



UNIVERSITY OF
CANBERRA



GETTING AUSTRALIA MOVING:

ESTABLISHING A PHYSICALLY LITERATE & ACTIVE NATION (GAME PLAN)

A DOCUMENT PREPARED BY THE UNIVERSITY OF CANBERRA
CENTRE OF EXCELLENCE IN PHYSICAL LITERACY AND ACTIVE YOUTH (CEPLAY).

KEEGAN, R.J., KEEGAN, S.L., DALEY, S., ORDWAY, C., EDWARDS, A.

NATIONAL INSTITUTE OF SPORT STUDIES

CEPLAY acknowledges the support of
Sport and Recreation Services ACT
in preparation of this report.

ISBN: 9781740883719

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
INTRODUCTION	2
'UNPACKING' PHYSICAL LITERACY	4
WHITEHEAD'S APPROACH TO PHYSICAL LITERACY	4
A WORKING MODEL FOR GAME PLAN	6
EVIDENCE OF THE IMPORTANCE OF PHYSICAL LITERACY	6
EXISTING PROGRAMMES PROMOTING PHYSICAL LITERACY	8
CONCLUSION AND RECOMMENDATIONS	17
REFERENCES	19



EXECUTIVE SUMMARY:

Recent estimates put the cost of physical inactivity to the Australian economy at \$13.8 billion per year, as a result of healthcare costs (\$0.72-1.5bn), lost productivity (\$9.3bn) and premature mortality (\$3.8bn). Sedentary lifestyles are the fourth highest risk factor in reducing Australian productivity, behind smoking, high blood pressure and obesity (two of which can be reduced by being more active). Australians need to get moving.

However, physical activity guidelines for children and adults alike are frequently not achieved. Australia needs to ensure its citizens are willing and able to be more physically active, and this can start at pre-school and primary school. Early years physical education (PE) is, by necessity, often delivered by teachers with limited training in PE; limited access to trained PE professionals, and severe constraints on time and resources. Consequently, the quality of children's early experiences in physical activity can be highly variable. If children's early experiences of being physically active fail to be enjoyable and build basic movement capacities, then children will be less likely to try, enjoy, and succeed in their future physical challenges. This 'vicious circle' of failure and demotivation creates Australians who neither value nor enjoy physical activity,

and who inexorably become sedentary – with all the associated risks this brings.

As a solution to the above problem, this report presents the case for increasing physical literacy amongst children in Australia, with a view to promoting physical activity and healthy lifestyles. Physical literacy is a concept capturing:

1. the ability to move effectively;
2. the desire to move;
3. the perceptual abilities that support effective movement;
4. the confidence and assurance to attempt movement challenges; and
5. the subsequent ability to interact effectively with their environment and other people.

Notably, this description is quite distinct from sporting prowess, athleticism, cardiovascular fitness, or time spent being active, which are amongst a long list of positive outcomes produced by becoming physically literate from a young age.

To ingrain physical literacy in the early years, Australian children must be supported in developing the ability to move proficiently, the confidence and willingness to try new activities, and an awareness of the importance of physical activity for health. In addition

to enhanced lifelong health, physical activity in childhood has been shown to provide immediate short term health benefits – both physical and mental – improved educational attainment, and enhanced life skills. These benefits also track into later life, such that physically active children are more likely to become active adults than sedentary ones, and physically inactive kids tend to become inactive adults. In short, physical literacy and active lifestyles allow children to be fitter, smarter, happier and healthier, for life.

This report reviews the evidence for the above relationships in relation to a physical literacy framework developed at the University of Canberra. After building the scientific case for promoting physical literacy in Australian children, successful models from other countries are reviewed and evaluated with a view to constructing a curriculum that both builds upon these existing programmes as well as being specific to the unique environment and culture of Australia. On the basis of this review, ten recommendations are made for any future Australian programme for promoting physical literacy.

***NB: This report uses footnotes (i, ii...) for the citation of websites and resources, and medical referencing (1, 2...) for formal scientific texts.**

INTRODUCTION

The magnitude of the problem:

Physical inactivity and sedentary lifestyles have emerged as a very serious health threat, both in Australia and across the world. For example, recent research by Medibank and KPMGⁱ estimated the cost of physical inactivity to the Australian economy at \$13.8 billion per year, as a result of direct healthcare costs (\$0.72bn -1.5bnⁱⁱ), lost productivity (\$9.3bn) and premature mortality (\$3.8bn). Likewise, the total cost is estimated to be £8.2 billion per annum (\$12 billion AU\$) in the UK (National Institute for Health and Clinical Excellence, 2008ⁱⁱⁱ), and \$75 billion per annum (\$71.5 billion AU\$) in the USA (Centers for Disease Control, 2011^{iv}, v). Physical inactivity is a threat common to all developed nations, undermining productivity and growth, and sapping nations' resources. In Australia, sedentary lifestyles are the fourth highest risk factor in reducing productivity, behind smoking, high blood pressure and obesity (Medibank, 2008). Even at the local level, a recent report in the ACT region^{vi} estimated sport and physical activity contributed to a financial saving of \$23 million in direct health care costs in 2009. This figure extended to a saving of \$105.9 million when associated health costs including productivity losses and carer costs were factored in.

Taking an overall picture, the 2000 National Physical Activity Survey¹ found that 54% of the Australian adult population were not getting enough physical activity to remain healthy. Likewise, 36% of the adults sampled by the Australian Bureau of Statistics in 2008 had been totally sedentary in the previous two weeks; an increase from 32% in 2001 (Australian



Bureau of Statistics, 2011^{vii}). This translates into almost nine million adult Australians putting their health, quality and length of life at risk due to insufficient physical activity (Medibank, 2007). Unfortunately, the trend is similar in children, with the 2007 Australian National Children's Nutrition and Physical Activity Survey^{viii} finding that only 69% of children between 2-16 years of age met the National Physical Activity Guidelines. Worse, the average time spent doing moderate to vigorous physical activity, as recommended, decreased with age: 80% of 9 – 13 year old boys reported meeting the national guideline, dropping to 64% for 14 – 16 year olds. The rates were even lower for girls at all ages: 71% for those aged 9 – 13 and 51% for 14 – 16 year olds. **In a world with a multitude of competing, often sedentary, pastimes and with technology increasingly making it unnecessary to exert physical effort, declining physical activity seems inevitable. However, to simply accept the inevitability of sedentary lifestyles would be to sign the death warrant of an entire generation.**

Why focus on childhood? When examining reasons for physical inactivity, medical research focuses on broad measures such as socio-economic status, the physical environment, ethnicity, gender and age². However, the reasons given by children centre around attitudes and intentions: positive early experiences, appreciation of the benefits of being active, perceptions of what is normal, and often disliking either the boring/unpleasant aspects of 'running laps', or the competitive aspects of formal sport^{2, 3, 4}. It is important to focus on childhood because levels of physical activity have been observed to 'track' throughout adolescence and adulthood^{5, 6, 7, 8}. For example, the UK Sports Council's (1992) National Fitness Survey⁹ found that 25% of those who were 'very active' between 14–19 years were still active in later life, whereas only two per cent who were currently active had been inactive at these ages. A European, multi-national study⁵ found a similar tracking effect from childhood into adolescence, suggesting a continuation from childhood right through to adulthood.

i. http://www.medibank.com.au/Client/Documents/Pdfs/The_Cost_OF_Physical_Inactivity_08.pdf

ii. <http://www.docstoc.com/docs/36086948/ECONOMIC-MODELLING-OF-THE-NET-COSTS-ASSOCIATED-WITH-NON>

iii. <http://www.nice.org.uk/nicemedia/live/11917/38990/38990.pdf>

iv. <http://www.ncbi.nlm.nih.gov/pubmed/10593542>

v. <http://www.cdc.gov/chronicdisease/resources/publications/aag/nutrition.htm>

vi. Access Economics 2010, Building an active community. The economic contribution of sport and recreation in the ACT.

vii. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4835.0.55.001Main+Features12007-08?OpenDocument>

viii. [http://www.health.gov.au/internet/main/publishing.nsf/content/66596E8FC68FD1A3CA2574D50027DB86/\\$File/childrens-nut-phys-survey.pdf](http://www.health.gov.au/internet/main/publishing.nsf/content/66596E8FC68FD1A3CA2574D50027DB86/$File/childrens-nut-phys-survey.pdf)

Further, 30% of adults in the National Fitness Survey had remained in the same activity bracket throughout their life span. Notably, the goals of physical education go beyond simply playing sport: PE should generate positive outcomes in the physical, lifestyle, affective, social and cognitive domains^{10, 11}. Given that all children go to school, PE is a key opportunity to influence both the volume and quality of children's early experiences of being physically active. In response, many Australian jurisdictions currently prescribe physical activity: for example, the ACT has mandated physical activity within schools for every childⁱ but enforcement of this allotted time remains at the discretion of individual teachers and schools. Children from kindergarten to year 6 are required to participate in 25 – 30 minutes of physical activity per day.

Recent trends in children's physical education:

The 2010 Schools Physical Activity and Nutrition Survey (SPANS¹²) estimated that less than half of primary (49%) and pre-school (44%) students met the Australian Physical Activity Guideline for children (at least 60 minutes of moderate to vigorous physical activity every day). Further, between 2004 and 2010 there was a significant decline in students' physical activity. Australian children attend school around 200 days per year where facilities and opportunities to be physically active abound. However, economic and political conditions at the beginning of the last decade produced tax and policy reforms in many Western nations that commanded funding cuts to public school education¹³. Concurrently, schools were faced with pressure to focus on reading, writing and numeracy, as these were central to national testing frameworks (e.g., NAPLAN in Australia, OFSTED in the UK¹⁴). Likewise, large amounts of

funding were redirected into providing a computer in every classroom, in order to accommodate a new digital age, but this redirected money away from subjects like music and physical education¹⁵.

