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Article Title: Do Irish Adolescents Have Adequate Functional Movement Skill and Confidence?

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Abstract

Recent research has shown that post-primary Irish youth are insufficiently active and fail to reach a level of proficiency across basic fundamental movement skills. The purpose of the current research was to gather cross-sectional data on adolescent youth, differentiated by gender, specifically to inform the development of a targeted movement-oriented intervention. Data were collected on adolescents (N=219; mean age: 14.45 ± 0.96 years), within two, mixed gender schools. Data collection included actual and perceived movement measurements; comprising of fundamental movement skills, the functional movement screen, perceived movement confidence and perceived functional confidence. Overall, levels of actual mastery within fundamental and functional movement were low, with significant gender differences observed. Adolescent males scored higher in the overall fundamental movement skill domain (male mean score = 70.87 ± 7.05; female mean score = 65.53 ± 7.13), yet lower within the functional movement screen (male mean score = 13.58 ± 2.59), in comparison to their female counterparts (female mean score = 14.70 ± 2.16). There were high levels of perceived confidence reported within fundamental and functional movement scales. Future intervention strategies should combat the low levels of actual movement skill proficiency, whilst identifying the reasons for higher perceived movement confidence within adolescents.

Keywords: fundamental movement skill, functional movement screen, motor development

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Physical literacy has been previously defined as having the motivation, confidence, physical competence, understanding, knowledge, skills and attitudes to live a physically active life (Whitehead, 2007). Movement competency, an integral component of physical literacy, has been shown to be an important correlate of regular physical activity (PA) participation and health-related fitness in children and adolescents (Cattuzzo et al., 2015; Lubans, Morgan, Cliff, Barnett, & Okely, 2010). Indeed, it could be argued that movement competency is a fundamental aspect of childhood development, such is its impact on current and future health (Stodden et al., 2008).

A previous systematic review, which identified 21 potentially relevant articles, was undertaken to examine the association between fundamental movement skill (FMS) competency and eight potential benefits in youth, namely global self-concept, perceived physical competence, cardio-respiratory fitness, muscular fitness, weight status, flexibility, PA and reduced sedentary behaviour (Lubans et al., 2010). From this review, conclusive positive associations between FMS competency and PA, and FMS competency and cardio-respiratory fitness were found, with an inverse association between FMS competency and weight status also identified. Likewise, a previously published longitudinal study highlights that the consequences of ineffective movement skills during childhood can have a significant impact on PA participation later in adolescence (Barnett, van Beurden, Morgan, Brooks, & Beard, 2009). While it has been established that levels of PA participation decline significantly during adolescence (Hallal et al., 2012; Woods, Tannehill, Quinlan, Moyna, & Walsh, 2010), evidence suggests that competency in a range of FMS may serve as a protective factor against this trend (Barnett et al., 2009; Lubans et al., 2010). Strategies to improve PA participation may need to consider ensuring that adolescents have competency in basic movement patterns (Belton, O' Brien, Meegan, Woods, & Issartel, 2014; Hardy, Barnett, Espinel, & Okely, 2013; O' Brien, Belton, & Issartel, 2016a, 2016b), at both a fundamental and functional movement level

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(Abraham, Sannasi, & Nair, 2015; Cook, Burton, & Hoogenboom, 2006). Although there is acceptance that movement competency is multidimensional in nature (Rudd et al., 2015; Whitehead, 2010), there is still a lack of agreement about how movement competency during childhood is comprised. One important reason for this lack of consensus may be the variances in methodological measurements used for movement competency (Giblin, Collins, & Button, 2014), specifically the wide array of movement skill assessment tools (Cools, Martelaer, Samaey, & Andries, 2009).

FMS are the basic observable building blocks or precursor patterns of the more specialised, complex skills, used in organised and non-organised games, sports and recreational activities (Hands, 2012). Examples exhibited during sport, exercise and PA include running, hopping, skipping (locomotor), throwing, catching, kicking (object control), balancing, twisting and dodging (stability) (Department of Education Victoria, 1996; Gallahue, Ozmun, & Goodway, 2012). Previous evidence suggests that children have the developmental potential to master most FMS skills by six years of age (Gallahue et al., 2012).

