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Understanding learners’ sense making of movement learning in physical education

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ABSTRACT
There is a substantial body of physical education scholarship focusing on movement learning. The question of how pupils themselves make sense of movement learning has however, largely escaped attention. Answers to such a question would seem to be highly germane if educators are to engage in pupil-centered pedagogies. In light of this absence, the aim of this investigation was to describe how movement learners made sense of their own movement development. Drawing on theoretical tenets of Gilbert Ryle (2009. The concept of mind. New York, NY: Routledge) and Michael Polanyi (1969. Knowing and being. Essays by Michael Polanyi. Chicago, IL: University of Chicago Press), three cases from an investigation in which movement learning was occurring are presented. The investigation was conducted during a physical education project week with pupils from an upper secondary school. Data were produced using observations, informal interviews, semi-structured interviews, and research diaries as a group of pupils learned to juggle. The results suggest that: the aspects of moving to which learners attend change as they learn; learners have a relatively limited capacity to verbally articulate what they learn, and; learners’ expectations of ideal ways of moving have considerable impact on how they come to make sense of their own ways of moving. The practical implications of these points are discussed in the final section of the paper.

KEYWORDS
Movement learning; awareness; sense making; knowledge; Polanyi; Ryle

Introduction
Teaching children how to move in different ways has been a longstanding objective of most physical education teachers (Kirk, 2010). There has been a general expectation that pupils will acquire new physical skills during physical education lessons and that these skills will prove useful beyond schooling (Smith, Green, & Thurston, 2009; Wallian & Chang, 2006). In line with this expectation, there exists a wealth of physical education scholarship that focuses on skill development or more broadly, movement learning (see for example, Light & Kentel, 2015; MacPhail, Kirk, & Griffin, 2008; Overdorf
& Coker, 2013; Smith, 2016). Researchers have focused on questions related to optimal amount of feedback or type of practice for bringing about movement learning (Boyce, Coker, & Bunker, 2006), how movements might be learned in authentic situations (Chow et al., 2007), and how teachers might best organise learning experiences in order for pupils to improve fundamental movement skills (Kalaja, Jaakkola, Liukkonen, & Digelidis, 2012), for instance. What has largely escaped attention are the ways in which pupils themselves make sense of movement learning. We know little about the kinds of challenges pupils describe while learning new movement patterns or the ways in which pupils’ ongoing understanding of what they are trying to achieve influences how they act. Such knowledge would seem to be highly germane if pedagogues are to engage in pupil-centered pedagogies as mandated by current educational texts and national curricula (Rovegno & Dolly, 2006). In light of this absence, the aim of this paper is to describe how movement learners make sense of their own movement development. Drawing on theoretical tenets of Gilbert Ryle (2009) and Michael Polanyi (1969), we present three cases from an investigation in which movement learning was occurring. The investigation was conducted during a special physical education project week with pupils from an upper secondary school. Data were produced using observations, informal interviews, semi-structured interviews, and research diaries as the group of pupils learned to juggle. The three cases described in the second part of the paper represent detailed illustrations from which new theoretical and practical starting points for movement education are developed.

**Background**

A number of physical educators have examined issues related to movement learning (Larsson & Quennerstedt, 2012; Whitehead, 2001). In this section we use Barker, Bergen-toft, and Nyberg’s (2017) recent review as a platform for our work. Briefly, the review suggests that four broad perspectives have influenced physical educators’ approaches to movement education. They term these the *information processing*, *non-linear*, *organic*, and *discovery* perspectives. In this section, we revisit these perspectives, examining specifically what they have to say about learners’ subjective understandings of movement learning.

An information processing perspective is based on the idea that people acquire motor programs (Rink, 2005, p. 9) when they learn to move. The brain is understood as a type of hard drive and as with computers, learners must be subjected to an encoding process if they are to learn. From this perspective, learners’ subjective understandings of what they are doing are either disregarded or framed as problematic. It is the teacher who must interpret pupils’ actions and the teacher who must work on pupils to gradually detect and eliminate errors in the pupils’ motor programs (Boyce et al., 2006). If teachers are successful, pupils should be capable of running their movement programs ‘automatically’ (Ward, 2013). In other words, they should be able to perform movements without their thoughts getting in the way.

