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What would physical educators know about movement education?

A review of literature, 2006-2016

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Abstract

This review paper identifies the conceptual underpinnings of current movement research in Physical Education. Using a hermeneutic approach, four analogies for movement education are identified: the *motor program analogy*, the *neurobiological systems analogy*, the *instinctive movement analogy*, and the *embodied exploration analogy*. Three issues related to logical consistency and its relevance for movement education are raised. The first relates to tensions between the analogies and educational policy. The second concerns differences among the four analogies. The third issue relates to the appropriateness of specific analogies for dealing with certain movement contexts. In each case, strategies for improvement are considered. The paper is concluded with a brief summary along with reflections on issues that require further attention.

Key words: analogy, hermeneutics, movement capability, skill, motor learning
**Introduction**

Movement pedagogies have garnered varying amounts of interest from physical education (PE) scholars over the years. Just over a decade ago Kirk, Macdonald and O’Sullivan’s (2006) comprehensive *Handbook of Physical Education* devoted only one chapter of 46 to the teaching and learning of movement capabilities (Wallian & Chang, 2006). More significantly, that chapter contained only a handful of references to investigations conducted within PE. Since then, there has been a relative groundswell of scholarly publications dealing with the teaching and learning of movement (see for example, Larsson & Quennerstedt, 2012; MacPhail, Kirk, & Griffin, 2008). These works have addressed a range of phenomena related to movement education and in some cases have provided valuable new insights into the role PE can play in helping young people learn to move. The aim of this review is to provide an ‘inventory’ of the conceptual underpinnings of current movement research in PE. Such a review helps physical educators: (1) better understand contemporary movement education practices, and (2) increase their possibilities to help students develop movement capability.

To identify central concepts and ideas, the paper utilizes a hermeneutic approach (Ricoeur, 1978), where the notion of analogy is used to both organize and describe themes in existing research. The paper is structured as follows: first we outline what we mean by movement education and discuss movement capability in relation to broader trends in PE. Second, we describe the methodology used to conduct the review of literature. The third section is a presentation of the results according to the main themes. In the fourth and fifth sections, we discuss the implications of the review with respect to the trends identified in the first part of the paper and consider implications for future scholarship.

**Contextualizing movement education within physical education**

The capacity to move in different ways constitutes practical knowledge. Amongst other things, this practical knowledge has been referred to as physical or motor ‘ability’ (Theodoraki & Kampiotis, 2007), ‘motor skill competence’ (Stodden et al., 2008), or more commonly ‘skill’ (Avery & Rettig, 2015; Drost & Todorovich, 2013; Mally, 2008). For the purposes of this paper and with a view to
loosening some of the connotations attached to other terms, we refer to this practical knowledge as *movement capability*.

There has been an enduring and widespread expectation that pupils will improve or expand their movement capabilities in PE lessons (Kirk, 1992; Smith, 2011; Tinning, 2010). As an example from our own context, the most recent Swedish curriculum for compulsory school states that teaching in PE will help students develop their physical ability and “promote all-round physical capacity” (SNAE, 2011). The Australian curriculum proposes that taking part in PE lessons will result in the “acquisition of movement skills, concepts and strategies that enable students to… participate in a range of physical activities” (ACARA, 2012). National PE standards in the USA refer to a physically literate person as a person who will “demonstrate competency in a variety of motor skills and movement patterns” (SHAPE America, 2013). Although differences exist in formulation, the development of movement capability is framed as a linear progression from individual, static, and closed movements to collective and dynamic performances (SHAPE America, 2013; ACARA, 2012).

