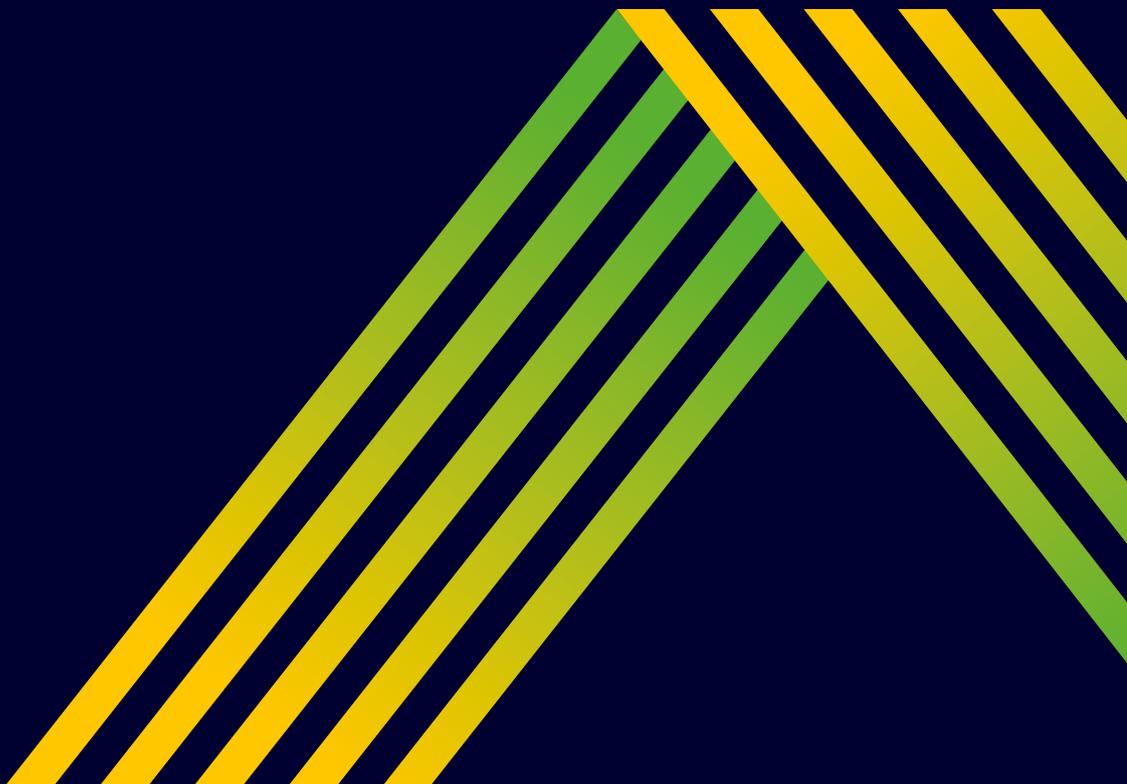




Australian Government
Australian Sports Commission

Physical Literacy: Informing a Definition and Standard for Australia



Physical Literacy: Informing a Definition and Standard for Australia

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Foreword

Australian communities continue to experience reduced rates of physical activity and an increase in sedentary behaviours, suggesting fewer Australians are leading active and healthy lives. The effects of this are seen in the increasing rates of obesity and preventable diseases such as heart disease and type II diabetes. In contrast, the benefits of regular physical activity and sport participation are well known; from improved health and fitness, through to better wellbeing and increased self-esteem. Yet, awareness of these benefits is not leading people to make healthier choices of sitting less and moving more.

The evidence shows that developing the necessary skills early in life is more likely to lead to increased participation in sport and physical activity throughout life. A focus on physical literacy emphasises the importance of developing a wide variety of skills required to participate fully and experience the full range of benefits that sport and physical activity have to offer. It is important to ensure all Australians have the opportunity to develop the physical skills needed to participate, along with the social, cognitive and affective skills to support enjoyable experiences and keep them coming back for more.

Recognising the importance of physical development and its contribution to whole-of-child development means a collaborative practical approach is required to achieve sustainable and impactful outcomes. The Australian Sports Commission (ASC) acknowledges the crucial role the education sector plays in developing children and young people and sees great opportunities to better utilise sport to support education outcomes. In 2015, the ASC introduced the Australian Government's Sporting Schools Program to increase children's participation in sport within schools, and to connect children with community sport. Since then the ASC has consulted with education, health and sport to better understand the interconnection between sport and education, and to identify opportunities for sport to further contribute to the overall health and wellbeing of all Australians, particularly young people.

To ensure we are all working from a position of clarity and national consistency around applying a physical literacy approach, the ASC is leading the development of an Australian definition for physical literacy. A National Physical Literacy Standard will also be developed to support coaches, educators and parents to identify and support development of the range of skills that enable active, healthy lifestyles. This work seeks to enhance collaboration between the sport and recreation system and the education and health sectors to improve participation outcomes, improve quality of life for future generations, and ease the health burden at a national level.

We are excited and enthusiastic to be working with a broad team of expert researchers, led by the University of Canberra, to explore and define this crucially important work on physical literacy. This is our opportunity to innovate and find new solutions to support all Australians to be motivated and capable to play sport and be active and healthy for life.



Kate Palmer

CEO

Australian Sports Commission



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Introduction

This report summarises a literature review conducted in establishing an academically sound research base for the establishment of a physical literacy definition and standard within Australia. In conjunction with this summary report there are accompanying online resources, including: (a) online citation resource including details of all papers sampled using the [Mendeley platform](#); and (b) [online shared database](#) detailing the papers sampled, the topics they address, and the information that can be extracted from them.

BACKGROUND

Physical literacy is recognised as the foundation of both lifelong participation and performance excellence in human movement and physical activity. To date, the consensus is that individuals who demonstrate good physical literacy are more likely to be active for life - although the true meaning of such an attribute, or set of attributes, has rarely been articulated. To support the Australian national agenda for health and wellbeing, this report explores and develops the concept of physical literacy for an Australian audience. This project presents an opportunity for the Australian Sports Commission, as the national body for sport, to take a clear position on physical literacy and influence the adoption of the concept more broadly. The aim of this project is to clearly define what physical literacy is and how it can be applied in the Australian context. This work will inform the development of a 'Physical Literacy Standard' and related products to promote participation and lifelong engagement with sport and physical activity.

The concept and approach of 'physical literacy' (Whitehead, 2001; 2007) has gained increasing prominence internationally in recent years (Edwards, Bryant, Keegan, Morgan & Jones, 2016), however, there is

still significant debate over how it is expressed, defined, and the possibility of its measurement or assessment/monitoring. This debate in the Australian context is believed to be limiting the scope for adoption of this concept as a national approach (Macdonald & Enright, 2014). As such, an academically developed and endorsed National Physical Literacy Standard has the potential to positively influence a wide range of health outcomes from obesity to mental health by addressing the long-term participation rates of children and young people in physical activity and sport.

The development of such a standard would lay the foundations to shape and guide future development in enhancing health and wellbeing for all Australians.

In order to inform such activities, the research team performed a comprehensive search of the research literature in both physical literacy and topics within the broader literature on the subject, typically including motivation, confidence, physical self-perceptions, competence (i.e. motor competence and fitness) and sport and physical activity promotion. The following report details the methods, progress and initial findings of that review and analysis.

Sampling Methodology

Our search strategy was designed to gather the best available research evidence in relation to physical literacy, as well as from topics closely related to physical literacy. Informed by previously existing definitions of physical literacy such as Canadian Sport for Life and the International Physical Literacy Association, the related topics that we also searched included:

- (i)** the broad research area of motor competence (including fundamental movement skills and motor coordination);
- (ii)** motivation towards physical activity/sport;
- (iii)** confidence, self-efficacy, physical self-perception or perceived physical competence in physical activity/sport
- (iv)** knowledge, attitudes and values towards physical activity and/or sport
- (v)** physical activity promotion, including the reduction of sedentariness
- (vi)** physical education pedagogy (including fitness and game-centred models)
- (vii)** school sport and physical education programs
- (viii)** measurement and evaluation of all the above factors

To our knowledge, no other research on physical literacy has sampled related topics as well as papers directly addressing physical literacy. We searched for peer reviewed academic papers using electronic databases including: MEDLINE, EBSCOhost, SPORTDiscus, Web of Science and Scopus, and additionally we drew on the expert knowledge of the research team and expert panel to ensure that well-known papers were included. Within each topic area, we had two further considerations for sampling the data. First, we sought to ensure that the sampling process generated content in relation to the following six areas, including: (a) definitions of the concept (not including well known and established definitions e.g. physical activity); (b) frameworks for each concept, including conceptual framework or explanatory theories; (c) standards for each concept, specifically any indication of

either prescribed/recommended developmental standards or descriptive developmental norms; (d) visual models for each sampled concept, typically representational models or illustrative guidelines; (e) assessment / measurement options in relation to each sampled concept; and (e) intervention programs or approaches that have been used to support each concept. Second, we screened papers for quality, using a two-tiered approach. For papers that were specifically about physical literacy – our core focus in the review – we included any journal papers with a peer reviewed, published status in the English language. For papers, we prioritised the best-available evidence, using the guidelines developed by the Oxford Centre for Evidence-Based Medicine (OCEBM - 2004 – Figure 1). Thus, we prioritised systematic reviews of high quality research papers, and if those did not exist then we searched for high quality research papers such as randomised controlled trials, then cohort studies etc. We progressed down the list until there was consensus that our database contained the best available evidence on each specific topic sampled. Hence, if good systematic reviews existed that clearly address a specific content area (i-viii above), no further papers were sought. However, it is important to note here a number of caveats. Firstly, regarding the concept and definition of physical literacy, such papers were commonly commentary and opinion papers and therefore, while these do not rate highly in a traditional evidence schema, they were considered relevant to consider and prioritise in the context of this work. Similarly, a validation paper on a particular measurement instrument might be very important in terms of understanding how a concept might be measured but not rated highly in terms of this evidence schema.



Level of Evidence	Grading Criteria	Grade of Recommendation
1a	Systematic review of RCTs including meta-analysis	A
1b	Individual RCT with narrow confidence interval	A
1c	All and none studies	B
2a	Systematic review of cohort studies	B
2b	Individual cohort study and low quality RCT	B
2c	Outcome research study	C
3a	Systematic review of case-control studies	C
3b	Individual case-control study	C
4	Case-series poor quality cohort and case-control studies	C
5	Expert Opinion	D

Each paper was reviewed by one of the three core researchers (RK, LB, DD), and these codings were reviewed by the other two researchers. Key data pertaining to each project deliverable (a-e above) were extracted and stored within the coding database.