A non-linear perspective takes learners to be complex organisms that interact with their environments (Renshaw, Chow, Davids, & Hammond, 2010). As organisms, learners have particular characteristics which both constrain and afford different ways of moving (Chow et al., 2007). Again, the importance of learners’ subjective understandings of what they are
doing is downplayed. The organism metaphor steers attention towards the biological characteristics of the learner. A key premise – that organisms seek homeostasis – suggests that learners react to external cues rather than make sense of them. Pedagogically, this means that if teachers can structure environmental and task conditions appropriately, organisms will naturally respond with the ‘right’ modes of behaviour. Chow et al. (2007) exemplify this position, suggesting that movement performance can be improved without the presence of explicit instructions on technique, and goal-directed behaviour will emerge ‘as a consequence of the presence of the specific task constraints in the learning task’ (p. 265).

An organic learning perspective has primarily been used to describe how younger children learn. The perspective frames movement as an organic, ‘animalistic’ activity that all children will engage in, regardless of socialisation (Baumgarten & Pagnano-Richardson, 2010). Children are assumed to have natural ‘urges’ to move and find movement inherently enjoyable. From this perspective, teachers should ‘harness’ individuals’ natural drives for movement (Baumgarten, 2006) and provide opportunities for children to move in different ways. There does not however, seem to be a need for pedagogues to understand how pupils make sense of movement tasks or movement learning from this perspective since children just move.

In contrast to the three perspectives mentioned above, a discovery perspective has framed movement learning as a process that involves various types of sense making. Nyberg and Carlgren (2015) for example, describe developing movement capability as learning to ‘discern’ certain key aspects of movement experience. From this perspective, novices unfamiliar with the experiences for which they are looking discover – or ‘grasp’ – new ways of moving (Nyberg & Carlgren, 2015; Nyberg & Larsson, 2017). Helping learners to locate such experiences can involve employing ‘search strategies’ such as inviting learners to communicate what they know, structuring experiences to make certain features more noticeable, encouraging reflection, and providing possibilities for social interaction (Light & Kentel, 2015). Searching is understood as a personal process and teaching informed by this perspective assumes that learners’ previous encounters with different ways of moving will affect how individuals learn to move (Nyberg & Carlgren, 2015).

In sum, the first three perspectives assume that change, or learning, occurs un-reflexively and un-reflexively. Scholarship within the guided discovery perspective has begun to account for these kinds of differences (Nyberg & Carlgren, 2015; see also Andersson & Östman, 2015) but even within this perspective, there have been few investigations examining how subjective evaluations reflexively influence what is learnt. There is thus a need to examine more closely individuals’ sense making as they are learning. In the following sections, we describe such an examination.

**Theoretical framework**

In this section we outline three principles of Gilbert Ryle’s (2009) and Michael Polanyi’s (1966, 1969) work regarding knowledge and learning. These principles relate to: different forms of knowledge; awareness; and articulation of movement knowledge.

The first principle is concerned with different forms of knowledge. Ryle (2009) challenged the traditional Cartesian dualism that divided body and mind. He proposed that human action is not a two-step process involving thoughtful planning followed by
execution. Instead, Ryle suggested that humans make sense in action, and that they act-think at the same time. From this perspective, we can gain an appreciation of the sense someone is making of moving in two ways. First, we can ‘see’ the sense people are making while moving when we watch them move. We might observe for example, a person taking an extra step at the bottom of a staircase. From this observation, we might propose that the person was moving as if there was still one step to descend. Alternatively, we can come to appreciate the sense someone is making by listening to the person. In the stair example, we might ask ‘why did you trip?’ In each case, we get a certain perspective on the sense that has been made (see also Nyberg and Larsson’s [2017] discussion of experiential and spatial aspects of moving). A methodological implication is that when we ask questions related to body–mind and moving-thinking, a consideration of both perspectives is advantageous.