In addition to the basic observable patterns of FMS, another indicator for actual movement skill proficiency in adolescents exists. Functional movement relates to the body's use of multi-planar and multi-joint movements, specifically those activating the core musculature region (Abraham et al., 2015). The Functional Movement Screen (FMS™) (Cook, Burton, Fields, & Kiesel, 1998; Cook, Burton, & Hoogenboom, 2006) is a pre-participation evaluation tool that comprises a series of movements designed to assess multiple domains of function and the quality of movement patterns (Letafatkar, Hadadnezhad, Shojaedin, & Mohamadi, 2014; O'Connor, Deuster, Davis, Pappas, & Knapik, 2011). Previous research has reported low levels of functional movement among children and adolescents (Abraham et al., 2015), further differentiated by observational gender and weight status associations during childhood (Duncan & Stanley, 2012; Schneiders, Davidsson, Hörman, & Sullivan, 2011). If

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such suboptimal movement strategies persist, there is a suggestion that this may lead to orthopaedic abnormality (e.g.'s arthritis, low back pain, osteoporosis) in later life (Duncan, Stanley, & Leddington Wright, 2013). Thus, understanding fundamental and functional movement during adolescence may provide a more insightful understanding within the motor development domain.

International based research, particularly with high school students in the USA (Sorenson, 2009; Wieczorkowski, 2010), suggests that a proactive, functional training approach can enhance overall wellness and productivity in active populations. Although, the FMS™ has been used in injury-related research, it was originally designed to assess functional mobility and postural stability (Cook et al., 2006). It is therefore logical to suggest that children who show high levels of functional movement, may also show higher levels of FMS proficiency, as functional mobility and postural stability underpin performances in the basic observable patterns of running, hopping, jumping, and throwing (Kraus, Schütz, Taylor, & Doyscher, 2014). This suggestion is based on the assumption that strength, movement, flexibility and stability are prerequisites for fundamental skill performance, which the FMS™ purports to examine (Kraus et al., 2014). However, no study to date appears to have examined this.

Within the discipline of motor development, many studies refer to perceived competence (perceived ability to perform a skill) (Babic et al., 2014; Seabra et al., 2013), while far fewer refer to perceived confidence (perception of ability/self-efficacy), specifically within the adolescent population (McGrane, Belton, Powell, Woods, et al., 2016). Perceived self-confidence is a key tenant of physical literacy, and is therefore, important to examine.

Perceived self-efficacy is defined as the belief in ones capabilities to organise and execute the courses of action required to manage prospective situations (Bandura, 1994). Previous research has highlighted the importance of assessing adolescents' skill-specific,

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physical self-confidence levels, across males and females (McGrane, Belton, Powell, & Issartel, 2016; McGrane, Belton, Powell, Woods, & Issartel, 2016). The assessment of adolescents' physical self-confidence, at a skill-specific level, has been reported to provide information on the confidence and FMS proficiency levels of participants, which may assist in the creation of an optimal motivational climate for movement (McGrane, Belton, Powell, Woods, et al., 2016). Dweck (1991) has outlined that those who possess a high performance ability, and a high self-confidence, will continue to choose challenging tasks providing they have a chance of achieving success.

The development of a valid and reliable instrument to assess physical self-confidence in adolescents, and at a skill specific level has only been recently established (McGrane, Belton, Powell, Woods, et al., 2016). This scale can be used to identify adolescents with low self-confidence, as being at risk of ceasing participation in PA and sport, as well as not achieving high levels of FMS proficiency (McGrane, Belton, Powell, Woods, et al., 2016). Yet, while the relationship between actual movement skill proficiency and PA participation is empirically established (Lubans et al., 2010), fewer studies have focused specifically on the perceived confidence levels amongst adolescents.

Some empirical research on actual and perceived FMS confidence levels has been conducted previously with adolescents (McGrane, Belton, Powell, & Issartel, 2016), however, no study published to date has examined the actual and perceived functional confidence levels amongst adolescents. In order to better target interventions aimed at enhancing movement skill proficiency and subsequent PA in adolescence, there is a need to better understand how perceived confidence may be related to both fundamental and functional movement during early adolescence. The purpose of the current research was to gather cross-sectional baseline data on Irish adolescent youth, differentiated by gender, specifically in order to inform the development of a targeted movement-based intervention.

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Methods

Overview of the Study

Cross-sectional baseline data to inform the design of a larger multi-component, movement based physical education (PE) intervention for post-primary schools in Ireland was collected, as part of a research programme which was initiated in October 2015. Baseline data, differentiated by gender-based comparisons, for the present study were gathered over a six-week period in April and May 2016, which specifically included FMS, FMS™, PA (accelerometry and self-report), perceived movement skill confidence and anthropometric characteristics (height and mass).

Ethical approval for this baseline study was provided by the Social Research Ethics Committee (SREC) in University College Cork (March 2016). Prior to the commencement of this school-based study, the leading researcher visited the Principal of each of the participating schools, where a full brief and outline of the data collection was provided. Subsequent to the granted approval from school Principals, information sheets and consent forms were then distributed to the selected class groups. Informed parental consent and child assent were the requirements for eligible participation in this study. All participants were free to withdraw from the research at any stage.

Participants and Setting

A convenience sample (based on the researchers' proximity to the schools) of cross-sectional data was collected on Irish adolescent youth, as part of the baseline study protocol. In terms of the research rigour associated with school-based measurements, it is important to note that the leading investigators for this study are qualified post-primary specialist PE teachers, as recognized by the Teaching Council of Ireland.