Despite pervasiveness, movement pedagogies and their place within PE have been a topic of debate. Commentators have pointed out that the amount of time devoted to movement education in PETE programs varies substantially between institutions (Kim, Lee, Ward, & Li, 2015); that a number of physical educators have insufficient knowledge to help students improve their movement capability (Fischman, 2007; Overdorf & Coker, 2013), and that traditional PE pedagogies have rarely led – indeed are incapable of leading – to improvements in students’ movement capabilities (Kirk, 2010). In the 1990s, Siedentop (1994) expressed frustration with traditional forms of PE in which students received short introductory lessons to different sports but were seldom provided with adequate time to develop movement capability, a concern that has since been reiterated (see for example, Kretchmar, 2006). Even prior to the 1990s, Bunker and Thorpe (1982) claimed that Demonstration-Explanation-Practice pedagogies, pedagogies that Tinning (2010) contends have dominated PE practice, were unlikely to lead to genuine improvements in movement capability.
In both Siedentop and Bunker and Thorpe’s cases, dissatisfaction propagated new approaches to PE (Kirk & MacPhail, 2002; Siedentop, 2002). It would be inaccurate to say that these approaches de-emphasized movement capability. They did however, widen the scope of objectives that physical educators aimed to meet. In Ennis’ (2014) terms, new approaches led to “diverse content perspectives” (p. 6). Within the Sport Education model, movement capability became just one of several objectives to be accomplished through PE lessons (Siedentop, 2002). In Teaching Games for Understanding, the development of students’ tactical awareness became a priority (Harvey & Jarrett, 2014). At the same time as these innovations were making headway in mainstream physical education programs, the ways in which the school subject was justified and rationalized generally expanded (Bailey et al., 2009). In attempting to remain politically relevant, PE advocates made claims related to citizenship (Laker, 2003) and more significantly health (McKenzie, 2007; Newell, 2011; Pühse et al., 2011). In light of these developments it is little wonder that scholarly interest in movement capability ebbed around the turn of the millennium.

Given discursive shifts it is pertinent to consider why movement capability persists as a central feature of official prescriptions of PE and why there has been a renewed scholarly interest in the topic over the last ten or so years. We would suggest that curricula have continued to prescribe movement learning because of historical precedent (see Kirk’s [2010] discussion of sports techniques in PE) and because the link between movement capability and lifelong physical activity continues to be firmly etched into the popular imagination (Claxton, Troy, & Dupree, 2006; Overdorf & Coker, 2013). Renewed interest from scholars may be seen as a reaction to a proliferation of aims and objectives; in other words, as an attempt to determine a distinctive or defining aspect of physical education through research. Indeed, Evans’ (2004) assertion that “talk of physically educating the body [has] almost disappeared from the discourse of PE in schools and Physical Education Teacher Education” (p. 95) presented an explicit call to return to a quintessential feature of physical education.

Regardless of the reasons behind this rekindled interest, there is now a substantial body of PE literature dealing with how young people learn to move. Given that some of the challenges that affected the work of earlier physical educators still exist today (large class sizes and limited
curriculum time, for example) and while other social transformations are significantly impacting on PE practices, notably the increasing use of digital technologies (Casey, Goodyear, & Armour, in press) and increasing cultural heterogeneity in schools (Barker & Lundvall, 2017), it is useful to consider current trends in movement education scholarship. What concepts and theories are currently informing movement research in PE? What, in other words, would physical educators know about movement education if they were to read recent research? Before addressing this question we want to outline how we conducted the review.

**Methodology**

Prior to beginning a structured electronic literature search, each of the authors had encountered various texts on movement education. We thus began our search with a set of scientific articles ($n=22$) which met the inclusion criteria for the review (described below). The electronic literature search was conducted in February 2016 using the databases *Education Research Complete*, *ERIC* and *SportDiscus*. The following search terms were used: “movement education” AND “physical education” AND (“skill” OR “ability”). The first two search terms were used as Subject terms and the last as an Abstract term.

**Sample selection**

To be included in the review, published research on movement capability needed to: (a) appear in peer-reviewed journals between 2006 and 2016. 2006 represented an appropriate starting point with an increase in publications on movement capability (six from this year were eventually included in the review). Additionally, we worked from the assumption that physical educators interested in current research would be unlikely to search for scholarship that is more than ten years old; (b) be written in English; (c) deal with PE in school contexts. This meant that texts that dealt with higher education, or adult learning, or organized sport contexts were omitted from the review; and (d) focus on pedagogical aspects of moving. Texts concerned with organizational aspects of movement education, typically aimed at providing ideas for activities such as yoga were excluded from the review. The electronic search yielded a total of 102 articles; 77 after 25 duplicates were removed. Titles and abstracts of the
77 publications were screened ‘inclusively’ meaning that if there was any doubt, they were included. 27 articles were omitted because they did not meet the inclusion criteria. The remaining 50 full-length articles were then independently evaluated by two of the authors for eligibility in light of the inclusion criteria. After discussion, a further fifteen were omitted leaving a total of 35 articles that met all inclusion criteria.

Retrieved articles were cross-referenced for additional inclusions as a further search strategy. In addition to identifying studies through the database search, articles (n=16) from the initial reading were included after assessment according to the inclusions criteria. See Fig. 1 for the procedures in which articles were selected.

