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'Deliberate Preparation' as an Evidence-Based Focus for Primary Physical Education

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Abstract

Background: There is a substantial amount of scientific research suggesting the physical and psychological health benefits of a physically active life-style. Consequently, Governments world-wide prioritise policies, finances and resources in healthcare, education and sports sectors to increase mass participation in physical activity (PA). However, practices in PA promotion are often not underpinned by evidence-based standardisation that is requisite in other domains of epidemiology.

Purpose: The aim of this paper is to critically examine the available scientific research on promoting life-long PA participation and propose an evidence-based model for implementation in PE.

Key Findings: Based on the examined evidence, we propose a development model that focuses on physical skill learning and incorporates psychological and behavioural concomitants of PA. Primary level PE could establish a standardised, evidence based approach for PA promotion. We discuss reasons why programmes that integrate physical, psychological and behavioural skills have been long acknowledged in PE and PA domains but remain lacking in empirical validation. Finally, we suggest future directions required to examine the application of this approach to practice in primary level PE.

Keywords: Physical education, Development, Fundamental motor skill, Physical activity, Government policy.

Introduction

Well-developed physical movement skills provide enriched embodied experiences that enhance quality of life (Whitehead 2001; Whitehead 2007). Accordingly, movement skills underpin multiple dimensions of physical activity (PA) (from elite level sports to habitual daily movement tasks). PA initiatives have received substantial attention and financial investments due to the positive effect on public health status: Exercise prescription plays a prominent role in the prevention and treatment of chronic diseases (e.g., obesity, diabetes, heart failure), mental illnesses (e.g., depression, anxiety), and neurological dysfunction (e.g., stroke; (Lubans et al., 2010). Physical Educaton (PE) is a ubiquitous and important resource for developing PA habits that has remained a proclaimed priority in education system despite challenges presented by the current austerity climate (Ford et al., 2012; Lubans et al., 2010).

The salience of PE is evident with the recent allocation of £150 million to the subject domain by the Department for Education (Budget, 2013) and offers optimism for the continual proliferation of PE. However, caution is still warranted. The re-investment of finances is £10 million less than the original provisions cut from the budget in 2010. To prevent further decrements (or discontinuation) of funding in 2016, effective outcomes of the current investment must be demonstrated. The document published by the Department for Education specifies that schools will be required to provide details of spending strategies for review after the two year guaranteed investment period. The report stipulates that future spending strategies will be formulated based on the methods deployed by the 'best' schools. Unfortunately, what constitutes *quality* spending is left open to interpretation and the criteria that will be assessed are not specified. Whilst future practice guidelines are requisite for driving policy in the direction of *quality* PE, the current lack of prescriptive guidance may compromise future financial resources to implement the prospective best-practices.

For example, schools will be free to choose how to spend their allocated funding and a list of suggested areas for investment are provided. The dichotomous 'possible suggestions' depict a divided approach to delivering PE. This is in contradiction to research findings evidencing that effective delivery of an integrative PE programme is underpinned by a *unified* system: one to which all educators, school sports and clubs can subscribe (Collins et al., 2010; Jess & Collins, 2003; MacNamara et al., 2011). For example, a lack of policy stipulation leaves financial allocation at the discretion of individual institutions to invest in either specialised teacher training, *or* employ external coaches and increase extracurricular games activities. The former option has been lobbied by education experts to the Education Select Committee inquiry into 2012 legacy. The latter options present methods of programme delivery that have limited the effectiveness of previous interventions (Busseri & Rose-Krasnor, 2010; Busseri & Rose-Krasnor, 2009) that, focusses on 'activity today' approaches rather than education of life-long PA skills. In this paper we argue, that the process of evidence-based promotion of PA through PE is too important to not be a fundamental priority within current government policy.

Evidence-based practice is imperative to ensuring the *efficiency* and *effectiveness* of interventions designed to promote population health (Bouffard & Reid, 2012). Governing policy in medicine, nursing, psychology, physiotherapy, and education is informed by scientific 'gold-standard' protocols that optimise service provision (Leng, Baillie, & Raj, 2008). However, discrepancy appears between the research findings, policy and practice in PA promotion throughout the UK (Collins et al., 2010; Bailey, Morley, & Dismore, 2009; Collins et al., 2012; Côté, Lidor, & Hackfort, 2009; Green, 2009) and similar trends prevail globally. For example almost half (49.1%) the respondents agreed that 'evidence' (for effective interventions) does not have major influence on decisions in PA policy in Australia (Bellew, Bauman, & Brown 2010).

