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What Is Physical Literacy, Really?

PAUL JURBALA

Applied Health Sciences, Brock University, St. Catharines, Ontario, Canada

Physical literacy has become an increasingly influential concept in the past few decades, and is being woven into education, sport, and recreation policy and practice, particularly in Canada. The term is based on a metaphor that likens movement fluency to language literacy. Use of a metaphoric rather than a theoretical foundation has enabled various interpretations and re-definitions of the term. This article aims at an understanding of physical literacy that encompasses and reunifies the interpretations, helping physical literacy to be theoretically understood, practically researched, and instrumentally employed. The division of the holistic physical literacy concept into various interpretations is traced and the metaphoric basis of physical literacy is discussed. Through this analysis the unifying theme of communication *is identified, and based on this a new definition of physical literacy is advanced and a model of physical literacy development is proposed. A series of questions that invite a multi-disciplinary approach to physical literacy research is presented.*

Keywords Physical Literacy, development, fundamental motor skill, physical activity, kinesiology

Introduction

"Mens sana in corpore sano," the notion that holistic mind–body wellness is essential to full human flourishing, is an old idea periodically revisited. A recent iteration is the concept of physical literacy (PL), advanced by Whitehead (2010) as a path to heightened embodiment and being. Since Whitehead's original work (Whitehead, 2001) the concept has been adopted by others and touted as both a new approach to physical education and a stepping stone to sport excellence. The PL concept has been embraced in Canada, where it was interpreted and popularized by the Canadian Sport for Life (CS4L) movement (Balyi & Way, 2005), made its way into the *Canadian Sport Policy 2012* as a foundation for sport participation, and is now being included by Canadian municipalities within community sport strategies (City of Mississauga Sport Plan, 2013; Vancouver Sport Strategy, 2008; Winnipeg Community Sport Policy, n.d.). The concept is also entrenched in physical education teacher training, practice, and curricula in England, Northern Ireland, Scotland, and Wales (Dowens, Dalziell, & French, 2013; McKee, Breslin, Haughey, & Donelly, 2013; Newton & Bassett, 2013; Rainer & Davies, 2013). Three different PL assessment protocols designed for practitioner use have been released (Kriellaars, 2013; Passport for Life, n.d.; Tremblay & Lloyd, 2010). Interest in PL among sport and physical activity practitioners and policy makers continues to grow with breath-taking rapidity.

Why so much support, so quickly? There is little empirical evidence that PL can be employed to stimulate interest in participation, or be a functional basis for activity programs. Rapid uptake appears to have depended on the power of the metaphor: PL is compared to language literacy, which is entrenched in social policy as fundamental

Address correspondence to Paul Jurbala, Applied Health Sciences, Brock University, 500 Glenridge Avenue, St. Catharines, Ontario, Canada. E-mail: pj11nl@brocku.ca

to full human development and flourishing (Ontario Ministry of Education: Literacy and Numeracy Strategy, n.d.; United Nations Educational Scientific and Cultural Organization (UNESCO) Education: Literacy, n.d.). Proponents have also been able to reinterpret and redefine it for instrumental purposes related to physical activity and sport (Higgs, 2010). While this may have helped increase the popularity of the construct, it has resulted in competing definitions (Higgs, 2010; Whitehead, 2010) and debate among practitioners about how best to employ it. The development of PL assessment protocols that proceed from different definitions and use different practical approaches to measurement (Kriellaars, 2013; Tremblay & Lloyd, 2010) threaten to further confuse the issue. The zeal of its proponents may prove self-defeating; without a coherent theoretical basis and a body of supporting evidence, hopes for a *PL movement* may prove to be short-lived.

What is PL, really? Is it nothing more than a powerful metaphor that captures the imagination? A certain set of fundamental movement skills (FMS)? Is it a philosophical rebuttal of mind–body dualism? Or is it old wine in a new bottle, a catchphrase that rebrands plain old physical activity? One can draw from numerous contemporary definitions to support each of these positions. In an attempt to reconcile these disparities, this article first traces the diversification of the concept as it has been appropriated for a variety of instrumental ends. An analysis of the metaphor underlying PL is offered, and from this a new definition encompassing the disparate definitions while retaining fidelity to the original holistic concept is presented. Finally, a model of PL development that suggests a series of research questions across a range of disciplines is proposed. With development of a better-articulated theory of PL, researchers may be able to validate the construct and practitioners may be able to employ it effectively to help fulfill its promise.

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Diffusion of a Concept

As the PL concept emerged into the public realm it has been interpreted in a number of different ways. A main purpose of this article is to see whether there is an understanding of the concept that can encompass these disparate uses, and allow it to be theoretically understood, practically researched, and instrumentally employed. To begin it is useful to review the origins, development, and recent purposing of the term.

PL, as elaborated by Whitehead and successors, is a relatively new construct. The term was used as early as 1930 in educational journals in the United States and Britain as a metaphor that invited comparison with language literacy. The theme of these early uses was that the fast pace of industrial modernity demanded PL just as much as intellectual literacy—"A physically fit America becomes more necessary with modern mechanical inventions" (Pennsylvania School Journal, 1930, p. 78). Acknowledging the term has been in use in the United Kingdom since at least the 1980s, Margaret Whitehead began elaborating the ideas beginning in the early 1990s (Whitehead, 2001, 2007), and has been largely responsible for giving the concept its current form.