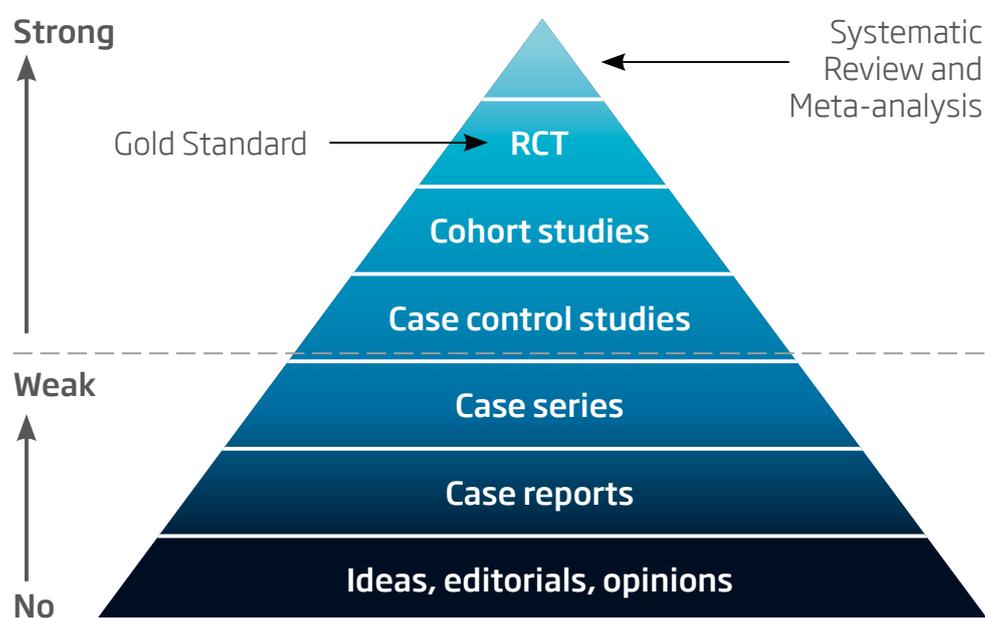


Figure 1: Illustration of the coding system adopted for evidence-quality, from OCEBM



RESULTS AND OUTCOMES

As at 18th July 2016, a total of 192 papers were sampled and encoded into the database: (i) 78 relating to physical literacy (median quality = **D**, although as noted previously this reflects the large number of expert opinion articles); (ii) 36 on motor competence (median quality = **B**); (iii) 17 on motivation (median quality = **C**); (iv) eight on confidence, self-efficacy or physical self-perception or perceptions of competence (median quality = **D**); (v) four on knowledge, values and attitudes towards physical activity (which to a very large extent were subsumed within motivation and self-perceptions, median quality = **C/D**); (vi) six on physical self-perceptions (median quality = **C**); (vii) 42 on physical activity and/or sedentary behaviour (median quality = **A**); (viii) 20 on physical education pedagogy/practice (median quality = **D**); and (ix) five on school sport programs (median quality = **B**).

A total of: **(a)** 125 papers offered definitions of either physical literacy or a key related construct; **(b)** 75 referred to frameworks; **(c)** 25 suggested some kind of standards (descriptive or prescriptive); **(d)** 15 offered some kind of visual models for the concept described; **(e)** 126 included some attempt to measure, assess or evaluate at least one core concept (including nine qualitative approaches); and **(f)** 92 studies either tested or recommended some kind of intervention or support strategy.



NARRATIVE SUMMARY OF KEY THEMES

The following section summarises key themes: definitions, frameworks, visual models and - where applicable - standards.

Definition and conceptualising

PHYSICAL LITERACY

Regarding physical literacy, definitions typically focused on the Whiteheadian approach: a capability reflecting motivation, confidence, physical competencies and knowledge/values that predispose an individual to engage in physically meaningful pursuits such as sport and physical activity. It was evident that, while many definitions imply that physical literacy is the integration of these concepts (for example figure 2), research (and terminology) to date often refer to them separately, and this is then reflected in the way they are subsequently discussed and measured. As such, one key reflection is that this 'integrated' or 'holistic' viewpoint should be revisited and re-emphasised.

Furthermore, several papers described physical literacy as a dynamic and interactional construct: constantly evolving in relation to both the environment and internal processes (learning, reflection, etc. - cf. Murino, 2013; Robinson et al., 2016).

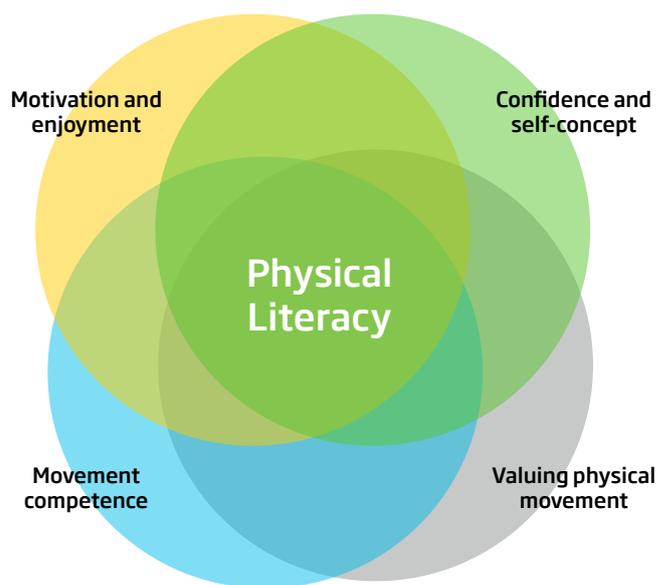


Figure 2: A schematic diagram representing the proposed integration between physical literacy concepts, as presented in a 2014 conference poster (Keegan, 2014)



ANALYSIS OF CURRENT DEFINITIONS

Table 1: A summary and analysis of currently existing definitions of physical literacy from Canada, the USA, Wales, New Zealand and the 'International Physical Literacy Association' (UK).

Definition	Source	Comments
Physical Literacy is the mastering of fundamental movement skills and fundamental sport skills that permit a child to read their environment and make appropriate decisions, allowing them to move confidently and with control in a wide range of physical activity situations.	Pacific Institute for Sport Excellence (PISE)	Highly focused on motor skills and perceptual aspects of 'reading' environment. Does acknowledge confidence, but little mention of other psycho-social factors that may facilitate lifelong PA. Appears to pertain to a desirable yes/no state, not the developmental journey/process. Focus on physical activity but not movement – may reflect health emphasis.
Physical literacy is the ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person.	SHAPE America – cf. Mandigo, Francis, Lodewyk & Lopez (2012) also Canada Passport for Life	As above - motor skills and confidence are addressed, but little mention of other psycho-social factors that may facilitate lifelong PA. 'Whole person' element captures 'holistic' nature. Appears to pertain to a desirable yes/no state, not the developmental journey/process. Focus on physical activity but not movement – may reflect health emphasis.
Physical literacy can be described as the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life.	International Physical Literacy Association (IPLA)	Arguably main source of the big four – competence, confidence, motivation and knowledge/values. Why were these specific attributes chosen? Still appears to describe a desirable/aspirational state, not the process of getting there. Focus on physical activity but not movement – may reflect health emphasis. 'For life' implies throughout life and for health.
"the motivation, confidence, physical competence, understanding and knowledge to maintain physical activity at an individually appropriate level, throughout life"	NSW DEC cf. Whitehead (2006)	Closely related to IPLA version, above. Underpinned recent NSW Physical Literacy Continuum.
IPLA version ++ The Sport NZ Physical Literacy Approach takes a holistic view of the participant that considers their physical; social and emotional; cognitive; and spiritual needs.	Sport New Zealand	Begins with IPLA wording then adds: <ul style="list-style-type: none"> • physical • social and emotional • cognitive • spiritual

Definition	Source	Comments
<p>Physical Literacy means that a person has a catalogue of technical skills along with the confidence and motivation to take part in lots of different sports and physical activities at every stage in their life.</p> <p>It gives them the power to choose to be physically active in whatever way they prefer, taking away fears of 'having a go' or a lack of motivation that many of us can suffer from.</p> <p>There are 4 individual elements that lead to a person becoming physically literate...</p> <p>Physical Skills + Confidence + Motivation + Lots of opportunities = Physical Literacy</p>	<p>Sport Wales Website</p>	<p>Different wording to previous but still emphasises skills, confidence and motivation. Additional emphases on: (1) empowering the individual and (2) opportunities being a vital consideration.</p> <p>Focus on physical activity but not movement - may reflect health emphasis.</p>
<p>Physically literate individuals consistently develop the motivation and ability to understand, communicate, apply, and analyze different forms of movement.</p> <p>They are able to demonstrate a variety of movements confidently, competently, creatively and strategically across a wide range of health-related physical activities.</p> <p>These skills enable individuals to make healthy, active choices that are both beneficial to and respectful of their whole self, others, and their environment.</p>	<p>PHE Canada - update 2016 Additional statements added to definition</p>	<p>As above (SHAPE and Passport) with addition of new statements and/or clarifications addition of 'developed' motivation and understanding addition of creative and strategic addition of whole self, others and environment.</p> <p>Still appears to invoke a desirable / aspirational state to be pursued/achieved, not a process / journey.</p> <p>Focus on physical activity but not movement - may reflect health emphasis.</p>
<p>Why Is it Important?</p> <p>Physical Literacy provides a solid foundation for children and youth to develop the skills, knowledge and attitudes they need to enable them to engage with poise and confidence across a wide variety of activities. The development of physical literacy is now a reality for educators and practitioners and many provincial physical education curricula now identify the development of physically literate students as the major outcome of physical education programs.</p>	<p>PHE Canada - updated 2016 Separate page added alongside definition</p>	<p>As above (SHAPE and Passport) with addition of new statements and/or clarifications. Addition of 'why is it important'.</p> <p>Clarification as a 'solid foundation for children' - queries when this desired 'level / state' is reached and how high the bar is.</p> <p>Still appears to invoke a desirable / aspirational state to be pursued/achieved, not a process / journey.</p> <p>Focus on physical activity but not movement - may reflect health emphasis.</p>
<p>To be physically literate includes the ability to move with poise and confidence across a wide range of activities. It also includes competencies that are linked to the development of the whole person (e.g., physical, affective, cognitive). Recent definitions of physical literacy include the importance of psycho-social aspects such as motivation, social responsibility, self-esteem, and culture.</p>	<p>Mandigo, Francis, Lodewyk & Lopez (2012)</p>	<p>Concept paper - arguably the first appearance of the distinction between:</p> <ul style="list-style-type: none"> • physical • affective • cognitive • social
<p>To be physically active an individual calls on their affective, cognitive and physical domains. They need to be motivated, confident and competent. These elements are entwined and are co-dependent - physical literacy is the blend of these elements. If one or more of the elements is lacking, or lagging behind the other elements (or if we focus solely on one aspect) the capacity to be physically active is affected.</p>	<p>IPLA clarification</p>	<p>Clarification appearing in a recent blog post on IPLA website. Clearly denotes three of the four domains signposted in the above cell.</p> <p>Re-emphasises integrated / holistic nature.</p>

Core Categories	Subthemes	Higher order themes
Confidence (26)	Affective	Properties of physical literacy
Motivation (23)		
Self-esteem (4)		
Knowledge and understanding of activities (16)	Cognitive	
Knowledge and understanding of healthy and active lifestyles (13)		
Value and take responsibility for physical activity (2)		
Movement capacities (22)	Physical capabilities	
Motor skill competence (18)		
Physical competence (12)		
Fundamental movement skills (8)		
Purposeful physical pursuits (6)		
Physical activity (22)	Behavioural characteristics	Associations and relationships
Health behaviours (13)		
Engage, enthuse and enjoy (13)	Psychological, social and attitudinal	
Support from significant others (10)		
Cognitive/academic performance (4)		
Physical education (38)	Contextual	
Sport sector (8)		

Figure 3: Sample of table offered in a recent systematic review by Edwards et al. examining the meaning of physical literacy in published scientific papers.

As demonstrated in the above analysis (table 1 & figure 3), the recent history of defining physical literacy began with a strong focus on motor skills and perceptual-motor decision making, perhaps symptomatic of a strong emphasis on sport participation. Following that there has been a strong emphasis on participation in physical activity more widely, and achieving a level of some attribute or disposition that will lead to sufficient physical activity to be healthy for life. Related to this change, the words confidence, motivation and sometimes 'knowledge/values' were added, suggesting a recognition that psychosocial factors may also be important. However, the reasons for choosing these specific words, or constructs, are unclear and not usually explained within the materials provided.

Perhaps it is assumed that words such as motivation and confidence are widely understood to a diverse audience, although the below analysis reveals the potential for common misconceptions in these areas – for example 'more is better' is not a good way of thinking about motivation or confidence, and knowledge/values is a particularly

ambiguous concept ranging from irrational beliefs to critical reasoning, rational logic and evidence-based decision making. It is possible, and – in the context of this paper – necessary, to critically question such choices and explore alternatives (see further discussion below).