Development in PA is dynamic and non-linear (Simonton 2001; Memmert, Baker, & Bertsch, 2010) and there are multiple pathways that individuals may take as they progress in their activity (Ford et al., 2012; Memmert, Baker, & Bertsch, 2010; Pankhurst & Collins, 2013). For present purposes, we consider how multiple pathways could be catered for within a development model: From our perspective, PA promotion should enable individuals to seamlessly move across a participation-performance *continuum*; engaging in a physically active life at any age or level (Collins et al., 2010; Collins et al., 2012; Jess & Collins 2003; MacNamara et al., 2011; Pankhurst & Collins 2013). Accordingly, it is crucial for development systems to offer maximum flexibility, enabling movement across the Participation-Performance-Excellence (PPE) continuum at any age. (Collins et al., 2012; Collins et al., 2010; MacNamara et al., 2011) This model is presented in Figure 1.

****Insert Figure 1 near here****

Full coverage of the derivation and application of this model is available elsewhere (Collins et al., 2012).

Consequently, we suggest that PE, particularly for younger ages, should be focused on improving physical skill competence rather than short-term transient fitness and/or achievement; the aim of PE could be re-framed as the promotion of long-term health behaviours that endure across the life-span instead of focusing on quantity of PA hours. The current focus on *quantity* in lieu of *quality* to regulate curricular content ('five hours of physical activity participation' (Quick, Simon, and Thornton 2010)) in PE seems to grate with policy in other educational realms. An exemplar parallel might be to seek to optimise literacy simply through high volume, facilitated reading (regardless of content or nature of challenge) rather than through delivery of a carefully designed, progressively challenging, validated and reviewed programme of study.

So what can be done to improve the specificity of policies that govern PE practices to provide a unified development system for PA participation? The remainder of this paper aims to examine the current evidence base, to source explanation for the absence of structured, unified policy and to evidence a model that we suggest depicts the life-long skills required for dynamic engagement in the PA through PE.

Deliberate practice, deliberate play and deliberate preparation

Ericsson et al. (1993) pioneered research that resulted in advocating the development of expertise through the accumulation of thousands of hours of effortful practice, an approach known as Deliberate Practice (Ericsson, Krampe, & Tesch-Roemer, 1993). Following this framework, development systems in PA have endeavoured to support prowess through the provision of early, specialised training (Pankhurst & Collins, 2013) the idea being that, to achieve timely success, individual's physical skills training must start early so that they 'get the required time in' as dictated by the now ubiquitously cited 10,000 hours rule. The Deliberate Play model was produced to counter some of the issues apparent with the Deliberate Practice approach when applied to physically demanding activities (Côté, Lidor, & Hackfort, 2009; Côté, Baker, & Abernethy, 2003; Berry, Abernethy, & Côté 2008). Largely based on a socio-psychological perspective, the model promotes the social and behavioural characteristics necessary for long-term participation through an initial emphasis on fun and wide ranging activity. The contrast between these two approaches is highlighted in Table 1.

****Insert Table 1 near here****

PA participation models (e.g. Participation in Youth Physical Activity) and PE conceptualisations (e.g. Physical Literacy) followed suit and the importance of psychological and behavioural skills in conjunction with physical skills for promoting PA engagement is widely acknowledged (Whitehead, 2007). Unfortunately, the extant models do not account for the focussed instruction and structured practice required to develop and refine physical skills

skills (Goodway & Branta, 2003). Thus, whilst the available models have significant implications for PA promotion, a framework for *acquiring* the essential base of general movement competence is absent. Accordingly, and as shown in Figure 1, we propose that lifelong participation in PA can derive from a robust foundation of psychomotor and psychological skills. We have called this approach to PA promotion 'Deliberate Preparation'. The following sections describe the empirically based justification for the content, method, and application of Deliberate Preparation in primary level PE.