Whitehead presents PL as an aspect of lived embodiment and a pathway to a better quality of life. Drawing on existential and phenomenological perspectives, she asserted a monist view that erases mind–body duality through awareness of the self as active embodiment, and claimed that through a fuller realization, exploration and expression of human physicality humans heighten self-awareness (Whitehead, 2007). She provided the following definition:

A. Physical literacy can be described as the ability and motivation to capitalise on our motile potential to make a significant contribution to the quality of life. As humans

we all exhibit this potential; however, its specific expression will be particular to the culture in which we live and the motile capacities with which we are endowed.

B. An individual who is physically literate moves with poise, economy and confidence in a wide variety of physically challenging situations. Furthermore the individual is perceptive in 'reading' all aspects of the physical environment, anticipating movement needs or possibilities and responding appropriately to these, with intelligence and imagination.

C. A physically literate individual has a well-established sense of self as embodied in the world. This, together with an articulate interaction with the environment, engenders positive self-esteem and self-confidence. Furthermore, sensitivity to and awareness of our embodied capacities leads to fluent self-expression through non-verbal communication, and to perceptive and empathetic interaction with others.

D. In addition the individual has the ability to identify and articulate the essential qualities that influence the effectiveness of his/her own movement performance, and has an understanding of the principles of embodied health, with respect to basic aspects such as exercise, sleep and nutrition. (Whitehead, 2010, p. 34)

The idea of a better life through PL has excited many, particularly practitioners in the fields of education, recreation, public health and sport, who have seized on the concept to advance their interest in increasing levels of physical activity or improving sport performance. Policy makers have woven it into national, provincial, and municipal policies and sport and recreation funding programs. The rapid rise of the concept abetted by various groups working for broad dissemination encouraged a catholic interpretation; as a result Whitehead's broad definition has been truncated and a number of "flavors" of PL have emerged. Four of these conceptions will be reviewed here: phenomenological, motor development, practical, and political.

Phenomenological PL

Whitehead (2010) wrote,

> Physical literacy is a concept developed from a philosophical study of monism, existentialism and phenomenology . . . . The concept seemed to encapsulate the way that our embodied dimension contributes to our humanness, through playing a key role in our interaction with the world and thus the realisation of our individual potential. (p. 78)

She rejected the mechanistic approach of contemporary physical education and sport coaching in which the individual is seen as sum-of-parts to be continually dis- and re-assembled in some improved form. She argued that mind/body cannot be separated (monism), that humans create their being existentially through their lived experience, and that experience can only be understood from the standpoint of the individual who lives it, phenomenologically. Therefore the purpose of physical education must be to support each individual to develop an understanding of his/her embodiment and movement abilities inherent in embodiment: the "ability to identify and articulate the essential qualities that influence the effectiveness of his/her own movement performance" (Whitehead, 2007, p. 288). Through intellectually and emotionally engaged participation in a wide variety of movement forms, the individual is prepared for a fulfilling, healthful life in which physical activity is prized and sustained.

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Others have expressed similar ideas. Rebecca Lloyd examined flow states (Csikszentmihalyi, 1990) from the perspective of both teacher and learner of physical activity (Lloyd & Smith, 2006) and commented on the ways in which structure and discipline in movement pedagogy diminish the possibility of creative engagement and detach children from a nascent connection to their world (Lloyd, 2012). Considering the advent of PL within the physical education curriculum, she asks whether the metaphoric comparison to language literacy is being used in ways that simply perpetuate views of body-as-object, for example introduction of normative assessments of PL (Tremblay & Lloyd, 2010) which parallel existing standardized tests of reading and writing. Similarly, Lundvall and Tidén (2013) identified tensions and conflicts between the holistic conception of PL and its practice in the Swedish PE curriculum, noting the need for approaches that support the development of embodied knowledge. Like Lloyd they distinguished between traditional normative assessment that categorizes students, and possible ipsative methods that could encourage learners to reflect on their personal development and potential.

As envisaged by Whitehead, Lloyd, and others, PL-supportive curricula and *praxis* in educational and sport settings would be re-imagined and considerably revised from the mechanistic and discipline-based approaches in current use. Learners would be encouraged to create and explore their movement, to nurture a greater connection between their embodiment and the physical world, and to reflect upon and understand the experiences of movement. Individuals would trace the growth of their own abilities and confidence, rather than be subjected to competitive comparison against peers or published norms. Disciplinary constraints—the coach's whistle, standing in tidy lines, waiting one's turn to perform—would give way to intrinsic challenge, individual experimentation, and self-selected levels of risk. This ideal is at odds with normative assessments of physical education mandated in some jurisdictions; compared to the other conceptions of PL reviewed here, the phenomenological may imply the most radical revision to current practice. However, new assessments such as Physical and Health Education (PHE) Canada's "Passport for Life" (n.d.) facilitate multi-year tracking of student progress, offering the possibility of ipsative comparison and supporting the idea of the lifetime PL journey (Whitehead, 2010).

PL as Motor Development

Much explanation of PL in physical education curricula and sport coaching pedagogy is focused on the need for development of FMS, linked to the maturity and developmental readiness of the learner. This parallels and draws upon a larger body of motor learning research and theory.