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Consenting post-primary participants enrolled in years one to three (12-16 years) from two, mixed gender, non-fee paying schools, were invited to partake. Both post-primary schools involved in the research study were from the same urban area in County Cork, within the province of Munster, Ireland. Two hundred and twenty-seven participants from the two schools were invited to participate in this study, with consent from 219 participants provided (97% of total sample). Of the participants, 120 were male (55%) and 99 were female (45%); 89 adolescents were in year one (40%), 52 adolescents were in year two (24%) and 78 adolescents were in year three (36%). The mean age of the participants was 14.45 ± 0.96 years (age range: 12.82-16.37 years old). The current sample of boys and girls provides the opportunity to compare and contrast mastery levels of adolescents.

Data Collection

Prior to data collection, all thirteen field staff, who were final year undergraduate pre-service physical education teachers, underwent a rigorous and robust 8 hour field researcher training workshop in the measurement protocol associated with FMS, FMS™, self-report questionnaires, accelerometry and body composition. This involved an objective criteria informed process to ensure field staff were consistent in the administration and implementation of the respective gross motor skill and movement task(s). Baseline data to inform the development of the intervention was collected on participants in their class groups (maximum n = 30) during specific school visits. Objective measurements, such as FMS and FMS™ were carried out during a typical PE class, while subjective self-report questionnaire measurements were taken during a separate school visit in a computer lab, using the online tool of 'Survey Monkey' for participant responses.

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Measures

Fundamental movement skills. During the course of one typical school week, at the beginning of May, the following 10 FMS were assessed in a 120-minute physical education period: run, skip, horizontal jump and vertical jump (locomotor, maximum score of 34); two-handed strike, stationary dribble, catch, kick, overhand throw (object control, maximum score of 40) and balance (stability, maximum score of 10), which combines to give an overall maximum raw score of 84. Each of the ten FMS were assessed in conjunction with the behavioural components from three established testing batteries, namely the Test of Gross Motor Development (TGMD) (Ulrich, 1985), TGMD-2 (Ulrich, 2000) and the Victorian Fundamental Motor Skills manual (Department of Education Victoria, 1996), designed to give an objective measurement of gross motor skill proficiency across a range of skills.

Prior to participant performance, one trained field staff member provided an accurate demonstration and instruction of the skill to be performed. Procedures outlined in the respective TGMD-2 examiners manual (Ulrich, 2000) were closely adhered to within the assessment of the 10 FMS during the selected physical education period. This process for FMS measurement has been reported previously in an Irish adolescent context (O' Brien et al., 2016a, 2016b). To ensure participant consistency within skill performance, no feedback, verbal or otherwise, from any of the trained field staff was given during the testing. Participants performed the skill on 3 occasions, including 1 familiarization practice, and 2 performance trials, as reported in previous Irish adolescent movement skill data collection protocol (O' Brien et al., 2016a, 2016b). Video cameras (3 × Canon type Legria FS21 cameras; Canon Inc., Tokyo, Japan and 2 x Apple iPads) were used to record each participant's performance and execution of the required skill. The distance and camera angles were at all times consistent; specifically, to ensure that the complete body movement was captured (O' Brien et al., 2016a, 2016b). The use of video-recording is an important consideration in data collection as it permits greater scrutiny and therefore accuracy

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of measurement precision (Okely & Booth, 2004). The FMS scoring process was completed at a later date by the principal investigators.

Functional movement screen. The following seven functional movements were assessed: deep squat, hurdle step, in-line lunge, shoulder mobility, active straight-leg raise, trunk stability push-up and rotational stability (Cook et al., 1998). The test administration procedures, instructions and scoring process associated with the standardized version of the test (Cook et al., 2006) were followed in order to ensure accuracy in scoring (Abraham et al., 2015; Bardenett et al., 2015). Trained field staff utilised the pre-determined verbal instructions during testing. During data collection, each participant was video-recorded, and given three attempts to perform the movement. It should be noted that all trained field staff scored the optimum trial stringently at a later date, as recommended in the original training workshop.

The FMS™ has a scoring range from zero to three, with three being the optimum score (Cook, 2010). If at any time during the testing, the participant demonstrated or acknowledged pain or discomfort, anywhere in the body, he/she received a score of zero and the area noted. A score of one was given to a participant, if they were unable to complete the movement. If the participant had to use a compensation, for example, lifting one's heels off the ground during the deep squat, to perform the movement, a score of two was allocated. A maximum score of three was allocated if the participant performed the movement correctly without any compensation. Bilateral scores for five (hurdle step; in-line lunge; shoulder mobility; active straight leg raise and rotary stability) of the seven functional movements were also recorded, as a means to compare possible imbalances between the right and left sides of the body for participants. The lowest score for either side of the body within each movement contributed to the final scoring protocol. For each of the seven screening items, the highest score from the three trials was recorded and used to generate an overall composite FMS™ score, with a maximum value of 21, as part of established and recommended protocol (Cook et al., 2006;

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Duncan & Stanley, 2012; Schneiders et al., 2011). On account of the video-recording set-up for data collection, the FMS™ scoring process was completed at a later date by the principal investigators.

