xin et al., 2020), S2M could therefore be a successful mechanism for promoting physical activity levels of children and adolescence.

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664 **Table 1. Description of the modified version of the feasibility framework (adapted from**
665 **Bowen et al., 2009).**

Dimension	Area of interest specific to the assessment of FMS	Resultant feasibility concepts relating to Start to Move
Demand	Estimated use or actual use of the assessment	Perceived demand, intent to use
Acceptability	How teachers react to the assessment	Satisfaction, reaction
Implementation	The extent and manner in which the assessment can be implemented as planned	Degree of execution, success or failure of execution
Practicality	The extent to which the assessment can be delivered within the constraints of the school setting (e.g. time and resources)	Factors affecting implementation, ease of use
Adaptation	Focuses on changing the assessment content or procedures to be appropriate	Degree to which similar outcomes are obtained in new format
Integration	Assesses how the assessment can fit within existing school structures	Intent to continue use, perceived fit within school, perceived sustainability
Expansion	Examines the potential use of the assessment to provide a different purpose	Broader benefits, alignment with school ethos/goals

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Table 2. Assessment criteria for kicking a ball

	Emerging	Developing	Established
Feet	Feet remain stationary and kicking foot reaches for the ball	Approaches ball with small step forwards	Large step (or leap) forwards to place non-kicking foot next to or just behind the ball
Legs	Limited leg backswing and/or follow through	Leg bends at the knee and then extends to kick ball	Hips extend to begin kicking action Kicking leg bends during backswing and extends as ball is kicked
Arms	Arms held by sides No swing of arms	Small amount of arm swing	Arms are held out to sides and swing in opposition to legs

Table 3. An integrated joint visual display of teachers' experiences and perspectives of using Start to Move

Theme	Survey	Interview data
Demand (Estimated use or actual use of the assessment)	8 of 9 participants agreed that they felt confident in their ability to assess children's FMS. 5 participants strongly agreed with this statement Linda gave a neutral response, indicating she was neither confident nor unconfident.	<p>"As a non-specialist in PE I think this is good for those who want a bit more direction in what you're doing. I've been teaching a long time but it's still not my area of expertise, but I think this does focus you in on it." <i>Linda</i></p> <p>"I think it would be really powerful because as they've gone away from levels across the board in schools, they are at power to assess how they like, I think just something like that almost gives ownership to schools doing it their own way" <i>Jose</i></p> <p>"I think that'll help with that as some do think they are perfect, but at least when it's a piece of writing you can show them where they've gone wrong, but in PE actually it's very hard to show them where they need to improve, but the video will do that." <i>Zoe</i></p> <p>"I think the app will help to get teachers thinking more about skills rather than games. It's getting people away from thinking what they're teaching and instead focus on how they're teaching it. And I think that's where PE lacks and the app will help" <i>Louise</i></p>
Acceptability (How teachers react to the assessment)	<p>All participants agreed that the data generated in S2M helped them to better understand children's FMS. 6 participants strongly agreed with this statement.</p> <p>All participants agreed that S2M engaged students during the PE lessons. 5 participants agreed strongly with this statement.</p>	<p>"It's [S2M] given me a better understanding of how in-depth I need to go at teaching the skills" <i>Lisa</i></p> <p>"The visualness [sic.] of it is really good and then obviously [the children] can watch themselves played back as well so there was a bit of a wow factor for the kids as well. So it's not just us standing there with an iPad, I found it very engaging for them as well, which was nice." <i>Jenny</i></p> <p>"The videos and the photos helped, they were a prompt and made me think of different things that I wouldn't have normally looked for in the skills. Rather than just looking at the obvious things, it was like the time on the balances and things as well." <i>Louise</i></p> <p>"The children enjoyed watching the demonstration videos and then assessing themselves from it. Ours are only very young but it was a really good skill to learn." <i>Jenny</i></p> <p>"It's definitely increased my knowledge and confidence in my ability to judge, so before I didn't know what level to assess children for balancing, but now with the app I've got more knowledge on saying if they're a beginner and what they should do to improve. It's built my confidence on that side of knowing the different levels on different topics." <i>Vince</i></p> <p>"When it came to the throwing I was able to give them those descriptions from the app. That was my main teaching points, which I hadn't used previously when we first started doing it. So that just gave me three easy bits of criteria to use with them, they could understand as well." <i>Rick</i></p>