There also remains a difficulty in relation to whether physical literacy pertains to physical activity, movement, or both – and some would argue it is possible to draw a distinction between these. Given that recent health research has developed a relatively precise definition of ‘physical activity’ (see [Physical Activity and Sedentariness](#) section), which does exclude certain forms of movement, there may be a necessity to recognise both in our subsequent work. For example, important sources of proprioceptive information and self-awareness such as meditation and yoga would not qualify as physical activity, but may be included under movement – even if the movements are imperceptibly small and simply those involved in breathing. If we then consider that the very purpose of such activities is to generate learning about the self, about internal states and feelings (physical, affective, and cognitive), then we may need to consider a wider definition of ‘movement’, as well as ‘physical activity’ (i.e., sufficient for health).

MOTOR COMPETENCE

In relation to the related concepts, motor competence was typically defined as: “an organized series of basic movements that involve the combination of movement patterns of two or more body segments” (e.g., Morgan et al., 2013). Like physical literacy, above, motor competence and motor development was described as a dynamic and evolving phenomenon (Stodden et al., 2008), and most recently, for example: “Collectively, children’s physical and psychological development is a complex labyrinth of biological, environmental, psychosocial, and behavioural factors that synergistically evolve across developmental time (Robinson et al., 2015; p.1250) .



There is a broad base of high-level evidence which supports the link between motor competence and health related behaviours and outcomes

This idea of motor competence being a dynamic process is not new. Newell proposed the constraints model, in which motor competence was seen to not emerge naturally during early childhood but rather as the result of cooperating dynamic subsystems: namely, ‘the task’, ‘the learner’ and ‘the environment’. An individual’s motor competence is therefore a product of the interaction within and between these dynamic, cooperating subsystems (Newell, 1985; 1991; 2003; Newell & Vaillancourt, 2001).

Dynamical systems theorists purport that biomechanical degrees of freedom in the motor system – the number of independent parameters that define a system’s configuration – are reduced through the process of the development of coordination. This process encourages development of functionally preferred coordination states, which then support particular goal-directed actions (Glazier, Davids & Bartlett, 2003). In this literature, terms such as motor competence, fundamental motor /movement skill and motor coordination can be interchangeably used. Some recent studies were also keen to emphasise that there is (or should be) a broader definition of motor competence than the attributes that we can readily (reliably) assess at this time (Robinson et al., 2015). Additionally, this paper clarifies the way we think about causal pathways; in that the ways that we model

motor development over time may not be unidirectional, or A-before-B means A-causes-B. These are two critical features that separate Robinson et al's model from other theoretical models that are used as paradigms to promote various aspects of health.

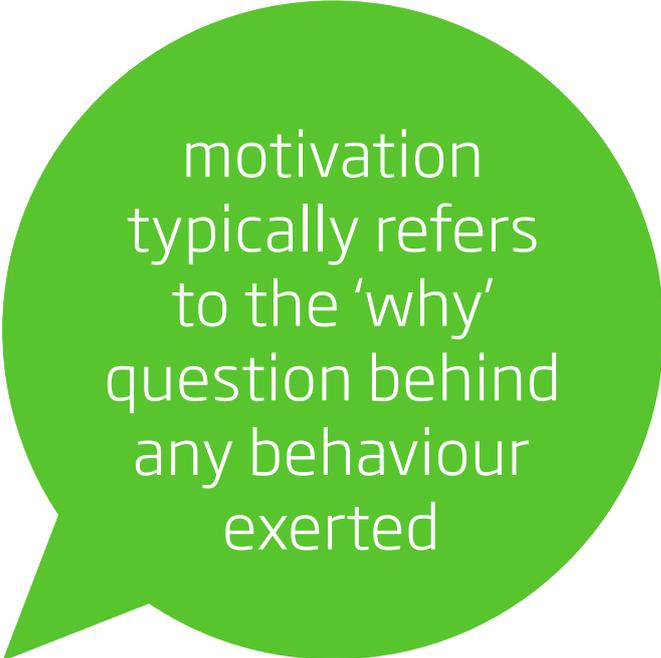
There is a broad base of high-level evidence which supports the link between motor competence and health related behaviours and outcomes (i.e. physical activity, fitness and weight status - Cattuzzo et al., 2016; Holfelder & Schott, 2014; Lubans, Morgan, Cliff, Barnett, & Okely, 2010)

Measurement in motor competence is usually objective although there are some parent report measures. Objective measurement tends to either be 'process' (also termed qualitative - referring to the form of the movement) or 'product' (referring to the movement outcome i.e. whether the ball hits the target). More recent papers advocate for measuring both process and product aspects of skills as they purport to measure different constructs (e.g., Logan, Barnett, Goodway, & Stodden, 2016; Rudd et al., 2016). Whilst objective measurement is typically done with one child at a time, some recent authors (from Canada and Europe) are developing obstacle type assessments where groups of children can be assessed (e.g., CAPL - Francis et al., 2015 and the [Dragon MultiSkills Challenge](#) in Wales). One of the challenges will be deciding what the best form of assessment will be for large groups of children, that is feasible and cost effective, but also reliable and a good representation of a child's motor competence.

MOTIVATION

Regarding motivation, almost all papers adopted the intrinsic-extrinsic continuum of motivational regulation, offered by Deci and Ryan's Self-Determination Theory (Deci & Ryan, 2008; Ryan & Deci, 2000). In this context, motivation is invariably most optimal (and sustained over time) when students perceive inherent value, and gain intrinsic rewards such as enjoyment from a task with no need for external inducement or expectations. Likewise, most papers recommended that tasks and situations should seek to develop intrinsic motivation by supporting the core psychological needs specified in Self-Determination Theory: the need for competence

(to experience progression and success on a task); relatedness (the need to feel both friendship/affiliation and group membership/belonging); and autonomy (the need to experience choice and a sense-of-control). It was also noted that the typical nature of expectations and standards within school contexts can direct undermine the psychological need for autonomy (e.g., Morgan, Bryant & Diffey, 2013). Within the SDT framework, motivation typically refers to the 'why' question behind any behaviour exerted - to the reasons behind a behaviour, or absence of behaviour. It often reflects: (a) what participants chose to do; (b) enjoyment; (c) persistence against difficulty; and (d) seeking challenge and development. Motivation was also considered in relation to several pedagogical models, such as Sport Education and Teaching Games for Understanding. Like physical literacy and motor competence, motivation was also typically described as a dynamic and evolving experience, for example being determined both prior to engagement in a task and then during the task, as a result of experiences within it.



motivation typically refers to the 'why' question behind any behaviour exerted

Motivation has typically been measured in psychological research using psychometric questionnaires (cf. Duda, 2001). Scales such as the Intrinsic Motivation Inventory (IMI - McAuley, Duncan, & Tammen, 1989); Sport Motivation Scale (SMS - Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013); and Behavioural Regulation in Exercise (BREQ - Markland & Tobin, 2004;

Mullan, Markland, & Ingledew, 1997) have all gained prominence in this area. Such questionnaires tend to focus on assessing the level of different types of motivational regulation: intrinsic, extrinsic, amotivation, introjected and more. An individual could score high or low in several at a time, in relation to a specific context or setting (i.e., “when I play football...”). Interestingly, this does not lead to an overall ‘amount’ of motivation, but rather an overview of the ‘type’ or ‘profile’ of motivational regulation, and usually in relation to a specific task or context.

In physiology, in particular, there has been more of a focus on motivation as a quantity - i.e., ‘more is better’, through the lens of ‘motivational intensity’ (Brehm & Self, 1989; Richter, Gendolla, & Wright, 2016). Under this interpretation, motivation is construed as an affective construct, alongside concepts such as energisation, mood, or emotion. Motivational intensity is defined as the strength of the tendency to either approach a positive situation or event or to move away from a negative situation or event (Gable & Harmon-Jones, 2010; Harmon-Jones & Gable, 2008; Harmon-Jones, Gable, & Price, 2013). Typically motivational intensity is not measured with questionnaires, but rather manipulating the goals, rewards or punishments within a task and assuming those manipulations measure motivational intensity. Visual analogue scales (pick a point on a line) or brain scanning studies have separately suggested such manipulations can cause these changes (Gable & Harmon-Jones, 2010; Harmon-Jones & Gable, 2008; Harmon-Jones et al., 2013). The important consideration here is that motivation can be construed as spanning at least the cognitive and affective domains (Schunk, 2000), and arguably social too (e.g., (Keegan, Spray, Harwood, & Lavalley, 2014).

While existing definitions of physical literacy typically involve the word motivation, it must also be noted that there are a range of highly related constructs in psychology and educational research - including: desire, determination, drive and passion (Philippe, Vallerand, Houliort, Lavigne, & Donahue, 2010; Vallerand, 2004). Each has been defined, conceptualised and measured separately by different research groups - but this similarity cannot be easily overlooked or ignored. Likewise, there are a number of closely related ideas in education settings, such as growth (versus fixed)

mindsets (Dweck, 1986), resilience (Fletcher & Sarkar, 2013; Kinman & Grant, 2011) and ‘grit’ (Hochanadel & Finamore, 2015; Pappano, 2013). It may be important to acknowledge these highly relevant and potentially complementary research traditions in any new/revised definition.

CONFIDENCE AND SELF-ESTEEM

Papers focusing on confidence and self-esteem typically adopted the definition of ‘expectations of success’, although some papers referred to expectations of return-on-investment, as opposed to simply successful outcomes - i.e., the participant believes “I will get something out of this” as opposed to “I will succeed at this task”. This may be an important nuance to consider, opening up the prospect of achieving learning, good experiences, improved relationships etc. as worthwhile outcomes of participation in a task. For the main part, subjective perceptions regarding a specific task formed the basis of self-efficacy or perceived competence, but these could then be arranged hierarchically to create broader perceptions of ‘self-efficacy for physical activity’ and ultimately ‘global self-esteem’.

There was also a strong tendency to define confidence through affective experiences, as well as more cognitive ‘beliefs/expectations’. For example, Nasuti and Rhodes (2013) defined confidence as “the overall pleasure/ displeasure, enjoyment, and feeling states expected from enacting an activity or from reflection on past activity”. Self-efficacy could refer to either the ability to complete the task (or gain some desired outcome), or alternatively to the belief that one could overcome barriers - and this distinction was evident in many of the papers sampled. One study also explored the belief that one could successfully seek help in pursuit of a particular task or outcome.