Deliberate Preparation – The centrality of movement skills

A proficient foundation of fundamental motor skills interlinks the three domains of PA engagement depicted by the PPE continuum in Figure 1 (Collins et al., 2012a). Appropriate and well-founded generic athletic skills (e.g. locomotion, balance, strength) allow flexible movement of individuals between levels and domains of PA involvement (Bompa, 2000; Seifert, Button, & Davids, 2013; Collins et al., 2012; Goodway & Branta, 2003; Starkes & Ericsson, 2003; Tucker & Collins, 2012). In addition to basic movement skills, motor coordination influences PA engagement in later life: High levels of motor coordination in childhood correlate positively with academic achievement, physical, psychological and behavioural outcomes measured in adolescence and later life (Lopes et al., 2012). Concurrently, motor coordination levels in children negatively correlates with sedentary behaviours throughout life. Additionally, sedentary behaviour influenced health outcomes *independent* of PA level and coordination level related to PA and sedentary behaviours inversely and directly respectively

Children with poor motor-coordination struggle with tasks of daily living, participate in less PA, have higher BMI and are at higher risk of cardiovascular disease than individuals with typical motor coordination development (Fong, Lee, Chan et al., 2011). The difficulties encountered by children due to poor motor coordination perpetuate decreased PA participa-

tion and decrease motor coordination level compared to children with normal motor development (Pesce et al, Fong et al,.). Poor motor coordination negatively effects physical health throughout the life span; children, adolescents and adults with poor coordination have lower physical fitness, increased adiposity, poor cholesterol profiles (low HDL and higher LDL) compared with their age-matched counterparts who possess normal coordination (Cantwell et al., 2008) . Motor-coordination level in children directly correlates with time spent in extra-curricular PA, diversity of PAs, engagement in PA (as measured by time spent in moderate to vigorous activity) during school based PE, self-rated enjoyment of PA and perceptions of ability (Fong et al., 2011).

Poor motor coordination is often coupled with poor academic achievement and cognitive defecits (Kirby & Sugeden, 2007). Notably, lower motor coordination level corresponds with lower attention control and planning functions of cognition. The development of these cognitive functions during childhood can be improved through specialist-led training in PA (Best, 2012, Klingberg, 2005, Pesce et.al, 2013). Physical, psychological and cognitive benefits of PA participation are optimised when cognitive challenge is incorporated in to PE lessons at a level that reflects the individual's motor coordination ability (Pesce, Crova, Marchetti et al., 2013): Children with poor coordination benefit from PAs that do not include additional cognitive demands, however, children with higher level coordination benefit more from PAs with enhanced cognitive challenge (Pesce et.al., 2013). The cognitive ability to assess the environment and adapt motor skills to satisfy the demands of novel movement tasks or environments (executive functioning) provides increased opportunities to explore and display mastery in a wide range of PAs (sport, dance, exercise etc.; Seifert et al., 2011; Seifert, Button, & Davids, 2013, Wright, Holmes, & Smith, 2011).

Development of motor coordination in children requires the identification, optimisation and assessment of movement competence that accounts for individual differences. For

example, gender, genetics, anthropometrics, physical skill level, task and environmental constraints influence coordination (Tucker & Collins, 2012). Further investigations that include empirical measures of motor coordination that are sensitive to individual differences and applicable to longitudinal research are required to enhance the evidence base beyond the cross-sectional information currently available (Lopes et al,. 2012).

Unfortunately, our only empirically validated measures of physical competence (i.e., coordinative skill rather than fitness) are designed to identify motor impairment (the bottom 5% of the population (Lubans et al., 2010). Tests often aggregate skill score in spite of the fact that different components of motor coordination influence over all coordination to varying extents. For example gross motor coordination skills accounted for 40% of variance on discriminant measures used to diagnose dysfunctional coordination development, but fine motor and flexibility scores do not differentiate between ability levels to a similar extent (Shoemaker et al., 2012, Hands, 2013). Thus, there is an apparent lack of informative diagnostic tools capable of discriminating between movement qualities within the 'normal' range and, therefore, little guidance available in relation to best developmental practice for motor-cordination. What work has been done on evaluation of normal motor ability has been related to checks for age-appropriate development. For example, the McCarron Assessment of Neuromuscular Development (MAND; Brantner, Piek, & Smith, 2009) offers a norm related marker of coordination on ten broad tasks against expected averages at six monthly intervals. Interestingly, these coordination measures appear to hold some external validity; for example, scores showing close correlations with performance on novel but age-appropriate fundamental skills (Brantner, Piek, & Smith, 2009). These are promising directions but more work is clearly needed, particularly to establish societally specific norm values and representative tests as a basis for developing an accountable motor skill curriculum.

