

1 Running head: Physical educators and movement education?

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What would physical educators know about movement education?

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A review of literature, 2006-2016

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31 **Abstract**

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

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

53 **Introduction**

54 Movement pedagogies have garnered varying amounts of interest from physical education (PE)
55 scholars over the years. Just over a decade ago Kirk, Macdonald and O’Sullivan’s (2006)
56 comprehensive *Handbook of Physical Education* devoted only one chapter of 46 to the teaching and
57 learning of movement capabilities (Wallian & Chang, 2006). More significantly, that chapter
58 contained only a handful of references to investigations conducted within PE. Since then, there has
59 been a relative groundswell of scholarly publications dealing with the teaching and learning of
60 movement (see for example, Larsson & Quennerstedt, 2012; MacPhail, Kirk, & Griffin, 2008). These
61 works have addressed a range of phenomena related to movement education and in some cases have
62 provided valuable new insights into the role PE can play in helping young people learn to move. The
63 aim of this review is to provide an ‘inventory’ of the conceptual underpinnings of current movement
64 research in PE. Such a review helps physical educators: (1) better understand contemporary movement
65 education practices, and (2) increase their possibilities to help students develop movement capability.
66 To identify central concepts and ideas, the paper utilizes a hermeneutic approach (Ricoeur, 1978),
67 where the notion of *analogy* is used to both organize and describe themes in existing research. The
68 paper is structured as follows: first we outline what we mean by movement education and discuss
69 movement *capability* in relation to broader trends in PE. Second, we describe the methodology used to
70 conduct the review of literature. The third section is a presentation of the results according to the main
71 themes. In the fourth and fifth sections, we discuss the implications of the review with respect to the
72 trends identified in the first part of the paper and consider implications for future scholarship.

73 **Contextualizing movement education within physical education**

74 The capacity to move in different ways constitutes practical knowledge. Amongst other things, this
75 practical knowledge has been referred to as physical or motor ‘ability’ (Theodoraki & Kapiotis,
76 2007), ‘motor skill competence’ (Stodden et al., 2008), or more commonly ‘skill’ (Avery & Rettig,
77 2015; Drost & Todorovich, 2013; Mally, 2008). For the purposes of this paper and with a view to

78 loosening some of the connotations attached to other terms, we refer to this practical knowledge as
79 *movement capability*.

80 There has been an enduring and widespread expectation that pupils will improve or expand their
81 movement capabilities in PE lessons (Kirk, 1992; Smith, 2011; Tinning, 2010). As an example from
82 our own context, the most recent Swedish curriculum for compulsory school states that teaching in PE
83 will help students develop their physical ability and “promote all-round physical capacity” (SNAE,
84 2011). The Australian curriculum proposes that taking part in PE lessons will result in the “acquisition
85 of movement skills, concepts and strategies that enable students to... participate in a range of physical
86 activities” (ACARA, 2012). National PE standards in the USA refer to a physically literate person as a
87 person who will “demonstrate competency in a variety of motor skills and movement patterns”
88 (SHAPE America, 2013). Although differences exist in formulation, the development of movement
89 capability is framed as a linear progression from individual, static, and closed movements to collective
90 and dynamic performances (SHAPE America, 2013; ACARA, 2012).

91 Despite pervasiveness, movement pedagogies and their place within PE have been a topic of
92 debate. Commentators have pointed out that the amount of time devoted to movement education in
93 PETE programs varies substantially between institutions (Kim, Lee, Ward, & Li, 2015); that a number
94 of physical educators have insufficient knowledge to help students improve their movement capability
95 (Fischman, 2007; Overdorf & Coker, 2013), and that traditional PE pedagogies have rarely led –
96 indeed are incapable of leading – to improvements in students’ movement capabilities (Kirk, 2010). In
97 the 1990s, Siedentop (1994) expressed frustration with traditional forms of PE in which students
98 received short introductory lessons to different sports but were seldom provided with adequate time to
99 develop movement capability, a concern that has since been reiterated (see for example, Kretchmar,
100 2006). Even prior to the 1990s, Bunker and Thorpe (1982) claimed that Demonstration-Explanation-
101 Practice pedagogies, pedagogies that Tinning (2010) contends have dominated PE practice, were
102 unlikely to lead to genuine improvements in movement capability.