In sport, PL has been positioned as a foundation of athletic development (Balyi & Way, 2005; Canadian Sport Policy, 2012; Higgs et al., 2005). PL is framed as a set of capabilities or achievements: "Individuals are physically literate when they have acquired the movement skills and confidence to enjoy a variety of sports and physical activities" (Kriellaars, 2013, p. 4). Canadian Sport for Life, in promoting the Long-Term Athlete Development (LTAD) framework, has positioned PL as the "cornerstone . . . upon which excellence and lifelong participation in sport and physical activity can be built" (Way, Balyi, Trono, Harber & Jurbala, 2014, p. 15). The notion of PL as a foundation for sport excellence is emphasized in descriptions of the early LTAD stages, from birth to the adolescent growth spurt, which are dubbed the "physical literacy stages." In these stages, the development of PL is characterized as the attainment of a lengthy list of locomotor, object control and balance skills, without which "a child will have difficulty participating in any sport. For example, to enjoy baseball, basketball, cricket, football, netball, handball, rugby and softball, the simple skill

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of catching must be mastered" (Way, Balyi, Trono, Harber, & Jurbala, 2014, p. 24). Higgs et al. (2005) asserted that to develop PL, children must learn FMS including locomotor, object control and balance and agility skills, and fundamental sport skills which sequence movements to meet intended outcomes relevant to the rules of diverse sport activities, in four basic environments, on the ground, in water, on snow and ice, and in the air.

The model of PL advanced by CS4L echoes stage-based models of motor development proposed over 30 years ago by Gallahue (1982) and Haubenstricker and Seefeldt (1986) which hold that early mastery of FMS is prerequisite for optimal later development of complex sport and dance skills. Drawing on the well-known progression of movement skill development from immature to mature forms, Haubenstricker and Seefeldt hypothesized a "proficiency barrier" between early and middle childhood: a lack of early proficiency may inhibit the development of more complex integrated skills later. More recently, Stodden and colleagues (2008) presented a model in which motor competence, mediated by self-perceived competence and fitness, influences levels of physical activity and obesity:

> We hypothesize (a) positive spiral of engagement will occur among moderately and highly skilled children. Children with higher perceived and actual motor skill competence will more likely persist in physical activities, especially those they perceive as fun and intrinsically rewarding . . . . As children move from childhood to adolescence, an obvious and significant 'physical activity divide' will occur between low-skilled, inactive children who perceive themselves as poorly skilled, and their higher skilled, more active counterparts who find physical activity rewarding and fun. (p. 297).

Stodden has gone on to explore the relationships between motor skill competence and fitness in young adults (Stodden, Langendorfer & Robertson, 2009), and has attempted to test Haubenstricker and Seefeldt's (1986) hypothesis more directly (Stodden, True, Langendorfer, & Gao, 2013).

Positive relationships between FMS and levels of physical activity have been found in 5- to 8-year-old children (Capio, Sit, Eguia, & Abernethy, 2014; Laukkanen, Pesola, Havu, Sääkslahti, & Finni, 2014). However, others found no significant relationship between skill or perceived skill and moderate-to-vigorous physical activity in children (Barnett, Ridgers, & Salmon, 2015). In separate meta-analyses, reviewers concluded that motor skill development interventions are effective in producing statistically significant improvements in both object-control and locomotor skills in children (Logan, Robinson, Wilson, & Lucas, 2012), and that high levels of FMS consistently relate to higher levels of child physical activity, but are of low predictive value for level of activity in adults (Holfelder & Schott, 2014). The latter authors conclude that consistent methodologies and longitudinal studies are needed to better elucidate these relationships, and that factors such as perceived competence, socio-economic status, and others need be considered in what they described as "multifactorial complexity which stems from the interdisciplinary nature of this area" (Holfelder & Schott, 2014, p. 389).

In sum, both proponents of PL and those who do not mention it have theorized that early motor skill development is necessary for later proficiency in complex movements including sport. Researchers have been able to establish a relationship between acquisition of FMS and physical activity, but this has not yielded clear evidence of a cause-and-effect relationship between skill acquisition in childhood and a propensity to increased physical activity in later life. A causal chain of increased motor skill resulting in increased self-efficacy leading to increased activity and/or improved physical fitness has

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been hypothesized, and is suggested by some research findings, but the multiple confounding effects observed in open systems, as well as methodological differences and lack of longitudinal studies, mean that causal links are not firmly established.

Practical PL

Many interpreters of PL, presumably believing that both the phenomenological and motor learning conceptions of PL are too abstracted and inaccessible to be useful to practitioners, have chosen to focus on outcomes rather than processes. What can a physically literate person *do,* and how will they *benefit?* In this conception PL has been defined as a set of competencies or a toolkit required for access to a more physically active, hence healthy, life. For example Tremblay and Lloyd (2010) stated, "Physical literacy is the foundation of skills or tools . . . that children need to possess or develop in order to receive the inherent benefits of taking part in physical activity and sport for life-long enjoyment and success" (p. 28).