INSERT FIG 1 HERE

Analysis and synthesis

To develop a clear picture of the conceptual underpinnings of the movement education literature, we engaged in two review processes: analysis and synthesis (see Hart, 1998). Analysis involved systematically breaking down the literature into parts and considering how they were similar to and different from one another. In line with the aim of the review, foundational ideas and assumptions about learning, development and knowledge constituted the parts or units. Synthesis involved putting the parts together in an arrangement that revealed something about the nature of the texts that was not apparent to begin with. Specifically, we looked for relationships at the level of analogy, metaphor and pedagogy and attempted to show how these features fitted together in logical clusters across different texts. To engage in analysis and synthesis, we used the concept of analogy that is employed in both hermeneutic and phenomenological research (Ricoeur, 1978).

Analogy involves comparing one thing with another. It is a reference to something familiar for the purposes of explaining something unfamiliar. Analogy is based on the principle, that which is true of one thing will be true of another (Gadamer, 1989). Analogies are used to communicate certain views of the world and are employed surprisingly frequently by researchers who are faced with the task of communicating ‘unfamiliar’ phenomena. Physiologists for example, might describe the human
body as a machine, neurologists the brain as a computer and so forth. While there are different
standpoints on scientific analogy, in line with Alvesson and Sköldberg (2000) we propose that analogy
does not stand outside the object but that it works to construct the object. Employing the body-as-
machine analogy for example, will involve not only thinking about the body as a machine but also
acting as if it were one. This is why in educational contexts analogies are often reflected in
pedagogues’ practical decisions and actions.

Unlike analogies which underlie whole systems of meaning and constitute forms of “pre-
understanding” (Alvesson & Sköldberg, 2000, p. 90), metaphors refer to less developed instances of
comparison. Metaphors are used for the purpose of quick illustration and are part of analogic thinking.
One might refer to ‘the tip of the iceberg’ or ‘scratching the surface’ to suggest lack of depth or rigor.
Metaphors are generally not developed to illuminate other parts of a phenomenon and in this sense, are
subordinate to analogy.¹

Two additional points should be made here. The first is that analogies are not evidence or data;
they are devices to make complex explanations understandable. They reflect certain assumptions and
are thus open to question, analysis and evaluation (Hart, 1998). A significant part of our analysis
involved attempting to recognize the interpretive leaps that authors were making and asking questions
such as: What needs to be taken for granted in order for this argument to be accepted? To what kind of
research and pedagogy does this analogy commit its users? This was quite a different task to
describing the types of methods or the origins of individual investigations that might be done in other
forms of review (see for example, Harvey & Jarrett, 2014). It was through asking such questions that
we could address our research aim. Second, although we have implied a rather unequivocal relation
between analogy and pedagogy, things were messier in practice. Alvesson and Sköldberg (2000) note
that there is “an ambiguous and slippery interaction between metaphors at different levels” (p. 283),
pointing out that people often combine and mix ideas and assumptions when they talk and write. This
proved true in our review. The analytic task required that we were open to the possibilities of different

¹Not all researchers use the terms ‘analogy’ and ‘metaphor’ in the same way that they are used here. It is
common nevertheless for researchers to make distinctions between higher level explanatory representations and
representations that have less power to shape thinking. Alvesson and Sköldberg (2000) for example, use ‘root
metaphors’ (pp. 90-91) to refer to the former and ‘metaphors’ to refer to the latter.
Review

The majority of the articles for the review came from journals with praxis-orientations and most were published in the US. The journals that appeared most frequently in the selection were the *Journal of Physical Education, Recreation and Dance* with eight articles, *Strategies* with six, and *Physical Education and Sport Pedagogy* also with six articles. In line with our analytic approach, the sub-sections below are organized according to four analogies. We have termed these the motor program analogy, the neurobiological systems analogy, the instinctive movement analogy, and the embodied exploration analogy. Each analogy provides conceptual organization for a perspective on movement education. To give adequate consideration to these four perspectives, discussion of perspectives described in only one text is not included here (for example, Hudson [2006] - applied biomechanics perspective; Oliver [2009] - postural alignment perspective).

