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9   What would physical educators know about movement education?

10   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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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

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 Sköldberg (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*

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[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, Miletić, & Miletić, 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,

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[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 programing 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).

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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).

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 measureable 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 programing 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

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[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 Sköldberg (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.

508

509   **References**

510   ACARA. (2012). The shape of the Australian curriculum: Health and physical education. Sydney:
511   Australian Curriculum, Assessment, and Reporting Authority.

512   Alvesson, M., & Sköldberg, K. (2000). *Reflexive methodology*. London: Sage.

513   Atencio, M., Yi, C. J., Clara, T. W. K., & Miriam, L. C. Y. (2014). Using a complex and nonlinear
514   pedagogical approach to design practical primary physical education lessons. *European*
515   *Physical Education Review, 20*(2), 244-263.

516   Avery, M., & Rettig, B. (2015). Teaching the middle school grade-level outcomes with standards-
517   based instruction. *Journal of Physical Education, Recreation and Dance, 86*(7), 17-22.

518   Bailey, R., Armour, K. M., Kirk, D., Jess, M., Pickup, I., & Sandford, R. (2009). The educational
519   benefits claimed for physical education and school sport: an academic review. *Research*
520   *papers in education, 24*(1), 1-27.

521   Barker, D. M., & Lundvall, S. (2017). Transformative pedagogy in physical education and the
522   challenges of young people with migration backgrounds. In K. Armour, A. Chen, C. Ennis, A.
523   Garn, E. Mauerberg-deCastro, D. Penney, S. Silverman, M. Solomon & R. Tinning (Eds.),
524   *Routledge Handbook of Physical Education* (pp. 356-368). London: Routledge.

525   Baumgarten, S. (2006). Meaningful movement for children: Stay true to their natures. *Teaching*
526   *Elementary Physical Education, July*, 9-11.

527   Baumgarten, S., & Pagnano-Richardson, K. (2010). Educational gymnastics: Enhancing children's
528   physical literacy. *Journal of Physical Education, Recreation and Dance, 81*(4), 18-25.

529   Boyce, B. A., Coker, C., & Bunker, L. K. (2006). Implications for variability of practice from
530   pedagogy and motor learning perspectives: Finding a common ground. *Quest, 58*, 330-343.

531   Bradford, B., Kell, S., & Forsberg, N. (2016). Mentorship in practice program: An effective school-
532   based strategy. *Strategies, 29*(1), 36-42.

533   Bunker, D., & Thorpe, R. (1982). A model for the teaching of games in the secondary school. *Bulletin*
534   *of Physical Education, 10*, 9-16.

535   Casey, A., Goodyear, V. A., & Armour, K. (Eds.). (in press). *Pedagogical Cases: Digital*
536   *Technologies in Youth Physical Activity, Physical Education & Sport*. London: Routledge.

537   Chow, J. Y. (2013). Nonlinear learning underpinning pedagogy: Evidence, challenges, and
538   implications. *Quest, 65*, 469-484.

539   Chow, J. Y., & Atencio, M. (2014). Complex and nonlinear pedagogy and the implications for
540   physical education. *Sport, Education and Society, 19*(8), 1034-1054.

541   Chow, J. Y., Davids, K. W., Button, C., Shuttleworth, R., Renshaw, I., & Araújo, D. (2007). The role
542   of nonlinear pedagogy in physical education. *Review of Educational Research, 77*(3), 251-
543   278.

544   Claxton, D. B., Troy, M., & Dupree, S. (2006). A question of balance. *Journal of Physical Education,*
545   *Recreation and Dance, 77*(3), 32-37.

546 Delaš, S., Miletić, A., & Miletić, Đ. (2008). The influence of motor factors on performing fundamental
547   movement skills – the differences between boys and girls. *Facta Universitatis: Series Physical*
548   *Education & Sport, 6*(1), 31-39.