These trends, along with cultural and societal norms labelling physical activity and sport as unsophisticated and unintelligent activities¹⁶ have led to school PE receiving less attention, less investment and resources, less time in the curriculum, less training for teachers, and an ever diminishing experience for each child exposed to PE in this system¹⁷. PE delivered by trained teachers is much more beneficial to pupils receiving it¹³, and yet primary school teachers do not feel that their training prepares them to deliver PE^{18, 19}. In fact, a key determinant in how PE is delivered remains the teacher's own, highly variable, experiences of PE and sport, and their attitudes to being active²⁰. Unsatisfactory early experiences of physical activity can create children (and adults) who are unable and unwilling to attempt physical activity: Australians who neither value being active, nor even expect positive outcomes from it. These children will be less likely to be active in childhood, adolescence and adulthood, and lack of physical activity is a leading cause of death across the Western world^{21, 22, 23}. By robbing them of up to five years of life expectancy, and creating the first generation of children who may not outlive their parentsⁱⁱ, **failure to invest in school physical education is killing Australian children.**

What is the alternative? As noted above, school physical education is not about playing sport, nor is it about simply building cardiovascular fitness or accumulating a minimum amount of time spent in class. Physical education should produce children who are physically literate – with

physical literacy incorporating:

- a) motivation to be active and use one's body;
- b) the ability to move effectively and efficiently and interact with the physical environment successfully;
- c) the ability to perceive, process and reason in the physical domain;
- d) increased confidence and self-esteem in relation to physical tasks and challenges;
- e) the ability to both express oneself physically and perceive physical cues in others, leading to improved communication and empathy; and
- f) an appreciation of the value of being physically active, moving effectively and the knowledge that underpins these abilities^{24, 25}.

The new Australian Curriculum for Health and Physical Educationⁱⁱⁱ has been drafted to reflect these wide-ranging values, mirroring other national curricula in Canada, the United States, Great Britain and New Zealand. However, the funding and resources to support the teachers of young children remains unclear; remembering that primary and pre-school teachers already receive little or no training in developing physical literacy. This document describes the concept of physical literacy; details the evidence linking physical literacy and physical activity to positive outcomes (including academic achievement); and overviews the delivery of physical literacy programmes in other countries. In doing so, this document ('Game Plan') both builds a compelling case for investing in the development of physically literate children, and it will provide a route-plan for Australia to develop an effective programme of its own: a programme that will save lives and save the Australian economy up to \$13.8 billion per year.

i. Physical Education and Sport Policy 2009, Department of Education and Training, www.det.act.gov.au accessed on line 7 May 2013

ii. http://designedtomove.org/downloads/Designed_To_Move_Full_Report.pdf

iii. <http://consultation.australiancurriculum.edu.au/Static/docs/HPE/F-10Curriculum.pdf>

‘UNPACKING’ PHYSICAL LITERACY

The concept of physical literacy was first described by Professor of PE Margaret Whitehead, in 2001²⁴, and has spawned a large number of practical interventions and programmes since (discussed below). Central to Whitehead’s work was the idea that moving and interacting with the environment is a critical challenge faced by humans across history: a fundamental and existential problem that defines human experience. To a large extent, and mirroring the introduction earlier, Whitehead developed the concept of physical literacy as a reaction against conceptions that PE is only about sport or fitness, and that PE is unsophisticated and unimportant compared to other subjects. Instead, Whitehead argued that the mind and body are not separate entities, but rather one and the same embodied entity, or being^{26, 27, 28}. Put simply, the ‘mind’ exists in order to produce physical movements in and through the environment and, as such, is just as physical as a hand or muscle²⁹. By positioning the ability and willingness to move at the very centre of the human experience, Whitehead attempted to overcome these ‘dualist’ assumptions.

WHITEHEAD’S APPROACH TO PHYSICAL LITERACY

Defined as ‘the motivation, confidence, physical competence, understanding and knowledge to maintain physical activity at an individually appropriate level, throughout life’ the core components of physical literacy, listed by Whitehead^{24, 25}, are as follows:

- a. In a wide range of physically challenging situations (dance, sport, music, art and crafts, self-expression, day-to-day travel), the physically literate person will move with poise and grace, with economy of movement, and with confidence;

- b. In that same wide range of physically challenging situations, the physically literate person will be able to read the situation, predict and/or anticipate what is likely to happen next as the situation unfolds, and then be able to react through movement in an appropriate manner.
- c. The physically literate person has the knowledge, skills, attitude, and motivation to fully use their capacity and potential for movement.
- d. The skills developed by a physically literate person will be appropriate to their local culture, and be based on the limits to their movement potential or their ability or physical disability.
- e. The physically literate person will have a well-established sense of their physical self: that they feel ‘at home’ in their body, and comfortable with their physicality.
- f. The physically literate person will have a high level of self-confidence and self-esteem that comes from confidence in their body and its abilities.

In developing this concept, Whitehead and colleagues have linked physical literacy with many other important outcomes, such as self-concept³⁰, childhood obesity³¹, healthy aging³² and supporting disabled people³³. Programmes delivering physical literacy in Canada, the US, and UK all operationalise physical literacy as the early development of fundamental motor skills and exposure to sport. However, there is scope for Australia to design a programme which better reflects the full range of physical literacy components, and therefore generates more of the associated benefits for Australian children.

The Long Term Athlete Development Approach to Physical Literacy:

A contrasting perspective, but one that has received extensive attention in recent years, is the Long Term Athlete Development (LTAD) model³⁴.

³⁵. As its name would suggest, the LTAD was conceived with a view to creating sporting talent, and specified two pathways towards either sports requiring ‘early specialisation’ - for example, gymnastics is a sport that generally requires athletes to focus on it exclusively from an early age - versus ‘late specialisation’ which may serve multiple sports and, potentially, general physical activity. An important feature of the model is its suggestion of three ‘critical periods’, which are proposed to be ‘windows for accelerated development’ in the areas of:

- a. speed development (age: 6-9 years for boys, 6-8 years for girls);
- b. motor coordination (age: 9-12 years for boys, 8-11 years for girls); and
- c. aerobic fitness and strength (age: 12-16 years for boys, 11-15 years for girls).

The model proposes that failure to develop relevant capacities during these critical periods will forever undermine the child’s capacity for key athletic skills. As such, the model (in its late specialising’ form) proposes seven stages of development, which are approximately mapped to chronological age (maturation and years of training are also listed as guidelines). These six stages are detailed below:

Active Start: From birth to age six. The main aim of this stage is to develop good physical activity habits in early childhood, including infancy, largely focussing on intrinsic enjoyment. During this stage children need to develop basic human movement skills and positive attitudes towards being active. At this stage, children need frequent short bursts

of physical activity spread throughout the day, totalling at least 60 minutes of vigorous activity per day.

Stage 1 - The FUNDamental Stage:

From 6-9 years for boys and 6-8 for girls. The objective of this stage is to learn all fundamental movement skills, before sport-specific skills are introduced. A positive, fun approach and participation in a wide range of sports is also encouraged. The fundamental movement skills that will support subsequent sporting participation are termed the ABC's of athleticism - Agility, Balance, Coordination and Speed.

The first proposed 'critical period' (for speed development) is proposed to occur during this phase. If children and parents have a preferred sport, participation once or twice per week is recommended, but participation in other sports is essential for developing multiple skill-sets.

Stage 2 - The learning to train

stage: From 9-12 years of age for boys, and 8-11 years of age for girls. The objective of this stage is cited by Balyi and Hamilton (2010³⁵) as being to learn fundamental sports skill. A second 'critical period' is proposed to occur in this period regarding 'motor coordination': "All fundamental movement skills should be further developed and general overall sports skills should be learned during this phase" (p.20). Training in strength, endurance and flexibility is also recommended, as well as an introduction to competition (up to 30% of participation time).

Stage 3 - The Training to Train

Stage: From 12-16 for males, and 11-15 for females. The objectives of this stage are to build the aerobic base, build strength and further develop sport specific skills. This phase forms a third proposed 'critical period', this time for aerobic and strength training. As with Stage 2, training in strength, endurance and flexibility is also recommended, with

competition becoming more relevant (up to 40% of participation time) but the focus on winning is discouraged.

Stage 4 - The Training to Compete

Stage: Sixteen to 18 for males, 15-17 for females. The objectives of this stage are to optimise sport specific and position-specific fitness, skills and performance. In this stage, a 50:50 balance between training and competition is recommended.

Stage 5 - The Training to Win

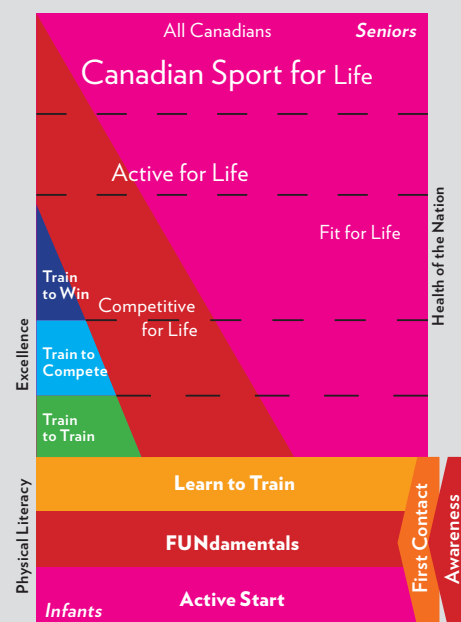
Stage: Aged 18 and over for males, 17 and over for females. This stage seeks to maximise: fitness; sport, individual and position specific skills; as well as performance. In this stage, all of the athlete's physical, technical, tactical, mental, personal and lifestyle capacities are now fully established and the focus of training has shifted to the maximisation of performance, at major competitions. Training is characterised by high intensity and relatively high volume.

Stage 6 - The Retirement /

Retention stage: The objectives of this phase are to retain athletes for coaching, administration, officials, etc. This phase refers to the activities performed after an athlete has retired from competition permanently.

It is clear from reading any materials detailing the LTAD model that its primary focus is on developing athletes and sporting performance, which appears to contradict Whitehead's conceptualisation. However, for the main part the two approaches to physical literacy appear to co-exist relatively peacefully. Recent programmes promoting physical literacy appear to have moved away from the 'sport only' viewpoint, and embraced a more holistic approach that promotes any-and-all physical activity for health. In fact, much of the efforts of Canada Sports for Life (CS4L) and Physical Health and Education Canada (PHE) have been in ensuring that those who do not wish to become elite athletes are also catered for (i.e., the red and purple areas of Figure 1, below).