**Motor programing and the information processing perspective**

An information processing perspective was by far the most pervasive way to view movement learning (Boyce, Coker, & Bunker, 2006; Hall, Heidorn, & Welch, 2011; Hill & Turner, 2012). Within this perspective, computer programing is used as an analogy. Learning is equated with acquiring sets of cognitive instructions, or “schema” (Boyce et al., 2006, p. 331) that learners can ‘run’ at the appropriate time (Delaš, Miletić, & Miletić, 2008). The brain is seen as a type of hard drive and program acquisition is an internal process that takes place through the central nervous system via a process of encoding (Fischman, 2007). Encoding is initiated through a demonstration of the desired outcome and achieved through repetition and practice (Avery & Rettig, 2015; Drost & Todorovich, 2013).

Individuals begin with “immature” (Miller, Vine, & Larkin, 2007, p. 63) or “rudimentary” (Boyce et al., 2006, p. 336) programs but refine and add to their programs over time. In concrete terms, O’Keefe and colleagues (2007) claim that one needs to have a basic overarm throwing pattern
before one can learn specific skills such as the badminton overhead clear and the javelin throw. Increasing the ‘maturity’ of programs takes place in a progressive, building block-type fashion (Martin, Rudisill, & Hastie, 2009), a point criticized and used as a point of departure by proponents of the non-linear pedagogical perspective – see next section. It is assumed that people must first learn fundamental motor/movement skills (FMS)\(^2\) relating to locomotion, object manipulation and balance (Stodden et al., 2008) before learning more advanced movement patterns (Kalaja, Jaakkola, Liukkonen, & Digelidis, 2012; Vandaele, Cools, de Decker, & de Martelaer, 2011; Zimmer, 2009). A significant corollary of this assumption is that if learners have been unable to acquire fundamental motor/movement skills in early schooling, it makes little sense to try to teach them advanced skills later (Bradford, Kell, & Forsberg, 2016; Kalaja et al., 2012).

Progression or learning is achieved primarily through receiving feedback and practicing (Hall et al., 2011; Saemi, Porter, Ghotbi Varzaneh, Zarghami, & Shafinia, 2012). The idea of feedback centers teachers in the learning process. By providing feedback, teachers act as technicians. They essentially modify learners’ programs, removing errors so that step-by-step, observable outcomes more closely match the ideal program represented in an initial demonstration (Hill & Turner, 2012). Practicing may be more student-centered but often still involves teachers determining practice conditions, a topic that has received a great deal of attention in texts aimed at practitioners (Kamla, 2013; Rukavina & Jeansonne, 2009; Vidoni, Lorenz, & de Paleville, 2014). Once learners have received sufficient practice time and feedback, they should be able to run their programs automatically, a term denoting the final stage of skill learning (Fischman, 2007; Satern, 2011). The test of whether individuals have successfully encoded the new program is to see whether they can run the program in ‘complex situations’, often used synonymously for competitive game environments (Männistö, Cantell, Huovinen, Kooistra, & Larkin, 2006; Vandaele et al., 2011).

At this point, it is useful to reiterate that the theoretical features described above are assumptions – they are part of a device which aims to render the phenomenon of movement education

\(^2\) ‘Motor’ and ‘movement’ have been used interchangeably in this literature. Larsson and Quennerstedt (2012) have critically engaged with the idea of FMS, asking “fundamental in relation to what?” (p. 291). Smith (2014) suggests that FMS can be seen as a complementary pair to fundamental game skills and that there is little reason to teach movement skills before game skills.
understandable. To accept the motor programing analogy, one not only needs to accept that the central nervous system is the site of movement learning and that learning takes place developmentally but that learning to move is largely an individual, undifferentiated process. With the exception of the teacher, a learner’s immediate or cultural surroundings are seen to have little effect on the learning process. Further, learners’ emotions or affective states are not seen as a factor that might influence learning.

There have been challenges to the information processing perspective from motor learning theorists and pedagogues (Smith, 2011). In general, these challenges center on issues of transfer and the ways in which the perspective ignores interactions between movement learners and the social and natural environment (Rink, 2005). Challenges have however been generative in the sense that they have led to other ways of understanding movement learning, including the non-linear pedagogical perspective.

**Neurobiological systems and the non-linear pedagogical perspective**

The non-linear pedagogical perspective gained momentum in PE scholarship around ten years ago (Smith, 2011). The analogy that forms the basis for the perspective comes from the natural sciences. Learners are seen as complex biological organisms that interact with their environments (Chow, 2013). As organisms, learners have biological characteristics that influence how they move. These ‘performer constraints’ (Chow, 2013) refer to factors such as learners’ height and muscle mass. An organism’s movement behavior is determined by an interaction between performer constraints, environmental constraints such as air temperature, and the constraints of the task that the organism is attempting to perform (for example, restrictions that are placed on the way a movement needs to be carried out) (Chow et al., 2007).