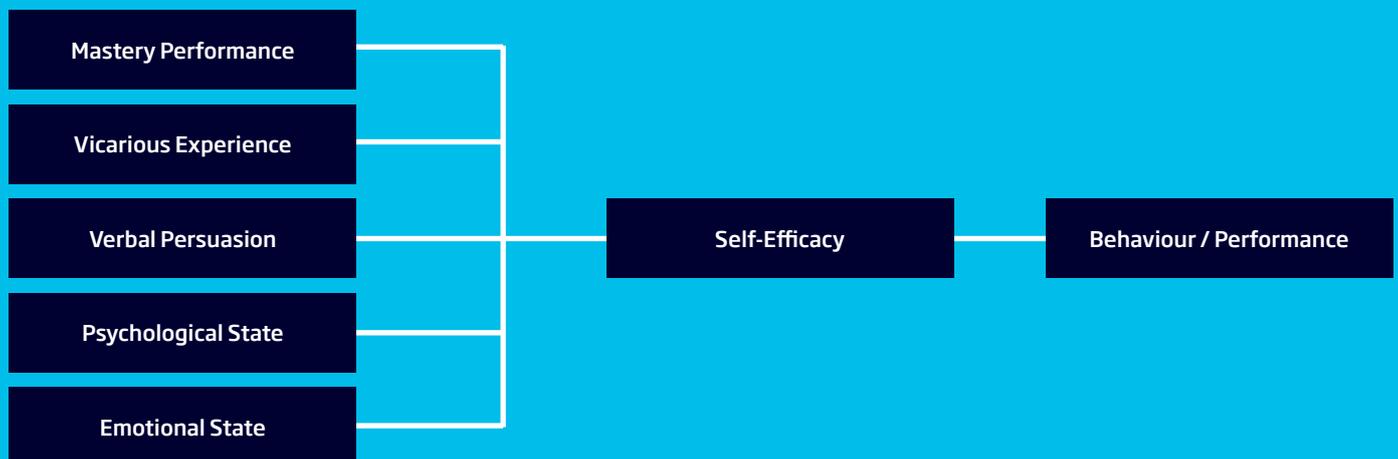
Measurement: Confidence is typically measured using psychometric questionnaires, ranging from a single subscale of the Competitive State Anxiety Questionnaire 2-(CSAI-2 - Marten, Vealey & Burton, 1990) to the two most commonly used scales: the Trait (and State) Sport Confidence Inventories (TSCI and SSCI, Vealey, 1986). Trait measures assess general beliefs that success can be achieved, whereas state measures refer to a more

specific task or event. More recently, a Carolina Sport confidence Inventory (CSCI) was validated and showed good consistency with the CSAI-2 and TSCI (Manzo, Silva & Mink, 2001). There are other means of evaluating confidence, such as a simple 'ruler' (or Visual Analogue Scale) as proposed by Bandura (1977), and techniques such as 'performance profiling' (Butler & Hardy, 1992) can also give numerical but more subjective indications of confidence. Confidence in the 'state' form can be analogised to self-efficacy, in relation to a belief that one can succeed at a specific task, and sometimes even 'perceived competence' - again typically measured using questionnaires.

Confidence in the more general form of overall positive regard for the self is generally labelled self-esteem, and can be arranged hierarchically from specific types of self-esteem (body image, academic, physical skills etc.) up to a 'global' level (see figures 4 & 5). One potential problem with measuring confidence is the current heavy reliance on psychometric scales, that may not be practical or useful in a day-to-day setting (classroom, home). Secondly, while some papers alluded to confidence in the form of 'investment - e.g., "I believe I will get something useful out of this" - this concept is not reflected in the current psychometric scales. Nonetheless it would appear to be very important for those who are building their capability, who may have no expectation of succeeding but who may still value learning and effort (cf. Dweck, 1986; Nicholls, 1984; 1989).



Figure 4: Sources of self-efficacy (confidence)



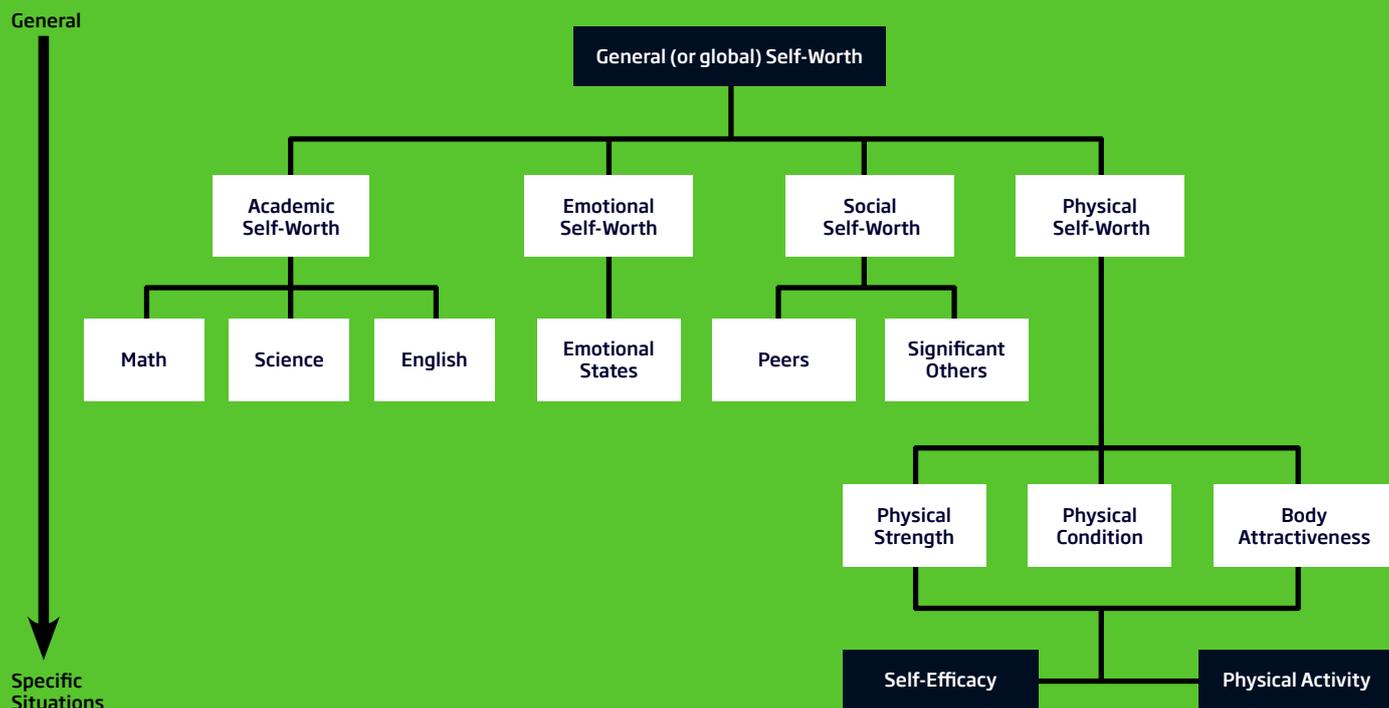


Figure 5: The construction of self-esteem (i.e., confidence) from various sources / domains

KNOWLEDGE, ATTITUDES AND VALUES TOWARDS PHYSICAL ACTIVITY OR SPORT

Concepts within this topic area were typically defined as specific knowledge of either current national guidelines or curriculum content. For the main part, affective attitudes, beliefs and expectations were captured by either the motivation or confidence papers. Oftentimes, papers adopting either a social-cognitive model, the theory-of-reasoned action (or planned behaviour), or the trans-theoretical model would contain some educational element - but it was less common to assess whether this explicit knowledge was understood and recalled. As such, the initial reflection would be that we may need to clarify exactly what we expect participants to know and understand - in an explicit sense - versus what beliefs we believe should be developed. For example, the belief that abilities and attributes can be developed and do respond to training/practice is typically cast as an implicit (unconscious) belief, but one that consistently

predicts motivation, task choice, and strategies adopted within tasks (Dweck, 1986; Dweck & Leggett, 1988). If participants believe a particular attribute is fixed and unresponsive to practice, a maladaptive pattern of avoidant behaviour, extrinsic motivation, and unsporting conduct (e.g., win at all costs) is typically observed. This aspect of 'physical literacy' is relatively under-emphasised in the data sampled, with either short quizzes to examine specific knowledge or general overviews of motivation/confidence towards a task. One worthwhile outcome may be to clarify what explicit knowledge and implicit beliefs we wish to adopt in relation to physical literacy.

PHYSICAL SELF-PERCEPTIONS

In relation to physical self-perceptions, most investigators in the area incorporated Shavelson et al.'s (Marsh, 1990; Shavelson, Hubner, & Stanton, 1976) multidimensional, hierarchical self-concept model. Fox and Corbin (1989) proposed a multidimensional and hierarchical model of physical self-concept, which is consistent with Shavelson et al.'s approach. The

model posits that global self-esteem is at the apex of a hierarchy, followed by the physical self-worth at the domain level, and sport competence, attractive body, physical strength, and physical condition at the sub-domain levels. Furthermore, in association with their model, they devised the Physical Self-Perception Profile (PSPP), which assesses the four specific facets of physical self-concept as well as the global self-esteem and the physical self-worth. PSPP is a self-report instrument designed to measure multiple dimensions of physical self-esteem. The model is clear that physical self-perceptions can contribute to global self-esteem and self-worth, but only alongside other sources of self-esteem such as academic performance, relationships and more. Harter's (1982) body of work in this area is also commonly mentioned in the literature, and refers to the concept of being able to differentiate physical self-perception from other aspects of perceived competence.

The measurement approaches used by researchers for studying self perceptions may not be readily adopted for everyday use in schools, homes and recreational settings

There is a recent development in the motor development field to align instruments measuring perception with the actual skills assessed, thereby specifically testing the impact of positive perceptions of one's own motor proficiency (Barnett, Ridgers, Zask, & Salmon, 2016; McGrane, Belton, Powell, Woods, & Issartel, 2015). In this field also, there were authors who had investigated the links between perceptions of the physical or motor self and actual motor competence and also physical activity and fitness behaviour (e.g. Barnett et al., 2009) thereby linking

many of the constructs that form physical literacy. Like several other concepts in this review, the measurement approaches used by researchers for studying self-perceptions may not be readily adopted for everyday use in schools, homes and recreational settings – so further consideration should be given to finding a balance between scientific validity and everyday practicality.

PHYSICAL ACTIVITY AND SEDENTARINESS

Papers that attempted to either promote physical activity or reduce sedentariness generally adopted the wider definition of any physical movement requiring energy expenditure. Typically, physical activity is anything you do where your body is moving – walking, running, riding a bike, dancing, playing sport: any kind of physical movement. This includes any activities that make you breathe hard, make you sweat, or make your muscles tired. In contrast, sedentary behaviour is when you are awake but expending almost no energy, and so you are in a sitting or reclining position. Common sedentary behaviours include TV viewing, video game playing, computer use, driving a car, or reading. Many papers simply referred to the existing national guidelines for physical activity, specifically moderate-to-vigorous physical activity – as appropriate to that age group and that country. There were distinctions drawn between physical activity that is sufficient for maintaining basic health versus low levels, and/or the higher levels that may be improving cardiovascular fitness or strength. For the main part, while (almost) all sports fall within the definition of physical activity, not all physical activity would be classified as sport.

Physical activity was typically measured either objectively using accelerometers or pedometers, subjectively using self-report and recall surveys, or both. Whilst objective measures are considered more accurate, they also don't typically measure certain types of activity well e.g. water based, cycling, contact sport (where monitors are often removed). Subjective self-report measures do measure the context and type of physical activity but have the biases of self-report (e.g., self-presentation, over-reporting of PA). As an example, the Exercise, Recreation and Sport Survey (ERASS) was conducted on an annual basis between 2001 and 2010.

The ERASS collected information on the frequency, duration, nature and type of activities participated in (i.e. playing) by persons 15 years and over for exercise, recreation or sport during the prior 12 months. Whilst it is now 5 years old the data is available at the Australian Bureau of Statistics and illustrates the importance and usefulness of an exercise recreation and sport survey surveillance system. Such a survey has the potential to provide estimates of long-term physical activity behaviour and therefore inform policy makers about the types of activities that contribute to population health (Merom, Bauman, & Ford, 2004)

Sedentary behaviour is more frequently captured by objective measures as monitors can be worn for all sedentary activities. Measuring physical activity and sedentary behaviour in the context of a physical literacy assessment will need to balance these considerations as well as being feasible and cost effective for large numbers of children. The website developed by the Australasian Child and Adolescent Obesity Research Network (ACAORN) is an invaluable resource for the measurement of physical activity and sedentary behaviour (<http://www.acaorn.org.au/streams/activity/tools-validation/index.php>).