Figure 1: The current LTAD model being used by Canada Sports for Life and many other organisations around the world¹.



i. <http://www.canadiansportforlife.ca/learn-about-canadian-sport-life/ltad-stages>

A WORKING MODEL FOR GAME PLAN

Recognising that the LTAD model may be incomplete due to its relatively heavy focus on sport and talent development for sport, Figure 2 (page 7) has been developed as a working model for Game Plan: combining aspects of both Whitehead's and Balyi's approaches. The taxonomy in Figure 2 contains the factors that contribute to physical literacy (Column 1), the core components of physical literacy itself (Column 2), and both the short and long term outcomes of increased physical literacy (columns 3 and 4, respectively). Factors are organised chronologically from left to right, and in order of increasing complexity from bottom to top. Taken together, this taxonomy can be considered an explanatory theoretical framework, explaining how physical literacy is produced, and how it may generate the positive outcomes specified in physical literacy theory. For example, working from left to right: increased exposure to high quality PE from an early age should generate motor competence and spatial awareness, improved perceptions of competence and self-esteem, and thus increased motivation and willingness to attempt movement activities. Reinforced and supported over time, these changes will lead children to experience a wider variety of movement activities, become more proficient, and develop positive attitudes to physical activity. Accumulated benefits would include increased energy expenditure, improved body composition, improved psychological well-being, and the knowledge and attitudes that support lifelong activity – which is known to improve health and reduce mortality. The following section details the current research evidence linking key factors in this taxonomy, and thus further demonstrates the argument that school PE needs to develop physical literacy from an early age.

Whilst Figure 2 details the broad scope of physical literacy theory, Figure 3 (page 8) notes the linkages that form the focus of this report. In both cases, diagram allows researchers to 'plot' the findings of individual studies against the predictions of physical literacy. As such, new studies, or those outside the scope of this report (which focuses on the influence of schools and parents) may also be added at a later date.

EVIDENCE OF THE IMPORTANCE OF PHYSICAL LITERACY

The following section reviews the evidence surrounding physical literacy, the ways it can be supported and the benefits it produces (as outlined in Figure 2). To date, many of the concepts outlined in the Physical Literacy Taxonomy have been studied in isolation, or in small clusters (as demonstrated in Table 1, page 9). However, when combined and synthesised into a coherent picture, the evidence in favour of developing physically literate children is strong, and continually growing. Table 1 details relevant research linking key determinants, characteristics and outcomes of physical literacy, focussing on the impacts of

1. schools, teachers and the curriculum; and
2. parents and family.

With reference to the Physical Literacy Taxonomy in Figure 1, each study is classified using the numbers accompanying each attribute, for example: a study demonstrating links between volume/quality of school PE with the development of gross motor skills as well as short and long-term health benefits would be classified [8-4-1-1]. Whilst not exhaustive, the Table 1 (page 9) focuses on the higher quality studies available in the current literature, giving a representative sample of the current 'best evidence'.

On reviewing Table 1, which surmises the recent evidence concerning key linkages at the focus of this report, the evidence is compelling that schools and parents play a substantial role in determining children's levels of physical activity, and the subsequent health benefits. Likewise, there is very strong evidence that quality PE, and the consequent effects on physical activity and fitness, are strongly associated with improved cognitive performance, academic success, and lasting health benefits. Notably, the available evidence does not suggest any harm



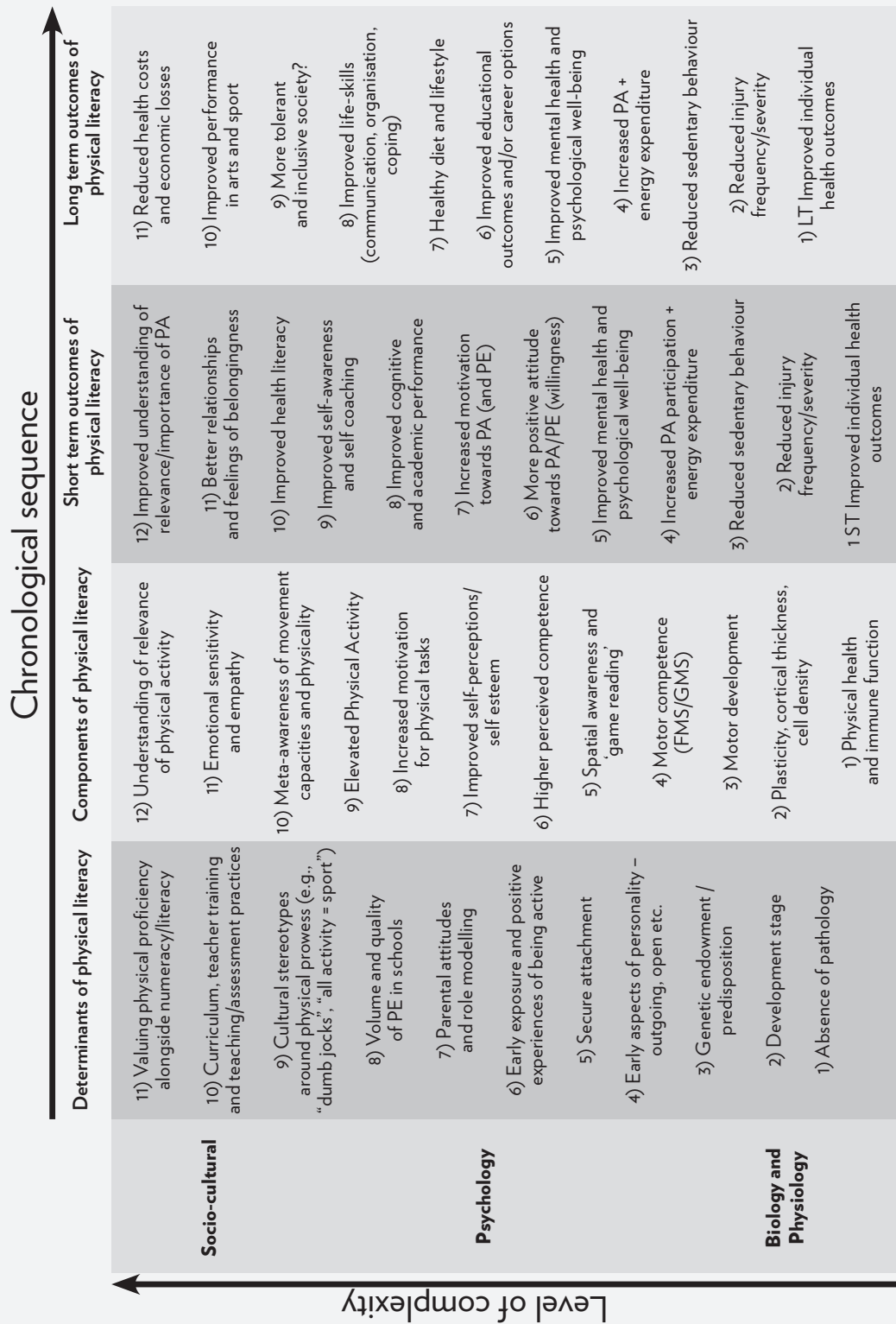


Figure 2: A taxonomy detailing the theory behind physical literacy. Numbers are included to allow 'tracking' of links in Table 1, below. ©UC-NISS2013

from devoting increased time and resources to quality PE and physical activity - even when time is taken away from other subjects. Instead the evidence shows either positive effects or equal educational attainment being achieved in less classroom time.

EXISTING PROGRAMMES PROMOTING PHYSICAL LITERACY

This section overviews and explains the programmes in other countries that have been designed to promote physical literacy. These countries include the UK, the USA, Canada and New Zealand. In each case, the programme goals centre around promoting lifelong physical activity, health and wellbeing. The content, delivery and funding of these programmes is reviewed. Owing to their relatively new and innovative nature, none of the programmes have yet completed formal evaluations.

United Kingdom: The United Kingdom (UK) has one of the largest selections of physical literacy models in the world, with separate programmes being developed in England, Scotland and Northern Ireland. The following section

summarises these programmes, their core principles, funding models and any measures of effectiveness.

Sport Northern Ireland (SNI)ⁱ - funded by the Sports Council of Northern Ireland - SNI has published the paper *Improving Physical Literacy*ⁱⁱ which investigated issues around the development, implementation and measurement of children's physical development in Northern Ireland. The document, and the ensuing physical literacy programmes, were stimulated from the Northern Ireland Strategy for Physical Recreation 2007-2017, which identified physical literacy as a main area for development. SNI and Lottery funding was pooled to deliver a programme called 'Sport in Our Community'. An investment of £3.6m was approved from the SNI Lottery Fund to deliver the 'Sport in Our Community' Programme from 1 April 2006 to 31 March 2010, with an additional £13m to be available between 2009-2014, all focussed on stimulating and supporting projects delivering physical literacy (projects were also encouraged to seek additional funding through sponsorships and partnerships, resulting in 15% more money being invested)ⁱⁱⁱ. The targets incorporated

within 'Sport in Our Community' related to the number of teachers, coaches, leaders and children participating in physical activity and physical literacy, and explicitly did not specify expected standards/benchmarks.