A second principle relates to awareness. For Polanyi (1962), tasks and movement can fall into a person’s focal or subsidiary awareness. When performing a task, a person becomes focally aware of particular aspects, while other aspects reside in the subsidiary awareness. When performing an habitual task such as walking, one’s focal awareness might shift between many things such as traffic, or other pedestrians. A person is usually only subsidiarily aware of her/his muscle contractions and balance.1 When learning a new task, it is generally not clear to which aspects of the task the person should attend. It is only through repetition that fragments of a task (or the particulars of a task) shift into the subsidiary awareness and become embodied knowledge (Polanyi, 1966, p. 13; see also Barker, Aggerholm, Standahl, & Larsson, 2017).

The third principle useful for considering sense making concerns articulation, or the ways in which individuals express knowledge to others or themselves. Polanyi suggested that articulation can be divided into three kinds of utterances: expression of feeling, appeals to other persons, and statements of fact (Polanyi, 1962, p. 80). All three types of utterance can be used to express knowledge. A juggler may be able to articulate juggling in terms which the audience can grasp however her articulation remains an interpretation. To begin to understand the sense the juggler is making of juggling, listeners need to have experiences that resonate with the explanation (see Polanyi, 1962). Again, using Polanyi’s work in the context of physical education, Nyberg and Carlgren (2015) suggest that sportpeople often struggle to articulate movement knowledge. With this point in mind, the next section describes our methodological approach.

Methodological approach

In order to examine the sense making of movement learning, empirical and analytic activities involved three phases (see Figure 1). The first phase involved the design of a pedagogical sequence in which movement learning was to take place. The second phase involved...
the generation of data on the ways in which individuals made sense of movement learning. The third involved analysis of the changing meanings which individuals ascribed to movement learning in relation to Ryle and Polanyi’s theories. Each of these phases is described in more detail after sampling selection, below and the section is concluded with a description of ethical considerations.

**Sample selection**

A class from an upper secondary school with whom the first author was already working participated in the study. The class contained 14 girls and 15 boys, aged 17–18 years. At the end of the pedagogical sequence (described below), four girls and five boys were invited to take part in interviews based on the first author’s assessment of the pupils’: (1) development of juggling skills and, (2) ability to textually and verbally articulate reflections on their learning during the sequence. This selection strategy represented purposive sampling (Silverman, 2009) with the objective being to include participants that could help to develop detailed accounts of movement learning. For the purposes of adequately describing the process of individuals’ meaning making in this paper, data from three cases (Flyvbjerg, 2006) will be presented. These three cases have been selected because of their capacity to illustrate variation in approaches to movement learning (see Gobo [2004], pp. 418–419, for a discussion of maximising variation in purposive sampling). In other words, it was not the characteristics of the learners that drew our attention to these individuals but the characteristics of their sense making.

**Design of pedagogical sequences based on Ryle’s and Polanyi’s theoretical frameworks**

The objective of the pedagogical sequence was to help students improve their bodily knowing in relation to juggling. Underpinning the approach was the idea that by reflecting on their own learning, students would become more capable of improving bodily knowing in contexts beyond physical education. Juggling was chosen because it is a flexible activity that can (1) ‘expand’ with multiple levels of complexity as students improve (for e.g. juggling with different objects or additional objects, which in turn, affects timing and weighting), and (2) provide students with opportunities to check their own learning. Equity issues also informed the choice of activity. Juggling falls outside of ‘mainstream sport’ and it was assumed that the activity would be unlikely to disadvantage students on the basis of prior experience (see Tidén, Redelius, & Lundvall, 2017). The pedagogical sequence took place over two school weeks and students took part in learning activities for approximately three hours on each day (week one: Tuesday – three hours, Wednesday – two hours, Thursday – three hours; week two, Tuesday – three hours, Thursday – three hours. 14 hours in total). This duration provided opportunities for students to display persistence and patience, as well as experience frustration and boredom, aspects we would suggest are typical of movement learning.