Perceived movement confidence. The physical self-confidence scale (McGrane, Belton, Powell, Woods, et al., 2016) was used as an indicator to measure the perceived movement confidence of participants' in their FMS proficiency. As previously reported, this adolescent measurement tool has excellent test-retest reliability (r=0.92) (McGrane, Belton, Powell, Woods, et al., 2016). Furthermore, the scale demonstrates good content and concurrent validity (r=0.72), when compared to the physical self-perception profile (Harter, 1985). Within this physical self-confidence scale, participants were asked to rate their confidence at performing 15 FMS, based on a Likert scale format of 1-10. A score of '1' indicated being not confident at all and a score of '10' indicated being very confident. This is the first valid and reliable instrument that has been developed to assess physical self-confidence in adolescents, and at a skill specific, FMS proficiency level. Furthermore, it is worth noting that the identified skills included within this instrument are deemed central to the Irish adolescent sporting culture (O' Brien et al., 2016a; Woods et al., 2010). In the current study, the physical self-confidence scale for perceived movement confidence has excellent internal consistency, with a Cronbach alpha coefficient of 0.94.

Perceived functional confidence. As part of this baseline study, the researchers have also developed a tool to assess perceived functional movement confidence amongst an Irish adolescent population. The developed functional movement confidence scale was further used as an indicator to measure the perceived movement confidence of participants' in their FMS™ proficiency at baseline. Similar to the McGrane, Belton, Powell, Woods, et al., (2016) protocol, participants were asked to rate their confidence at performing the identified 7 FMS™ tasks, based on a Likert scale format of 1-10, as part of this functional movement confidence scale.

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A score of '1' indicated being not confident at all and a score of '10' indicated being very confident. This is the first instrument that has been developed to assess perceived functional movement confidence in adolescents. As the FMS™ tasks are non-sport specific, it was decided that a visual image alongside the question would be provided (Barnett, Vazou, et al., 2016; Barnett, Ridgers, Zask, & Salmon, 2015), in support of a previously validated pictorial instrument for assessing FMS perceived competence. To ensure that adolescent performance was consistent over time across the 7 selected perceived functional confidence items, trained field staff conducted a 48-hour time sampling test–retest reliability measurement amongst a sample of 23 participants, aged 12 to 14 years old. The coefficients for the 7 items ranged from 0.82 to 0.93, showing the scores across the 7 perceived functional confidence items to be stable over time. Furthermore, in the current study, the perceived functional movement confidence scale has excellent internal consistency, with a Cronbach alpha coefficient of 0.92.

Data Analysis. Once data collection was complete, the principal investigators were required to reach a minimum of 95% inter-observer agreement for all ten FMS and seven FMS™. The actual and perceived FMS and FMS™ data sets were analysed using SPSS version 20.0 for Windows. Descriptive statistics and frequencies for FMS and FMS™ at the skill and composite score levels were calculated, according to their associated gender breakdown. For the FMS and FMS™ constructs in this study, 'Mastery' was defined as correct performance of all skill components on both trials (Booth, Denney-Wilson, & Okely, 2005; O' Brien et al., 2016a). Gender differences in overall and individual FMS/ FMS™ performances were analysed using independent sample t-tests and Mann-Whitney U tests. Statistical significance was set at $p<.05$.

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Results

Fundamental Movement Skills

Of the 181 students with full FMS data, no student possessed complete mastery level across all ten skills. The mean overall composite score was 68.72 (± 7.54), out of a possible total of 84. The highest skill performance was the catch, with 86.6% achieving complete mastery. The poorest performance was for the horizontal jump, where only 14.8% achieved complete mastery.

The mean skill score and standard deviation (SD) for all ten FMS amongst males and females are shown in Table 1, while the percentage of complete mastery, differentiated by gender is shown in Figure 1.

When broken down by gender, a Mann-Whitney *U* test revealed a significant difference in the overall gross motor score, with males scoring higher than females ($p = .001$). At the subset level, males performed significantly higher in the overall object control domain ($p = .001$), when compared to females; specifically, males performed higher in three of the five object-skills assessed (kick ($p = .001$), strike ($p = .001$), throw ($p = .001$)) although females did perform significantly better in the catch ($p = 0.003$). There was no significant gender difference found in overall locomotor skill performance. Males did, however, perform significantly higher in the horizontal jump ($p = .001$), when compared to females.