Deliberate Preparation – Perceived motor skill competence

PE programmes require psychological and psycho-social components that cater for varying motivations, beliefs and abilities for PA engagement (Collin et al., 2010; Fairclough et al., 2012). There is significant evidence supporting the influence of early PE experiences on PA behaviours and perceptions of ability in later life (Aelterman et al., 2012; Bailey & Morley, 2006; Berry, Abernethy, & Côté, 2008; Bompa, 2000; Fairclough et al., 2009, 2012; Kirk, 2005; Lawford et al., 2012; Lopes et al., 2012; Lubans et al., 2010). Individuals with high perception of competence are more likely to persist and master skills (Horn & Harris, 1996; Goodway & Rudisill, 1997; Goodway & Branta, 2003). Notably, the interaction between actual competence and perceived competence predicts future engagement in PA more accurately than the level of competence (actual or perceived). For example, individuals who either under or overestimated their actual level experienced less positive PA involvement than those accurately perceiving their ability, irrespective of level (Aelterman et al., 2012). In this regard, developmental psychology has provided significant considerations for PE. Specifically, studies evidencing that children's perception of their physical competence are high irrespective of skill level and that the mediating influence of differences between actual and perceived competence is not apparent before the age of eight (Goodway & Rudisill, 1997). Therefore, developing a proficient physical skill level to match children's' high perception before the discrepancy becomes a mediating factor on their experience of PE could enhance future PA engagement. Again, this highlights the importance of *early* and well-structured education in physical skills. Studies examining models for developing youth PA participation have provided substantial insight in to the concomitants that inform students' perceptions of physical ability and experience of PE. Notably, children with high perceptions of their ability and who believe that PE is worthwhile engage in more extra-curricular PA (Fairclough et al., 2012).

Deliberate Preparation – Psycho-behavioural factors

An important objective of school PE programs is to develop children who have the skills, knowledge, positive attitudes and confidence to enjoy a physically active lifestyle beyond the cessation of formal PE. An increasing body of research has explored the identification, development, and application of psycho-behavioural skills needed to control, exploit, or simply to cope with the varied challenges and demands faced by individuals as they pursue personal objectives in PA and PE (Collins et al., 2012; Collins et al., 2010; Fairclough et al., 2009; MacNamara et al., 2011; Whitehead, 2010).

The behaviours characteristic of grit (Duckworth & Quinn, 2009 – e.g. goal setting, imagery, reflection) appear to play a crucial role in the realisation of potential by enabling individuals to invest the requisite time to practice, avoid distractions, and stay committed to pursuing excellence in any domain. These behaviours are even more crucial when the significant challenges of prolonged engagement in PA are considered. Indeed, such skills have already been shown to be vital in weight control in the crucial transition to adolescence (Duckworth, Tsukayama, & Geier 2010; Tsukayama et al., 2010). Young people must have the skills (e.g., coping skills, self-efficacy, for example) to overcome associated risk factors (e.g., competing demands, lack of positive reinforcement) and steer a passage through the everyday stressors they encounter such as social and peer pressures. In essence, these psycho-behavioural skills act as a buffer against risk factors and contribute to a young person's ability to make appropriate choices about their physical activity involvement. Studies have validated the importance of student beliefs and behaviours in PE (Fairclough et al., 2012) and demonstrated the effectiveness of autonomy supportive teacher-student interactions (particularly for females) and self-determined motivations for increasing engagement in PE lessons.