549 Docherty, D., & Morton, A. R. (2008). A Focus on skill development in teaching educational
550   gymnastics. *Physical & Health Education Journal, 74*(2), 40-44.

551 Drost, D. K., & Todorovich, J. R. (2013). Enhancing cognitive understanding to improve fundamental
552   movement skills. *Journal of Physical Education, Recreation and Dance, 84*(4), 54-59.

553 Ennis, C. (2014). The role of students and content in teacher effectiveness. *Research Quarterly for*
554   *Exercise and Sport, 85*, 6-13.

555 Evans, J. (2004). Making a difference? Education and ability in PE. *European Physical Education*
556   *Review, 10*(1), 95-108.

557 Evans, J., & Penney, D. (2008). Levels on the playing field: The social construction of physical
558   'ability' in the physical education curriculum. *Physical Education and Sport Pedagogy, 13*(1),
559   31-47.

560 Fischman, M. G. (2007). Motor learning and control foundations of kinesiology: Defining the
561   academic core. *Quest, 59*(1), 67-76.

562 Fuchs, M. A. (2015). Movement matters: Observing the benefits of movement practice. *Montessori*
563   *Life: A Publication of The American Montessori Society, 26*(4), 30-37.

564 Hall, T. J., Heidorn, B., & Welch, M. (2011). A description of preservice teachers' task presentation
565   skills. *The Physical Educator, Winter*, 188-198.

566 Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination.*
567   Thousand Oaks, CA: Sage.

568 Harvey, S., & Jarrett, K. (2014). A review of the game-centred approaches to teaching and coaching
569   literature since 2006. *Physical Education and Sport Pedagogy, 19*(3), 278-300.

570 Hill, G. M., & Turner, B. (2012). A System of Movement and Motor Skill Challenges for Children.
571   *Strategies: A Journal for Physical and Sport Educators, 25*(8-), 8-11.

572 Hudson, J. (2006). Applied biomechanics in an instructional setting. *Journal of Physical Education,*
573   *Recreation & Dance, 77*(8), 25-27.

574 Kalaja, S. P., Jaakkola, T. T., Liukkonen, J. O., & Digelidis, N. (2012). Development of junior high
575   school students' fundamental movement skills and physical activity in a naturalistic physical
576   education setting. *Physical Education and Sport Pedagogy, 17*(4), 411-428.

577 Kamla, J. (2013). Minute to win it: A fun alternative to improve skill-related fitness. *Strategies, 26*(5),
578   25-29.

579 Kim, I., Lee, Y. S., Ward, P., & Li, W. (2015). A critical examination of movement content
580   knowledge courses in physical education teacher education programs. *Journal of Teaching in*
581   *Physical Education, 34*(1), 59-75.

582 Kirk, D. (1992). Curriculum history in physical education: A source of struggle and a force for change.
583   In A. Sparkes (Ed.), *Research in Physical Education: Exploring Alternative Visions* (pp. 210-
584   230). London: Falmer Press.

585   Kirk, D. (2010). *Physical education futures*. London: Routledge.

586   Kirk, D., Macdonald, D., & O'Sullivan, M. (Eds.). (2006). *Handbook of physical education*. Thousand
587   Oaks, CA: Sage.

588   Kirk, D., & MacPhail, A. (2002). Teaching games for understanding and situated learning: re-thinking
589   the Bunker-Thorpe model. *Journal of Teaching in Physical Education, 21*, 177-192.

590   Kretchmar, R. S. (2006). Life on easy street: The persistent need for embodied hopes and down-to-
591   earth games. *Quest, 58*(3), 344-354.

592   Laban, R. (1948). *Modern educational dance*. London: Macdonald & Evans.

593   Laban, R., & Lawrence, F. C. (1974). *Effort: Economy in body movement*. Boston: Plays.

594   Laker, A. (2003). Citizenship, sport and education. In A. Laker (Ed.), *The Future of Physical*
595   *Education: Building a new Pedagogy* (pp. 32-53). London: Routledge.