		<p>“You saw Lisa, she’s not the most engaged child in PE, but she wanted to be involved and she loved the video and I think for some children it helps to draw them in a bit more, and keep them focused and on task. It doesn’t work for all of them, but some of them it did.” <i>Jenny</i></p>
<p>Implementation (The extent and manner in which the assessment can be implemented as planned)</p>	<p>8 participants felt that they could administer S2M within PE lessons without assistance. 1 participant (Linda), gave a neutral response.</p> <p>8 participants strongly disagreed that the video was a distraction within S2M. 1 participant gave a neutral response.</p> <p>All participants agreed that they could understand the data generated within the app, with 7 participants strongly agreeing with this statement.</p> <p>7 participants felt that they could integrate S2M into their lessons without disrupting children’s learning. Of these, 4 participants strongly agreed with the statement. 2 other participants (Jenny and Linda) gave a neutral response to this statement.</p>	<p>“They were working in small groups. It enabled me to see each child work at that particular station because they were moving around 8 different stations looking at different skills so when they got to my station, I was there with the iPad and I was able to video them.” <i>Rick</i></p> <p>“We looked at what the lesson intention was and then we looked to put the app into that, so for instance when it was our balance, it was easy because we could use the one legged balance and we’d set up three groups and we’d have an assessment group and then the other two groups would be doing an activity in and around balancing so then all of a sudden you have three groups and then you just keep on rotating so that everyone is having a go at all three different ones.” <i>Neil</i></p> <p>“They might do it twice and I’ll look at the arms and legs then I’d get them to go again and do the next one. It sort of worked as well but obviously with a class of 30 it was quite hard.” <i>Vince</i></p> <p>“To be honest it was quite hard at first, because trying to have the tablet in your hand and then you’re trying to score as well as teach. Whereas myself, I like to use my hand when I’m teaching PE and I like to move around, be a bit crazy. And I think it sort of stopped the way I teach, but at the same time it was still useful, so it helped me with getting, like, pointing out like “she’s done it well” and getting the points that what she’s doing right and what she’s doing wrong and the videos actually show this is how you’re supposed to do it and things like that” <i>Vince</i></p> <p>“I use the videos in the lesson now as well, so instead of me showing them I try to use a different way of doing it, so getting it on the board and trying to get different ways of doing it.” <i>Vince</i></p> <p>“I love the three clips of the development stages. I’ve still not got that in my mind and even if I’ve got it on paper, I’ve gone with that, I’ve judged them on those stages.” <i>Zoe</i></p> <p>“Instead of changing my lessons around the assessment, I added the assessment into what I was already going to do because my PE lessons are quite free flowing anyway.” <i>Louise</i></p>
<p>Practicality</p>	<p>5 participants strongly agreed that the MAT can</p>	<p>“The simplicity is great as it doesn’t take a long time to show them how to do it and for them to have a go with it.” <i>Jose</i></p>