Functional Movement Screen

Twenty nine of the original 181 participants were subsequently omitted from the functional movement screening data set, specifically as a result of incomplete camera angle footage, and missing data. Of the 152 students with full Functional Movement Screen data, no student achieved complete mastery across all seven tests (maximum score of 3 for all). The mean composite score was 14.05 ± 2.48 out of a possible total of 21. An independent samples

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t-test revealed a significant difference in the overall composite functional movement screen raw score between gender, with females (p = .011) performing better than males. When broken down by specific screening items, females displayed significantly higher functional movement proficiency in the active straight leg raise (p = .001), and the shoulder mobility (p = .005) test, while males displayed significantly higher functional movement proficiency in the trunk stability push-up test (p = .001). The mean FMS™ score and standard deviation (SD) for all seven screening measurements amongst males and females are shown in Table 2, while the percentage of complete mastery, differentiated by gender is shown in Figure 2.

Perceived Movement Confidence

There were significant gender differences observed in physical self-confidence, with males scoring significantly higher than females in eight of the ten individual skills, as highlighted in Table 1. This included all five object control skills (dribble (p = 0.05), kick (p = 0.001), strike (p = 0.001), throw (p = 0.001) and catch (p = 0.013)), as well as three of the locomotor skills (horizontal jump (p = 0.001), vertical jump (p = 0.001) and run (p = 0.046)).

Perceived Functional Confidence

Again, when broken down by gender, a Mann-Whitney *U* test revealed considerable gender differences, with males scoring significantly higher than females (p = .001) in their overall perceptions of perceived functional confidence. As indicated within table 2, there were also significant gender differences observed amongst four of the seven individually perceived functional movement screening items, including the hurdle step (p = .001), rotary stability (p = .001), shoulder mobility (p = .021) and trunk stability push-up (p = .001), with males having higher perceived functional confidence at the individual item level.

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Discussion

The availability of successful evidence-based programmes targeting motor development, particularly in the early childhood and pre-pubescent literature, has paved the way for the implementation of other FMS movement-oriented interventions to address the identified needs within specific populations (Barnett et al., 2013; van Beurden et al., 2003; Mitchell et al., 2013; O' Brien, Issartel, & Belton, 2013). To the authors' knowledge, this baseline cross-sectional collected data is the first study to combine both fundamental and functional movement assessment in adolescence. It is intended that these baseline findings will help inform the design and development of the larger, movement-oriented intervention, at a later stage.

The current baseline study heightens the reader's understanding of the trends in actual and perceived movement confidence, differentiated by gender within the Junior Cycle years of Irish post-primary education. Generally, results of the present cross-sectional baseline study highlight that a large proportion of Irish adolescent youth are lacking both fundamental and functional movement skill proficiency. Specifically, no participant demonstrated overall mastery across the range of selected FMS and/or the FMS™, irrespective of the associated gender breakdown. In the present study, participants appear to have considerably higher perceived movement, and higher perceived functional confidence levels, when compared to their actual skill proficiency in FMS and FMS™. On the perceived movement and functional confidence scales (0-10), participant mean values were generally in the upper thresholds (mean values of $\geq$7 within tables 1 and 2), indicating higher levels of perceived confidence amongst this selected mixed-gender cohort. This is aligned with recent research on an Irish cohort, which highlighted that adolescent males in particular consistently scored a mean of 8 or above (out of 10) in confidence, regardless of their actual ability (McGrane, Belton, Powell, & Issartel, 2016).

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In terms of actual FMS proficiency, overall skill execution is low amongst the selected adolescent youth, supporting most recent motor development literature within Ireland (Belton et al., 2014; O' Brien et al., 2016a). When broken down by gender, and consistent with research informed FMS literature, males appear to have higher movement skill proficiency within the object-control subset, when compared to females (Barnett, van Beurden, Morgan, Brooks, & Beard, 2010; O' Brien et al., 2016a; Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006). Interestingly, there were no gender differences within overall locomotor performance. These overall low FMS findings are in line with most recent research carried out on adolescents in a different region of Ireland (O' Brien et al., 2016a), and support the statement that Irish youth may be engaging in sport-specific skills, without learning the prerequisite criteria for basic skills and movement patterns. Considering the future directions of this research, it is reasonable to suggest based on the current findings that strategies for FMS proficiency need to be integrated within the intervention, with specific directional emphasis towards object-related skill development for females, and overall locomotor jumping (vertical and horizontal) opportunities for participants. Indeed, actual movement skills are one of the few modifiable risk factors for the prevention of poor health outcomes (Bremer & Cairney, 2016), and therefore promoting movement skill proficiency is integral to a holistic view of development (Barnett et al., 2016).

