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Fundamental Movement Skills: an Important Focus

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Fundamental Movement Skills: An Important Focus

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Abstract

Purpose: Recent international conference presentations have critiqued the promotion of fundamental movement skills (FMS) as a primary pedagogical focus. Presenters have called for a debate about the importance of, and rationale for teaching FMS, and this letter is a response to that call. The authors of this letter are academics who actively engage in FMS research. **Method:** We have answered a series of contentions about the promotion of FMS using the peer reviewed literature to support our perspective. **Results:** We define what we mean by FMS, discuss the context of what skills can be considered fundamental, discuss how the development of these skills is related to broader developmental health contexts, and recommend the use of different pedagogical approaches when teaching FMS. **Conclusion:** We conclude the promotion of FMS is an important focus in Physical Education (PE) and sport and provide future research questions for investigation.

Keywords: physical activity, motor coordination, motor skill, teaching pedagogy.

Introduction

Recent presentations at international conferences ('AIESEP World Congress', February 10 - 13, Auckland, New Zealand and 'The International Congress on Children's Physical Activity and Sport', 17 -18 October, Liege, Belgium) (Almond, 2014; Pot & van Hilvoorde, 2014) have critiqued fundamental movement skills (FMS) as a pedagogical focus. Moreover, a circulating YouTube clip highlights a number of contentions regarding the role of FMS in promoting physical activity in young people: (www.youtube.com/watch?v=sLNppM8UmPg), Afonso, Coutinho, Araújo, and Pot (2014). Presenters at these conferences have called for a debate about the importance of, and rationale for promoting FMS. In general their criticisms include the following.

1. FMS are not all fundamental.

2. Each FMS only leads to a limited number of sports and/or activities and therefore skill transfer is limited.

3. Skills are learnt by doing rather than being taught.

4. That a focus on FMS ignores a constraints-based approach.

5. FMS is a ‘skills and drills’ teaching approach.

6. There is little data supporting the association between movement competence and physical activity.

Authors of this letter are academics with PE, kinesiology or public health backgrounds based in Australia, the United States of America (USA) and Europe, who actively conduct research involving FMS. We respect the viewpoints of the presenters at these sessions for highlighting their perspectives and encouraging divergent thought, as it encourages critical thinking and academic debate. The specific purpose of this paper is to answer the critiques against FMS, based on the best available evidence.

It is important firstly to define what we mean by FMS. Confusion in the literature around FMS means terms are often used interchangeably. FMS (also termed fundamental motor skill) are defined as basic learnt movement patterns that do not occur naturally and are suggested to be foundational for more complex physical and sporting activities. They can be classified into three distinct categories: locomotion (involving locomotion of the body e.g. running), object control (manipulative skills e.g. catching a ball) and stability skills such as balancing (Gallahue, Ozmun, & Goodway, 2012). Motor coordination can be described as the capacity to have body segments work together in an organized manner (Turvey, 1990) and might be considered an underlying component of FMS.

Critique 1: FMS are not all ‘fundamental’

The first contention is concerned with how these skills were chosen, as they don’t necessarily include every skill that might be considered *fundamental*. Different test batteries have emerged around the world, all testing slightly different forms and groups of skills (Cools, Martelaer, Samaey, & Andries,

2009). For each testing battery, the developers and/or users are required to decide how many test items to include (i.e. how many skills) in the context of the specific study aims, time, cost and participant burden, and what test items are going to best represent the movement skill competence of the child. Therefore there can be an incongruity between a conceptual definition of what is considered “fundamental” and the actual assessment instrument that measures this concept. Many tests were, on the whole, originally developed to assist with the identification of children with developmental issues. Recent test batteries have emerged with the purpose to classify typically developing children according to different levels of movement competency. That is why it is inappropriate to draw the basic - commonly known - definitions (such as FMS in this case), from what is measured with, or included in, a specific test battery.

Of course it is difficult to determine the most representative skills to target, and we agree that what one person may consider ‘fundamental’ may be different to another person within a different context. Those skills considered FMS have often been tied to the skills that are inherently integrated in common sports, e.g. kicking and running are part of football (soccer). Yet there is also a degree of cultural appropriateness needed for measures, as different sports and physical activities are popular in different countries (e.g. football in England and baseball in the USA). Also, certain groups (e.g. individuals with disabilities) may not be able to attempt certain movement skills but this doesn’t mean that such skills shouldn’t be classified as *fundamental*. There will always be individual circumstances that challenge assumptions that are made on a population basis, but this doesn’t preclude the attempt to develop skill batteries that may have relevance for many health behaviours and psychosocial outcomes on a population level. The disparity of skill in some populations (Bardid, Rudd, Lenoir, Polman, & Barnett, 2015; Goodway, Robinson, & Crowe, 2010) further emphasizes the need for assessment that can accurately identify skill deficits and tailor interventions to meet the specific needs of these individuals.