PHYSICAL EDUCATION PEDAGOGY

Several approaches to PE pedagogy were detailed within the literature, and for the main part papers addressing this topic tended to define, compare and offer narratives on the different approaches. As such the level of evidence was typically 'D' according to the OCEBM scale. Our sampling suggests several different approaches are currently identified in the existing literature: (1) Game-centred approaches (GCAs) such as Teaching Games for Understanding and Game Sense (TGFU - Bunker & Thorpe, 1982, 1986; Werner, Thorpe, & Bunker, 1996); (2) Sport Education (Alexander & Luckman, 2001; Siedentop, 2002); (3) constraints-led learning (Renshaw et al., 2015); (4) Teaching Personal and Social Responsibility (Hellison, 2000; Martinek, Schilling, & Hellison, 2006); (5) Vygotski's Scaffolding and Zones-of-Proximal Development (Vygotski, 1929); (6) Health Optimising Physical Education (Metzler, McKenzie, van der Mars, Barrett-Williams, & Ellis, 2013); and (7) Osberg and Biesta's (2010a; b) non-linear approach specifying 'self-

organisation' or 'self-emergence' in learning. Kirk (2005) offers the clear argument that physical literacy is not - in itself - a pedagogical model, but that it may necessitate and justify the development of a new pedagogical model. "Physical literacy is a particular and distinctive philosophical position on physical education derived primarily from the work of Whitehead... ..She claims, as a counterpoint, that every human is an indivisible whole and that embodiment and personhood are inseparable. At the same time, she accepts that the notion of 'body-as-lived' includes both the lived experience of embodiment and instrumental uses of the body. In her critique of dualist thinking, her starting point is that the body-as-lived is 'the ongoing axis of thought and knowing'". There are demonstrable consistencies and contradictions between the various pedagogies described, but they are rarely tested against either 'normal practice' or each other - so most of the evidence is simply narrative argumentation. In some cases the models are not well articulated - or are inconsistently operationalised in practice - making it difficult to compare or evaluate them (note several papers seek to clarify differences and 'misconceptions'). There is a strong argument that considering the concept of physical literacy may prompt the reconsideration of both (typical) curriculum content as well as the methods of instruction/delivery - and as such this would likely constitute a new self-contained pedagogical model.

In terms of specific programs, the LOOK study (Lifestyles Of Our Kids) which investigates the impact of an externally provided specialist physical education program in schools on physiological and psychological health and development in young children has had some positive results (Telford et al., 2013a; Telford et al., 2012; 2013b; Telford & Cunningham, 2012). Systematic review evidence clearly demonstrates that teacher led programs in Physical Education within schools can have success in terms of increasing physical activity and movement skill competence (Lander, Eather, Morgan, Salmon, & Barnett, 2016).

School sport programs tended to either increase the amount of sport within PE, introduce sport as an extra-curricular activity, or promote links to community sports organizations. Such programs were used to promote physical activity, improve movement competence, enhance physical self-perceptions or influence



motivation, confidence or knowledge/values. Barriers and difficulties to implementation were noted in these papers, and likewise the form of sport supplementation could vary widely between studies. There may be good value in clarifying the exact strategies that are available for promoting physical literacy through sporting initiatives linked to schools, and facilitating the evaluation and/or comparison of different approaches and in difference contexts.

An International Mandate. The significance of early intervention and whole-child development in the physical literacy literature is also well supported by international mandate. The Convention of the Rights of the Child (United Nations Human Rights, 1989) supported by the United Nations International Children's Educational Fund (UNICEF) states that education must address the best interests and ongoing development of the whole child. This means that, in addition to being child centred,

education is much more than attention to cognitive development. It is also concerned with the child's social, emotional, and physical development. It also calls for more than the conventional integrated approach. Rather, education must be conceptualised from the child's point of view and with an understanding of the inter-related nature of the child's needs, which vary according to level of individual development. The United Nations Educational, Scientific and Cultural Organization Early Childhood Care and Education (UNESCO – ECCE; Malcolm Institute of Educational Research, 2015) also places particular emphases on developing the whole child: attending to his or her social, emotional, cognitive and physical needs whilst establishing a solid and broad foundation for lifelong learning and wellbeing. In line with the [Education 2030](#) agenda, UNESCO supports national, regional and international efforts to expand and improve ECCE provision equitably so as to provide every child a best start in life.

Frameworks, Standards and/or Visual Models

Relatively few of the identified papers offered clear frameworks for describing physical literacy, or supporting the development of physical literacy. The much criticised (e.g., Bailey & Collins, 2013) Long-Term Athlete Development model (Balyi, Cardinal, Higgs, Norris, & Way, 2006) tends to drive papers emanating from Canada, and while it continues to be revised and updated, may not adequately reflect the very wide scope of activities and capabilities that can be reconciled with physical literacy. For example, many people who might consider themselves physically literate, and achieving sustained engagement in physical activity, may not consider themselves 'athletes', except in a very loose interpretation. The Youth Physical Development Model (Lloyd & Oliver, 2012) is another athlete model (figure 6), and has a focus on competence and fitness from early childhood to adulthood. The model identifies when and why the training of particular fitness components should be emphasised. Central to the model is that during pre-pubescence, strength, motor competence, speed, and

agility should be the main physical qualities targeted. Once the child reaches adolescence, additional components (e.g. power) become more important. Another model which is relevant to introduce at this juncture is Gagné's Differentiated Model of Giftedness and Talent (Gagné, 2004 - DMGT). The DMGT consists of four aptitude domains: intellectual, creative, socio-affective, and sensorimotor in which someone can have natural abilities. The model proposes a distinction between talent and giftedness. 'Giftedness' refers to the possession of superior natural abilities (called aptitudes), in at least one domain to a level that would put someone in the top 10% of their peers. Talent on the other hand refers to the superior mastery of systematically developed abilities (or skills) and knowledge in at least one field of human activity to a degree that places an individual within at least the upper 10% of age peers. If sport or athlete development is a focus it follows that someone may have giftedness and/or talent in the motor domain.





Youth Physical Development (YPD) Model for Males																				
Chronological Age (Years)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+
Age Periods	Early Childhood			Middle Childhood						Adolescence						Adulthood				
Growth Rate	Rapid Growth			Steady Growth			Adolescent Spurt			Decline in Growth Rate										
Maturation Status	Years Pre-PHV						PHV			Years Post-PHV										
Training Adaptation	Predominantly Neural (Age-related)						Combination of Neural and Hormonal (Maturity-related)													
Physical Qualities	FMS			FMS			FMS			FMS										
	SSS			SSS			SSS			SSS										
	Mobility			Mobility						Mobility										
	Agility			Agility						Agility			Agility							
	Speed			Speed						Speed			Speed							
	Power			Power						Power			Power							
	Strength			Strength						Strength			Strength							
	Hypertrophy						Hypertrophy			Hypertrophy			Hypertrophy							
	Endurance & MC			Endurance & MC						Endurance & MC			Endurance & MC							
Training Structure	Unstructured			Low Structure			Moderate Structure			High Structure			Very High Structure							

Figure 6: *The Youth Physical Development Model (Lloyd et al., 2012)*

The FTEM model (figure 7) is another model providing a framework for the athlete development pathway, however this model also signposts the existence of a pathway to an active lifestyle and shows the dynamic nature of participation throughout life, thus perhaps offering more detail and legitimacy to the 'other' activities outside of the sporting 'pyramid'. FTEM is an acronym for the four stages of skill and performance development of those who participate in sport (i.e., Foundation, Talent, Elite and Mastery - Gulbin, Croser, Morley, & Weissensteiner, 2013). The FTEM Framework comprises 10 phases in athlete development, including: Foundation (i.e. Learning and Acquisition of Basic Movement; Extension and Refinement of Movement; Sport Specific Commitment and/or Competition), Talent (Demonstration of Potential; Verification; Practicing and Achieving; Breakthrough and Reward) and Elite & Mastery (Representation; Success; and: Sustained Success). The 3D-AD Model (figure 8) is utilised to complement the operational framework of FTEM and illustrates the different factors both systems and chance, which influence the athlete.



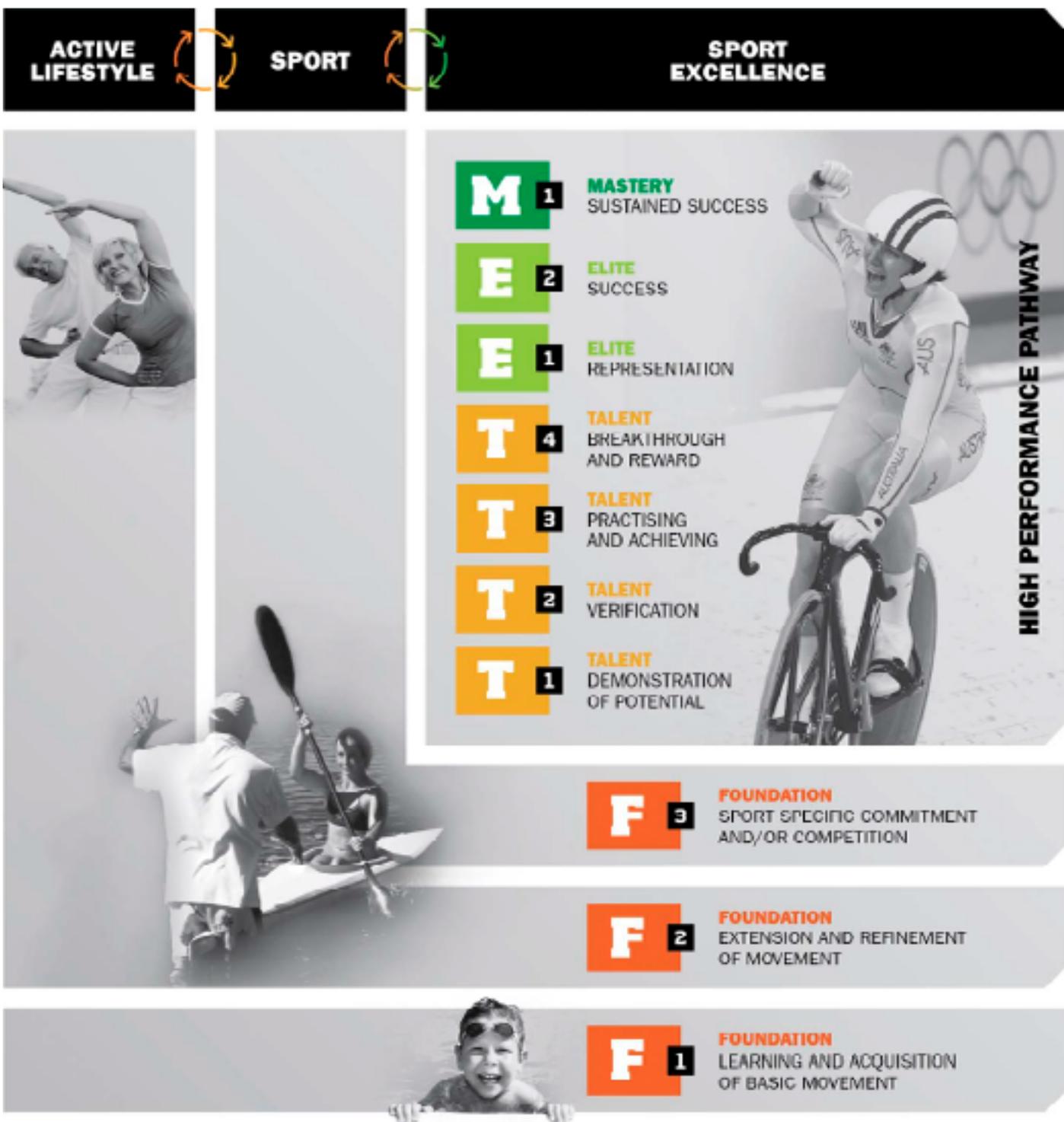


Figure 7: The FTEM model

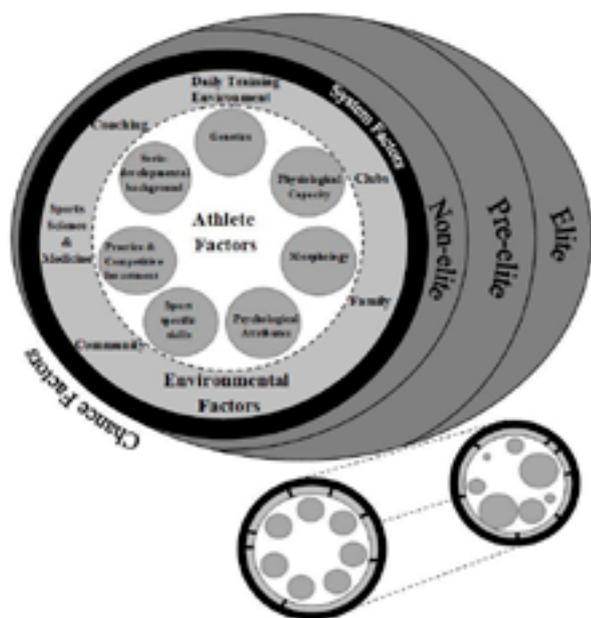


Figure 8: *The 3D-AD Model (Source: Gulbin & Weissensteiner, 2013)*

A similar model by McKee et al. (2013) referred to a ‘Lifelong Involvement in Sport and Physical Activity’ model (figure 9) –developed in Northern Ireland – also acknowledges both the progression towards high-performance sport as well as other forms of physical activity such as: (1) Active Living (characterised by the integration of physical activity into daily routines, e.g., walking whenever you can, cycling to work, etc.); (2) Active Recreation (the use of leisure time for activities that require moderate energy expenditure and produce health and/or social benefits, usually performed in a non-competitive setting), and (3) recreational organised sport - with no desire to progress ‘up’ the levels towards higher competitive standards. Hulsteen et al. (2015) also explored the importance of lifelong physical activity. He conducted a systematic review of lifelong physical activity assessments and provided a definition of lifelong activity as those “sports and leisure-time activities typically performed individually or in small groups that involve minimal structure, avoid physical contact and have varying levels of intensity and competitiveness and can be carried into adulthood and old age”.