103 In both Siedentop and Bunker and Thorpe's cases, dissatisfaction propagated new approaches to
104 PE (Kirk & MacPhail, 2002; Siedentop, 2002). It would be inaccurate to say that these approaches de-
105 emphasized movement capability. They did however, widen the scope of objectives that physical
106 educators aimed to meet. In Ennis' (2014) terms, new approaches led to "diverse content perspectives"
107 (p. 6). Within the Sport Education model, movement capability became just one of several objectives
108 to be accomplished through PE lessons (Siedentop, 2002). In *Teaching Games for Understanding*, the
109 development of students' tactical awareness became a priority (Harvey & Jarrett, 2014). At the same
110 time as these innovations were making headway in mainstream physical education programs, the ways
111 in which the school subject was justified and rationalized generally expanded (Bailey et al., 2009). In
112 attempting to remain politically relevant, PE advocates made claims related to citizenship (Laker,
113 2003) and more significantly health (McKenzie, 2007; Newell, 2011; Pühse et al., 2011). In light of
114 these developments it is little wonder that scholarly interest in movement capability ebbed around the
115 turn of the millennium.

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

127 Regardless of the reasons behind this rekindled interest, there is now a substantial body of PE
128 literature dealing with how young people learn to move. Given that some of the challenges that
129 affected the work of earlier physical educators still exist today (large class sizes and limited

130 curriculum time, for example) and while other social transformations are significantly impacting on
131 PE practices, notably the increasing use of digital technologies (Casey, Goodyear, & Armour, in press)
132 and increasing cultural heterogeneity in schools (Barker & Lundvall, 2017), it is useful to consider
133 current trends in movement education scholarship. What concepts and theories are currently informing
134 movement research in PE? What, in other words, would physical educators know about movement
135 education if they were to read recent research? Before addressing this question we want to outline how
136 we conducted the review.

137 **Methodology**

138 Prior to beginning a structured electronic literature search (see Fig. 1. below), each of the authors had
139 encountered various texts on movement education. We thus began our search with a set of scientific
140 articles ($n=22$). The electronic literature search was conducted in February 2016 using the databases
141 *Education Research Complete*, *ERIC* and *SportDiscus*. The following search terms were used:
142 “movement education” AND “physical education” AND (“skill” OR “ability”). The first two search
143 terms were used as Subject terms and the last as an Abstract term.

144 **Sample selection**

145 To be included in the review, published research on movement capability needed to: (a) appear in
146 peer-reviewed journals between 2006 and 2016. 2006 represented an appropriate starting point with an
147 increase in publications on movement capability (six from this year were eventually included in the
148 review). Additionally, we worked from the assumption that physical educators interested in current
149 research would be unlikely to search for scholarship that is more than ten years old; (b) be written in
150 English; (c) deal with PE in school contexts. This meant that texts that dealt with higher education, or
151 adult learning, or organized sport contexts were omitted from the review; and (d) focus on pedagogical
152 aspects of moving. Texts concerned with organizational aspects of movement education, typically
153 aimed at providing ideas for activities such as yoga were excluded from the review. The electronic
154 search yielded a total of 102 articles; 77 after 25 duplicates were removed. Titles and abstracts of the
155 77 publications were screened ‘inclusively’ meaning that if there was any doubt, they were included.

156 27 articles were omitted at this stage of the selection process. The remaining 50 full-length articles
157 were then independently evaluated by two of the authors for eligibility in light of the inclusion criteria.
158 After discussion, a further 15 were omitted. The remaining 35 articles were added to the 16 texts that
159 the authors had before beginning the electronic search, giving a total of 51 texts that met all inclusion
160 criteria.