Critique 2: That each FMS only leads to a limited number of sports and/or physical activities and therefore skill transfer is limited

The second critique is: how can we term these skills *fundamental* when each skill only leads to a limited number of sports and/or activities. 'Fundamental' can essentially be commonly defined as forming a necessary base or core. Therefore, this is why sets of skills are proposed; to attempt to cover *the most representative or salient skills* that, if mastered, will give children the best possible chance to successfully and persistently participate in a range of health-enhancing physical activities. It is suggested that FMS can be subsequently fine-tuned for application in specific sports. For example, advanced mechanisms of throwing or striking transfer to various sports (i.e., cricket, baseball, tennis etc.), whose context can be adapted or varied at different levels across the lifespan (Gallahue et al., 2012; Langendorfer, Roberton, & Stodden, 2011). These points are important and are why we are not concerned with whether FMS competency transfers to non-active pursuits such as playing chess or flying a Red Bull Plane (Afonso et al., 2014). This is also why test batteries assessing FMS do not directly assess skills needed in daily living such as getting out of bed and rising from a chair, as typically developing children will successfully accomplish these activities with little training (i.e., noted as phylogenetic activities). Rather, test batteries focus on skills that require practice and training (i.e., ontogenetic activities) and which promote engagement in a broad range of culturally relevant and socially driven activities.

In general, as the world becomes highly mechanized, sedentary and obesogenic, developing skills that promote a diverse movement foundation (i.e., functional coordination and control) that allows successful participation in ontogenetically driven activities may be a highly viable tactic to promote/encourage sustained physical activity across the lifespan (Breuer & Wicker, 2009). In this context, FMS are the foundations of later activities frequently taught in PE curricula. Thus, the question is, whether FMS development provides this diverse movement background.

Superficially, it seems reasonable to suggest there would be no direct progression or transfer from developing a highly advanced throwing pattern to activities such as being able to wakeboard, swim, mountain bike or horse ride. However, upon closer inspection, the development of highly advanced throwing (as well as kicking and striking) requires the demonstration of underlying attributes. These attributes could be seen as "fundamental" aspects of coordination and control for many types and forms of movements (i.e., dynamic balance, contralateral coordinative functioning of extremities, perceptual motor integration, development of high angular velocities of multiple joints, optimal relative timing of segmental interactions, optimal inter- and intra-muscular coordination and optimal transfer of energy through the kinetic chain), including water skills, mountain biking or horse riding. See Langendorfer, Roberton, and Stodden (2011) for a more thorough explanation of neuromotor and biomechanical mechanisms of object projection skills. Thus, isolating the skill of throwing, as only a "sports skill" with limited applicability and transfer to other types of movements or neuromuscular-related aspects of physical fitness (Stodden, Gao, Langendorfer, & Goodway, 2014) promotes a narrow viewpoint of the complexity of these types of movements and a lack of appreciation of the broad applicability of the high levels of functional coordination and control demanded in many FMS. Furthermore, the psychological effects of perceiving oneself as competent, as independent of actual FMS competence, may have a tangible impact on an individual's desire to engage in other physical activities (Babic et al., 2014; Robinson et al., 2015).

Critique 3: That skills are learnt by doing rather than being taught

The third contention is that skills are learnt by *doing* rather than being *taught*. We agree that we may acquire rudimentary levels of some FMS through exploration and having opportunities to do so, being engaged, and having appropriate environments with space, equipment and positive reinforcement that allows us to practice and learn (Barnett, Hinkley, Okely, & Salmon, 2013). Yet not every child has access to the conditions that would promote learning at an appropriate rate or has the capacity to learn independently even when the environmental conditions are supportive. Thus, we

also benefit from being instructed on how to reach advanced levels of many FMS (just as we also benefit from being taught to read, spell and write). Opportunity to practice, instruction and modelling are important to the development of FMS (McKenzie, Alcaraz, Sallis, & Faucette, 1998). A number of early childhood intervention programs (Goodway & Branta, 2003; Robinson & Goodway, 2009) show that when young children are provided with well-equipped free play time, they do not significantly improve their FMS, and only in the instructed condition are significant improvements in FMS seen. In addition, three recent systematic reviews confirm that interventions improve children's movement skills beyond what can occur in free-play (Logan, Robinson, Wilson, & Lucas, 2012) or ecological control groups (Iivonen & Sääkslahti, 2013; Logan et al., 2012; Morgan et al., 2013).