In line with the overarching biological analogy, a central idea of this perspective is that organisms attempt to self-regulate and find homeostasis. This means that if the environment and task are structured correctly, learners will naturally tend towards the ‘right’ way of performing (Chow, 2013). Chow and colleagues (2007) suggest for example, that improvement in performance can be “achieved without the presence of explicit instructions on technique [and that] goal-directed behavior
can emerge as a consequence of the presence of the specific task constraints in the learning task” (p. 265). Smith (2011) uses a downhill skier that automatically adapts to the undulations of the slope as a case in point.

At least two implications follow on from the principle of self-regulation. First, learning does not follow a pre-set pathway. Instead it emerges within a set of “dynamic, spontaneous and even unpredictable interactions” (Chow & Atencio, 2014, p. 1035; see also, Miller et al., 2015). Second, the primary role of the teacher is not to tell learners how to move but to manage learning situations in such a way that students will generate ‘performance solutions’ independently (Chow, 2013; Atencio, et al., 2014). In line with other advocates of the perspective, Renshaw, Chow, Davids, and Hammond (2010) claim that the approach is student-centered and empowering and leads to a “hands-off approach to learning” (p. 117). In analogic terms, pedagogical manipulation can be understood as a kind of funneling or directing where certain forms of behavior are encouraged or made more possible while others are inhibited.

While adopting the right way to move is seen as a natural process, learners are granted the capacity to make decisions and construct meaning. In this respect, learners are not simply cell-like organisms and teaching cannot to be equated with laboratory work. Chow and colleagues (2007) propose that one of the corner stones of the non-linear pedagogical approach is establishing information-movement couplings so that learners will reflect on and consciously select movement responses to employ. The idea that in order for learners to construct meaningful relations, learning environments should be realistic is a central element of this proposition.

Again, there are tacit assumptions that need to be entertained for theorists to utilize the neurobiological systems analogy. Centrally, one must accept a unidirectional cause and effect relationship between a series of identifiable factors and a person’s way of moving. One also needs to accept that these factors can in turn be divided into discrete categories, a proposition that is not always straightforward (where, for example should the line be drawn between task and environmental constraints with a task like freestyle swimming?). The notion that humans tend towards ‘correct’ ways
of moving suggests a continuum of moving styles which within the non-linear pedagogical perspective takes on biomechanical or ergonomic connotations. It would also be possible to evaluate movement in aesthetic or creative terms.

Concerning PE practice, non-linear pedagogies have been associated with game sense approaches where game manipulation is also used to foster particular patterns of behavior (Chow et al., 2007). Note however that proponents have recently pointed to key differences between non-linear pedagogical and game sense approaches (Renshaw et al., 2015). Other scholars have suggested that the perspective needs to be expanded to account for socio-cultural factors (Uehara, Button, Falcous, & Davids, 2014).

**Instinctive movement and the organic learning perspective**

The organic learning perspective focuses specifically on children as movement learners. It frames movement as a ‘natural’ activity and children as curious, open and intuitive (Baumgarten, 2006). The work of Laban (Laban, 1948; Laban & Lawrence, 1974) is sometimes referenced in this perspective (Theodoraki & Kampiotis, 2007). Orienting ideas are that children have natural urges to move and movements like swinging, jumping, and running are inherently meaningful for children. In other words, children would swing, run and jump to express themselves, even without formal education or instruction.

From an organic learning perspective, physical educators should foster differences between children and ‘harness’ children’s natural desires to move (Baumgarten, 2006; Baumgarten & Pagnano-Richardson, 2010). Teachers should foreground the importance of *playful* movement (LaMaster, 2006) and underscore creativity, spontaneity and risk taking in their lessons (Evans & Penney, 2008). More concretely, learners should be provided with open-ended tasks and given opportunities to respond to tasks in their own ways (Fuchs, 2015). Educational gymnastics is frequently proposed as a suitable activity in this perspective and terms like ‘body management’, ‘kinesthetic awareness’ and ‘movement

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3 Compare with advocates of an information processing perspective who claim that “a common misconception is that children ‘naturally’ learn fundamental motor skills” (Stodden et al., 2008) or Martin and colleagues’ (2009) claim that “children do not acquire FMS as a result of the maturation process but rather through instruction and practice” (p. 228).
confidence’ are common (Baumgarten & Pagnano-Richardson, 2010). Educational gymnastics is further seen as an appropriate way to facilitate development of the ‘whole child’ and can be used to improve not only movement capability but also flexibility, strength, and muscular endurance as well as help learners to express themselves through movement (Docherty & Morton, 2008; Mally, 2008). In this sense, the perspective is concerned with holistic education and does not concentrate solely on motoric aspects (Weiller-Abels & Bridges, 2011).