Individuals possessing high autonomous motivation, demonstrate higher levels of moderate to vigorous activity during class, persist in mastering skills and enjoy PE more than individuals reporting lower levels of autonomous (controlled) motivation (Aelterman et al.,

2012). Developmentally and instructionally appropriate lessons where students to decide how to deploy their skills in response to various environmental constraints (e.g., task level, instructional authority, recognition, peer grouping, evaluation, and time), increases motivation to display physical skill competence and perceived competence compared to 'free-play' or 'low autonomy' activities in pre-school children (Silva & Stevens 2002; Lawford et al., 2012; Aelterman et al., 2012). Thus, it is important to provide early *structured* PE classes that allow children to experience success (and sometimes failure), set goals, make decisions and endorse PA through self-reflection on their experiences

Notably, the behaviours required for attaining expertise are transferable across domains of excellence. For example, developing persistence, motivation and decision-making skills in motoric endeavours can be deployed by individuals to pursue excellence in other aspects of life (e.g., music, academia, business). A learning environment that is structured to foster autonomously motivated children could provide education *through* the physical and *of* the physical. This thrust offers a robust argument in favour of PE's contribution to meeting broader educational agendas, particularly at primary level where research evidences that children learn optimally through perception and interaction with their physical environment (Newell, 2011). Deliberate Preparation proposes that structured physical skill development could provide a situated learning environment for students to acquire the behavioural and psychological skills that improve physical ability, perception of ability and increase appreciation of the importance of leading a physically active life (Fairclough et al., 2012).

Conclusion

Our proposal and future directions

The benefits of integrative development in PE and the limitations of focusing exclusively on physical or psychological skills is acknowledged in PE theory (Whitehead, 2001, 2007), youth participation in PA models (Welk, 2005) and action research (MacNamara et

al., 2011; Jess & Collins 2003; Collins et al., 2010; Collins et al., 2012). Consequently, rather than continuing the proliferation of theory formulation in research, we propose proceeding with a scientifically grounded action-based approach (e.g. Deliberate Preparation) that prioritises *quality* physical skill acquisition in PE at primary level.

School systems and finances are presently in place that *could* offer a unified and structured PE programme (reflecting the Deliberate Preparation approach) to optimise current investments, justify sustaining investment, and reduce additional financial repercussions of combatting insufficient, poorly designed PE in the future. However, to continue progressing with practical implementation, there are a number of barriers that need to be removed: Without comparative examination between developmental strategies, the generation of scientifically supported guidelines to inform curricula from research findings is clearly limited (Ramey & Rose-Krasnor, 2012; Busseri & Rose-Krasnor, 2010; Busseri & Rose-Krasnor, 2009).

Echoing the arguments for valid, reliable tests of motor coordination ability reported across sub-disciplines of exercise and movement sciences, a valid measurement of physical movement competence is required to test the application of Deliberate Preparations and other models in PE. Recent advances in movement assessment tools and technology (Sheehan & Katz, 2012) offer scope for establishing measures of physical competence that could be practical for classroom-based testing. For example, objective measurements that meet the demands of large scale assessment will facilitate longitudinal investigations of the effect of PE programmes on PA habits in later life (Tucker & Collins 2012; Collins et al., 2012; Lubans et al., 2010; MacNamara et al., 2011). Substantial empirical evidence is required to examine if structured physical skill development models (Deliberate Preparation) provide a comprehensive PE that translates to enhanced PA habits later in life.

References

Aelterman, Nathalie, Maarten Vansteenkiste, Hilde Van Keer, den Berghe Van, Jotie De Meyer, and Leen Haerens. 2012. "Students' Objectively Measured Physical Activity Levels and Engagement as a Function of between-Class and between-Student Differences in Motivation Toward Physical Education." *Journal of Sport & Exercise Psychology* 34 (4): 457-480.

Bailey, Richard and David Morley. 2006. "Towards a Model of Talent Development in Physical Education." *Sport, Education & Society* 11 (3): 211-230.

Bailey, Richard, David Morley, and Harriet Dismore. 2009. "Talent Development in Physical Education: A National Survey of Policy and Practice in England." *Physical Education & Sport Pedagogy* 14 (1): 59-72.

Baker, Joseph, Jean Côté, and Janice Deakin. 2005. "Expertise in Ultra-Endurance Triathletes Early Sport Involvement, Training Structure, and the Theory of Deliberate Practice." *Journal of Applied Sport Psychology*17 (1): 64-78.

Balyi, Istvan and Ann Hamilton. 2005. "Long-Term Athlete Development: Trainability in Childhood and Adolescence "Windows of Opportunity, Optimal Trainability"." *Performance Conditioning Soccer* 12 (1): 8-10.