Many believe PL offers a new approach for school-based physical education. It is asserted that PL-based school programming "is likely to be a richer and more real learning experience for secondary aged pupils" (Killingbeck, Bowler, Golding, & Sammon, 2007, p. 20) and state that given the adoption of PL objectives in school curricula, physical educators must understand how to deliver PL-based programs (Mandigo, Francis, Lodewyk, & Lopez, 2009). However in early deployment, the curricular aspirations for PL confront the challenge of entrenched culture. A study of new physical education teachers in Ontario revealed a desire for a clearer definition of PL, limited emphasis in teacher training on how to deliver a PL curriculum, systemic tendency to default to sport-based physical education, and calls for testing of PL, since in the words of one teacher "I need to put a grade on a report card" (Tristani, 2014). It may be that what is needed by practitioners is not simpler definitions, but more information on what PL-supportive programs look like in practice. Some articles aimed at physical educators aim to do this: the PL feature issue of the International Council of Sport Science and Physical Education (ICSSPE) *Journal of Sport Science and Physical Education* contains a number of articles promoting practical approaches to operationalizing the broader, holistic concept in physical education (Weinberg, 2013).

Assertions that PL can be a rallying point for renewed effort to increase physical activity and that early attainment of PL is essential for later success in sport, along with inclusion of PL in physical education curricula, have led to demand for assessment protocols. Both practitioners and policy makers want empirical support for the efficacy of PL programs. However, the exigencies of creating practical tests lead to reductionist reverse engineering of the original concept. Tremblay and Lloyd (2010) tested four core domains. The Physical Literacy Assessment for Youth (Kriellaars, 2013) is limited to a set of ground-based locomotor, object control and balance and stability tests combined with questions to assess understanding. In proposing improved PL assessment batteries Tompsett, Burkett, and McKean (2014) appeared to conflate PL with FMS; while noting in passing the need to establish learning and understanding in assessment, they focused almost exclusively on the superiority of FMS tests over sport skill tests in assessing PL.

The conflation of PL with FMS is perhaps even more evident in sport coaching. Pot and van Hilvoorde (2013) noted that in the Netherlands, PL is primarily understood by national sport organizations as a stepping-stone to elite performance, and CS4L was described PL in part as "the cornerstone of both participation and excellence in physical activity and sport" (Way et al., 2014, p. 23). Soccer Canada (n.d.) defined PL as simply "the

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mastering of fundamental movement skills and fundamental sport skills" (p. 45) while the Ontario Soccer Association (n.d.) refered to PL obliquely and only in terms of multi-lateral sport development, encouraging participation in complimentary sports such as gymnastics, swimming, and skating. While the systematic dumbing down of PL for practitioners has been criticized (Almond, 2013), the current trend in practitioner-focused literature is avoid explaining PL at all, or to over-simplify, stripping out much of the holism inherent in Whitehead's definitions.

PL in Policy

The inclusion of PL in sport, recreation, and education policy has been important in popularizing the PL concept and driving initiatives aimed at operationalizing it. The concept has been integrated in position papers and Non Government Organization (NGO) policy in at least 10 nations (Weinberg, 2013). In a few cases, most notably in Canada, PL has also emerged in government policy at departmental levels. The Canadian Sport Policy 2012, endorsed by Canada's provincial and federal ministers of sport, positions PL as "a precondition for the lifelong participation in, and enjoyment of, sport" (p. 7). Canadian municipalities are including PL within their community sport strategies; (City of Mississauga Sport Plan, 2013; Vancouver Sport Strategy, 2008; Winnipeg Community Sport Policy, n.d.) and the government of Ontario is providing funding support to communities to "implement PHYSICAL LITERACY . . . as a foundation for lifelong participation" (Ontario Sport and Recreation Communities Fund Program Guidelines 2013–14, 2013, p. 2). PL appears as a basic element in the Alberta Sport Plan (2014), and most recently, in the *Framework for Recreation in Canada 2015* produced by Canada's national and provincial/territorial recreation associations. It also appears in the Ontario physical education curriculum for grades 1–8 as an objective of the movement competence strand (The Ontario Curriculum, Grades 1–8: Health and Physical Education, 2010).

In Canadian policy, definitions appear to be drawn from ones popularized by CS4L or Physical and Health Education Canada. PL is generally described as the basis of active participation, sport success and ultimately improved health, consistent with Higgs et al. (2005) who asserted the potential of PL to mitigate chronic health problems related to inactivity and obesity, "to create an active and healthy population ALL Canadian children need a sound foundation of movement and sport skills to build on later in life; and this foundation is called Physical Literacy" (p. 4). Policy statements are typically aspirational and use a justification logic emphasizing the instrumental benefits of enhanced PL without providing a detailed understanding of how or why PL-supportive programs are different. This may leave the impression that PL is a term interchangeable with "physical activity" or "physical fitness."

Diversity or Dissensus?

The PL concept has been interpreted in ways that facilitate instrumental use but diverge from original holistic conceptions. Increasingly, the term is used to describe a measurable outcome of a developmental process. A child participates in diverse physical activities, develops motor skill proficiency and fitness, and becomes one of the individuals "who are physically literate (and) move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person" (PHE Canada, n.d.). Proponents of PL present it as an attainment or a steppingstone to future success rather than as a continually emergent state of being, diminishing

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PL to little more than the result of more/better physical activity. Simplified definitions also conflate means and ends: if PL means acquisition of the movement skill competence and confidence to enjoy a variety of sports and physical activities, how are humans to determine whether competence derives from confidence, or vice versa? The net effect is to decenter PL so it is no longer seen as an inherent human capacity, but rather a discrete set of skills to be taught and evaluated by technicians (i.e., teachers and sport coaches), and a social imperative to be advanced by technocrats (i.e., policy and decision makers).