Along with educational gymnastics, non-supervised experiences such as climbing trees have been cited as ways to improve movement capabilities (Baumgarten & Pagnano-Richardson, 2010). Again, such activities are understood to help children learn about their bodies’ capabilities and limitations as well as how their bodies can be effectively managed in different contexts (Baumgarten, 2006). In contrast to much current educational discourse that stresses measurable educational outcomes and assessment (see for example, Evans & Penney, 2008), the organic perspective lays little emphasis on what children should be able to do at the end of learning experiences, a point to which we shall return. Instead, advocates of the perspective suggest that many movement solutions can be correct (Weiller-Abels & Bridges, 2011).

It should be increasingly clear that each perspective contains different assumptions about the nature of movement and movement education and that these assumptions are contestable. We could question for example, whether swinging is inherently meaningful for children or whether children will automatically learn to manage their bodies through unsupervised play. Our impression is that it is rarely evidence that decides which perspectives are adopted in policy and practice. Empirical material could after all be marshalled to support the idea of instinctive movement (observations of some school playgrounds, for example) and yet (a) the organic perspective has all but disappeared from movement education research, and (b) educational gymnastics struggles to find a place in many PE programs today. With this in mind, we would like to introduce a fourth and final perspective that likens learning to the process of searching.

**Embodied exploration and the guided discovery perspective**
The final perspective to emerge from the literature framed the development of movement capabilities as an exploratory process that revolves around the concept of searching. Following Gilbert Ryle (2009) and his notion of “knowing how” and “knowing that”, Nyberg and Carlgren (2015) for example, describe the process of developing movement capability as ‘discerning’ the aspects of experience involved in moving in particular ways. Learners are unfamiliar with the movements for which they are looking so discovery, or ‘grasping’, occurs in two senses: (a) learners discover a way of moving that was unfamiliar to them, and (b) learners discover how it feels to move in that new way. This means that coming to understand a movement and coming to master that movement are two sides of the same embodied process (Nyberg & Carlgren, 2015; Nyberg & Larsson, 2014). Indeed from this perspective, ways of knowing become embedded in individuals’ bodies (Nyberg & Carlgren, 2015).

Teaching from this perspective can be seen as a process of helping learners to ‘find’ moments where their intentions and their capacities to enact these intentions coincide (Light & Kentel, 2015). Helping learners locate such moments can involve different ‘search strategies’ such as inviting learners to articulate their tacit knowing, structuring movement experiences in ways that make certain features more noticeable, encouraging reflection upon action, and providing possibilities for social interaction (Light & Kentel, 2015). Light and Kentel (2015) elaborate on these final two points. They suggest that teachers can help learners to be mindful of body presence and encourage learners to ‘dwell’ in that presence. They also propose that interacting with other learners and discussing possible ways of moving is a useful tactic to discover and develop movement capabilities. Since learners’ bodily knowledge will affect how they explore and the kinds of knowledge for which they search, teachers need to be aware of learners’ movement histories (or habits) and how these histories affect current movement situations (Nyberg & Carlgren, 2015).

Unlike in the motor programing and non-linear perspectives, learning in the embodied exploration perspective occurs between learner and movement. Although the teacher is expected to plan thoroughly for learning experiences, they are not expected to steer the learning process by identifying what is done ‘wrong’ by learners. Teachers use guided discovery teaching where the primary question is ‘what does it mean to know/grasp this movement?’ (Nyberg & Larsson, 2014)
rather than ‘what is the best way to...’ which guides the non-linear pedagogical perspective, for example.

As with the other perspectives, there are basic assumptions that need to be accepted for the embodied exploration analogy to be of explanatory value. Centrally, we need to accept the idea that anyone can learn to move in more complex ways, even if they have not ‘mastered the basics’. They simply need to be prepared to spend time searching. We also need to accept that certain corporeally-sensed ideas present ‘keys’ to moving and that if these can be located and made explicit, they will ‘unlock’ previously unknown experiences. Not a great deal of research exists using the embodied exploration analogy and there appears to be a need for the potential advantages, limitations and applications of the perspective to be examined further.