The rationale for this SNI project referred to physical literacy as described by the Long Term Athlete Development model^{34,35}, which focuses on developmental stages and windows-of-opportunity for learning key skills. As noted earlier, this model explicitly focuses on developing athletes and sportspeople, not competent movers in the broader sense. In doing so, however, **the LTAD model highlights that primary schools are the most important setting for the delivery of physical literacy, as these offer a constant and reliable opportunity to reach every child.** Recognising this, Northern Irish schools have physical development and movement components in the curriculum. Here, children develop a range of fundamental movement skills such as balance, co-ordination, control and locomotion. In this respect, NI schools may have focused too exclusively in fundamental movement skills (FMS)

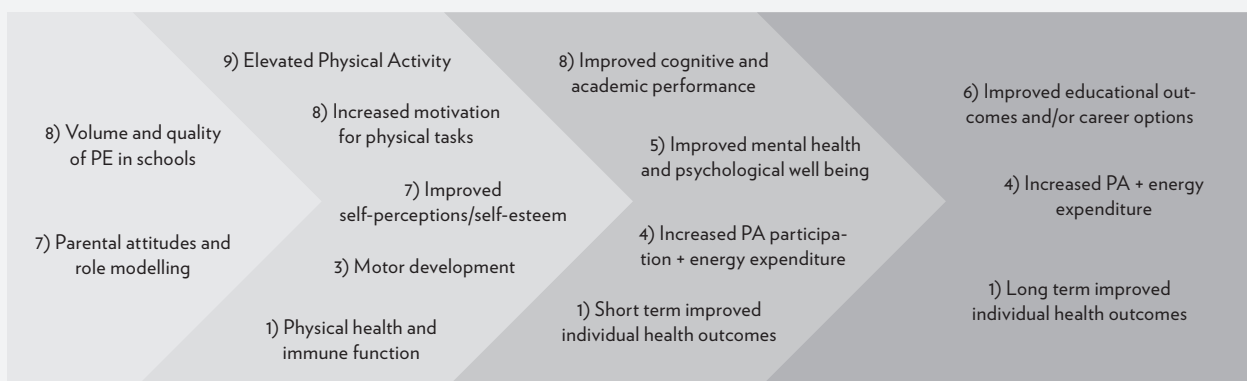


Figure 3: The aspects of physical literacy at the centre of this report, and assessed in the next section.

i. http://www.dcalni.gov.uk/sport_matters.pdf
 ii. <http://www.sportni.net/NR/rdonlyres/55E52C28-A450-494A-9BD9-88FFB7D2E6E9/0/ImprovingPhysicalLiteracy.pdf>
 iii. <http://www.sportni.net/NR/rdonlyres/7CB69F0D-1A92-4E2C-9002-37C7C5A59693/0/SportinOurCommunityInvestmentProgramme.pdf>

Table 1: A summary of the available evidence examining the effects of: a) school curricula and policies on physical literacy, activity and health; b) parenting practices and attitudes on physical literacy, activity and health; and c) physical activity and health on academic achievement and educational attainment. Notably, the available evidence does not suggest any harm from the promotion of physical literacy, through increased time in PE or increased activity in PE. Instead the evidence shows either positive effects or equal educational attainment in less time.

Source of influence	Classification (Refer to Taxonomy) [Determinant-Characteristic-ST-LT]	Nature of Research	Researchers	Sample	Findings
Schools/ teachers	8 - 1+9 - 1 - 1	4-year RCT Study	Telford et al. (2013 ³⁶)	708 children from 29 elementary schools	Specialist PE teaching led to decreased insulin resistance and risk of metabolic disease.
Schools/ teachers	8 - 1 - 1+8 - 1	2 year intervention	Telford et al (2012 ³⁷)	620 Grade 3 Australian Children	Specialist PE teaching led to reduced body fat and faster improvements in numeracy and writing.
Schools/ teachers	8 - 9 - 1+8 - NA	Cross sectional sample	Telford et al. (2012 ³⁸)	757 children in 29 elementary	Schools with more active children contained healthier children and achieved better NAPLAN performance
Schools/ teachers	8 - 1+9 - 1+8 - NA	Systematic review	Trudeau & Shepherd (2008 ³⁹)	7 experimental studies and 9 cross sectional studies	Increased time devoted to PE does not reduce academic achievement, and increases GPA (i.e., increased learning per unit of time in class). Increased physical activity linked to improved fitness, concentration, memory and classroom behaviour.
Schools/ teachers	8 - 1+9 - 1+8 - NA	Narrative review	Taras (2005 ⁴⁰)	14 published articles	Increased time devoted to PE does not reduce academic achievement, suggesting increased learning per unit of time in class. Increased physical activity linked to improved fitness and cognitive performance.
Schools/ teachers	8 - 1+3+9 - 1+8 - NA	Systematic review	Shepherd (1997 ⁴¹)	15 cross sectional studies and 4 longitudinal interventions	Increased time devoted to PE does not reduce academic achievement, and in some cases produced improved academic performance. Again suggesting increased learning per unit of time in class. Increased physical activity linked to improved physical fitness/health, improved academic performance and/or cognitive performance, and reduced sick days.
Schools/ teachers	8 - 9 - 8 - NA	Cross sectional sample	Carlson et al. (2008 ⁴²)	1280 US primary schools, including 5316 pupils	Significant benefit for academic achievement in girls doing high levels of PE. Effects stronger in younger participants.
Schools/ teachers	8 - 9+7 - 8 - NA	Cross sectional sample	Chanal et al. (2009 ⁴³)	451 French high school students	Positive relationship between volume of PE, maths performance and self-concept.
Parents/ family	7 - 9 - NA - NA	Systematic review	Lim & Biddle (2012 ⁴⁴)	11 papers examining parental influence on children's PA (from 100 - 2500 participants)	Active parents (+), logistical support from parents (+), preventing activity (-), obese parents (-), parents believing child is competent (+), supporting child's autonomy (+), child perceiving parents to be active (+), parents enjoyment of PA (+) and confidence with PA (+) all strongly linked to children's levels of PA.

Table 1 continued...

Parents/ family	7 - 9 - NA - NA	Cross sectional sample	Sigmund et al. (2008 ⁴⁵)	193 children and their parents	Parents' activity strongly associated with children's, parents' sedentariness strongly associated to children being inactive
Parents/ family	7 - 9 - 4 - 4	Longitudinal Study	Bois et al. (2005 ⁴⁶)	152 French children and their parents	Parents' role modelling of PA and beliefs about the ability of their child significantly predict child's PA levels.
Parents/ family	7 - 9 - 4 - 4	Longitudinal Study	Davison and Jago (2009 ⁴⁷)	174 girls between 9-15	Parents who maintained high levels of PA (modelling) and logistical support led to girls who remained physically active throughout the study
Not given	NA - 9 - 1 - 1	Longitudinal Study	Telford et al. (2012 ⁴⁸)	734 children (at 8, 10 and 12 years)	PA influenced adiposity but not food consumption. Children who become less active during the study increased adiposity.
Not given	NA - 1 - 8 - NA	Cross sectional sample	Castelli et al. (2007 ⁴⁹)	259 3rd and 5th grade students	Aerobic capacity (+) and BMI (-) strongly associated with total academic achievement, maths achievement and reading achievement
Not given	NA - 9 - 8 - NA	Cross sectional sample	Morales et al. (2011 ⁵⁰)	284 secondary students (mean age 14.7)	Strong links between self-reported PA levels and academic performance
Not given	NA - 1 - 8 - NA	Cross sectional sample	Chang & Chen (2011 ⁵¹)	476 secondary school students	Significant relationship between physical fitness, PE assessment scores and academic performance
Not given	NA - 1 - 8 - 6	Cross sectional sample	Joshi, Howatt & Bryan (2011 ⁵²)	5321 students from grades 4, 8 and 10	Students who achieved healthy fitness scores and/or healthy BMI scored significantly higher in maths and reading.
Not given	NA - 1 - 8 - 6	Systematic review	Tomporowski et al. (2008 ⁶³)	14 papers examining effects of PA on cog. performance, intelligence and academic achievement	Positive effects of exercise and PA on children's cognitive performance, intelligence scores and academic performance
Not given	NA - 1+9 - 8 - NA	Cross sectional sample	Dwyer et al. (2001 ⁶⁴)	7061 Australian school children aged 7-15	Various measures of physical activity and fitness/health strongly linked to scholastic ability
Not given	NA - 1 - 8 - NA	Cross sectional sample	Chomitz et al. (2009 ⁶⁵)	1847 students from a single US school	Passing more fitness tests significantly increased odds of passing standardised maths and English tests.
Not given	NA - 9 - 8 - NA	Cross sectional sample	Fox et al. (2010 ⁵⁶)	4746 UK middle and high school students	Sport participation and total PE associated with increased GPA in girls, sport was only predictor for boys.
Not given	NA - 9 - 5+8 - NA	Cross sectional sample	Kristiansen et al. (2008 ⁵)	6246 adolescents in Iceland	Lower BMI, higher levels of PA and healthy diet all associated with higher GPA and higher self-esteem.

at the expense of physical literacy in the broader sense. Recent revisions to physical literacy theory suggest that we must give children the confidence and motivation to move, as well as a solid understanding of the importance of moving frequently and proficiently.

An example of the type of programme being delivered in Northern Ireland is Skills 4 Sport (S4S). The S4S programme was developed by Coaching NI at the request of SNI and aims to develop fundamental movement and sport skills in young people. The programme adopts a 'multi-skills' approach, believing it is vital to the eventual development of sport-specific skills that will allow children to maintain lifelong involvement in sport and physical activity. Like other programmes, S4S is constructed around a set of key principles derived from the LTAD. These 'FUNDamentals of movement' are: a) agility; b) balance; and c) co-ordination. The S4S programme has a deliberately applied focus devoting a major part of the resource to 30 games which apply the skills in co-operative, competitive, group, pair and individual situations. This applied focus separates S4S from other programmes which focus on simply delivering fundamental movement skills, but leave their subsequent usage to chance.

TOP Sportsability (TOPs – 2007):

The Youth Sports Trust is a well-established organisation in the UK, founded as a charity in 1994 and aimed at supporting high quality PE and sport programmes for all young people. The Youth Sport Trust (YST) is based at Loughborough University and has developed links with Europe, Asia, Russia and Africa. Like SNI, the YST has developed a series of programmes targeting different age groups, from babies and toddlers through to secondary school children, with a view to creating physical literate and active (therefore healthy) adults.



Collectively, these programmes are called TOPs programmes: Top Tot's (18 months), Top Start (3-5 years), Top Play (4-9 years), and TOP sport (10-18 years).

TOP Tot's is a fun introduction to physical activity and play, seeking to use physical activity to develop communication and language techniques, co-ordination, co-operation and social skills. The programme is designed to be sufficiently flexible to be used in a playgroup or nursery environment, or by parents in the home. TOP Start is focused on developing basic movement and ball skills and is designed for use with groups of children in pre-school environments. The programme aims to deliver four groups of core skills:

- basic motor skills;
- co-ordination and control;
- spatial awareness; and
- aiming, predicting and estimating.