Ultimately, making the PL concept accessible to practitioners requires a more thoughtful approach. Stripping out the metaphysical language of the phenomenologists removes that which makes PL more than simple physical activity: concern with the experience and interpretation of movement, and the learning and self-awareness that accompanies it. Glossing the motor development research may omit the fact that the proficiency barrier (Haubenstricker & Seefeldt, 1986) is a hypothesis that remains to be validated. Most crucially, separating the phenomenological and the motor commits the crime of reductionism, negating Whitehead's original idea of the inseparability of mind and body and with it the potential for new approaches to movement learning and pedagogy. This, in turn, makes it impossible to produce the empirical evidence that PL "works," as demanded by both practitioner and policy maker: all that can be produced is evidence that childhood acquisition of FMS "works" in some limited ways. A holistic theory of PL cannot be founded on a reductionist model, and a theory purporting to be based in science cannot casually conflate means and ends. If one is to take PL seriously, one must be able to articulate coherent theory and testable hypotheses, and gather evidence showing PL to be more than simple physical activity or FMS.

More Than a Metaphor

Was PL ever intended to be theory? The initial usages found in educational journals in the 1930s are built on a literacy metaphor designed to appeal to educators. Is PL simply and only a metaphor intended to capture public attention, or does the metaphor illuminate a deeper, testable phenomenon? The term itself is built on a comparison with linguistic literacy, the ability to read and write. The power of metaphor in language, the sciences, philosophy, and other fields has been much commented upon (cf., Kuhn, 1996; Lakoff, 1993; Pinker, 2007); metaphor is not merely ornamental but is central to human mental process, revealed in many aspects of language, and foundational to the development of theory and knowledge. In the case of PL there is an anachronistic aspect to comparing the expression of movement by the physical self to the relatively recent, in evolutionary terms, development of language and writing; it is as though humans are grasping to give a name to what is immanent, yet somehow ineffable, in their nature. Be that as it may, the term PL captures the attention by a metaphorical comparison between two traits felt to be essential to the selves—the ability to move fluently and the ability to use language fluently.

PL is an example of a novel metaphor (Bowdle & Gentner 2005) in which the base term *literacy* is not typically associated with a metaphoric sense. Until recently one was not used to talking about PL as an accepted use of the word "literacy," and consequently, one grasps for the new meaning by a process of mental comparison. Simply put, novel metaphors make one think. Novel metaphors provide a way for researchers to make a theoretical claim when they have, as yet, no literal evidence, and over time as knowledge advances the metaphors become constitutive of the emergent reality (Cornelissen & Kafouros, 2008). This is currently the case with PL; because extensive research findings on the development and expression of PL do not yet exist, the metaphoric sense, and therefore the generally

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accepted meaning of PL, is still fluid. This fluidity has enabled the multiple conceptions and definitions which have arisen.

Can one understand PL as a theory-constitutive metaphor, or is it simply a metaphor of convenience intended to create a comparison one believes will be instrumentally useful? It appears that to date, the primary concern has been to use the metaphor to make the concept easy to understand for practitioners and policy makers. Whitehead says one reason the term was chosen was that it "was also helpful as it is a concept commonly used to describe a human characteristic that . . . is within the grasp of most people" (Whitehead, 2010, p. 26). The idea that the term allows the layperson to associate with the perceived importance attached to language literacy was echoed by Higgs (2010):

> Governments understand the concept of literacy. One needs to learn to read as a child in order to become a fully functioning member of society; through use of the term physical literacy, many stakeholders have come to understand that children and youth need a repertoire of physical skills, or "physical literacy'' that will enable them to become physically active, and therefore healthier, adults. (p. 7)

There is risk in allowing the metaphor to become no more than assertion that building a broad repertoire of movement skills is as important as building reading and writing skills. Inevitably, policy makers will want evidence that spending on PL development is more efficacious than the programs they are currently funding. Such evidence cannot be gathered without a robust theoretical framework for PL as the basis for a program of applied research.

To move from facile comparisons to a theory-constitutive usage, a deeper reading of the PL metaphor is necessary. To do this one must map the key concepts shared by the two conceptual domains: language literacy and the reading of and physical movement response to an environment (Lakoff, 1993). The author believes that the power of the metaphor depends on the similarities between language-based communication and physical communication with the environment. To again quote Whitehead (2010):

> Physically literate individuals . . . should be able to achieve an effective and dynamic interaction within a wide variety of familiar and novel environments. The richer the vocabulary of competences the better individuals will be able to respond . . . . The ability to interact with the world is referred to in the definition of physical literacy as "reading" the environment. (p. 75)

The metaphor of reading the environment, or in sport settings of reading the game, as precursor to responsive movement is present in other writings about PL (cf., Higgs et al., 2005; Mandigo, Francis, & Lodewyk, 2007; Mandigo & Holt, 2004). Both the linguistic and the physical domains share a sequence of *reading*, gathering information and conceptualizing, generating and internalizing meaning, and *writing*, making an expressive, externalized response to the generated meaning.