161 INSERT FIG 1 HERE

162 **Analysis and synthesis**

163 To develop a clear picture of the conceptual underpinnings of the movement education literature, we
164 engaged in two review processes: analysis and synthesis (see Hart, 1998). Analysis involved
165 systematically breaking down the literature into parts and considering how they were similar to and
166 different from one another. In line with the aim of the review, foundational ideas and assumptions
167 about learning, development and knowledge constituted the parts or units. Synthesis involved putting
168 the parts together in an arrangement that revealed something about the nature of the texts that was not
169 apparent to begin with. To engage in analysis and synthesis, we used the concept of analogy that is
170 employed in both hermeneutic and phenomenological research (Ricoeur, 1978).

171 Analogy involves comparing one thing with another. It is a reference to something familiar for
172 the purposes of explaining something unfamiliar. Analogy is based on the principle, that which is true
173 of one thing will be true of another (Gadamer, 1989). Analogies are used to communicate certain
174 views of the world and are employed surprisingly frequently by researchers who are faced with the
175 task of communicating ‘unfamiliar’ phenomena (Shoemaker, Tankard, & Lasorsa, 2004).
176 Physiologists for example, might describe the human body as a machine, neurologists the brain as a
177 computer and so forth. While there are different standpoints on scientific analogy, in line with
178 Alvesson and Sköldbberg (2000) we propose that analogy does not stand outside the object but that it
179 works to construct the object. Employing the body-as-machine analogy for example, will involve not

180 only thinking about the body as a machine but also acting as if it were one. This is why in educational
181 contexts analogies are often reflected in pedagogues' practical decisions and actions.¹

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

197 **Review**

198 The majority of the articles for the review came from journals with praxis-orientations and most were
199 published in the US. The journals that appeared most frequently in the selection were the *Journal of*
200 *Physical Education, Recreation and Dance* with eight articles, *Strategies* with six, and *Physical*
201 *Education and Sport Pedagogy* also with six articles. In line with our analytic approach, the sub-
202 sections below are organized according to four analogies. We have termed these the *motor program*

¹ Some researchers use the term ‘metaphor’ in much the same way as we use ‘analogy’ here. Alvesson and Sköldberg (2000, p. 90) make a distinction, suggesting that analogies underlie whole systems of meaning and constitute forms of “pre-understanding”. Metaphors in contrast, refer to less developed instances of comparison. Using this distinction and given our focus on higher level explanatory representations, analogy appears to be the more appropriate term.

203 *analogy, the neurobiological systems analogy, the instinctive movement analogy, and the embodied*
204 *exploration analogy.* Each analogy provides conceptual organization for a perspective on movement
205 education. To give adequate consideration to these four perspectives, discussion of perspectives
206 described in only one text is not included here (for example, Hudson [2006] - applied biomechanics
207 perspective; Oliver [2009] - postural alignment perspective).

208 **Motor programing and the information processing perspective**

209 An information processing perspective was by far the most pervasive way to view movement learning
210 (Boyce, Coker, & Bunker, 2006; Hall, Heidorn, & Welch, 2011; Hill & Turner, 2012). Within this
211 perspective, computer programing is used as an analogy. Learning is equated with acquiring sets of
212 cognitive instructions, or “schema” (Boyce et al., 2006, p. 331) that learners can ‘run’ at the
213 appropriate time (Delaš, Miletic, & Miletic, 2008). The brain is seen as a type of hard drive and
214 program acquisition is an internal process that takes place through the central nervous system via a
215 process of encoding (Fischman, 2007). Encoding is initiated through a demonstration of the desired
216 outcome and achieved through repetition and practice (Avery & Rettig, 2015; Drost & Todorovich,
217 2013).