Separately, Dudley (2015) offered a different approach with a taxonomy based on four core elements: (1) movement competence; (2) rules, tactics and strategy; (3) personal motivation; and (4) social responsibility.



Figure 9: *Lifelong Involvement in Sport and Physical Activity’ model*

Overall, one key reflection is that there is substantial work to be done in adequately describing the ‘left hand side’ of the model shown in figures 7 and 9 (i.e. the non-elite sport sides of the FTEM and McKee et al, and any related frameworks). It is possible however, to inform such a task by drawing on frameworks and models in the other related areas. For example, motor competence research contains relatively well-established descriptions of motor skills, how to evaluate them, and how they progress over time (e.g., with development/maturation). The Stodden et al (2008) model (figure 10) has been very well used in the last decade: describing a cyclical relationship between motor competence and physical activity, which strengthens over time. Perceived competence and fitness are situated as mediators within this model with the idea that one can either develop a positive cyclical trajectory that results in a healthy weight status or a negative trajectory resulting in an unhealthy weight status. The highly developed nature of research in this topic may have led to its relative dominance in the discussion of physical literacy.

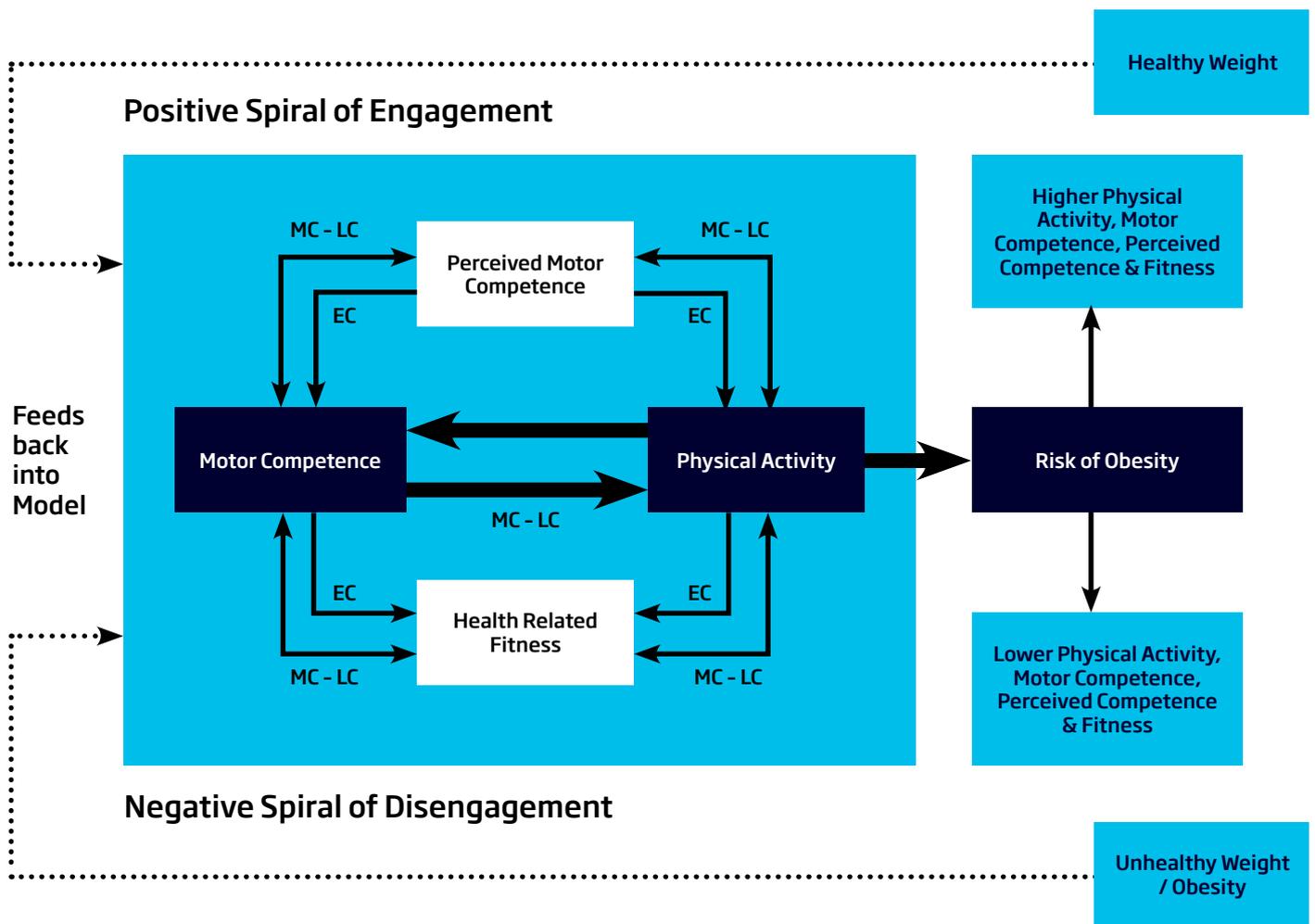


Figure 10: The Stodden et al model, 2008

Separately, motivation towards physical activity/sport is generally researched using the intrinsic-extrinsic continuum of motivational regulation, and this appears to be a promising method of informing any future physical literacy framework. This particular framework shines an illuminating light on the tension caused by the tendency of education settings to use externally determined standards, expectations and requirements, which would appear to directly undermine the 'psychological need' to experience autonomy. While there is no prescriptive pattern for how motivation should develop with age, studies tend to report (descriptively) that motivation towards PA and sport decreases through adolescence - a trend this project seeks to reverse. There is, however, a clear continuum traced from amotivation and externally regulated motivation through to intrinsic motivation (see figure 11), along with recommendations for ensuring participants' motivation is more adaptive and intrinsically

regulated. Likewise, confidence, self-efficacy and perceived competence in physical activity/sport has been well researched and tends to specify clear models for (a) how confidence/self-efficacy can be developed and (b) the nature/constitution of these concepts (see Figures 4 & 5). Like with motivation, and as noted above, while it is possible to quantify aspects of confidence or self-efficacy using subjective rating scales, and tally sub-domains into a total score, there is no clear developmental trajectory: prescriptive or descriptive.

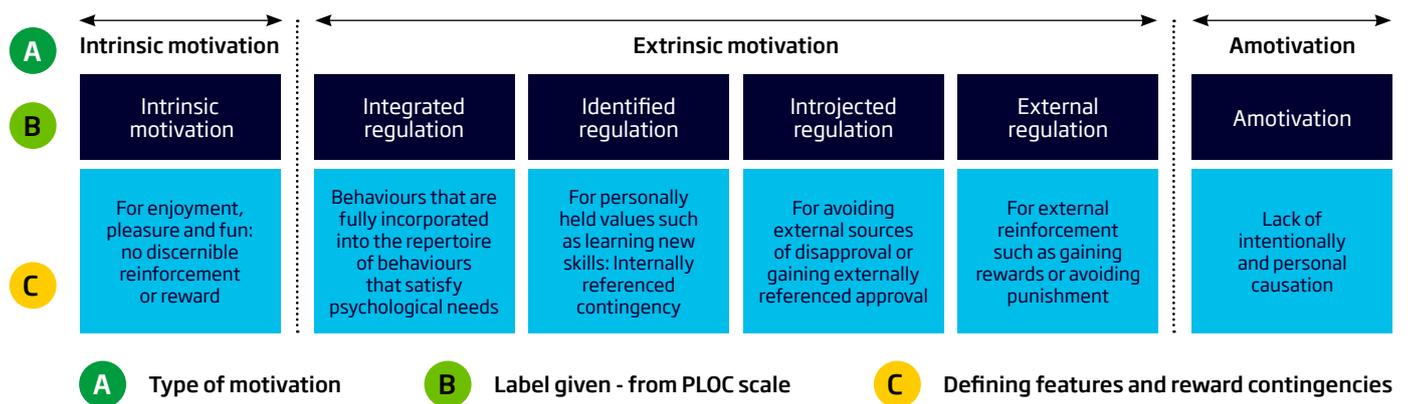
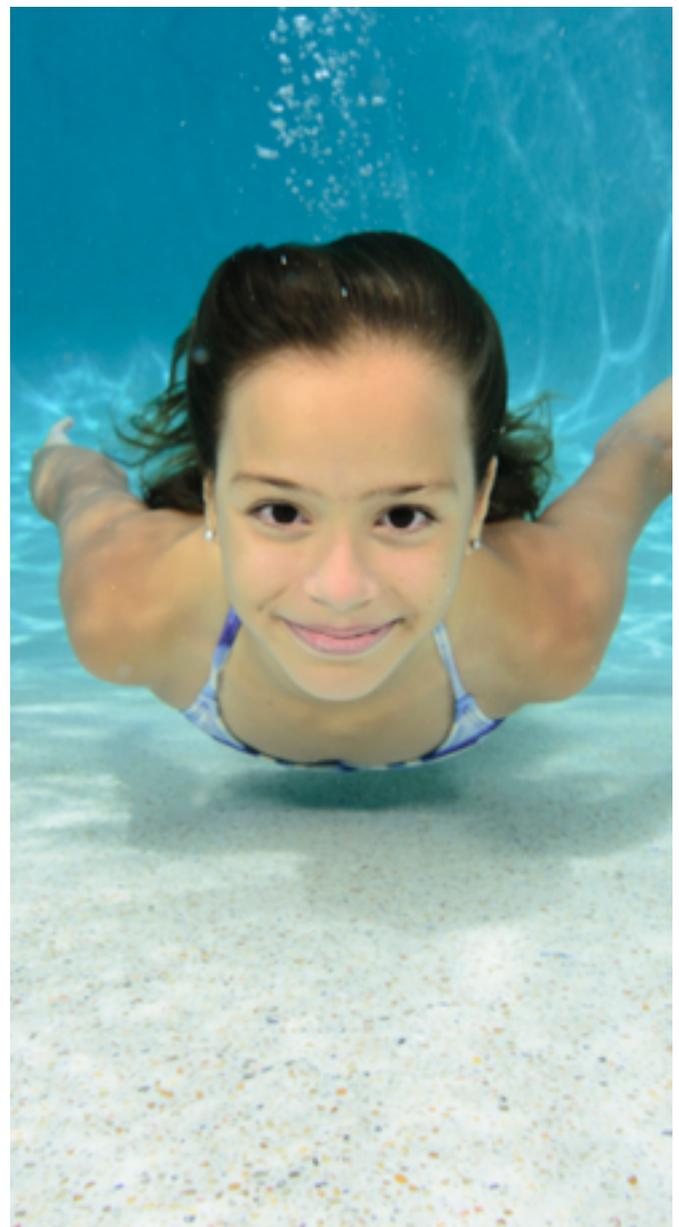


Figure 11: The different forms of motivational regulation describe by Self-Determination Theory

The frameworks or visual models regarding knowledge, attitudes and values were limited to: (1) Vygostkian Scaffolding and Zones-of-Proximal Development (Vygotski, 1929), (2) Bloom’s Taxonomy of Learning Objectives (Bloom, 1956); (3) the SOLO taxonomy (Biggs, 1989; Biggs & Collis, 2009; Biggs & Tang, 2007) and (4) simple tests of basic knowledge through quizzes (i.e., Assessment OF learning). As such, there remains scope to develop further consensus regarding how we wish to conceptualise and represent knowledge/values in relation to physical literacy, and the difference between explicit knowledge and implicit beliefs (see Figure 12).