**Discussion**

So far we have identified key analogies that shape movement education research in PE. In this section, we want to discuss the motor program, neurobiological systems, instinctive movement, and embodied exploration analogies in relation to PE policy, practice and in relation to each other. In doing this, we want to think in more detail about the consequences that different analogies have for researchers and practitioners and reflect on how research dealing with movement capability may develop in the future.

At the outset of this paper, we noted that PE attempts to meet a broad range of objectives (Ennis, 2014) but that movement capability continues to be a persistent feature of PE policy (ACARA, 2012; SHAPE America, 2013; SNAE, 2011). In some respects, it is reassuring that scholars are currently giving consideration to this aspect of PE and that a number of analogies provide a variety of ways to understand movement capability. Nonetheless, not all the perspectives described above fit equally comfortably with current educational thinking. There are gaps between the logic of the non-linear learning, organic and guided discovery perspectives for instance, and the basic ‘stage learning’ analogy on which much current PE policy is based (for example, SHAPE America, 2013; ACARA,
The idea that learning takes place spontaneously and unpredictably (Chow & Atencio, 2014; Miller et al., 2015) or that movement capabilities are transient and subject to change (Baumgarten, 2006) is inconsistent with the rationalist idea that learners progress through designated levels prominent in educational discourse today (Evans & Penney, 2008). In this respect, researchers adopting neurobiological systems, embodied exploration or instinctive movement analogies provide practitioners and policy makers with conceptions of movement and learning that are potentially challenging and incongruous to the models and ideas with which they are obliged to work. Akin to offering Lego pieces to someone playing with Play Doh, some researchers produce ideas that do not ‘attach’ to teachers’ existing sense making resources. This is not to suggest that ‘alternative’ conceptions of movement learning are unhelpful or that scholars should stop framing movement education in different ways. On the contrary, providing new ways of understanding the world would appear to us to be a hallmark of quality research. It is rather to suggest that researchers need to consider the practical consequences of working with their perspectives in more detail. As Renshaw et al. (2010) suggest, there would appear to be benefits from “continuous interaction between movement scientists and pedagogists” (p. 118) and not just from discussions between members of the research community.

The idea of analogic consistency between policy and practice also works as a possible explanation for why the Demonstration-Explanation-Practice (DEP) approach to movement education – an approach that has received much criticism over the years (Siedentop, 1994; 2002) – is still commonplace in PE today. In short, the DEP model, with its implicit focus on linear learning is consistent with a central feature of current policy and continues to be reflected in practice. Pedagogical approaches based on other analogies continue to be seen as pedagogical innovations, despite decades of use in schools (Kirk, 2010). Still, change is evident. The proliferation of aims and objectives for PE in recent times (Bailey et al., 2009) points to an evolving school subject. McKenzie (2007) claims that this process is disorienting. This may be true yet policy expansion appears necessary if the insights from a growing body of (physical) educational research are to be accommodated in practice.

On the other hand, Atencio et al. (2014) suggest that the non-linear perspective does “find sympathy with recent calls in PE to educate pupils more holistically” (p. 245).
The presence of multiple perspectives highlights a need for movement capability researchers to think beyond their immediate theoretical frameworks. Researchers need to consider how conceptions of movement education fit within the ‘bigger’ ideas and practices that make up PE and how research traditions influence their work (see Kirk, 2010 for a detailed discussion of this theme). Each of the analogies described above offer something unique to PE students and the school subject is poorer for the absence of any one of them. At the same time, it is somewhat unhelpful to claim that the perspectives are complementary and that they can be used together to inform research and practice. As indicated, the analogies are oppositional on certain fundamental assumptions. One cannot assume for example, that learning occurs linearly and non-linearly at the same time. Rather than see analogies as models that can be combined, or alternatively, as models containing tensions that need to be resolved, it is useful to see analogies as bases for assumptions that can be entertained in a flexible, variable manner. As such, they may be employed in parallel or used as a reflection device to generate better understandings of other perspectives (see Boyce et al., 2006) but not as conceptual equivalents to be evaluated against one another.

Examinations of the theoretical tenets underpinning movement research such as the one provided by this review are relatively rare (see Renshaw et al., 2015, for a sophisticated examination of this nature). By identifying implicit tenets, or what Alvesson and Sköldberg (2000) refer to as forms of “pre-understanding” (p. 90), it is possible to appreciate the contributions that certain perspectives can make more precisely. Here, we cannot help think of the organic learning analogy and the way that the perspective constructs risk taking as a necessary and productive part of movement learning (LaMaster, 2006; Mally, 2008). For us, this is an important aspect of movement education but is one that is absent from the other perspectives and in PE more generally. Advocates of this perspective may be more successful in creating a place within PE for this kind of pedagogy by emphasizing – or at least making explicit – the utility of this element in movement learning.