TOP Play offers four to nine year olds the opportunity to develop their core physical and movement skills through fun and stimulating activities. These incorporate four key skill areas:

- rolling;
- striking;
- throwing; and
- kicking.

Finally TOP sport offers children the chance to specialise in specific sports.

Like SNI, the TOPS programmes contain strong links to the LTAD, and are funded from a variety of sources. The YTS is a charity, and so receives lottery funding of around £1.5m per year, contributions from all NSOs (NGBs in the UK) as well as donations and partnerships with companies such as the English FA (£6.3m over 3 years), BUPA (£1m per year for 'Start to Move'), Sainsbury's (£10m) and Matalan (£undisc). Overall, whilst obtaining concrete figures is extremely challenging, the YTS receives substantial funding. For example, over £128m of Lottery and Government funding is being invested to support a new 'School Games' initiative (a national competition between schools to promote competitive sport). This total is made up of £35.5m Lottery funding from Sport England between 2010-15; £28.4m exchequer funding from the Department of Health and Sport England; £65m exchequer funding from the Department for Educationⁱ.

i. <http://www.youthsportstrust.org/how-we-can-help/programmes/sainsbury's-school-games.aspx>

Basic Moves (Scotland) - funded by the Scottish Executive (Health) - programme, developed in the University of Edinburgh⁵⁷, is based on the premise that basic/fundamental movements (viewed as are the foundation of a lifetime of physical activity) do not develop naturally in children, but must be supported/encouraged. This programme is based on the premise that children need to be offered many opportunities for learning over an extended period of time and by a range of knowledgeable adults, in order to master these skills. There is a total of 37 'Basic Moves' addressed in the programme, arranged as follows: Travel (basic, rhythmical, jumps, and apparatus); Object control (send, receive, travel with, receive and send); and Balance (postural and co-ordination). Estimates from industry leaders suggest this project received £20m at the outset, and further £6m to be developed into a CPD programme for teachers (the Scottish Primary PE Project). **This continuity from school PE into the community may be one of the strongest aspects of this programme, and a principle worth considering in any Australian model.**

Primary PE in the UK and NI: In a drive to increase competition and choice, schools in the UK receive funding that they may spend on equipment, training or other initiatives. As such, it is impossible to identify an individual programme or package being delivered in UK schools. Funding, however, is more easily captured, following the recent announcement of an additional £150 million in each of the next two years as part of the Olympic legacy. This funding will be dedicated to helping develop (or buy) the necessary expertise to deliver better quality primary school PE lessons. On average, this will equate to £9250 per primary schoolⁱ. As already noted, each school will be able to spend this money

as they choose, making the tracking of benefits/outcomes impossible.

Canada (CS4L): Much like the United Kingdom, Canada has been working towards promoting physical literacy. One of the most well-known programmes currently in operation is the Canadian Sport for Life (CS4L) programme, in Alberta. This model is purportedly built upon Whitehead's (2001) paper "The Concept of Physical Literacy" and centres around three phases: Active Start (girls & boys, 0-6 years); FUNDamentals (girls 6-8 & boys 6-9); and Learn to Train (girls 8-11, boys 9-12). Note that these phases closely resemble Balyi's LTAD, perhaps more closely than Whitehead's formulation. In reality, the Canadian model relies heavily on the LTAD model, assuming that the two approaches to physical literacy work are complimentary in generating the best results. The CS4L programme has been developing since 2004, when four experts were contacted to design a generic model for both able bodied and disabled athletes. In 2005, the team produced two documents: 'Canadian Sport for Life' and 'No Accidental Champions'. These documents became the models upon which National Sporting Organisations (NSOs) framed their individual sport-specific LTAD models and challenged the status quo in the Canadian Sport System. During a conference in August 2005, initial efforts on the implementation plan were to recognise the importance of physical literacy as it relates to early childhood education and to establish links with the Joint Consortium on School Health. Fifty-three sports were funded by Sport Canada in 2006-07 to begin or continue working on their individual sport LTAD models.

The CS4L programme is funded by the Canadian Government and, whilst exact amounts remain undisclosed, the funding is substantial. For

example, the Quebec government contributes \$20m per yearⁱⁱ and partner organisation, such as Aviva, also contribute large amounts (\$1m/yearⁱⁱⁱ). As with the UK and NI models above, the funding is broken down into focussed grants. An example of this is the Saskatchewan LTAD Implementation Grant, which aims to provide financial assistance to provincial sport organisations for establishing sport-specific CS4L - LTAD Implementation Plans. This grant program is supported through the Saskatchewan Lotteries Trust Fund and by Sport Canada through the Federal-Provincial Sport Participation Bilateral Agreement. Approved organisations are eligible to receive up to \$7,000 for CS4L - LTAD Planning Support. Different states and territories with Canada have similar grant proposals to help fund start up sports programmes designed to promote physical literacy. As a result of the CS4L-LTAD programme there have been 93 new sports organisations which have been created to promote sport across the lifespan in Canada. As a result of this variety and a lack of clear assessment criteria, it remains unclear how effectively this programme has been in promoting physical literacy. It is clear, however, that the uptake is very strong and the Canadian model is currently viewed very favourably by other countries. As above, the heavy focus on using sport and athleticism to develop physical literacy may not reflect the tenets of Whitehead's model, but very clearly encompasses Balyi's LTAD approach. Even though the Canadian model clearly legislates for non-athletes and even 'all Canadians', much of the delivery is provided by sporting organisations, using sport as their vehicle. As noted throughout this document, this may overlook the opportunity to reach every child during their initial experiences of PE at school.

i. http://www.youthsporttrust.org/media/3387106/sportingstart_specialedition-2.pdf

ii. [http://www.canadiansportforlife.ca/sites/default/files/resources/Developing%20Physical%20Literacy%20-%20The%20Quebec%20en%20Forme%20Experience%20\(Steeve%20Ager\).pdf](http://www.canadiansportforlife.ca/sites/default/files/resources/Developing%20Physical%20Literacy%20-%20The%20Quebec%20en%20Forme%20Experience%20(Steeve%20Ager).pdf)

iii. <http://www.sasksport.sk.ca/SportsPage/Aug12.html>

Primary PE in Canada and the United States: In both Canada and the United States (see below), school curricula and teacher training are determined by the relevant states or provinces, and not the federal government (mirroring the Australian system). As such, amounts of funding and how they are spent remains unclear, and this lack of co-ordination and transparency may be undermining the production of a 'bigger picture' of how early years physical literacy may best be delivered. Whilst a free market of service providers is generally viewed as a good thing, **Australia may be sitting on an excellent opportunity to identify, test and refine an approach that better represents 'best practice' in delivering physical literacy through primary and pre-school PE.** A very recent development in Canada (currently undergoing piloting and due to be launched in September 2013) is the 'Passport for Life' programme, being developed by Physical and Health Education (PHE) Canada (launched 21st April 2013). This package, focussed on primary school children, contains: resources (lesson plans and task cards); a broader curriculum and structure focussed on physical literacy; assessment tools both for schools considering using the programme (to aid planning) and also for checking children's development (notably, the resource consistently advises against using these resources for making normative comparisons or summative assessments/reports). Importantly, Passport for Life is delivered through a central website, with teachers obtaining materials from the site as well as offering feedback through it. Likewise, pupils can sign in to track their progress, set and monitor personal goals, and offer feedback. When lessons are modified or created anew by teachers, these can also be shared on the website, producing a valuable shared resource. The details

that are currently available suggest the Passport for Life is based on a model of physical literacy and health, rather than sport and athleticism, and this reflects very recent trends in the delivery of physical literacy (see also 'Designed to Move', below). Like the UK's YST, PHE Canada is set up as a charity and so receives funding from government, sponsorships and partnerships, and the public, and the exact amounts devoted to its projects remains undisclosed.

United States - The Utah Sport for Life Model: Much like Canada and the UK, the United States has developed a physical literacy model based upon the principles of LTAD. The model, developed in 2009, is called the Utah Sport for Life Model. Utah Sport for Life employs a collective community-wide effort to evaluate quality of life through participation in sport and recreation. The programme aims to respond to three key issues:

- a. the desire to increase participation at all levels of sport programming at Utah venues;
- b. an interest to introduce more of the population to sport opportunities; and
- c. improve winter sports clubs to inspire success.

Although the basis of the model has physical literacy at its core, the emphasis seems to be that once the fundamentals are learnt, everyone will stay involved in sport in the longer term, with the goal of becoming excellent or competitive. This emphasis once again focuses on sport and performance over-and-above active lifestyles, health and quality-of-life. The repeated pattern of physical literacy projects becoming 'sport for life' projects may serve as a warning to those developing an Australian model, that the cultural tendency to conflate activity and movement with sport and athleticism is extremely strong, but possibly quite damaging - for example

to those who do not wish to compete but simply express themselves, or be active and healthy.

Designed to Move: Nike's 'Designed to Move' programme has been produced in an effort to establish the basis of the physical activity action agenda throughout the United States (and other countries where Nike operates). Focussing explicitly on physical activity rather than sport, the Designed to Move documentⁱ is a relatively thorough 'manifesto' for promoting physical activity in the US and the rest of the world. One of the most useful aspects of the Designed to Move document is the generation of seven key criteria for any efforts to be successful in promoting physical activity and health (the same aims as this report):

1. universal access;
2. age appropriate;
3. dosage/duration;
4. fun;
5. motivation;
6. feedback; and
7. teaching/coaching.

The report argues that any initiatives or activities need to 'get it right' on these key issues in order to ultimately achieve the goals of creating a healthier, more active nation. Mirroring other initiatives in the UK, Canada and US, Designed to Move funds initiatives to promote physical activity and physical literacy, with a particular focus on children (below 10 years). The Designed to Move document lists projects such as 'Sustrans' in the UK (£65m), and the Miami-Dade PE initiative (US\$20m/annum) as examples of its effectiveness. Further, the document lists funding options ranging from a simple 1% income tax in Brazil (US\$50m/year raised), a surcharge on tickets to sporting events, donating rewards earned on store credit cards

i. http://designedtomove.org/downloads/Designed_To_Move_Full_Report.pdf



(e.g., Target, US\$26m/annum), Social Impact Bonds (e.g., US\$100m/annum in 2012) and public-private partnerships (e.g., Inter-American Development Bank, US\$20m to date). However, by offering explicitly different selection criteria, and an agenda clearly focussed on physical activity and health, Nike may be breaking the current trend to assume that sport is the only answer to the problem of inactivity. Launched in 2012, the programme is too new to have been assessed, but it certainly merits closer examination when considering the way forwards for an Australian physical literacy project.

