



The BASES Expert Statement on the Importance of Fundamental Movement Skills for Children's Physical Activity and Health

Produced on behalf of the British Association of Sport and Exercise Sciences by Prof Michael Duncan FBASES, Prof Gareth Stratton FBASES, Dr Lawrence Fowweather, Helen Collins and Prof David Stodden.

Introduction

Promotion of physical activity (PA) in youth continues to be a challenge, with limited success in increasing the proportion of children who attain 60 min/day of moderate-to-vigorous physical activity (MVPA) (Chief Medical Officers, 2019). The development of fundamental movement skills (FMS) provides a foundation for more advanced, complex movements needed to successfully participate in sports and activities across the lifespan (Gallahue *et al.*, 2012). Developing proficiency in FMS domains of locomotor (e.g. running, jumping), object control (e.g. throwing, catching) and stability (e.g. balancing, twisting) skills require appropriate learning opportunities to promote a foundation of skill during childhood and adolescence. It is concerning, therefore, that low levels of FMS competence have been widely reported in children and adolescents and that this is associated with low PA (Robinson *et al.*, 2015). These reports are particularly relevant as skill competence tracks from childhood into adolescence (Robinson *et al.*, 2015; Logan *et al.*, 2015). Consequently, developing proficiency in a range of FMS has become a prominent focus in school curricula and sport programmes worldwide, including the National Curriculum for Physical Education (PE) in England.

Since 2000 there has been a considerable increase in evidence highlighting the positive role that development of FMS during childhood plays in children's current and future PA and health (Robinson *et al.*, 2015). Moreover, the latest Chief Medical Officers' guidelines for PA emphasise the importance of movement quality as well as quantity, including the development of FMS for the first time (Chief Medical Officers, 2019). This expert statement summarises what is known about the importance of FMS for children's PA and health, and provides recommendations for research and practice.

Background and evidence

Stodden's conceptual model (2008; see Figure 1) illustrates a developmental perspective (i.e. different antecedent/consequent pathways across age) for the influence of FMS on long-term trajectories of PA, fitness and obesity. PA opportunities drive acquisition of FMS and musculoskeletal fitness in early childhood and vice versa. During middle to late childhood acquiring competency in FMS is a critical antecedent for PA, fitness and healthy weight status. The development of self-concept, specifically perceived competence, also plays a critical role in the model. All factors in the model interact, promoting either positive or negative developmental cascades with the strength of

associations between variables hypothesised to increase across time. Evidence to support this model continues to emerge, including multiple recent reviews and meta-analyses (Robinson *et al.*, 2015; Logan *et al.*, 2015; Utesch *et al.*, 2019).

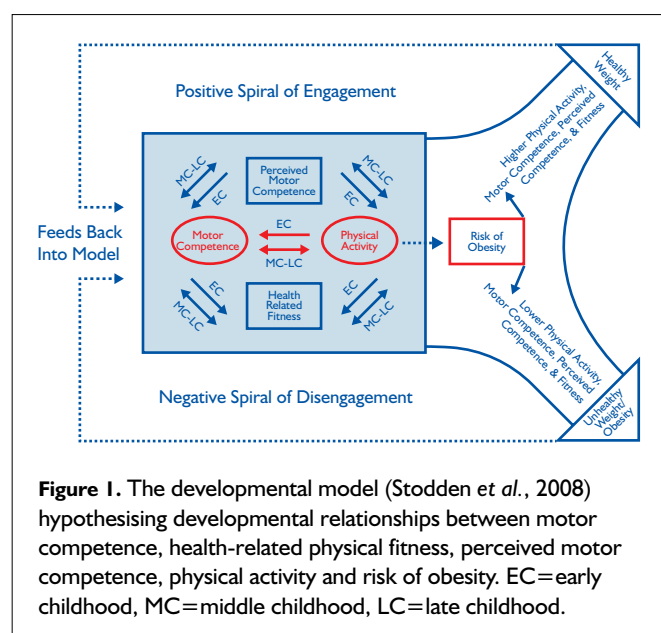


Figure 1. The developmental model (Stodden *et al.*, 2008) hypothesising developmental relationships between motor competence, health-related physical fitness, perceived motor competence, physical activity and risk of obesity. EC=early childhood, MC=middle childhood, LC=late childhood.