218 Individuals begin with “immature” (Miller, Vine, & Larkin, 2007, p. 63) or “rudimentary”
219 (Boyce et al., 2006, p. 336) programs but refine and add to their programs over time. In concrete
220 terms, O’Keefe and colleagues (2007) claim that one needs to have a basic overarm throwing pattern
221 before one can learn specific skills such as the badminton overhead clear and the javelin throw.
222 Increasing the ‘maturity’ of programs takes place in a progressive, building block-type fashion
223 (Martin, Rudisill, & Hastie, 2009), a point criticized and used as a point of departure by proponents of
224 the non-linear pedagogical perspective – see next section. It is assumed that people must first learn
225 *fundamental motor/movement skills* (FMS)² relating to locomotion, object manipulation and balance
226 (Stodden et al., 2008) before learning more advanced movement patterns (Kalaja, Jaakkola,

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.

227 Liukkonen, & Digelidis, 2012; Vandaele, Cools, de Decker, & de Martelaer, 2011; Zimmer, 2009). A
228 significant corollary of this assumption is that if learners have been unable to acquire fundamental
229 motor/movement skills in early schooling, it makes little sense to try to teach them advanced skills
230 later (Bradford, Kell, & Forsberg, 2016; Kalaja et al., 2012).

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

244 At this point, it is useful to reiterate that the theoretical features described above are
245 *assumptions* – they are part of a device which aims to render the phenomenon of movement education
246 understandable. To accept the motor programming analogy, means to accept that the central nervous
247 system is the site of movement learning, that learning takes place developmentally, and that learning
248 to move is largely an individual, undifferentiated process. With the exception of the teacher, a
249 learner's immediate or cultural surroundings are seen to have little effect on the learning process.
250 Further, learners' emotions or affective states are not seen as a factor that might influence learning.

251 There have been challenges to the information processing perspective from motor learning
252 theorists and pedagogues (see for example, Smith, 2011). In general, challenges center on issues of

253 transfer and the ways in which the perspective ignores interactions between movement learners and
254 the social and natural environment (Rink, 2005). Challenges have however been generative in the
255 sense that they have led to other ways of understanding movement learning, including the non-linear
256 pedagogical perspective.

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

258 The non-linear pedagogical perspective gained momentum in PE scholarship around ten years ago
259 (Smith, 2011). The analogy that forms the basis for the perspective comes from the natural sciences.
260 Learners are seen as complex biological organisms that interact with their environments (Chow,
261 2013). As organisms, learners have biological characteristics that influence how they move. These
262 ‘performer constraints’ (Chow, 2013) refer to factors such as learners’ height and muscle mass. An
263 organism’s movement behavior is determined by an interaction between performer constraints,
264 environmental constraints such as air temperature, and the constraints of the task that the organism is
265 attempting to perform (for example, restrictions that are placed on the way a movement needs to be
266 carried out) (Chow et al., 2007).

267 In line with the overarching biological analogy, a central idea of this perspective is that
268 organisms attempt to self-regulate and find homeostasis. This means that if the environment and task
269 are structured correctly, learners will naturally tend towards the ‘right’ way of performing (Chow,
270 2013). Chow and colleagues (2007) suggest for example, that improvement in performance can be
271 “achieved without the presence of explicit instructions on technique [and that] goal-directed behavior
272 can emerge as a consequence of the presence of the specific task constraints in the learning task” (p.
273 265). Smith (2011) uses a downhill skier that automatically adapts to the undulations of the slope as a
274 case in point.

275 At least two implications follow on from the principle of self-regulation. First, learning does not
276 follow a pre-set pathway. Instead it emerges within a set of “dynamic, spontaneous and even
277 unpredictable interactions” (Chow & Atencio, 2014, p. 1035; see also, Miller et al., 2015). Second,
278 the primary role of the teacher is *not* to tell learners how to move but to manage learning situations in

279 such a way that students will generate ‘performance solutions’ independently (Chow, 2013; Atencio,
280 et al., 2014). In line with other advocates of the perspective, Renshaw, Chow, Davids, and Hammond
281 (2010) claim that the approach is student-centered and empowering and leads to a “hands-off approach
282 to learning” (p. 117). In analogic terms, pedagogical manipulation can be understood as a kind of
283 funneling or directing where certain forms of behavior are encouraged or made more possible while
284 others are inhibited.