New Zealand - KiwiSport:

KiwiSport is a government funded initiative, generated in response to a perceived need for child-centred introductory sports activities. Initially, all of these activities were adapted versions of adult sports, but the 'package' has now been extended to include a wide-ranging KiwiSport Fundamental Skills (KFS) element. KFS is designed to help children to acquire a range of skills that will help them feel successful and satisfied in sport. The programme was launched in 2009, and provides funding for years 1-13 through the Ministry of Education and Sport New Zealand, which funds the regional sports trust. The overall aims of KiwiSport are to increase the number of school-aged children participating in organised sport; increase the availability and accessibility of sport opportunities for school-aged children; and to

support children in developing skills that enable them to participate confidently in sport. The programme for 0-5 year olds centres around an 'active movement guide', which SportNZ has developed. Similarly, the 5-12 programme centres around the concept of enjoyment. To support these programmes, KiwiSport have developed a manual called KiwiDex, including a range of ideas and games which teachers and physical activity providers can use. The activities are designed to encourage children to be spontaneous and creative and give them the enthusiasm and confidence to move into sport and stay involved. A crucial aspect of this resource is its flexibility; it can be adapted to suit all children, facilities and people who are leading the activity. In addition to this, KiwiSport have also developed resources to assist Maori schools develop and maintain physically active school communities, called Kori kit te kura. Importantly, the resources are supported by a network of KiwiSport Co-ordinators in regional sports trusts, whose job is to arrange appropriate training for adults and to advise on the best use of the KFS materials.

The KiwiSport programme is a government funded initiative which then also receives support from Regional Partnership funding. The RST has approved \$22.4 million worth of projects and opportunities being delivered to 969,101 individual participants since 2009. Community organisations, including schools and clubs, have also contributed

\$13.8 million to the total investment available since funding began 2009. Recently, KiwiSport Regional Partnership Funding allocations have been confirmed regional priorities and funding processes for the next three years. As an example, Sport Auckland have prioritised funding for primary (\$1.05 million/year) and secondary schools (\$0.6 million/year) respectively. This funding is dedicated to improve fundamental movement skills, create school/club links, improve access to facilities and increase volunteers.

Primary PE in New Zealand:

Mirroring the models in other western countries, New Zealand schools are self-governing and managed through a national framework. As such, each individual school may decide how physical education and physical literacy are delivered; with local communities, private providers, and charitable organisations all contributing to the way lessons are delivered. Like Passport for Life, KiwiSport offer schools free Microsoft Excel software 'SportCID' to help PE departments with the day to day running of sports programmes. The KiwiSport programme also provides funding to the Regional Sports Directors and the SportsMark programme, to help schools self-review and provide quality PE delivery in secondary schools. The issue of free-market choice and independence faced by NZ, UK, Canadian and US schools is also likely to be faced by Australia. The system guarantees competition and choice, but also undermines the study of the programmes' effectiveness, and prevents the generation of 'best practice' guidelines. **As such, Australia is presented with the ideal opportunity to both deliver an excellent programme of physical literacy, as well as adding value by monitoring effectiveness and refining materials - so as to produce world-leading expertise (and maximise benefits).**

Current practices in Australia:

Within Australia, there have been several projects to promote physical education, sporting participation and fundamental movement skills (FMS) in childhood - FMS being largely based on the LTAD 'FUNDamentals' stage. One of the most recognised resources was developed at Cowan University in Perth, and was adopted in the UK and Northern Ireland. This model is one of the few to have been investigated scientifically, with trained teachers producing benefits to pupils' self-esteem and self-worth (including perceived improvements in academic competence⁵⁸). Additionally, the Victorian government has produced a package of resourcesⁱ tied to 'School Sports Victoria'ⁱⁱ - an inter-school competition - and South Australia produced a very popular package called 'Everyday PE' (2004), which offers a relatively comprehensive curriculum for PE, albeit without offering specific lesson resources for generalist teachers. Tasmania has also produced a similar document detailing the core FMS and how to assess them (1997ⁱⁱⁱ), and New South Wales offers a web resource for teachers wishing to engage with FMS^{iv}. The Victorian programme, for example, focuses on: catching; kicking; running; jumping; overhand throws; ball bouncing; leaping; dodging; punting (a long kick); forehand strikes; and two-handed side-arm strikes. The Tasmanian and Cowan models include similar skills, and divide these into locomotor skills (run, hop, skip), body management skills (rolls, balance) and object manipulation (catching, throwing, striking). The models have generally been maintained and updated regularly, suggesting some popularity. **However, very few data exist on the programmes' uptake and effectiveness, and the explicit focus on sporting skills may have been overtaken by the recent refocusing**

of physical literacy on motivation and awareness, as well as movement skills. Programmes such as 'Kids at Play' in the ACT^v, focussing on 0-5 year olds, adopt a broader focus on diet, breastfeeding, and hydration as well as active play. **Nonetheless, there does not appear to be a consistent programme for developing children's physical literacy throughout pre-school and primary school, in preparation for physical activity across the lifespan.** Additionally, until these programmes (or any of those listed in this section) are monitored and assessed for uptake and effectiveness, it will remain difficult to establish best practice or academic rigour. The funding of these programmes remains difficult to ascertain, and is likely to have been driven by state-or-territory led initiatives.

Section summary: This section has highlighted some of the most prominent physical literacy programmes currently being offered globally (summarised in Table 2, below). Many of the programmes appear to be funded through multiple channels as charitable organisations - receiving money from national and regional governments, sponsorships, partnerships and private citizens. As such, details of specific funding is often undisclosed, but the information that is available suggests a substantial commitment and financial investment in physical literacy programmes. Many of the more successful programmes are delivered in partnership with universities - for example, The UK (Loughborough University), Scotland (University of Edinburgh); Canada (University of Alberta, Brock University), and New Zealand (University of Otago, University of Auckland) all collaborate with academics in designing and (where possible) evaluating their programmes^{vi}.

Additionally, several of the programmes explicitly recognise and adapt to the specific needs of their demographics, with Gaelic sports being used in Northern Ireland and Maori initiatives being developed in New Zealand. Australia also has unique aspects to its citizenry which may require special consideration, particularly indigenous games and practices. It is important to note that whilst many of the models discussed above are built around the LTAD and (for young children) fundamental motor skills, recent developments suggest a movement towards a broader definition of physical literacy as the capacity for, and appreciation of, movement (e.g., Passport for Life, Designed to Move). Whilst there is little public discussion of this development, these very recent programmes may be recognising that a focus on sport and athleticism can exclude many children from the curriculum - with potentially very damaging consequences. Likewise, many of the programmes delivered abroad have been run by focussing on sporting organisations, with less emphasis on school PE. This misses an important opportunity to engage every single child in physical literacy. In a world where schools are able to invest in their own resources, providers and training, and even choose their own curricula, the lesson may be that **Australia must develop a programme that is self-evidently world leading, immediately effective for teachers and pupils, and constantly improving.**

Overall, it is clear that other countries facing similar problems of inactive lifestyles and obesity are responding with significant investment in promoting physical literacy in children, using increasingly sophisticated programmes. Australia faces the same problems as these other

i. <http://www.eduwebvic.gov.au/edulibrary/public/teachlearn/student/fmsteachermanual09.pdf>
 ii. <https://www.ssvvic.edu.au/Pages/HighQualityFundamentalMotorSkillsCurriculumforPrimarySchools.aspx>
 iii. <http://resources.education.tas.gov.au/items/2de3308f-7956-cb08-4932-381bbc0cb345/1/FundamentalMotorSkills.pdf>
 iv. <http://www.curriculumsupport.education.nsw.gov.au/primary/pdhp/pe/gamesport/fms001.htm>
 v. <http://health.act.gov.au/kids-at-play/active-play-everyday/fundamental-movement-skills>
 vi. NB some programme evaluations are also tendered to private companies

Table 2: A summary of the physical literacy programmes being run around the world, drawing out key learning points to inform any Australian programme.

Country	Program	Funding	Activity Focus	Take home message for Australian model
Sport Northern Ireland	Northern Ireland Strategy for Physical Education 2007 – 2017	Lottery Sponsorships	Development stages for learning key skills Multi skill approach leading to development of sport specific skills.	Substantial funding Primary schools are extremely important aspect of delivery Inclusion of fundamental movement skills Care taken to acknowledge national sports/customs
United Kingdom (Youth Sports Trust)	TOP Sportsability Series of programs linked to different age groups.	Lottery Registered charity Commercial partnerships Government	Basic motor skills Physical and movement skills Specialisation in specific sports	Link with a university to ensure solid evidence base, monitoring and evaluation of programme. Target interventions at different age groups Link physical literacy to other curriculum areas (e.g., language development)
Scotland	Basic Moves	Initial Government funding	Basic/ fundamental movements focussed on travel, object control and balance	Substantial funding (£20m start-up, = AU\$30m = approx. AU\$4 per citizen) Ensure continuity from school PE into community sport. Link with a university to ensure solid evidence base, monitoring and evaluation of programme
United Kingdom	Olympic 'Legacy' Funding	Lottery	Schools can choose to use funding for equipment, training or delivery	Substantial funding (£150m pa in next 2 years = AU\$450m in total) Substantial issues created by allowing individual school to spend funds without direction - monitoring/evaluation impossible. Develop one model to avoid an ad hoc approach by individual schools and states.
Canada	Canadian Sport for Life	Government funding (federal and state)	Develop physical literacy through sport and athleticism - small grants to local clubs	Substantial funding Develop appropriate assessment criteria Sport alone may not be sufficient to reach every child
Primary PE Canada	Passport for Life	Registered Charity Government Commercial partnerships	Teaching resources Physical literacy curriculum Assessment tools	Explicit focus on quality PE and physical activity, and not a focus on sport alone Develop a central website of resources for teachers and students. Website becomes core way of accessing materials, as well as gathering feedback and information regarding uptake/effectiveness.
United States of America	The Utah Sport for Life Model	Not clear	Develop fundamental motor skills = competitive.	Avoid emphasis on competition and athleticism. Focus on health and active participation. Focus on childhood
United States of America	Designed to Move	Nike	Universal access Age appropriate Dosage/duration Fun Motivation Feedback Teaching/coaching	Give consideration to these seven core criteria in any Australian model. Explicit focus on physical activity and movement, and not a focus on sport alone
New Zealand	Kiwisport	Government Funded	Fundamental movement skills Modified sports	Substantial investment Resources for teachers should be flexible in content and delivery and appropriate to all ages. Include indigenous games.

nations. In 2013, the time is right for Australia to invest in the futures of its own children by offering them opportunities and experiences that will inspire them to move more, and so be healthier, happier, fitter and smarter. The justification is clear, the evidence is strong, and lessons have been learned in other countries so that Australia can be certain to 'do it right'. Further, Australia already possesses the expertise, resources and desire to deliver a world class physical literacy programme for the health of its citizens.