Bellew, Bill, Adrian Bauman, and Wendy Brown. 2010. "Evidence-Based Policy and Practice of Physical Activity in Australia: Awareness and Attitudes of Attendees at a National Physical Activity Conference (the PAPPA Study)." *Health Promotion Journal of Australia* 21 (3): 222-228.

Berry, Jason, Bruce Abernethy, and Jean Côté. 2008. "The Contribution of Structured Activity and Deliberate Play to the Development of Expert Perceptual and Decision-Making Skill." *Journal of Sport & Exercise Psychology* 30 (6): 685-708.

Bompa, T. O. 2000. *Total Training for Young Champions*. Champaign, Ill.; United States: Human Kinetics.

Bouffard, Marcel and Greg Reid. 2012. "The Good, the Bad, and the Ugly of Evidence-Based Practice." *Adapted Physical Activity Quarterly* 29 (1): 1-24.

Brantner, Sarah, Jan P. Piek, and Leigh M. Smith. 2009. "Evaluation of the Validity of the MAND in Assessing Motor Impairment in Young Children." *Rehabilitation Psychology* 54 (4): 413-421.

Brown, Trent D. and Phillip G. Payne. 2009. "Conceptualizing the Phenomenology of Movement in Physical Education: Implications for Pedagogical Inquiry and Development." *Quest* 61 (4): 418-441.

Busseri, Michael A. and Linda Rose-Krasnor. 2010. "Addressing Three Common Issues in Research on Youth Activities: An Integrative Approach for Operationalizing and Analyzing Involvement." *Journal of Research on Adolescence (Blackwell Publishing Limited)* 20 (3): 583-615.

Busseri, Michael A. and Linda Rose-Krasnor. 2009. "Breadth and Intensity: Salient, Separable, and Developmentally Significant Dimensions of Structured Youth Activity Involvement." *British Journal of Developmental Psychology* 27 (4): 907-933.

Carson, Howie J. and Dave Collins. 2011. "Refining and Regaining Skills in fixation/diversification Stage Performers: The Five-A Model." *International Review of Sport & Exercise Psychology* 4 (2): 146-167.

Collins, Dave, Richard Bailey, Paul A. Ford, Áine MacNamara, Martin Toms, and Gemma Pearce. 2012. "Three Worlds: New Directions in Participant Development in Sport and Physical Activity." *Sport, Education & Society* 17 (2): 225-243.

Collins, Dave, Russell Martindale, Angela Button, and Katie Sowerby. 2010. "Building a Physically Active and Talent Rich Culture: An Educationally Sound Approach." *European Physical Education Review* 16 (1): 7-28.

Côté, Jean, Ronnie Lidor, and Dieter Hackfort. 2009. "Issp Position Stand: To Sample Or to Specialize? Seven Postulates about Youth Sport Activities that Lead to Continued Participation and Elite Performance."*International Journal of Sport & Exercise Psychology* 7 (1): 7-17.

Cote, J., J. Baker, and B. Abernethy. 2003. "From Play to Practice: A Developmental Framework for the Acquisition of Expertise in Team Sports." In . United States.

Duckworth, Angela L., Eli Tsukayama, and Andrew B. Geier. 2010. "Self-Controlled Children Stay Leaner in the Transition to Adolescence." *Appetite* 54 (2): 304-308.

Duckworth, Angela Lee and Patrick D. Quinn. 2009. "Development and Validation of the Short Grit Scale (Grit-S)." *Journal of Personality Assessment* 91 (2): 166-174.

Ericsson, K. A., R. T. Krampe, and C. Tesch-Roemer. 1993. "The Role of Deliberate Practice in the Acquisition of Expert Performance." *Psychological Review* 100 (3): 363-406.

Ford, Paul, Dave Collins, Richard Bailey, Áine Macnamara, Gemma Pearce, and Martin Toms. 2012. "Participant Development in Sport and Physical Activity: The Impact of Biological Maturation." *European Journal of Sport Science* 12 (6): 515-526.

Gabor, Barton. 2010. "Virtual rehabilitation–a Focus on Movement Function." *Biomechanica Hungarica* 2 (2): 7-14.

Gladwell, Malcolm. 2009. *Outliers: The Story of Success*. Penguin, UK.