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

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

301 Concerning PE practice, non-linear pedagogies have been associated with game sense
302 approaches where game manipulation is also used to foster particular patterns of behavior (Chow et
303 al., 2007). Note however that proponents have recently pointed to key differences between non-linear
304 pedagogical and game sense approaches (Renshaw et al., 2015). Other scholars have suggested that the

305 perspective needs to be expanded to account for socio-cultural factors (Uehara, Button, Falcous, &
306 Davids, 2014).

307 **Instinctive movement and the organic learning perspective**

308 The organic learning perspective focuses specifically on children as movement learners. It frames
309 movement as a ‘natural’ activity and children as curious, open and intuitive (Baumgarten, 2006).³ The
310 work of Laban (Laban, 1948; Laban & Lawrence, 1974) is sometimes referenced in this perspective
311 (Theodoraki & Kampiotis, 2007). Orienting ideas are that children have natural urges to move and
312 movements like swinging, jumping, and running are inherently meaningful for children. In other
313 words, children would swing, run and jump to express themselves, even without formal education or
314 instruction.

315 From an organic learning perspective, physical educators should foster differences between
316 children and ‘harness’ children’s natural desires to move (Baumgarten, 2006; Baumgarten & Pagnano-
317 Richardson, 2010). Teachers should foreground the importance of *playful* movement (LaMaster, 2006)
318 and underscore creativity, spontaneity and risk taking in their lessons (Evans & Penney, 2008). More
319 concretely, learners should be provided with open-ended tasks and given opportunities to respond to
320 tasks in their own ways (Fuchs, 2015). Educational gymnastics is frequently proposed as a suitable
321 activity in this perspective and terms like ‘body management’, ‘kinesthetic awareness’ and ‘movement
322 confidence’ are common (Baumgarten & Pagnano-Richardson, 2010). Educational gymnastics is
323 further seen as an appropriate way to facilitate development of the ‘whole child’ and can be used to
324 improve not only movement capability but also flexibility, strength, and muscular endurance as well as
325 help learners to express themselves through movement (Docherty & Morton, 2008; Mally, 2008). In
326 this sense, the perspective is concerned with holistic education and does not concentrate solely on
327 motoric aspects (Weiller-Abels & Bridges, 2011).

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).

328 Along with educational gymnastics, non-supervised experiences such as climbing trees have
329 been cited as ways to improve movement capabilities (Baumgarten & Pagnano-Richardson, 2010).
330 Again, such activities are understood to help children learn about their bodies' capabilities and
331 limitations as well as how their bodies can be effectively managed in different contexts (Baumgarten,
332 2006). In contrast to much current educational discourse that stresses measurable educational
333 outcomes and assessment (see for example, Evans & Penney, 2008), the organic perspective lays little
334 emphasis on what children should be able to do at the end of learning experiences, a point to which we
335 shall return. Instead, advocates of the perspective suggest that many movement solutions can be
336 correct (Weiller-Abels & Bridges, 2011).

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

347 **Embodied exploration and the guided discovery perspective**

348 The final perspective to emerge from the literature framed the development of movement capabilities
349 as an exploratory process that revolves around the concept of searching. Following Gilbert Ryle
350 (2009) and his notion of “knowing how” and “knowing that”, Nyberg and Carlgren (2015) for
351 example, describe the process of developing movement capability as ‘discerning’ the aspects of
352 experience involved in moving in particular ways. According to this perspective, learners are largely
353 unfamiliar with the movements for which they are looking so discovery, or ‘grasping’, occurs in two

354 senses: (a) learners discover a way of moving that was unfamiliar to them, and (b) learners discover
355 how it feels to move in that new way. This means that coming to understand a movement and coming
356 to master that movement are two sides of the same embodied process (Nyberg & Carlgren, 2015;
357 Nyberg & Larsson, 2014). Indeed from this perspective, ways of knowing become embedded in
358 individuals' bodies (Nyberg & Carlgren, 2015).