CONCLUSION AND RECOMMENDATIONS

The evidence presented in this report makes it clear that physical inactivity is a significant threat to Australia - its physical and economic health - and that this threat is common across many developed (and developing) nations. Whilst many previous initiatives have used sport alone (often competitive sport) as a solution to the problem of inactive lifestyles, recent trends suggest we need to recognise that not all physical activity is sporting activity. Instead, recent developments suggest physical literacy - in the form of movement proficiency, motivation to move, and appreciation of the value of moving - is a more inclusive and holistic approach. Ultimately, a physical literacy approach may reach more children, alienate fewer children, and thus ensure that more children are more active. A physical literacy approach may save more lives.

By 'unpacking' the concept of physical literacy it becomes possible to trace causal chains from determinants (teachers, parents, individual attributes) through to outcomes (physical, mental and social health), in the short and long term. The review of evidence performed in relation to this 'taxonomy' is very clear in linking teaching and parenting practices to physical literacy, physical activity, and subsequent health/fitness, academic achievement,

and self-esteem. The phenomenon of 'tracking' also suggests that active children remain active into adolescence and adulthood. Even the critical observation that this pattern can only emerge from the 'stitching together' of multiple studies and findings does not undermine the fact that, overall, the case for promoting physical literacy in early childhood is compelling.

In order to maximise the effectiveness of any Australian programme for physical literacy, it is also important to learn lessons from other countries to achieve the same goal. Overall, any programme to promote physical literacy should incorporate the following considerations:

1. The programme should look beyond solely using sport as a vehicle, and encourage any/all physical movement activities - including dance, creative expression, and everyday travel. Recent adaptations to the Canadian and US models suggest this has been recognised as an oversight in previous efforts. Physical literacy in its broadest sense (e.g., Figure 2) should be the focus of any Australian model, ensuring motivation to move and appreciation of its importance - as well as the basic ability to move.
2. The programme should make provisions for unique aspects of Australia, explicitly considering the needs of Aborigines and Torres Strait Islanders, and city versus rural populations. The success of New Zealand and Northern Ireland in these respects makes it imperative for any Australian programme to do the same.
3. For teachers who are often not confident in delivering PE, the Australian programme needs to offer freely available, simple-to-use, and well organised resources that allow teachers to deliver fun, inspiring and effective lessons. As above, these resources

should focus on delivering core movement skills, not competitive sport; particularly in young children.

4. Clearly missing from many existing programmes is the ability to monitor and assess programmes' uptake and effectiveness. The idea of a central website, such as Passport for Life, which both disseminates resources and encourages feedback and user-contributions, is promising in this respect. The recent development of mobile devices, apps and affordable technology offers incredible opportunities for the delivery of first-class resources to the fingertips of teachers, parents and children, whilst also collecting data about its usage and effectiveness. Without the monitoring of programme effectiveness, there can be no assurance that our physical literacy programme is benefitting children, and Australia, as intended.
5. Following from (4), there is substantial value in developing an Australian programme that permits refinement and development, so that best practice can be assured in the short and long term. Without making best practice guidelines a specific goal of the programme, future developments and funding decisions will remain dependent on anecdotal evidence.
6. With (4) and (5) in mind, there is a strong argument for working closely with universities in order to ensure academic rigour and reliable data. This is one strategy that the programmes in other countries have consistently deployed to varying degrees.
7. Also following from (4) and (5), it must be recognised that the development of physical literacy, and the slow accrual of benefits from physical activity, are both long term and untenable to

the individual – despite their importance. This can easily undermine the uptake of, and adherence to physical literacy programmes by schools, teachers and children. To prevent this, any Australia programme should seek, wherever possible, to generate immediate and self-evident benefits to users. For children, these may be simply enjoyment, improved competence, and intrinsic motivation. For teachers and schools, these may require easy-to-use and effective assessment strategies and measurement tools, such that the effects of one lesson, or a short unit of work, can be easily observed and shared.

8. The existence of developmental critical periods and ‘tracking’ of physical activity levels (and attitudes) throughout life make it clear that focussing on childhood is extremely important. Whilst adults and older adults should not be overlooked, programmes to promote physical activity in these groups will take a very different shape: with a different message (perhaps less focussed on sport and games), and different delivery mechanisms (perhaps mass media and health professionals, as school is no longer an option).
9. The funding of physical literacy programme is often, by necessity, substantial; with government investments (federal, state of both) easily surpassing AU\$150-200 million per annum in some of the programmes listed, as well as sponsorships, partnerships with industry, and public donations. To achieve this, many of the organisations are set up as charitable trusts, and they frequently offer grants to local schools, sports clubs and other organisations to deliver services that clearly support the goals and structure of the programme. As such, any Australian model

should have a clear structure for physical literacy, and if grants are to be offered, funding should be contingent upon adopting the same structure, using the programme’s resources, and (preferably) feeding information about uptake and effectiveness back so as to support monitoring, reporting and improvement. In the short term, existing initiatives might also be incorporated, or invited to participate, such that the experiences and best-practices of these groups are not overlooked.

10. The arguments for making physical literacy a key part of the curriculum are clear, and the myth that time spent in PE is detrimental to learning has been clearly exposed as wrong (children who ‘lose’ time to PE either perform the same or better in academic tests, but no study suggests any drop in performance). However, the case for incorporating physical literacy into national testing frameworks (e.g., NAPLAN) remains unclear, and whilst governments, schools and teachers should be compelled to develop physical literacy, it would be deeply detrimental to undermine children’s motivation and love of being active by exposing them to ‘standardised tests’, levels and expectations. To achieve its goals of motivation towards active lifestyles, any national programme assessing the physical literacy in the curriculum should arguably only be applied at the national, state, and school levels. The urgency for physical literacy and physical activity should not be ‘transmitted’ to our children, or else it will almost certainly be self-defeating. Sophisticated solutions to (4) and (5) above may help to ensure that states and governments can collect their monitoring data without causing children to be compared to national standards, or each other.

The above recommendations are drawn from the review of concepts, evidence, and existing programmes that preceded, as well as through consultation with world leaders in this field from the UK, Canada and Australia. Fortunately, the same review and consultation process has suggested elegant and practical strategies for ensuring these recommendations are met.

Overall, the story is clear: Australians need to get moving. To do this, Australians need to feel able and motivated to move – every day, and at every opportunity. There is no better time to develop these capacities and attitudes than in childhood, and the results could be both relatively immediate (benefitting school performance, creating a healthier workforce) as well as life-long. All children go to school, and schools have both the physical (e.g., space, equipment) and intellectual (e.g., teachers) resources to promote physical literacy and activity. If Australia can do this well, as per the recommendation above, then we will generate a healthier, happier, fitter and smarter nation, and reposition ourselves as the world leaders in health, active leisure, sport and science. In this way, the entire Australian economy could be fitter, to the tune of at least \$13.8bn per annum.