Finally, we want to address the ‘what’ issue of the different perspectives – specifically the ‘what it is that students are supposed to learn’ according to the four perspectives (Nyberg & Larsson, 2014). Each of the perspectives have been associated with particular kinds of movement, or perhaps more
accurately, moving in certain ways within certain ‘movement cultures’ (Larsson & Quennerstedt, 2012). Scholars working within the non-linear pedagogical perspective for example, have related movement learning to sports and games (Chow, 2013) whereas proponents of the organic perspective have advocated educational gymnastics (Baumgarten & Pagnano-Richardson, 2010). At the same time, the connections between perspectives and their anticipated movements/movement contexts has at times been problematic. The motor program analogy has been connected to ball sports and games yet the link between de-contextualized practice and authentic understanding of games has received a great deal of criticism. There is consequently a need to continue to explore the kinds of movements and contexts about which these analogies have something useful to say. Nyberg and Larsson (2014) and Light and Kentel (2015) have suggested that embodied exploration may be useful in more technique-intensive activities such as running and swimming and in activities where learners have opportunities to create new movements (for example, in dance). Perhaps there are specific contexts to which each perspective is suited.

**Concluding thoughts**

The aim of this review was to provide an ‘inventory’ of the conceptual underpinnings of current movement research in PE. Using a hermeneutic approach, four guiding analogies of movement capability were identified in the PE literature. The motor program analogy provided basic orientation for the information processing perspective. In this perspective, learning to move was likened to writing a set of instructions for a computer. Feedback and practice were essential elements of learning in this perspective. The neurobiological systems analogy supported the non-linear pedagogical perspective. From this perspective, learning to move was a natural process that occurs as learners adapt to their surroundings. The instinctive movement analogy provided the base idea for the organic learning perspective. This analogy was naturalistic, emphasizing the animal-like instincts of (younger) learners that compel them to move. The embodied exploration analogy provided a fourth and final way of understanding the development of movement capability. This analogy belonged to a guided discovery perspective and framed movement learning as a process of searching for moments in which learners’ intentions and their capacities to enact these intentions are brought together.
In considering these analogies, we made three points related to logical consistency and its relevance for movement capability researchers. The first concerned conflict between perspectives and educational policy. We claimed that providing practitioners and policy makers with concepts that did not fit their discursive environments could lead to challenges. Following this, we suggested that there is a need for movement capability researchers to think beyond their immediate theoretical frameworks and consider how conceptions of movement education fit within the framework of ideas and practices that make up PE. Here, we proposed that movement capability researchers should make explicit their own starting assumptions and reflect thoroughly on the starting assumptions of other movement researchers. This would, we believe, enable scholars to communicate the nature of their contributions to research, policy and practice more effectively. Third, we suggested that there is a need to continue to explore the kinds of movements and contexts in which these analogies could be employed.

We would like to finish with two brief reflections. First, although we have advocated for pedagogical plurality, we recognize that we have provided few ideas for how this could look in practice. To our minds, multiple perspectives could be prescribed and implemented in an internally consistent manner in at least two ways. It could be done at the curricular level where, in line with models thinking (Harvey & Jarrett, 2014), modules of movement education with their own rationales, intended outcomes and means of achieving those outcomes, are implemented sequentially so that teaching based on the different perspectives does not overlap during the course of the year. Alternatively, different perspectives could inform teaching and learning at different year levels. In certain grades, learning activities could be informed by certain perspectives of learning to move. This second approach already receives some support in the current literature with the organic learning perspective being promoted as appropriate for younger learners. At the same time, we would propose that students of any age can benefit from each of the four perspectives presented above; to our minds older students could learn just as much from a guided discovery approach to movement as younger students. This is an issue that we believe requires further consideration. Second, this paper has attempted to capture what physical educators would know about movement pedagogies as if they were reading up-to-date, peer-reviewed scholarship. There are of course, few guarantees that PE teachers
are reading this work and we doubt that practitioners have the time or inclination to conduct a review
of the kind presented here. To really know what physical educators know about movement and
movement education and to know what they do as a result of this knowledge, empirical investigations
are necessary.
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