Research indicates that FMS competence is positively associated with health-related fitness, perceived competence and MVPA (i.e. better FMS is associated with higher levels of PA) and inversely related to weight status (i.e. better FMS is associated with healthier weight; see Logan *et al.* (2015); Robinson *et al.* (2015); Utesch *et al.* (2019)). Longitudinal data suggest that increasing motor competence is associated with healthier weight and higher PA in children and forms the foundation of a positive developmental trajectory for PA (Lima *et al.*, 2017). However, there are limited longitudinal studies and a lack of experimental studies preventing demonstration of cause-effect. Future research using these types of design would enable a better understanding of the causal mechanisms at play, if they exist. Most recently, Tyler *et al.* (2020) demonstrated that FMS successfully integrate into the youth PA promotion model and are related to clear outcomes for health enhancing behaviour demonstrating a clear path for FMS as a mechanism for enhancing children's PA.

Methods of FMS assessment

Although the published literature includes a plethora of tools to assess FMS, there is, as yet, no consensus on a gold standard method. Broadly, assessment methods for FMS comprise process measures, reflecting the quality of movement, or product measures, reflecting the outcome of movement. The Tests of Gross Motor Development (TGMD) is the most widely used measure of process-oriented FMS, offering a low cost, valid and reliable means to assess children. Process-oriented measures, such as the TGMD described above, provide an evaluation of movement quality/technique but do not examine the outcome of the movement. A number of other studies provided quantitative, product measures of FMS and gross motor coordination tasks such as the KörperKoordinationsTest für Kinder (KTK), Bruininks-Oseretsky Test of Motor Proficiency, Movement ABC or other measures that address overall physical fitness, but incorporate FMS skills (e.g. Eurofit, standing long jump, shuttle run for agility). The literature relating to product measures suggest that these are economical, objective, reliable and valid means to assess FMS. Very few assessments examine both process and product measures together, although recent research has suggested validity of combined measures within the same tool (Dragon Challenge, Tyler *et al.*, 2018). The use of wearable sensors also offers potential for more precise quantification of movement quantity and quality.

FMS based interventions

Low FMS competence levels and the evidence for the importance of FMS on health and development highlight the need for effective interventions. As yet, such interventions have not been forthcoming. In particular, younger children, overweight/obese groups, girls, children from low socio-economic status backgrounds and children with disabilities require targeted FMS interventions. A number of systematic reviews and meta-analyses demonstrate that interventions aimed at enhancing FMS are efficacious (see Logan *et al.*, 2015) and show promise in improving various health-related parameters, particularly weight status and PA (Robinson *et al.*, 2015). However, most intervention studies are conducted over relatively short periods with little or no follow up data collected.

The school setting and PE in particular appear to be a favoured site for any intervention to enhance FMS with limited examples from other settings. Studies based within schools emphasise “high quality PE” yet there is currently insufficient fidelity data to establish best practice for interventions, when they are delivered by individuals without specialist training in the sport and exercise sciences. Employing process evaluations and using an intention-to-treat protocol for analysis remain key gaps in study designs and translating FMS into wider practice. There is also limited data available to establish a dose-response for FMS “training” and there is a relatively high risk of bias in the intervention studies published to date.

Conclusions and recommendations

- The development of FMS across childhood and adolescence plays an important role in promoting health-enhancing PA.
- Children’s levels of FMS competency are low and there is a need for interventions to encourage positive health trajectories during childhood.
- There are valid and reliable means to assess FMS, but no gold standard tool to effectively assess both processes and products of movement competence.
- While FMS is important, enabling factors such as physical activity, fitness, participation and accessible facilities are key correlates and determination of cause and effect relationships needs to be explored.
- Interventions can enhance children’s FMS with subsequent beneficial effects on PA and health. However, the

sustainability of programmes is limited and remains a key challenge to address in future research.

- Interventions should include both structured and non-structured programmes including activities specifically aimed at developing a broad range of FMS, delivered at least twice per week by appropriately trained individuals (e.g. teachers, parents, coaches).
- Although cross-sectional and longitudinal evidence suggests FMS is important for health and development, research is needed to understand the causal mechanisms relating to how changes in movement competency influences key outcomes such as PA behaviours, fitness and obesity. ■



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