Critique 4: That a focus on FMS ignores a constraints-based approach

It has been suggested that focusing on FMS within PE ignores a constraints based approach (Newell, 1986) by considering skills in isolation, and that not taking account of environmental constraints suggests this approach is not 'authentic' (Afonso et al., 2014). What is important to keep in mind here though, is that an authentic learning environment is provided when the development of a coordination pattern is promoted via the interaction of the individual, the environment, as well as the specified task that is being promoted (Newell, 1986). Thus, an authentic learning environment is one that is developmentally appropriate, based on the individual's developmental level, which may necessitate that a new skill (or new variation of a skill) be learnt and practiced in a closed environment (e.g., without the pressures of competition or other external variables), before being able to integrate it in other more advanced movement learning opportunities (Boyce, 1992). Many elementary teachers and intervention studies use a constraints perspective to teach FMS in isolation. For example the SKIP program developed by Goodway & colleagues (2003, 2015), accounts for individual constraints (e.g. lack of ability to track a ball in catching) by manipulating environmental (e.g. equipment, ball size) and task (self-tossed, peer tossed) constraints to account for the individual child's developmental level. Overall, teaching should take into account the interaction of individual,

environmental and task variables and these factors should be synergistically and variably integrated with a variety of movement concepts; thus providing an appropriate application of Newell's Constraints Theory (1986).

Critique 5: That FMS is a 'skills and drills' teaching approach

The approach to teaching is *pedagogy*; being the practice and method of teaching. An underlying critique against the promotion of FMS appears to rest on the 'misperception' of FMS as a teaching *approach*. Teachers generally are required to be highly qualified in the content area of the domain or subject area in which they teach (i.e., high levels of content knowledge [CK]). However, expertise in content alone is inadequate. Effective teachers also possess a high level of pedagogical content knowledge (PCK), that being the skills and knowledge to successfully plan and implement a diversity of pedagogical approaches, which address individual student learning styles and developmental levels (Ayvazo & Ward, 2011; Shulman, 1987). Importantly, the literature suggests that teachers who demonstrate high levels of *both* CK and PCK achieve better FMS outcomes for their students (R. Cohen, Goodway, & Lidor, 2012). To suggest there is only one way to impart the content serves as a great injustice to not only the students, but also the teaching profession.

FMS is just one content area within international PE curricula (e.g. Standard 1 of the SHAPE America standards incorporates FMS for the lower elementary grades). As such, a variety of evidenced-based approaches have been used to teach FMS utilising a variety of pedagogical approaches. Thus a broad range of both 'instructional models' (Gurvitch & Metzler, 2013) as well as teaching strategies (Mosston & Ashworth, 2008) can be implemented when teaching FMS.

FMS can be taught and practiced within a game-like environment, where game play, either structured or non-structured is integrated in the curriculum or practice environment. Launder and Piltz (2013) in their Play Practice Model suggest expertise in skills can be taught within the game context. Others also emphasise that teachers who exhibit a deep understanding of game-centred

pedagogy are capable of balancing the teaching of skills/tactics in a game play context (Dudley & Baxter, 2009; Dudley & Baxter, 2013). Simultaneous development of FMS and tactical skill has been demonstrated using such an approach (Miller, Christensen, Eather, Gray, et al., 2015; Miller, Christensen, Eather, Sproule, et al., 2015). This implies that teachers and researchers need to (and can) move from seeing 'skills teaching' and 'tactical instruction' as distinct elements of PE to a position where the interrelationship existing between skills and tactics is paramount (Dudley & Baxter, 2009). The important point to note when motor skills are taught together/within game components is that FMS contribute to development and provide a framework for instruction within integrated models of instruction (especially for non-specialist PE teachers in primary schools).