Goodway, J. D. and C. F. Branta. 2003. "Influence of a Motor Skill Intervention on Fundamental Motor Skill Development of Disadvantaged Preschool Children." *Research Quarterly for Exercise & Sport* 74 (1): 36-46.

Goodway, Jacqueline D. and Mary E. Rudisill. 1997. "Perceived Physical Competence and Actual Motor Skill Competence of African American Preschool.." *Adapted Physical Activity Quarterly* 14 (4): 314-326.

Green, Mick. 2009. "Podium Or Participation? Analysing Policy Priorities Under Changing Modes of Sport Governance in the United Kingdom." *International Journal of Sport Policy* 1 (2): 121-144.

Green, Mick and Shane Collins. 2008. "Policy, Politics and Path Dependency: Sport Development in Australia and Finland." *Sport Management Review (Sport Management Association of Australia & New Zealand)* 11 (3): 225-251.

Horn, T. S. and A. Harris. 1996. "Perceived Competence in Young Athletes: Research Findings and Recommendations for Coaches and Parents." In *Children and Youth in Sport: A Biopsychosocial Perspective.*, edited by F. Smol L., 309-329. United States: Madison, Wis..Borwn & Benchmark.

Jess, M. and D. Collins. 2003. "Primary Physical Education in Scotland: The Future in the Making." *European Journal of Physical Education* 8 (2): 103-118.

Kirk, David. 2005. "Physical Education, Youth Sport and Lifelong Participation: The Importance of Early Learning Experiences." *European Physical Education Review* 11 (3): 239-255.

Lawford, Heather L., Heather L. Ramey, Linda Rose-Krasnor, and Andrea S. Proctor. 2012. "Predictors of Adolescent Successful Development After an Exchange: The Importance of Activity Qualities and Youth Input." *Journal of Adolescence* 35 (5): 1381-1391.

Leng, Gillian, Nick Baillie, and Thara Raj. 2008. "NICE Guidance and Mental Health: Supporting Change." *Psychology and Psychotherapy: Theory, Research and Practice* 81 (4): 351-364.

Lopes, Luís, Rute Santos, Beatriz Pereira, and Vítor Pires Lopes. 2012. "Associations between Sedentary Behavior and Motor Coordination in Children." *American Journal of Human Biology: The Official Journal of the Human Biology Council* 24 (6): 746-752.

Lubans, David R., Philip J. Morgan, Dylan P. Cliff, Lisa M. Barnett, and Anthony D. Okely. 2010. "Fundamental Movement Skills in Children and Adolescents: Review of Associated Health Benefits." *Sports Medicine* 40 (12): 1019-1035.

MacNamara, Aine, Dave Collins, Richard Bailey, Martin Toms, Paul Ford, and Gemma Pearce. 2011. "Promoting Lifelong Physical Activity and High Level Performance: Realising an Achievable Aim for Physical Education." *Physical Education & Sport Pedagogy* 16 (3): 265-278.

Memmert, Daniel, Joseph Baker, and Claudia Bertsch. 2010. "Play and Practice in the Development of Sport-Specific Creativity in Team Ball Sports." *High Ability Studies* 21 (1): 3-18.

Newell, Karl M. 2011. "Physical Education of and through Fitness and Skill." *Quest (00336297)* 63 (1): 46-54.

Ollis, Stewart, Alan Macpherson, and Dave Collins. 2006. "Expertise and Talent Development in Rugby Refereeing: An Ethnographic Enquiry." *Journal of Sports Sciences* 24 (3): 309-322.

Pankhurst, Anne and Dave Collins. 2013. "Talent Identification and Development: The Need for Coherence between Research, System, and Process." *Quest (00336297)* 65 (1): 83-97.

Quick, Susannah, Aline Simon, and Alex Thornton. 2010. "PE and Sport Survey 2009/10." .

Ramey, Heather L. and Linda Rose-Krasnor. 2012. "Contexts of Structured Youth Activities and Positive Youth Development." *Child Development Perspectives* 6 (1): 85-91.

Seifert, Ludovic, Chris Button, and Keith Davids. 2013. "Key Properties of Expert Movement Systems in Sport." *Sports Medicine* 43 (3): 167-178.