Similar to the low levels of FMS proficiency observed in the present study, overall functional movement skill execution is also low amongst participants, which is consistent with other previously published functional movement adolescent literature (Paszkewicz, McCarty, & van Lunen, 2013; Portas, Parkin, Roberts, & Batterham, 2016). Overall, the mean composite FMS™ raw score for this study was 14.05 (out of a possible 21), which is similar to the mean values reported by Abraham et al., (2015) on 1005 mixed-gender adolescents in India. Interestingly, when broken down by gender, Abraham et al., (2015) found statistically

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significant differences, with males outperforming their female counterparts. Despite the convenience sample, and lower number of participants (n=152), data from the current study appear to go against the previous findings of Abraham et al., (2015). Results found that females outperformed males in their overall functional movement, suggesting that there may be adolescent gender-based differences within both FMS and FMS™ assessment protocol. In terms of future intervention design and development, findings suggest that overall functional movement development may need to be addressed, with specific developmental opportunities provided for male Irish adolescent youth. Previous research informed data on functional movement, as measured by the FMS™, suggests that structured interventions lead to positive movement-based outcomes (Kiesel, Plisky, & Butler, 2009).

Interestingly, results of this cross-sectional baseline study indicate that the perception of males in relation to their movement confidence, does not equate to their actual movement skill proficiencies. Although males have higher perceptions of their skill-specific ability than females, particularly within their perceived functional confidence levels, they have lower actual skill proficiency when compared to their female counterparts, specifically in six of the seven movement screening tasks. These findings are significant on a number of levels, as they accentuate the need to analyse the relationship between actual and perceived movement, as separately by gender, in the adolescent population. The varying gender discrepancies in the perceived movement and functional confidence levels highlight that some adolescents may require different attention and a tailored intervention focus, specifically targeting their requirements, as previously acknowledged by McGrane, Belton, Powell, & Issartel (2016). Indeed, assessing actual FMS and FMS™, and perceived movement and functional confidence levels highlights those in most need of an intervention, but also facilitates the potential development of an adolescent movement-based intervention in Ireland.

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In light of this study, it may be plausible that despite the low levels of actual skill competence at both fundamental and functional movement levels, Irish adolescents may be inaccurately overestimating their perceived confidence levels for movement. Previous research within social psychology research has documented the existence of positive illusory bias within the general population (De Meester et al., 2016; Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007), and further research indicates that there is a positive bias among children and adolescents with learning disabilities in their predictions of performance (Heath & Glen, 2005). While results from the present study heighten the need for improving low actual movement skill competencies amongst Irish adolescents, the observed high perceptions for movement across both genders could be argued as a benefit. For example, De Meester et al., (2016) highlighted that a specific cohort of adolescents who overestimated their perceived motor competence were more autonomously motivated for PE and sufficiently active, when compared to their peers with accurate perceptions of motor competence. While overestimating perceptions of movement may be a favourable outcome for physically active pursuits in adolescents with low actual movement skill proficiency (De Meester et al., 2016), this has yet to be confirmed within an Irish adolescent cohort in a longitudinal capacity.

Creating a change in PA behaviour and movement skill proficiencies during adolescence requires a multi-faceted approach (Bremer & Lloyd, 2014; O' Brien, Belton, & Issartel, 2015), with the necessity of creating developmentally and gender- appropriate activities (Barnett, van Beurden, Morgan, Brooks, & Beard, 2010; Lai, Costigan, Stodden, Salmon, & Barnett, 2014; Logan, Robinson, Wilson, & Lucas, 2011; Morgan et al., 2013; Robinson et al., 2015) that positively impact movement proficiency. Indeed, as measured in the present cross-sectional study, components that foster the development of both actual and perceived confidence levels may significantly improve the long-term impact of adolescent movement.

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Limitations

A potential limitation of this research is the cross-sectional nature of the study. Furthermore, as the convenience sample of adolescents in this baseline study was limited to just two post-primary schools in one Irish city, any potential findings cannot be generalised to other adolescents. Although reliability and face validity have been identified, future research using the perceived functional confidence scale is needed to establish criterion validity, however, this was the first attempt in an Irish context to collect such data amongst adolescent youth.

Conclusion

Considering the observed low levels of actual fundamental and functional movement amongst the sample, developing a specifically designed movement-oriented intervention would be a strategic step towards improving the current levels of adolescent movement skill proficiency found in this study. In terms of both perceived movement and functional confidence, participants generally display high levels of confidence, however, these results do not appear to be associated with the actual movement-based tasks. Furthermore, a conflicting gender-based disparity may exist within the next phase of the programme; it appears that females need additional hours of instructional practice towards the acquisition of actual FMS proficiency, whilst males may need additional time devoted to their functional movement development, when compared to their female counterparts. Results from the current study suggest that the future intervention may need to specifically address the low levels of actual movement skill proficiency, with developmentally appropriate strategies for understanding perceived confidence at both the fundamental and functional movement level.