Another train of thought that is starting to permeate in the physical literacy literature is that the concept may be aligned to a post-Piagetian notion of development. Dudley (2015) argued that Piagetian modes (sensory-motor, intuitive, concrete symbolic and formal) can be observed in physical literacy development spanning cognitive, affective and psychomotor development. In relation to physical literacy, he argued that it would be a reasonable expectation that people should be able to produce formal mode learning responses with increased physical literacy. However, he also reflects on Boulton-Lewis’s (1998, p. 206) proposition that - when confronted by new and challenging concepts - people often revert to a more simplistic concrete-symbolic mode of operation.



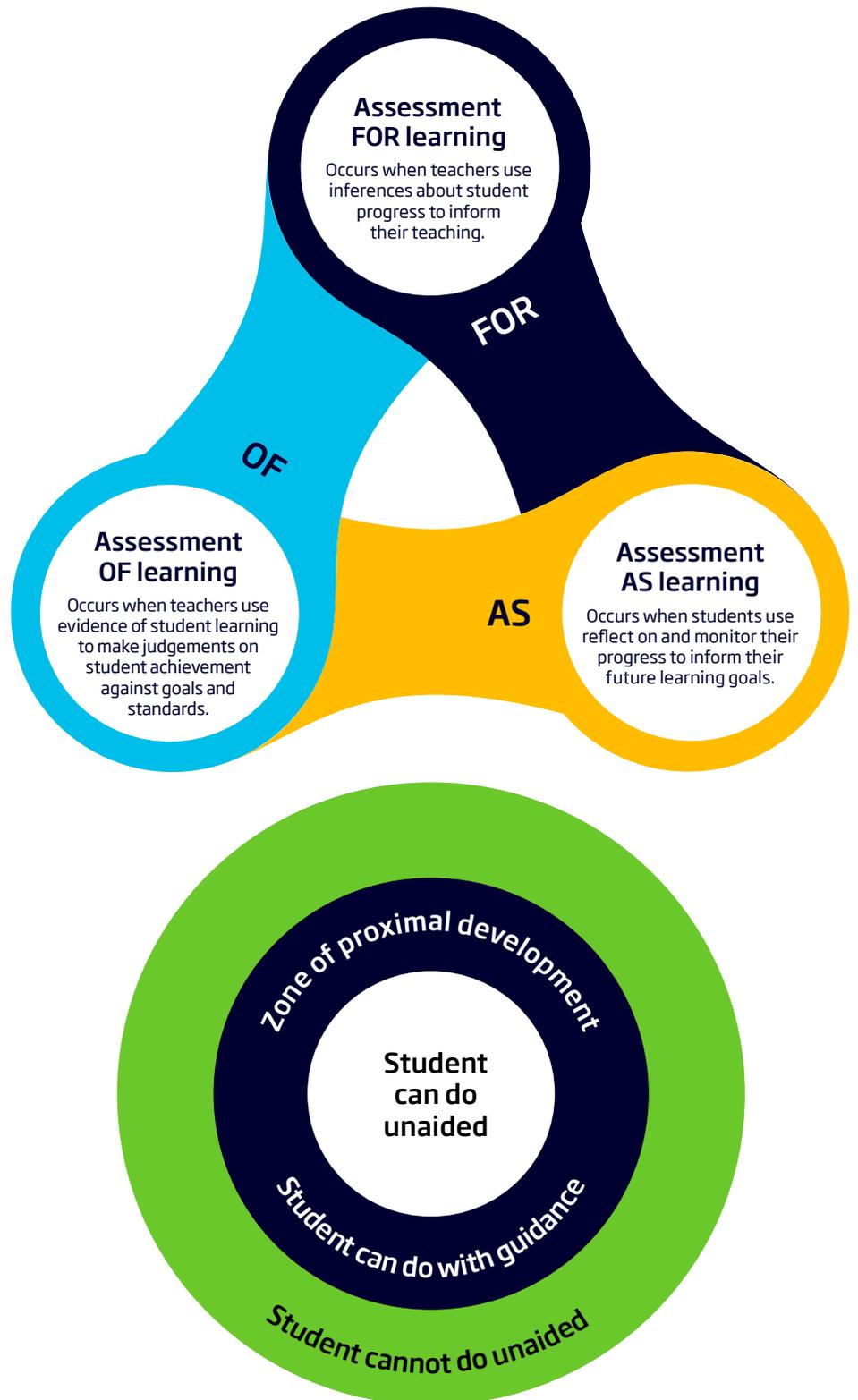
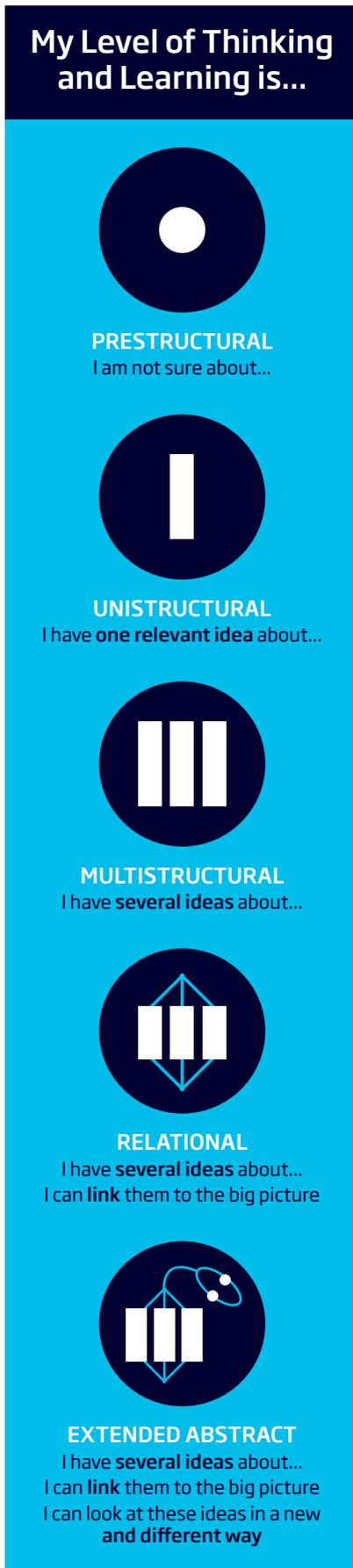
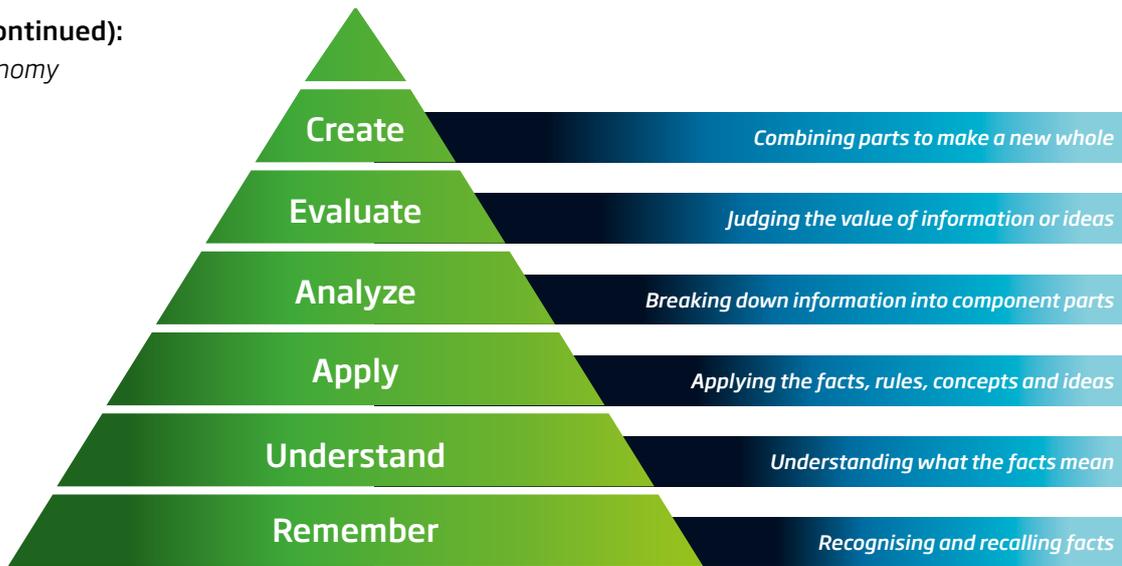


Figure 12: Visual models to represent the SOLO taxonomy (left), 'assessment OF learning' (top, right), and Vygotski's 'zone of proximal development' (right, bottom).

Figure 12 (continued):
Bloom's taxonomy



Regarding physical self-perceptions, there was a relatively clear model adopted by all papers addressing this topic, the Physical Self Perception Profile (PSPP) (figure 13), which has been adapted for children, adolescents, adults and across cultures. The model specifies a hierarchical construction of physical self-perceptions, and generally attempts to assess both one's perception of a particular attribute as well as one's satisfaction with that rating/perception.

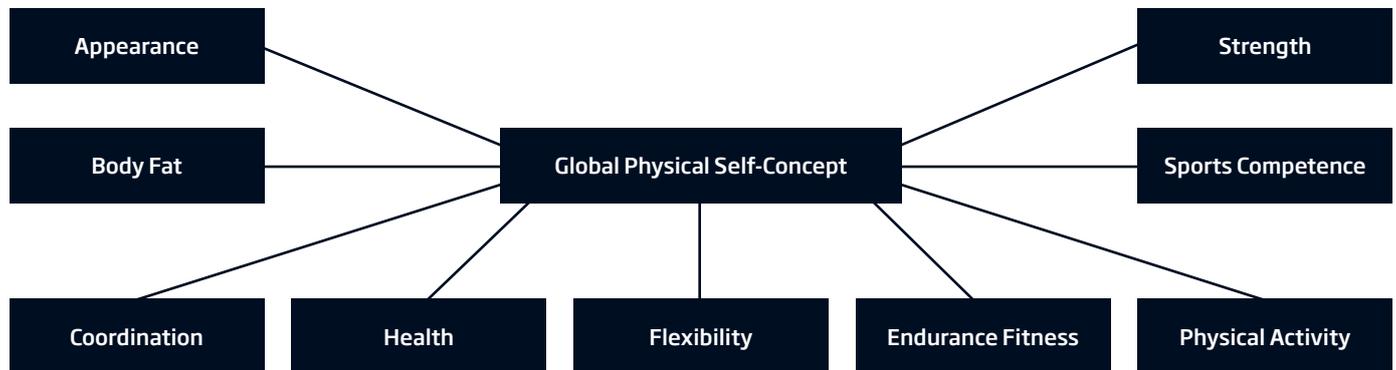


Figure 13: *Fox and Corbin's model of self-concept and self-perceptions*

The literature reflects that perceived competence towards physical movement is initially high and then starts to decrease when children make peer comparisons and start to understand their ability in relation to the world around them (around 8 years according to Harter, 1982). Recent literature in the motor competence field shows an extension of this model to include perceived motor competence, as a subset of perceived physical confidence. This was hypothesised by Stodden et al (2008) and now there is evidence of operationalisation in terms of measurement development, i.e. in young children (Barnett, 2015), and in adolescents, particularly around perceived motor confidence (McGrane, 2016).