(The extent to which the assessment can be delivered within the constraints of the school setting [e.g. time and resources])	be conducted within PE lesson time, 3 participants agreed that S2M can be conducted in lesson time	<p>“The only downside to that obviously it is a little bit more time consuming, but again, the more competent we become with it, the quicker we’ll be able to do things. I found I was having to wait as I was having to go back into a page to find video, or to take video.” <i>Zoe</i></p> <p>“Once we get it working regularly, then we can come to it and get more proficient at using it and more confident at using it, because I still feel a little bit unsure with it.” <i>Linda</i></p> <p>“I think the scoring took too long because you’re trying to do your scoring as they’re getting bored, trying to wait for you to get all your scoring down, so I think shorten the things or putting them in bullet points all together.” <i>Vince</i></p> <p>“The videos are really, really good and some of the explanations were good, some were a bit interesting but the only thing I didn’t like was you couldn’t click quickly on them to say where there are, it’s a long process to go through on each one.” <i>Neil</i></p>
Adaptation (Focuses on changing the assessment content or procedures to be appropriate)	All 9 participants strongly disagreed that the content of S2M is inappropriate for to the PE curriculum at EYFS and Key Stage 1, indicating that teachers believe the content of S2M to be highly suitable for children aged 4-7 years old.	<p>“We’ve basically been applying it to the core curriculum areas, so for striking and fielding games, we’ve broken it down into the fundamental skills you’d need to be successful at striking and fielding and then just a brief description of how that skill would look, for emerging, developing or established.” <i>Jose</i></p> <p>“I think the Key Stage 1 team found that there wasn’t enough challenge with some of the skills. That they found a lot of the children could master those skills quite easily.” <i>Louise</i></p> <p>“It’s made me think about the finer details of skills, like I think before I would just see the big picture and I wasn’t focused on the smaller things, unless they were really obvious. So it’s made me think about all the aspects of the skills and not just the skill as a whole part.” <i>Zoe</i></p> <p>“I think it will make your teaching a lot more focused and I think it will make your teaching better.” <i>Louise</i></p>
Integration (Assesses how the assessment can fit within existing school structures)	<p>7 participants strongly agreed with the statement that they will continue incorporate S2M within PE lessons, 1 participant agreed with this statement, and 1 participant gave a neutral response.</p> <p>All 9 participants would recommend S2M to other primary school teachers. Of these, 7 participants,</p>	<p>“The way I see this being used is the more we introduce it into schools, is most of this being done in reception and then building up the children’s portfolio’s in reception, and when they come to us [year 1] we’re then going through and can cherry pick as not all the children are going to be starting off from day 1, so we’re going to be able to look at that and decide who’s going to need to do ABC - the children who haven’t got great co-ordination skills – so I’ve been using it and starting from scratch,” <i>Jenny</i></p> <p>“We’ve developed a new PE scheme, the ABC scheme that we introduced, we’ll now be able to build this into it.” <i>Jenny</i></p> <p>“I’d try and get a slot at a staff meeting because we’re looking at assessment through the school as well in terms of how they get measured in other areas so obviously they have other tests which are similar to SATs.” <i>Rick</i></p>

	strongly agreed with the statement.	<p>“I really like the transferability of it, so if I was ever to teach another class I could pick that up and use it even if I don’t know the children very well, I could go down to reception to teach a PE lesson and know how to use it” <i>Jenny</i></p> <p>“Showing the parents the assessment that we use. Because they won’t know anything about it and they’ll go “wow, this is really good, what else are you doing?” <i>Neil</i></p>
Expansion (Examines the potential use of the assessment to provide a different purpose)	<p>All teachers felt that S2M had increased their confidence in assessing children’ FMS. Of these, 4 participants strongly agreed that S2M had increased their confidence.</p> <p>All participants felt that S2M would enhance their teaching of FMS. 6 participants strongly agreed with this statement.</p>	<p>“I’ve used it when I support in other schools with their PE curriculum or physical literacy programs to upskill them in what movements look like. So it’s been quite handy from a CPD delivery angle as well as it’s enabled me to work in a different angle with subject leaders or school leaders and kind of demonstrated to them within the physical literacy side of things to look at the different competencies of movements. They think it’s brilliant and can’t wait to get it when it comes out.” <i>Jose</i></p> <p>“That’s really useful for non-PE specialists more than anything. Because you know they’re [child] is not quite right, but you don’t know how to help it not be right.” <i>Zoe</i></p> <p>“For the teachers that don’t teach PE, if they were to video and have that evidence it would be good to have activities within the app to help them know what they should be doing.” <i>Lisa</i></p> <p>“I’ve changed the words on the PE bit in my report to reflect their agility, balance and co-ordination and talk about how they’ve become more aware of their own body and how to use their bodies more. Which I don’t think we would have done before without using something like this [the app].” <i>Jenny</i></p>

Figure captions

Figure 1. Skills contained within the Start to Move assessment

Figure 2. Example of Start to Move on screen assessment content and information and content