If communication is the central idea of the PL concept, theories of communication and language literacy may be productively used to elaborate it. It is not possible to provide an in-depth analysis of these theories here, so the author will only suggest how they can explicate PL. Gleick (2011) provided a chronicle of language and information up to the recent dawn of information theory and the electronic information age. Pinker (2007) drew on psychology and linguistics to illustrate how the structure of language reflects the

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workings of the thinking brain. A link between the two works is a focus on language as an imperfect medium for communication, and agreement that "language is a 'lossy' medium, discarding information about the smooth, multidimensional texture of experience" (Pinker, 2007, p. 276). Converting sensory information to language requires a kind of cognitive analog-to-symbol conversion process. From the physical perspective, information is analog: the senses bring an undifferentiated flow of light, sound, touch, and taste impulses to the brain. The brain is organized to identify patterns in the flow, which is transformed into representations of objects, events, states, and changes. On to these are mapped agency, causality, and emotion, forming ideas that may be expressed in language. The selection of relevant information, encoding into ideas and the transformation into the symbolic medium of language turns the chaos of sense information into the order of thought and speech—but only within the limitations of sensory and cognitive apparatus and the constraints of perceptual and cognitive biases. As Luhmann (1992) said, "[Communication] arises through a synthesis of three different selections, namely, selection of **information,** selection of the **utterance** of this information, and a selective **understanding or misunderstanding** of this utterance and its information." (p. 252)

What Does This Mean for PL, and for Physicality as Literacy?

First, one can understand movement as communication: the gathering of information from the environment, the selection of pertinent information from within it, the selection of action, action as movement, and movement as expression. Movement begins with cognition: the selection of shapes, sounds, kinesthetic sensations, patterns, and movement from the available information. It proceeds through decision: the processing of meaning (including affective or emotional content) that is derived from the selected stimulus, and the selection of an appropriate action. The meaning ascribed to the stimulus reflects a synthesis of both the sensory informational content (e.g., a ball moving rapidly from left to right) and the context assigned by cognition, which turns the information into "a pass from one attacking player on the left, to another on the right, who is entering a scoring position." Experience and practice help reinforce and speed this process but it is the assignment of contextual meaning rather than the reading of simple informational content that triggers the pathway. This is the ability to "read the game" (Mandigo & Holt, 2004), a process analogous to reading language and constructing meaning from written symbols. Movement is purposeful, based in intention, mediated by emotion. In essence movement is the writing of the physical in the world; but it is an expression that cannot occur without a prior reading of the world, a gathering of information and an assignment of contextualized meaning.

I contend that the idea of communication is central to PL, over-arching and reuniting the phenomenological and motor conceptions and offering new insight into development of a theory of PL. This is echoed by Whitehead (2013):

> The phrase "fluent and productive interaction" with the world, sums up the root characteristics of "literacy" in any field/area . . . . I feel it is not inappropriate . . . to describe physical literacy as identifying a human capability that affords us "*the ability to identify, understand, interpret, create, respond effectively and communicate, using the embodied human dimension, within a wide range of situations and contexts.*" (p. 26)

In this article, a communication-based definition of physical literacy is proposed:

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> The dynamic communication between the embodied self and the physical environment, which continuously integrates perceptive reading of, and appropriate response to, physical challenges.

From Metaphor to Model. A communication-based definition shifts focus to the continuous, dynamic interaction of the sensory, cognitive, motor, and musculoskeletal systems with each other and the physical environment. It is the dynamic communicative read-and-respond aspect, and the integration of systems into a whole greater than the sum of its parts that sets the concept of PL apart. Traditionally, components of movement have been studied in relatively isolated disciplines, including motor psychology, sport psychology, biomechanics, and exercise physiology, and research has been published in the journals of those respective disciplines. However, if PL is greater than the sum of its parts it cannot be understood by a simple summation of parts; research may point to important intersections, but advances in the study of PL will result from the study of interactions. This perspective is captured in the ecological approach to life and social sciences:

> a multi-disciplinary approach to the study of living systems, their environments, and the reciprocity that has evolved between the two . . . [emphasizes] the study of information transactions between living systems and their environments, especially as they pertain to perceiving situations of significance to planning and executing of purposes activated in an environment" (Kugler & Turvey 1987, cited in Handford, Davids, Bennett, & Button, 1997, p. 625).

There are several theoretical models of how FMS development may contribute to movement mastery or increased physical activity. The basic motor skill development models (Gallahue, 1982; Haubenstricker & Seefeldt, 1986) including Haubenstricker and Seefeldt's (1986) hypothesis of a proficiency barrier have been referenced above, as has Stodden's model in which motor competence, perceived motor competence, and health related fitness mediate physical activity and associated risk of obesity (Stodden et al., 2008). Clark and Metcalfe (2002), who also used metaphor as a basis for exploring motor skill development, produced a *mountain* metaphor integrating processes and products of motor development in which proficiency in various movements, built on foundations of FMS over time, resemble a series of mountain peaks. This multi-dimensional view is derived from dynamical systems theory (Clark & Metcalfe, 2002; Smith & Thelen, 2003), which provides a powerful theoretical perspective for examining evolving, integrated multi-factor processes. A theory of PL development should integrate elements of the phenomenological and motor development views while explaining how these co-evolve over time to produce proficiency and outcomes as diverse as increased levels of physical activity, better health, and improved quality of life.