REFERENCES

- Armstrong T, Bauman A, Davies J. (2000). Physical activity patterns of Australian adults. AIHW Catalogue CVD 10. Canberra: Australian Institute of Health and Welfare.
- Uijtendewilligen, L., Nauta, J., Singh, A., Mechelen, W., Twisk, J., Horst, K. & Chinapaw, M. (2011). Determinants of physical activity and sedentary behaviour in young people: a review and quality synthesis of prospective studies. *British Journal of Sports Medicine*, 45, 897-906.
- Martin, J., Oliver, K & McCaughy, N. (2007). The theory of planned behavior: predicting physical activity in Mexican American children. *Journal of Exercise Psychology*, 2, 225-138.
- Rhodes, R. E.; Macdonald, H. M.; McKay, H. A. (2006). Predicting physical activity intention and behaviour among children in a longitudinal sample. *Social Science and Medicine*, 62, 3146 - 3156.
- Kristensen, P.L., Moller, N.C., Korsholm, L., Wedderkopp, N., Andersen, L.B. & Froberg, K. (2008). Tracking of objectively measured physical activity from childhood to adolescence: The European youth heart study. *Scandinavian Journal of Medicine & Science in Sports*, 18, 171-178.
- Seefeldt, V., Malina, R.M. & Clark, M.A. (2002). Factors affecting levels of physical activity in adults. *Sports Medicine*, 32, 143-168.
- Trudeau, F., Espindola, R., Laurencelle, L., Dulac, F., Rajic, M. & Shephard, R.J. (2000). Follow-up of participants in the Trois-Rivières Growth and Development Study: Examining their health related fitness and risk factors as adults. *American Journal of Human Biology*, 12, 207-213.
- Trudeau, F., Laurencelle, L., Tremblay, J., Rajic, M. & Shephard, R.J. (1999). Daily primary school physical education: Effects on physical activity during adult life. *Medicine and Science in Sports and Exercise*, 31, 111-117.
- Allied Dunbar National Fitness Survey (1992). Summary Report: Activity and Health Research. London: Sports Council and Education Authority.
- Bailey, R. (2006). Physical Education and Sport in Schools: A Review of Benefits and Outcomes. *Journal of School Health*, 76(8), 397-401.
- Bailey, R., Armour, K., Kirk, D., Jess, M., Pickup, I., Sandford, R., & BERA Physical Education and Sport Pedagogy Special Interest Group (2009). The educational benefits claimed for physical education and school sport: an academic review. *Research Papers in Education*, 24(1), 1-27.
- New South Wales Government - Health (2010). The 2010 Schools Physical Activity and Nutrition Survey (SPANS). SPANS 2010 - NSW Schools Physical Activity and Nutrition Survey - Executive Summary
- De Corby, K., Halas, J., Dixon, S., Wintrup, L. & Janzen, H. (2005). Classroom teachers and the challenges of delivering quality physical education. *The Journal of Educational Research*, 98, 208-220.
- Kohn, A. (2003). The 500 pound gorilla. *The Teachers' Net Gazette*, 4(2). Retrieved January 9, 2004, from <http://teachers.net/gazette/FEB03/kohn.html>
- Klein, N. (2000). No logo. Taking aim at the brand bullies. Toronto, Ontario: Vintage Canada.
- Sparkes, A.Templin, T. & Schempp, P. (1990). The problematic nature of a career in a marginal subject: some implications for teacher education programme. *Journal of Education for Teaching*, 16, 3-28.
- Harris, J., Cale, L. & Musson, H. (2012). The predicament of primary physical education: a consequence of 'insufficient' ITT and 'ineffective' CPD? *Physical Education and Sport Pedagogy*, 17, pp. 367 - 381.
- Carney, C. & Chedzoy, S. (1998) Primary Student Teacher Prior Experiences and Their Relationship to Estimated Competence to Teach the National Curriculum for Physical Education. *Sport Education and Society*, 3, 19-36.
- Morgan, P. J. & Bourke, S. F. (2005). An investigation of pre-service and primary school teachers' perspectives of PE teaching confidence and PE teacher education. *ACHPER Healthy Lifestyles Journal*, 52, 7-13.
- Curtner-Smith, M. (1999). The More Things Change the More They Stay the Same: Factors Influencing Teachers' Interpretations and Delivery of National Curriculum Physical Education. *Sport, Education and Society*, 4, 75-97.
- Löllgen H, Böckenhoff A, & Knapp G. (2009). Physical activity and all-cause mortality: an updated meta-analysis with different intensity categories. *International Journal of Sports Medicine*, 30, 213-324.
- Samitz, G., Egger, M., & Zwahlen, M. (2011). Domains of physical activity and all-cause mortality: systematic review and dose-response meta-analysis of cohort studies. *International Journal of Epidemiology*, 1, 1-19.
- Zelle, D.M., Corpeleijn, E., Stolk, R.P., de Greef, M.G.H., Gans, R.O.B., van der Heide, J.J.H., Navis, G., & Bakker, S.J.L. (2011). Low Physical Activity and Risk of Cardiovascular and All-Cause Mortality in Renal Transplant Recipients. *Clinical Journal of the American Society of Nephrology*. 6, 898-905.
- Whitehead, M. (2001). The Concept of Physical Literacy. *European Journal of Physical Education*, 6, 127-138.
- Whitehead, M. (2010). *Physical Literacy throughout the Lifecourse*. London: Routledge.
- Gill, J.H. (2000). *The Tacit Model*. New York: State University of New York Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York: Perseus Books Group. Basic Books.
- Sartre, J-P. (1957). Being and Nothingness. Translated by H.Barnes, London. Methuen.
- Burkitt, I. (1999). *Bodies of thought: Embodiment, identity and modernity*. London: Sage.
- Fox, K. (2010). The physical self and physical literacy. In M.Whitehead (Ed.) *Physical Literacy Throughout the Lifecourse*. London: Routledge. (pp. 71-82).
- Gately, P. (2010). Physical literacy and obesity. In M.Whitehead (Ed.) *Physical Literacy Throughout the Lifecourse*. London: Routledge. (pp. 83-99).

32. Almond, L. (2010). Physical literacy and the adult population. In M.Whitehead (Ed.) *Physical Literacy Throughout the Lifecourse*. London: Routledge. (pp. 116-129).
33. Vickerman, P., & DePauw, K. (2010). Physical literacy and individuals with a disability. In M.Whitehead (Ed.) *Physical Literacy Throughout the Lifecourse*. London: Routledge. (pp. 130-141).
34. Balyi I., & Hamilton A. (2004). *Long-Term Athlete Development: Trainability in Childhood and Adolescence. Windows of Opportunity, and Optimal Trainability*. Victoria: National Coaching Institute British Columbia & Advanced Training and Performance Ltd.
35. Balyi, I., & Hamilton, A. (2010). *Long-Term Athlete Development: Trainability in Childhood and Adolescence. Windows of Opportunity, and Optimal Trainability*. www.swimcoach.org . Summer 2010, Issue 10.
36. Telford, R.D., Cunningham, R.B., Telford, R.M., Daly, R.M., Olive, L.S., & Abhayaratna, W.P. (2013). Physical Education Can Improve Insulin Resistance: the LOOK Randomized Cluster Trial. *Medicine and Science in Sport and Exercise* [Eprint ahead of publication].
37. Telford, R.D., Cunningham, R.B., Fitzgerald, R., Olive, L.S., Prosser, L., Jiang, X., & Telford, R.M. (2012). Physical education, obesity, and academic achievement: a 2-year longitudinal investigation of Australian elementary school children. *American Journal of Public Health*, 102, 368-374.
38. Telford, R.D., Cunningham, R.B., Telford, R.M., & Abhayaratna, W.P. (2012). Schools with fitter children achieve better literacy and numeracy results: evidence of a school cultural effect. *Pediatric Exercise Science*, 24, 45-57.
39. Trudeau, F., & Shephard, R. J., (2008). Physical education, school physical activity, school sports, and academic performance. *International Journal of Behavioral Nutrition and Physical Activity*, 5 (10), 1-12.
40. Taras, H. (2005). Physical activity and student performance at school. *Journal of School Health*, 75(6), 214-218.
41. Shephard, R.J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science*, 9, 113-126.
42. Carlson, S A., Fulton, J. E., Lee, S. M., Maynard, M L., Brown, D. R., Kohl, H.W., & Dietz, & William H. (2008). Physical education and academic achievement in elementary school: Data from the early childhood longitudinal study. *American Journal of Public Health*, 98 (4), 721-727.
43. Chanal, J.P., Sarrazin, P.G., Guay, F., & Boiché, J. (2009). Verbal, mathematics, and physical education self-concepts and achievements: An extension and test of the Internal/External Frame of Reference Model. *Psychology of Sport and Exercise*, 10 (1), 61-66.
44. Lim, C., & Biddle, S.J.H. (2012). Longitudinal and prospective studies of parental correlates of physical activity in young people: A systematic review. *International Journal of Sport and Exercise Psychology*, 10, 211-220.
45. Sigmund, E., Turoňová, K., Sigmundová, D., & Přidalová M. (2008). The effects of parents' physical activity and inactivity on their children's physical activity and sitting. *Acta Universitatis Palackianae Olomucensis Gymnica*, 38, 17-24.
46. Bois, J.E., Sarrazin, P.G., Brustad, R.J., Trouilloud, D.O., & Cury, F. (2005). Elementary school children's perceived competence and physical activity involvement: The influence of parents' role modelling behaviours and perceptions of their child's competence. *Psychology of Sport and Exercise*, 6, 381-397.
47. Davison, K.K., & Jago, R. (2009). Change in parent and peer support across ages 9 to 15 years and adolescent girls' physical activity. *Medicine & Science in Sports & Exercise*, 41, 1816-1825.
48. Telford, R.D., Cunningham, R.B., Telford, R.M., Riley, M., & Abhayaratna, W.P. (2012). Determinants of childhood adiposity: evidence from the Australian LOOK study. *PLoS One*. 7, e50014. doi: 10.1371/journal.pone.0050014
49. Castelli, D.M., Hillman, C.H., Buck, S.M., & Erwin, H.E. (2007). Physical Fitness and Academic Achievement in Third- and Fifth-Grade Students. *Journal of Sport & Exercise Psychology*, 29, 239-252.
50. Morales, J., Pellicer-Chenoll, M., Garcia-Masso, X., Gomez, A., Gomis, M., & Gonzales, L. (2011). Relation between physical activity and academic performance in 3rd year secondary education students. *Perceptual and Motor Skills*, 113, 539-546.
51. Chang, H-C, & Chen, J-F. (2011). The Relationship between Physical Education Performance, Fitness Tests and Academic Achievement in Elementary School. *International Journal of Sport and Society*, 2, 65-73.
52. Joshi, P., Howatt, H., & Bryan, C. (2011). Relationship Between Fitness Levels and Academic Performance. *Journal of Physical Education and Sport*, 11, 376 - 382.
53. Tomporowski, P.D., Davis, C.L, Miller, P.H and Naglieri, J.A. (2008). Exercise and children's intelligence, cognition and academic achievement. *Education Psychological Review*, 20, 111-131.
54. Dwyer, T., Sallis, J.F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science*, 13, 225-237.
55. Chomitz, V.R., Silining, M.M., McGowan, S.E., Mitchell, S.E., Dawson, G.F., & Hacker, K.A. (2009). Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the Northeastern United States. *Journal of School Health*. 79, 30-37.
56. Fox, C.K., Barr-Anderson, D., Neumark-Sztainer, D., & Wall, M. (2010). Physical activity and sport team participation: Associations with academic outcomes in middle school and high school students. *Journal of School Health*, 80, 31-37.
57. Jess, M. and Dewar, K. (2004). Basic Move: Developing a Foundation for Lifelong Physical Activity. The British Journal Of Teaching Physical Education. Summer 2004. http://www.ed.ac.uk/polopoly_fs/1.590181/fileManager/BasicMoves-MikeJess-KayDewar.pdf
58. Breslin, G., Murphy, M., McKee, D., Delaney, B. and Dempster, M. (2012) The effect of teachers trained in a fundamental movement skills programme on children's self-perceptions and motor competence. *European Physical Education Review*. (18), p114-126.