596   LaMaster, K. (2006). Get moving: On meeting your movement standards... creatively. *Strategies,*
597   *20*(1), 31-34.

598   Larsson, H., & Quennerstedt, M. (2012). Understanding movement: A sociocultural approach to
599   exploring moving humans. *Quest, 64*(4), 283-298.

600   Light, R. L., & Kentel, J. A. (2015). Mushin: learning in technique-intensive sports as a process of
601   uniting mind and body through complex learning theory. *Physical Education and Sport*
602   *Pedagogy, 20*(4), 381-396.

603   MacPhail, A., Kirk, D., & Griffin, L. (2008). Throwing and catching as relational skills in game play:
604   Situated learning in a modified game unit. *Journal of Teaching in Physical Education, 27*,
605   100-115.

606   Mally, K. (2008). Creative opportunities to improve young children's balance, strength and stability.
607   *Strategies, 21*(4), 25-28.

608   Martin, E. H., Rudisill, M. E., & Hastie, P. A. (2009). Motivational climate and fundamental motor
609   skill performance in a naturalistic physical education setting. *Physical Education and Sport*
610   *Pedagogy, 14*(3), 227-240.

611   McKenzie, T. L. (2007). The preparation of physical educators: A public health perspective. *Quest, 59*,
612   346-357.

613   Miller, A., Christensen, E., Eather, N., Gray, S., Sproule, J., Keay, J., & Lubans, D. (2015). Can
614   physical education and physical activity outcomes be developed simultaneously using a game-
615   centered approach? *European Physical Education Review*, 1-21.

616   Miller, J., Vine, K., & Larkin, D. (2007). The relationship of process and product performance of the
617   two-handed sidearm strike. *Physical Education and Sport Pedagogy, 12*(1), 61-76.

618   Männistö, J., Cantell, M., Huovinen, T., Kooistra, L., & Larkin, D. (2006). A school-based movement
619   programme for children with motor learning difficulty. *European Physical Education Review,*
620   *12*(3), 273-287.

621   Newell, K. M. (2011). Physical education of and through fitness and skill. *Quest, 63*(1), 46-54.

622 Nyberg, G., & Carlgren, I. M. (2015). Exploring capability to move–somatic grasping of house-
623   hopping. *Physical Education and Sport Pedagogy*, *20*(6), 612-628.

624 Nyberg, G., & Larsson, H. (2014). Exploring 'what' to learn in physical education. *Physical*
625   *Education and Sport Pedagogy, 19*(2), 123-135.

626 O'keeffe, S. L., Harrison, A. J., & Smyth, P. J. (2007). Transfer or specificity? An applied
627   investigation into the relationship between fundamental overarm throwing and related sport
628   skills. *Physical Education and Sport Pedagogy, 12*(2), 89-102.

629 Oliver, S. (2009). Alignment in early movement education: Remembering what we know. *Journal of*
630   *Physical Education, Recreation & Dance, 80*(3), 24-29.

631 Overdorf, V., & Coker, C. (2013). Efficacy of movement analysis and intervention skills. *The Physical*
632   *Educator, 70*, 195-205.

633 Pühse, U., Barker, D., Brettschneider, W., Feldmeth, A. K., Gerlach, E., McCuaig, L., . . . Gerber, M.
634   (2011). International approaches to health-oriented physical education - local health debates
635   and differing conceptions of health. *International Journal of Physical Education, 48*(3), 2-15.

636 Renshaw, I., Araújo, D., Button, C., Chow, J. Y., Davids, K. W., & Moy, B. (2015). Why the
637   constraints-led approach is not teaching games for understanding: A clarification. *Physical*
638   *Education and Sport Pedagogy*, 1-22.

639 Renshaw, I., Chow, Y., Davids, K. W., & Hammond, J. (2010). A constraints-led perspective to
640   understanding skill acquisition and game play: A basis for integration of motor learning theory
641   and physical education praxis? *Physical Education and Sport Pedagogy, 15*(2), 117-137.