Considering the broad scope of action and numerous benefits claimed by proponents of PL, a multi- or inter-disciplinary approach is needed. The model presented here (Figure 1) represents PL development as a spiral of ongoing engagement in movement that yields a number of intermediate outcomes as the individual ascends to enduring improvements in health and quality of life, or alternately descends through decreased participation with concomitant loss of self-efficacy and movement confidence. Importantly, improved quality of life is not seen as a static attainment resulting from earlier acquisition of PL, but rather a product of the ongoing cycle of communication with the physical world, expressed through movement, maintained through active engagement: metaphorically, a continuously moving spiral escalator, not a one-time trip up a staircase.

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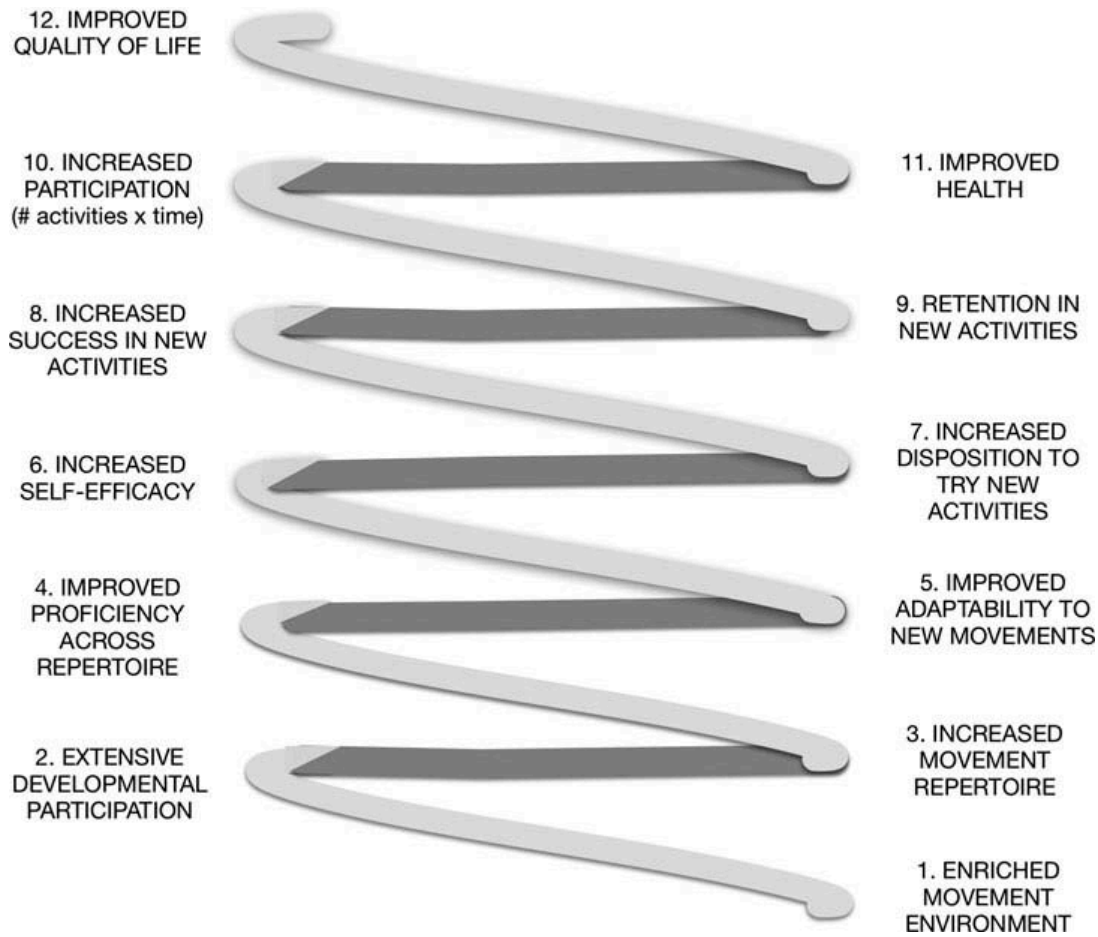

Figure 1. A proposed virtuous cycle of PL development. The hypothesized links between steps are subject to experimental verification and/or depend on social factors, such as access to movement opportunities or contributing lifestyle factors. Establishing the links between steps 1 to 5 may be considered as a research agenda for the movement sciences, from 5 to 8 for psychology, and 8 to 12 for social sciences.