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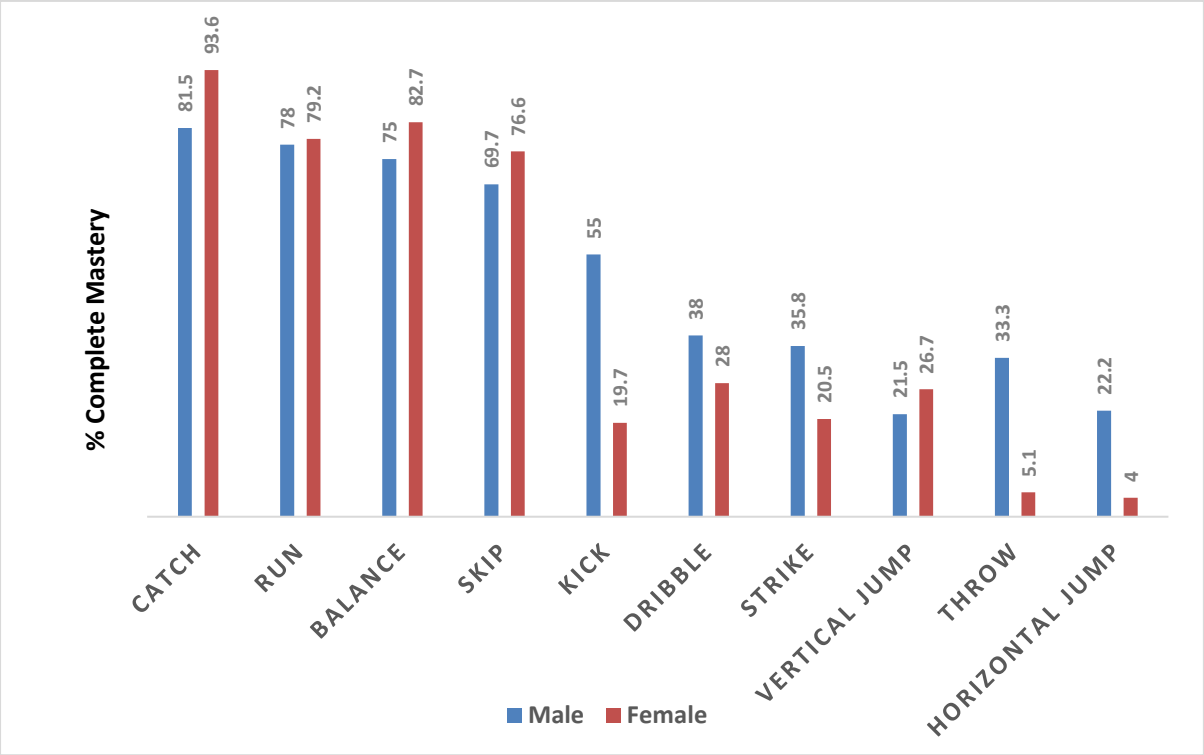
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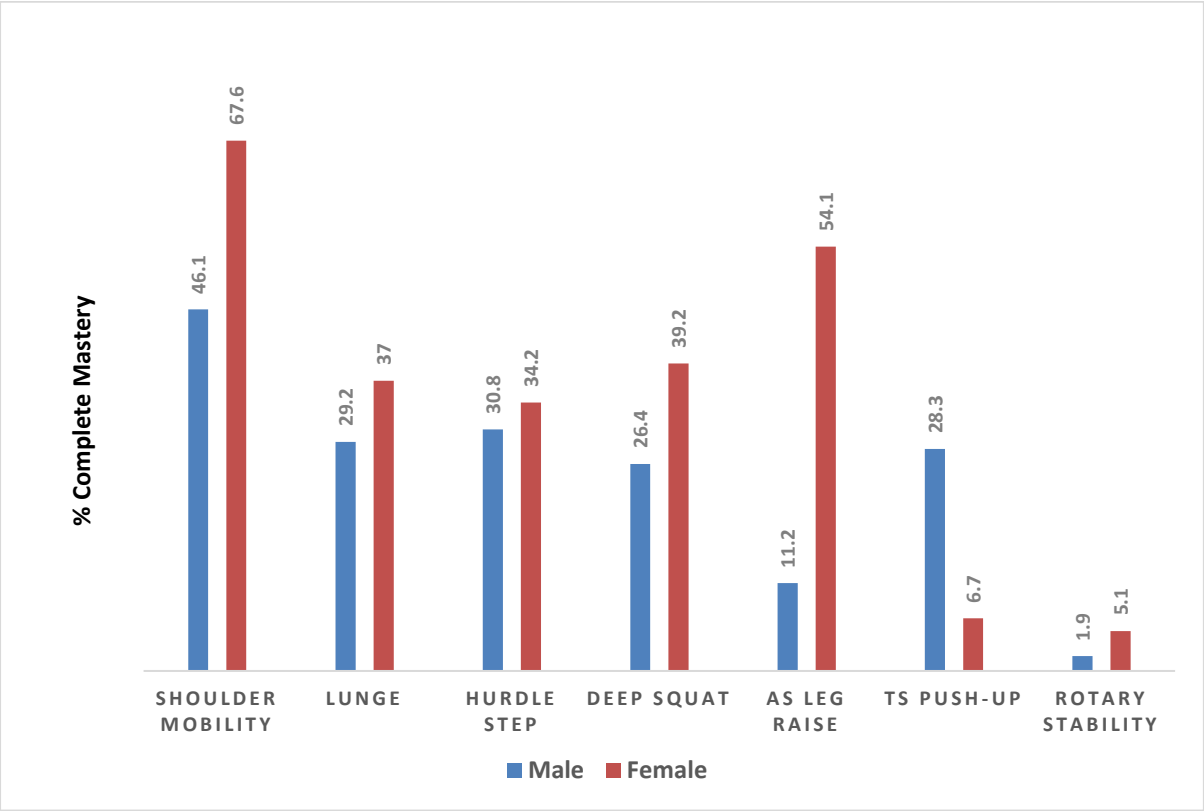
Figure 1. Percentage Mastery of Fundamental Movement Skills (FMS) by gender