359 Helping learners locate such moments can involve different pedagogical 'search strategies' such
360 as inviting learners to articulate their tacit knowing, structuring movement experiences in ways that
361 make certain features more noticeable, encouraging reflection upon action, and providing possibilities
362 for social interaction (Light & Kentel, 2015). Light and Kentel (2015) elaborate on these final two
363 points, suggesting that teachers can help learners to be mindful of body presence and encourage
364 learners to 'dwell' in that presence. They also propose that interacting with other learners and
365 discussing possible ways of moving is a useful tactic to discover and develop movement capabilities.
366 In each case though, the emphasis is on *in-depth* searching (or learning) and developing an
367 appreciation of characteristics of moving.

368 From this perspective, teachers also need to be aware that learners have encountered different
369 ways of moving in the past, either as 'movers' or 'observers of movers'. These encounters affect how
370 learners appreciate new ways of moving (Nyberg & Carlgren, 2015). A dancer learning a basketball
371 layup for example, may search for the layup experience in a different way to a volleyball player
372 because of corporeal differences as well as the meanings that each learner gives to the layup. The
373 learners' meanings are in turn connected to cultural norms and values – in some contexts, the ability to
374 perform a layup may be highly valued, in other contexts the ability might count for relatively little.

375 Unlike in the motor programming and non-linear perspectives, learning in the embodied
376 exploration perspective occurs between learner and their subjective understandings of moving.
377 Although the teacher is expected to plan thoroughly for learning experiences, they are not expected to
378 steer the learning process by identifying errors nor is the central aim to manipulate environmental or
379 task constraints. Instead, teachers are more likely to use guided discovery-type teaching where the

380 primary question is ‘what does it mean to know/grasp this movement?’ (Nyberg & Larsson, 2014)
381 rather than ‘what is the best way to...?’.

382 As with the other perspectives, there are basic assumptions that need to be accepted for the
383 embodied exploration analogy to be of explanatory value. The idea that anyone can learn to move in
384 complex ways, even if they have not ‘mastered the basics’, is central. To entertain the assumptions of
385 the perspective is also to accept that: (1) there is a movement experience to be ‘found’, and (2)
386 teachers and learners can recognize moments when these experiences are found. Not a great deal of
387 research exists using the embodied exploration analogy and there appears to be a need for the potential
388 advantages, limitations and applications of the perspective to be examined further.

389 **Discussion**

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

395 At the outset of this paper, we noted that PE attempts to meet a broad range of objectives
396 (Ennis, 2014) but that movement capability is a persistent feature of PE policy (ACARA, 2012;
397 SHAPE America, 2013; SNAE, 2011). In some respects, it is reassuring that different perspectives
398 exist. Nonetheless, not all perspectives fit equally comfortably with current educational thinking.
399 There are logical gaps between the non-linear learning, organic and guided discovery perspectives for
400 instance, and the basic ‘stage learning’ analogy underpinning much current PE policy (for example,
401 SHAPE America, 2013; ACARA, 2012).⁴ The idea that learning could take place spontaneously and
402 unpredictably (Chow & Atencio, 2014; Miller et al., 2015) or that movement capabilities could be
403 transient and subject to change (Baumgarten, 2006) are inconsistent with the rationalist notion of

⁴ 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).

404 performance levels prominent in education today (Evans & Penney, 2008). Akin to offering Lego
405 pieces to someone playing with Play Doh, researchers employing neurobiological systems, embodied
406 exploration or instinctive movement analogies provide educators with conceptions that are challenging
407 and incongruous to the discursive models with which they are obliged to work. This is not to suggest
408 that ‘alternative’ conceptions of movement learning are unhelpful. On the contrary, providing relevant,
409 new ways of understanding the world are for us a hallmark of quality research. Rather it is to suggest
410 that scholars need to consider the practical consequences of working with their perspectives in more
411 detail and as Renshaw et al. (2010) claim, there would appear to be benefits from “continuous
412 interaction between movement scientists and pedagogists” (p. 118).