642 Ricoeur, P. (1978). The metaphorical process as cognition, imagination, and feeling. *Critical Inquiry,*
643   *5*(1), 143-159.

644 Rink, J. E. (2005). *Teaching physical education for learning*. Boston: McGraw-Hill.

645 Rukavina, P. B., & Jeansonne, J. J. (2009). Integrating motor-learning concepts into physical
646   education. *Journal of Physical Education, Recreation & Dance, 80*(9), 23-65.

647 Ryle, G. (2009). *The concept of mind*. New York: Routledge.

648 Saemi, E., Porter, J. M., Ghotbi Varzaneh, A., Zarghami, M., & Shafinia, P. (2012). Practicing along
649   the contextual interference continuum: A comparison of three practice schedules in an
650   elementary physical education setting. *Kinesiology, 44*(2), 191-198.

651 Satern, M. N. (2011). Defining the "correct form": Using biomechanics to develop reliable and valid
652   assessment instruments. . *Strategies: A Journal for Physical and Sport Educators, 25*(2), 32-
653   34.

654 SHAPE America (2013). Grade-level outcomes for K-12 physical education. Reston, VA.

655 Shoemaker, P. J., Tankard, J. W., & Lasorsa, D. L. (2004). *How to build social science theories*.
656   Thousand Oaks, CA: Sage.

657 Siedentop, D. (1994). *Sport education: Quality P.E. through positive sport experiences*. Champaign,
658   IL: Human Kinetics.

659 Siedentop, D. (2002). Sport education: A retrospective. *Journal of Teaching in Physical Education,*
660   *21*(4), 409-418.

661 Smith, W. W. (2011). Skill acquisition in physical education: A speculative perspective. *Quest, 63*(3),
662   265-274.

663 Smith, W. W. (2014). Fundamental movement skills and fundamental games skills are complementary
664   pairs and should be taught in complementary ways at all stages of skill development. *Sport,*
665   *Education and Society*(ahead-of-print), 1-12.

666 Swedish National Association for Education. (2011). *Curriculum for the compulsory school, preschool*
667   *class and leisure-time centre*. Stockholm: Skolverket.

668 Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., &
669   Garcia, L. E. (2008). A developmental perspective on the role of motor skill competence in
670   physical activity: An emergent relationship. *Quest, 60*(2), 290-306.

671 Theodoraki, K., & Kampiotis, S. (2007). The development of movement synthesis ability through the
672   teaching of creative movement and improvisation. *Science Education International, 18*(4),
673   267-275.

674 Tinning, R. (2010). *Pedagogy and human movement: Theory, practice, research*. London: Routledge.

675 Uehara, L., Button, C., Falcous, M., & Davids, K. (2014). Contextualised skill acquisition research: A
676   new framework to study the development of sport expertise. *Physical Education and Sport*
677   *Pedagogy*(ahead-of-print), 1-16.

678 Wallian, N., & Chang, C. W. (2006). Development and learning of motor skill competencies. In D.
679   Kirk, D. Macdonald & M. O'Sullivan (Eds.), *Handbook of Physical Education* (pp. 292-311).
680   Thousand Oaks, CA: Sage.

681 Vandaele, B., Cools, W., de Decker, S., & de Martelaer, K. (2011). Mastery of fundamental movement
682   skills among 6-year-old Flemish pre-school children. *European Physical Education Review,*
683   *17*(1), 3-17.

684 Weiller-Abels, K., & Bridges, J. (2011). Movement education framework (MEF) made EZ! *Strategies,*
685   *25*(2), 8-10.

686 Vidoni, C., Lorenz, D. J., & de Paleville, D. T. (2014). Incorporating a movement skill programme
687   into a preschool daily schedule. *Early Child Development and Care, 184*(8), 1211-1222.

688 Zimmer, J. (2009). Getting girls in the game! *Physical & Health Education Journal, 74*(4), 30-31.

689

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691