Promoting a mastery or high autonomy climate is an approach which aids learning through autonomous motivation, and can be attached to both skills and games based pedagogies. A mastery approach promotes the development of skills in a non-competitive, non-threatening learning environment. In this sort of environment all students have an opportunity to succeed, receive instruction and positive reinforcement and are encouraged to improve, which can lead to higher levels of intrinsic motivation, enjoyment and perceived competence (Robinson, Rudisill, & Goodway, 2009; Theeboom, De Knop, & Weiss, 1995 Valentini & Rudisill, 2004). A mastery climate directs control to the learner, who progresses through a planned learning environment which is structured around the dimensions of task, authority, recognition, grouping, evaluation and time (Ames, 1992). A recent article found a mastery climate approach, focusing on success, optimal challenge, and autonomy led to improvements in FMS (Kalaja, Jaakkola, Liukkonen, & Digelidis, 2012), highlighting the benefits of incorporating these principles into a pedagogical approach. Furthermore, a recent study which utilized a mastery climate approach to guide the SAAFE (i.e., Supportive, Active, Autonomous, Fair and Enjoyable) teaching principles implemented in the study, demonstrated that improvements in FMS competency mediated the effect of the intervention on physical activity and cardiorespiratory fitness in children (K. E. Cohen, Morgan, Plotnikoff, Barnett,

& Lubans, 2015). Thus, how one chooses to promote FMS is a pedagogical matter. FMS in and of itself is clearly not an approach, and it is inappropriate to suggest otherwise.

Critique 6: That there is little data supporting the association between movement competence and physical activity

A main contention levelled at our research focus is that there is little data supporting the association between FMS and physical activity. We find it interesting that physical activity was the only health-related factor mentioned, as not only do we reject the premise that there is weak evidence that movement skill competency and physical activity are associated, but we also note there is strong evidence supporting associations between FMS and multiple aspects of health-related fitness, including body composition. Systematic reviews have found strong evidence for a positive association between FMS and physical activity and fitness, and an inverse association with body weight status (Cattuzzo et al. in press). Specifically, Holfelder & Schott (2014) indicated that 20/23 studies found an association between FMS or other forms of motor competence and physical activity. Lubans, Morgan, Cliff, Barnett, & Okely (2010) also noted that of 13 studies that specifically examined FMS, 12 found a positive association with physical activity. Although Cohen and colleagues (2015) have demonstrated an antecedent/consequent relationship between FMS and physical activity, we do acknowledge the need for more appropriately designed experimental studies to demonstrate a cause–effect relationship (Robinson et al., 2015).

Future Research Questions

There are many questions that remain unanswered based on the points argued here. In terms of whether the FMS commonly assessed are really a representative sample of *fundamental* skills, future researchers could seek to investigate a) what range of skills are important to truly assess the level of movement skill competence that allow us to demonstrate a high and sustained level of capacity to engage in an active lifestyle, and, b) are the ‘typically accepted’ FMS universal across cultural contexts? In relation to the transferability of FMS, future research may seek to examine whether

some skills demonstrate more global transferability to a wider range of lifetime activities and sports, as well as sustainability for health-enhancing physical activity and fitness. With regard to the teaching of FMS, future research should continue to examine and compare/contrast pedagogical strategies to optimize the learning/development of FMS. Lastly, to extend the field, we should examine whether competence in other types of skills become more important later in life. Lifelong activity skills have been used to describe sports and leisure activities typically performed individually or in small groups with no or limited physical contact, and which can easily be continued into adulthood and old age; such as resistance training and swimming (Hulteen et al., 2015). Future issues worth investigating may include whether traditional FMS also provide a foundation for these lifelong skills and other health-enhancing forms of physical activity.

Fundamental Movement Skills is a 'Seriously Useful' Focus

One final argument presented in the aforementioned 'critiques' of FMS, is that FMS do not equal physical literacy. Whilst definitions of physical literacy remain a contested topic, we concur with this point. Even the United Nations Educational, Cultural and Scientific Organization (2005) recognize that developing 'an autonomous set of skills' is but one of four key indicators that need to be addressed to understand literacy-based constructs. Importantly, we see FMS as consisting of one of several components that need to be addressed within the physical literacy construct and one that is most effective, as previously mentioned, when it is integrated with multiple health behaviours and outcomes (Robinson et al., 2015). Being competent in FMS, is associated (and predictive) with not only physical activity (Holfelder & Schott, 2014; Lubans et al., 2010), but also fitness (Cattuzzo et al. in press; Lubans et al., 2010), healthy weight status (Lubans et al., 2010) and cognitive and academic outcomes (Haapala 2013). Promoting FMS is integral to a holistic view of development. So in our joint quest to optimise physical, psychological and mental health by promoting the development of more physically literate children (and we think we can join forces here), we maintain that the competence component is a *seriously useful focus*.

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