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Figure 2. Percentage Mastery of the Functional Movement Screening (FMS™) items by gender.



Notes: AS = Active Straight; TS = Trunk Stability.

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Table 1. Mean scores for Fundamental Movement Skill (FMS) proficiency and Physical Self-Confidence by gender.

	FMS			PSC	
Skill	Male	Female	Maximum possible score	Male	Female
Balance	9.44 SD = ±1.18	9.59 SD = ±1.05	10	8.77 SD = ±1.85	8.48 SD = ±1.80
Catch	5.44 SD = ±1.38	5.88* SD = ±0.53	6	9.22* SD = ±1.77	8.55 SD = ±1.98
Dribble	6.48 SD = ±1.60	6.11 SD = ±1.57	8	9.29* SD = ±1.55	8.84 SD = ±1.75
Horizontal Jump	6.02** SD = ±1.61	5.01 SD = ±1.70	8	8.17** SD = ±2.19	6.77 SD = ±2.54
Kick	7.02** SD = ±1.31	5.18 SD = ±1.99	8	9.34** SD = ±1.79	8.19 SD = ±2.29
Run	7.59 SD = ±0.87	7.51 SD = ±1.05	8	9.09* SD = ±1.76	8.56 SD = ±2.01
Skip	5.33 SD = ±1.26	5.55 SD = ±0.99	6	8.58 SD = ±2.26	8.40 SD = ±2.05
Strike	8.51** SD = ±1.34	7.40 SD = ±2.18	10	8.54** SD = ±2.12	6.75 SD = ±2.56
Throw	5.56** SD = ±2.21	3.73 SD = ±1.91	8	9.31** SD = ±1.41	8.48 SD = ±1.77
Vertical Jump	9.45 SD = ±1.95	9.53 SD = ±1.92	12	8.60** SD = ±1.97	7.35 SD = ±2.44

*$P \leq 0.05$; **$P \leq 0.001$

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Table 2. Mean scores for the Functional Movement Screening (FMS™) items and Physical Self-Confidence by gender.

	FMS™			PSC	
FMS™	Male	Female	Maximum possible score	Male	Female
AS Leg Raise	1.69 SD = ±0.67	2.38** SD = ±0.75	3	7.74 SD = ±2.26	7.47 SD = ±2.32
Deep Squat	1.78 SD = ±0.84	2.01 SD = ±0.88	3	7.63 SD = ±2.37	7.41 SD = ±2.26
Hurdle Step	2.30 SD = ±0.48	2.34 SD = ±0.48	3	8.24** SD = ±1.95	7.11 SD = ±2.22
In-Line Lunge	2.26 SD = ±0.51	2.36 SD = ±0.51	3	7.94 SD = ±2.16	7.38 SD = ±2.29
Rotary Stability	1.75 SD = ±0.52	1.78 SD = ±0.53	3	8.12** SD = ±2.24	6.97 SD = ±2.18
Shoulder Mobility	2.16 SD = ±0.89	2.51* SD = ±0.76	3	8.28* SD = ±2.01	7.62 SD = ±2.05
TS Push-Up	1.68** SD = ±0.89	1.15 SD = ±0.51	3	7.77** SD = ±2.40	6.60 SD = ±2.37

Notes: AS = Active Straight; TS = Trunk Stability. *$P \leq 0.05$; **$P \leq 0.001$.