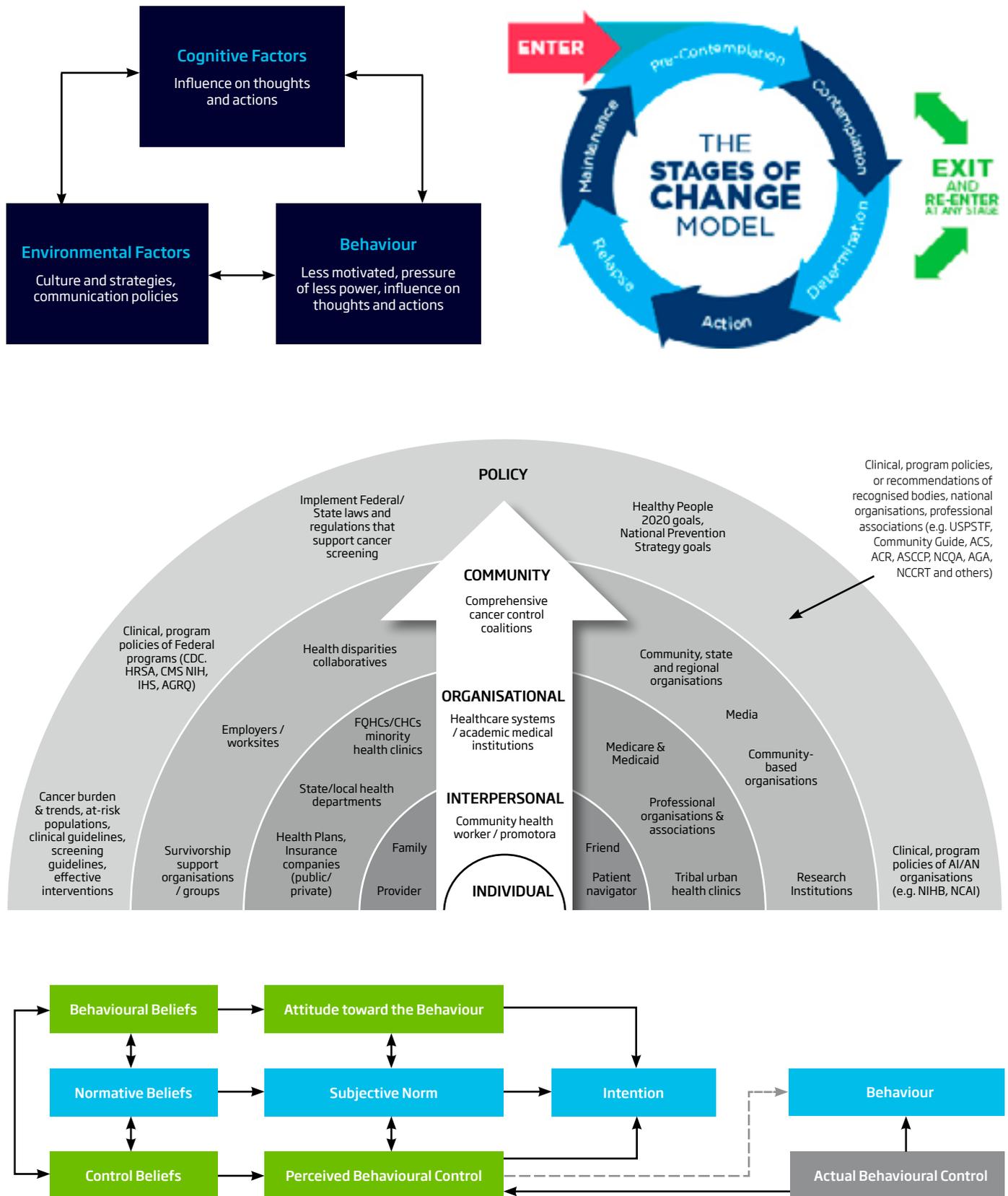


Figure 14: Top-left, the social-cognitive model; top right, the trans-theoretical model of behavior change; middle, the socio-ecological model; bottom, the theory of reasoned action (and/or planned behavior).

Replicating motivation, confidence, knowledge and other topic areas, the measurement of self-perceptions contained different questioning approaches (picture based, wordings, number of items) in relation to reading and comprehension ability. Of course, in all these cases it is worth questioning whether progression should be strictly tied to age or maturation, or whether it occurs in a predictable linear sequence. The definitions of many of the core constructs in relation to physical literacy tend to emphasise dynamic, complex and evolving patterns of development that will be unique according to individuals, contexts and cultures.

Frameworks for the promotion of physical activity (or reduction of sedentariness) tended to emphasise theories of behaviour change - including (1) social cognitive theory (Bandura, 1991); (2) the socio-ecological model (Bronfenbrenner, 1994); (3) the trans-theoretical model (Prochaska & Velicer, 1997); (4) theory of reasoned action (and/or theory of planned behavior) - (Ajzen & Fishbein, 1980, 2005; Azjen, 1991; Fishbein & Ajzen, 1975) (see figure 14); and (5) self-determination theory (as described earlier - Ryan & Deci, 2000).

As elsewhere, there are no clear developmental trajectories predicted by these models, but in some cases there are identifiable patterns of change - for example from 'pre-contemplation' (disinterested) in the trans-theoretical model to action and maintenance of a desired/adaptive behaviour. The models each place a different emphasis on the causes of behaviour - in this case physical activity - with some focusing on social and environmental factors and offering little agency to the participant, yet others placing almost all the power and agency with the individual and much less in the environment/context. Likewise, the role of information and knowledge varies from a relatively explicit educational focus in some approaches, to more implicit and attitudinal in others - re-emphasising the importance of clarifying what messages we would like to develop explicitly versus implicitly in our own approach.

Studies examining pedagogical interventions and sport promotion elements fall under the 'interventions and strategies', which are not within the scope of this paper.



Discussion and Reflections

KEY FINDINGS

- > The quality of evidence in physical literacy is extremely modest; broader sampling methods identified a stronger research base for some related concepts
- > There are clear consistencies and reinforcing themes between the core elements of physical literacy and the findings of research in the related topics
- > The contribution and relative importance of specific elements is unclear
- > It is important to view physical literacy as the holistic integration of themes; attempts to reduce or simplify into separate component parts undermines a full and complete understanding of the concept
- > Physical literacy may form a coherent 'organising framework' for the interpretation of findings from various fields
- > Instead of being constrained to choose certain psychological constructs, it may be more robust and inclusive to describe analytic levels or learning domains, such as Physical, Affective, Cognitive and Social
- > Current measurement approaches may be measuring something, but perhaps not the underlying 'thing' intended by many proponents of physical literacy
- > Physical literacy and many of its component constructs do not offer a consistent developmental trajectory
- > Physical literacy is argued to be a constantly evolving and dynamic process, and thus unique to each individual at any point in time

This report has detailed the approach taken in creating an academically sound research base for the establishment of a physical literacy definition and standard for Australia, as well as outlining some of the early themes to emerge from that research-base. We expanded our searching to include topics commonly related to physical literacy, as well as drawing on papers that have directly considered physical literacy, and in this way we were able to identify extremely relevant and useful concepts, some of which had a stronger research-base supporting them. Overall, however, the quality of evidence in relation to physical literacy is extremely modest, with only research in motor competence, physical self-concept and physical activity promotion generating consistently high quality evidence. We would argue that by expending our search to include related topics, and not just papers on physical literacy, our research-base is as strong as it can be at this point in time and clearly stronger than if it had depended exclusively on physical literacy literature.

In relation to the definition of physical literacy, it is clear that physical and motor capabilities, motivation, confidence and knowledge/values play a key role - although the specific choices of these terms, their contributions and relative importance all remain largely unacknowledged. Instead of being constrained to choose certain psychological constructs (i.e., over others), it may be more robust and inclusive to describe analytic levels or learning domains, such as Physical, Affective, Cognitive and Social. Such a distinction would be consistent with: recent statements clarifying physical literacy (e.g., Table 1); the educational curriculum for Australia; and several recent systematic reviews (e.g., Bailey, 2006; Eime, Young, Harvey, Charity, & Payne, 2013; Janssen & Leblanc, 2010). Likewise, many definitions emphasise the importance of viewing physical literacy as the holistic integration of themes, with attempts to reduce or simplify physical literacy into separate component parts argued to undermine a full and complete understanding of the concept. In this light, current measurement approaches may be measuring something, but perhaps

not the underlying 'thing' intended by many proponents of physical literacy. Furthermore, physical literacy is argued to be a constantly evolving and dynamic process, and thus unique to each individual at any point in time. These attributes of physical literacy may necessitate the construction of a framework for understanding and mapping physical literacy, and patterns of development/progress, perhaps without the possibility of offering strict absolute (or normative) standards to be enforced. Both physical literacy and many of its component constructs do not offer such a consistent developmental trajectory (perhaps early motor development is the exception to this, where development appears to follow some patterns but note this was also viewed as potentially misleading in a recent clarification paper – Robinson et al 2016). We note, however, that such a trend is in conflict with the necessity of creating a curriculum that specifies clear learning outcomes and developmental progressions year-on-year.

Reassuringly, there do appear to be clear consistencies and reinforcing themes between the core elements of physical literacy and the findings of research in the related topics. In fact to a large extent the boundaries between considerations such as motivation, confidence and knowledge/values become increasingly difficult to define (i.e., the overlaps in Figure 1). Furthermore, while these findings and themes strengthen the understanding of physical literacy, it may be possible that physical literacy forms a coherent 'organising framework' for the interpretation of findings from various fields, and sometimes with contradictory finding. For example, in circumstances where a coach, teacher or parent attempts to boost the confidence of a student or athlete through praise, based on objective measurements and achievement standards (self-efficacy theory), this may- *counter-intuitively* - undermine motivation in some participants who feel it undermines their

sense of autonomy (i.e., self-determination theory). Likewise, upon preparing and completing this review, the close interplays between research into motivation and research into attitudes/values is also instructive, and raises important issues such as the discrepancy between explicit/declarative and implicit/procedural knowledge. Upon completing this review, we feel that by exploring these synergistic links and the new insights generated by including this wider sample of literature, the resulting product for Australian physical literacy will be both stronger and more effective, quickly offering the potential to be world-leading.

Finally, reflecting on the quality of evidence available on several topics we reviewed, there appears to be an important opportunity to facilitate and encourage high-quality research on physical literacy in the future. As well as emphasising definitions, models and frameworks that encourage uptake and implementation, the current project is well-placed to develop robust definitions, clear testable models/frameworks, coherent and valid approaches to evaluation/monitoring, and - ultimately - highly effective intervention recommendations, including considerations for adaptation into local contexts. In fact, we would argue that such a scientific approach does not need to be contradictory to utilisation and adoption - as Kurt Lewin surmised: there is nothing so practical as a good theory. One thing that we would seek to do, however, is to bring an end to the argument that physical literacy is a contested construct - a claim that appears to have limited the implementation of physical literacy in Australia. We will pursue this not by simply choosing and endorsing an existing approach, but rather by understanding, analysing, and synthesising all the available information on physical literacy, and extracting the most defensible and evidence-based proposals in the formation of an expert consensus.

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