Simonton, Dean Keith. 2001. "Talent Development as a Multidimensional, Multiplicative, and Dynamic Process." *Current Directions in Psychological Science (Wiley-Blackwell)* 10 (2): 39-43.

Smith, Andy and Richard Leech. 2010. "'Evidence. what Evidence?': Evidence-Based Policy Making and School Sport Partnerships in North West England." *International Journal of Sport Policy* 2 (3): 327-345.

Starkes, J. L. and K. A. Ericsson. 2003. *Expert Performance in Sports: Advances in Research on Sport Expertise*. Champaign, Ill.; United States: Human Kinetics.

Syed, Matthew. 2010. *Bounce: How Champions are made* Fourth Estate.

Tsukayama, Eli, Sara L. Toomey, Myles S. Faith, and Angela Lee Duckworth. 2010. "Self-Control as a Protective Factor Against Overweight Status in the Transition from Childhood to Adolescence." *Archives of Pediatrics & Adolescent Medicine* 164 (7): 631.

Tucker, Ross and Malcolm Collins. 2012. "What Makes Champions? A Review of the Relative Contribution of Genes and Training to Sporting Success." *British Journal of Sports Medicine* 46 (8): 555-561.

Van Waelvelde, Hilde, Wim Peersman, Matthieu Lenoir, and Bowien C. M. Smits Engelsman. 2007. *The Reliability of the Movement Assessment Battery for Children for Preschool Children with Mild to Moderate Motor Impairment*.

Whitehead, Margaret. 2001. "The Concept of Physical Literacy." *European Journal of Physical Education* 6 (2): 127-138.

Whitehead, Margaret. 2007. "Physical Literacy: Philosophical Considerations in Relation to Developing a Sense of Self, Universality and Propositional Knowledge." *Sports Ethics and Philosophy* 1 (3): 281-298.

Wright, David J., Paul S. Holmes, and Dave Smith. 2011. "Using the Movement-Related Cortical Potential to Study Motor Skill Learning." *Journal of Motor Behavior* 43 (3): 193-201.

Table 1: A contrast between the tenets and modus operandi of Deliberate Practice and Deliberate Play

Deliberate Practice	Deliberate Play
• Effortful...not intrinsically enjoyable • Focussed on specifics • Coach /adult led • Performance/specialist agenda • ONE TRACK • Psychosocially independent	• Emphasis on FUN • Focussed on generics • Child centred/minimal adult involvement • Broad sampling agenda • TWIN TRACK • Psychosocially dependant

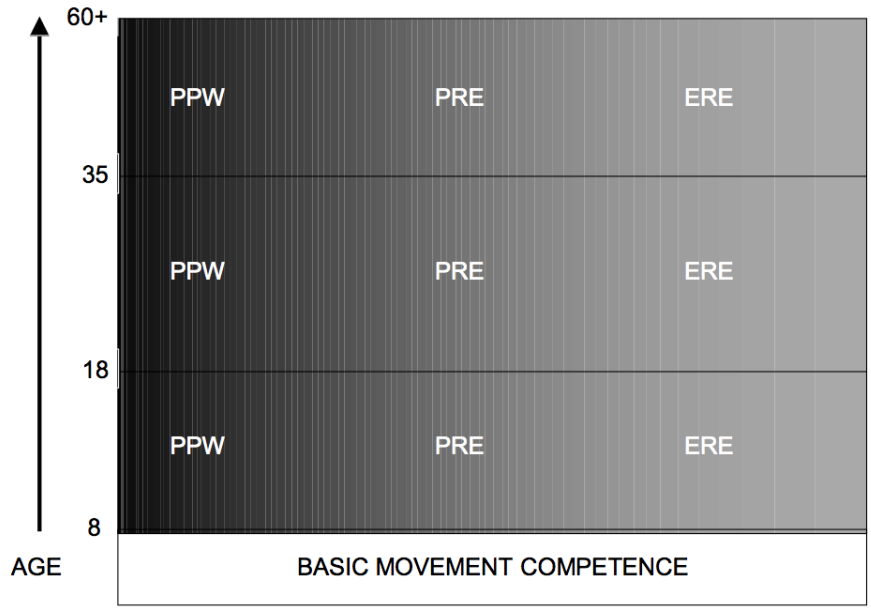

Figure 1: The Participation – Performance – Excellence Continuum