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From this model a number of potential research questions present themselves. What kinds of environment, i.e., land, air, water, ice, best support the development of enhanced PL, and to what extent is PL environment-specific? Do natural environments (e.g., a forest) conduce to PL enhancement more than artificial (e.g., a gymnasium)? What scope and patterns of developmental motor activity most effectively develop proficiency across the breadth of the repertoire? How is this different at different stages of cognitive, motor, and physical development? Crucially, does having increased proficiency across an extensive movement repertoire help an individual learn new motor patterns more effectively, or more quickly? Does an individual who has developed this extensive proficiency demonstrate an expanded set of movement responses when facing a novel task? Is there a critical sub-set of FMS that has a near-equivalent enabling effect? How do movement proficiencies link to self-efficacy, and how does self-efficacy link to disposition to try new movement activities? Working upward in the virtuous cycle, the initial steps suggest questions that inform a research agenda in the movement sciences, and later steps suggest questions for psychology and the social sciences. The model supports research on particular questions by particular sciences, as well as inter-disciplinary cooperation to help understand the bigger picture. Moreover, by questioning how the *quality* of the movement experience

relates to development of motor competence or retention in physical activity, it supports the combination of phenomenological and motor learning perspectives.

For the practitioner, a communication-based developmental model of PL suggests a number of ways to support the *PL journeys* of individuals in physical education and sport settings. Instructional approaches that maintain learner engagement through use of experimentation, questioning, and progressive application of increasing cognitive challenge (e.g., reducing time and space, increasing novelty and distraction) support enhanced communication with the physical environment. Well-known approaches such as Teaching Games for Understanding (TGfU; Bunker & Thorpe, 1982), which contextualize motor skills within tactical game settings are consistent with PL. *Decision training*, (Vickers, Livingston, Umeris-Bohnert, & Holden, 1999) with its emphasis on identifying and modeling the decisions an athlete must make in employing specific skills, presents a similar opportunity in sport coaching. A focus on the individual's quality and sensation of movement along with attention to and support for socialization and shared experience helps to integrate the phenomenological aspect and enrich the learning environment, which in turn may contribute to increased engagement with the activity and thus, enhanced self-efficacy. As PL represents a holist integration of the sensory, cognitive, motor and physical, active environments must also integrate these elements to fully support PL development.

Conclusion

PL is neither a discovery nor an innovation: it is a metaphor that gives name to the innate human capacity for embodied communication with the physical environment. Just as one uses symbolic language as a framework for intellectual communication, reading, interpreting, and writing to connect with one another, so too one reads, interprets, and writes in the physical realm through movement. This embodied communication with the physical predates language and indeed predates *homo sapiens*. It is so essential that it seems to have never been named: words including movement, locomotion, and activity capture only the performative aspect, but not the sensory-cognitive process of reading the space around and selecting appropriate action, nor the feedback mechanisms which integrate sensory and proprioceptive signals and allow humans to continually modify action. The new phrase PL enables a metaphoric comparison between a relatively recent evolutionary development that one considers innate and essential to one's humanity, and a primal one essential to one's animalism.

In this construction, all who can move have PL. It is a question of degree. By understanding PL as a term for what is innate, it is redundant to speak of evidence or proof for PL per se. At the same time it is obvious that humans have varying levels of movement capacity, and that PL is relative and specific to individuals. Humans can again borrow from the literacy vocabulary and speak of *functional PL*, the possession of the basic movement skills needed for daily life, or *advanced PL*, as virtuosity in physical communication with the physical environment. It makes sense to speak of virtuosity or excellence in PL much as one does of the virtuosity of great writers, while admitting the same ignorance about exactly how that virtuosity arises.

The pursuit of knowledge about movement virtuosity has resulted in sizeable bodies of research in the areas of cognition, motor development, biomechanics, and skill learning. Recently, there has been a turn toward integrationist ecological explanations, in some cases utilizing approaches from complexity science including dynamical systems theory. This turn represents an attempt to understand the interaction of complex, open systems as a basis for a more holistic view of embodiment and embodied cognition. A primary purpose

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of this article has been to analyze the founding metaphor of PL to discover a root concept, communication, which can be used to reunify fragmented conceptions and help illuminate a theoretical model that can be empirically tested. Communication, as a foundational concept for PL, also provides a conceptual link to a dynamical systems approach to understanding how complex capabilities such as PL develop.

The author has argued that PL is a new name for an innate human capacity, rather than a new thing in itself. Advocates for PL are not arguing that PL exists, but that *improving* one's PL is both enabling and protective; it is claimed that individuals with more advanced PL are more able to participate in and enjoy physical activity, as well as less likely to suffer acute exercise-related injury and inactivity-related illness, setting up a virtuous cycle that supports enhanced quality of life. The practical and political interests operate at a social level, asserting that improving population PL will improve sporting success, reduce health care costs, and so on. Before testing these claims, however, the links between motor skill development, quality of learning, and resulting self-efficacy and propensity for ongoing physical activity must be more firmly established. A second purpose of this article has been to propose a theoretical model that can be used as a basis for linked, multi-disciplinary research.

PL has shown itself to be a remarkably powerful idea. For many practitioners in the fields of education, sport, recreation and public health, the literacy metaphor triggers a light bulb moment that has stimulated both discussion and collaborative action to promote physical activity. There can be little doubt that this is a good thing for an increasingly sedentary society. If a narrow view of physical activity as high performance sport for elites and unpleasant medicine for the rest of humans can be replaced by a holistic view in which each individual aspires to a skillful, joyful communication with the physical environment in all aspects of life, humans will all be the better for it. Ultimately, though, there must be more than metaphor. For the PL concept to succeed when efforts to promote physical activity have largely failed, there must be substance to the claims made by its proponents. One must use clear definitions, resist confusing means and ends, and verify claims through solid research. One must try to understand what PL really is.

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