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

423 The presence of multiple perspectives highlights a need for movement capability researchers to
424 think beyond their immediate theoretical frameworks. Researchers need to consider how conceptions
425 of movement education fit within the ‘bigger’ ideas and practices that make up PE and pay heed to
426 how the school subject’s traditions influence their work (see Kirk, [2010] for a detailed discussion of
427 this theme). Each of the analogies described above offer something unique and PE is poorer for the
428 absence of any one of them. At the same time, it is unhelpful to claim that the perspectives are
429 complementary and that they can be used together to inform research and practice. As indicated, the
430 analogies are oppositional on certain fundamental assumptions. Learning cannot occur linearly and

431 non-linearly at the same time, for example. Rather than see analogies as conceptual models to be
432 combined, or alternatively, as models containing tensions that need to be resolved, it is useful to see
433 analogies as bases for assumptions that can be entertained in a flexible, variable manner. As such, they
434 may be employed in parallel or used as a reflection device to generate better understandings of other
435 perspectives (see Boyce et al., 2006) but not as conceptual equivalents to be evaluated against one
436 another.

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

447 Finally, we want to address the ‘what’ issue of the different perspectives – specifically the ‘what
448 it is that students are supposed to learn’ according to the four perspectives (Nyberg & Larsson, 2014).
449 Each of the perspectives have been associated with particular kinds of movement, or perhaps more
450 accurately, moving in certain ways within certain ‘movement cultures’ (Larsson & Quennerstedt,
451 2012). Scholars working within the non-linear pedagogical perspective for example, have related
452 movement learning to sports and games (Chow, 2013) whereas proponents of the organic perspective
453 have advocated educational gymnastics (Baumgarten & Pagnano-Richardson, 2010). At the same
454 time, the connections between perspectives and their anticipated movements/movement contexts has at
455 times been problematic. The motor program analogy has typically been associated with ball sports and
456 games for instance, but has been criticized for ignoring context and the importance of game awareness
457 in movement capability. There is consequently a need to re-consider the kinds of movements and

458 contexts about which these analogies have something useful to say. Nyberg and Larsson (2014) and
459 Light and Kentel (2015) have suggested that embodied exploration may be useful in more technique-
460 intensive activities such as running and swimming and in activities where learners have opportunities
461 to create new movements (for example, in dance) and it would seem likely that there are specific
462 contexts to which each perspective is suited.

463 **Concluding thoughts**

464 The aim of this review was to provide an ‘inventory’ of the conceptual underpinnings of current
465 movement research in PE. Using a hermeneutic approach, four guiding analogies of movement
466 capability were identified in the PE literature. The motor program analogy provided basic orientation
467 for the information processing perspective. In this perspective, learning to move was likened to writing
468 a set of instructions for a computer. Feedback and practice were essential elements of learning in this
469 perspective. The neurobiological systems analogy supported the non-linear pedagogical perspective.
470 From this perspective, learning to move was a natural process that occurs as learners adapt to their
471 surroundings. The instinctive movement analogy provided the base idea for the organic learning
472 perspective. This analogy was naturalistic, emphasizing the animal-like instincts of (younger) learners
473 that compel them to move. The embodied exploration analogy provided a fourth and final way of
474 understanding the development of movement capability. This analogy belonged to a guided discovery
475 perspective and framed movement learning as a process of searching for moments in which learners’
476 intentions and their capacities to enact these intentions are brought together.

477 In considering these analogies, we made three points related to logical consistency and its
478 relevance for movement capability researchers. The first concerned conflict between perspectives and
479 educational policy. We claimed that providing practitioners and policy makers with concepts that did
480 not fit their discursive environments could lead to challenges. Following this, we suggested that there
481 is a need for movement capability researchers to think beyond their immediate theoretical frameworks
482 and consider how conceptions of movement education fit within the framework of ideas and practices
483 that make up PE. Here, we proposed that movement capability researchers should make explicit their

484 own starting assumptions and reflect thoroughly on the starting assumptions of other movement
485 researchers. This would, we believe, enable scholars to communicate the nature of their contributions
486 to research, policy and practice more effectively. Third, we suggested that there is a need to continue
487 to explore the kinds of movements and contexts in which these analogies could be employed.

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

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