The sequence was informed by Ryle’s (2009) and Polanyi’s (1966, 1969, 2002) theories of the practical and tacit dimensions of knowledge and learning. In practical terms, the sequence was designed by the first and last authors who created a series of activities in which the pupils would engage. The sequence aimed to provide many possibilities for
students to explore their bodily knowing and students were for example, invited to juggle with different objects, in different positions and with different rhythms. The sequence was initiated with two introduction activities: a short discussion of juggling and students’ experiences of juggling, followed by the viewing of several online inspirational videos featuring different kinds of juggling. Student activities were structured according to stations. Each station had its own set of instructions (for example, students needed to watch an online instructional video and experiment with an aspect of juggling, or film a partner juggling and then compare and contrast juggling styles). Students formed groups spontaneously during these tasks. The entire sequence was facilitated by the first author who set up the stations and circulated in the gymnasium, providing prompting questions, encouragement, and occasionally instruction. Over the course of the sequence, the students had greater opportunity to decide which stations they worked at and how long they remained at each station. In line with Polanyi’s (1962) notion of connoisseurship, the students’ general assignment was to develop a sophisticated appreciation of juggling rather than an ability to juggle in a specific way.

**Data generation using observations, interviews and learning diaries during implementation of pedagogical sequences**

(a) Observations: Over the five days, the first author observed learning practices of the students. The author paid attention to the students’ dispositions in terms of the ways they acted and interacted with others and with features of the environment including stance, body orientation, and focus of view, for example. The researcher recorded moments where changes became evident with paper and pen at the conclusion of each lesson and followed these moments up in pupil interviews.

(b) Interviews: Informal conversations of short duration were conducted with all students during the sequence. These conversations provided pupils with opportunities to talk about their experiences and enabled the researchers to identify: (i) features of movement that participants distinguished as important, and; (ii) learners’ reported impressions as their attempts to act purposefully were facilitated and inhibited. These conversations took place between activities and during rest periods. In addition, nine semi-structured interviews (Rapley, 2004) were conducted by the first author and two experienced researchers. During these interviews, pupils were asked questions similar to ones asked in the informal conversations but were invited to expand on their answers. The pupils also watched film extracts from their learning diaries (see below) and were asked to describe events selected by the first researcher. These interviews were audio recorded and extracts deemed relevant to the aim of the project were transcribed verbatim.

(c) Learning Diaries: The students were provided with tablets which they used as diaries over the course of the week (see Maivorsdotter and Lundvall [2009] for a similar but non-digitalised methodology related to learning in PE). Students were encouraged to use the tablets in three ways: as cameras to make still photos of themselves; as video cameras to film short action sequences; and as notebooks to write textual reflections of their learning experiences. At the end of each practical session, students were given 45 minutes to record reflections related to developments in bodily knowing.
In order to structure the students’ use of the diaries, they were required to address a number of questions based on our interpretation of Polanyi’s and Ryle’s concepts in a pedagogical setting. These questions included: What are the easy/difficult parts of juggling? What factors help/hinder you in your learning process? What do you pay particular attention to when you are practicing? What problems typically arise when you are learning to juggle? How do you typically solve problems during these learning sessions? Students were able to determine how they responded to the questions and could construct their diaries in ways that they found appropriate.

Analysis of generated data

All data were produced in Swedish. Direct quotes provided in this paper have been translated by the first author with an attempt to retain the intended meaning rather than a literal translation. The names that are used are pseudonyms. Analysis involved multiple close readings of the participants’ data sets, which comprised ‘observed actions’ (field notes based on observations and film material provided in learning diaries) and ‘participant texts’ (interviews and written entries in diaries). Similarities and differences were noted in the participants’ data sets around topics such as flow/fluency, patterns, rhythm, and multitasking. After comparing and contrasting the sets, individual cases were developed through a reflexive process. This process involved writing a text with a sequential dimension for each participant (see Richardson & Adams St. Pierre, 2005), and returning to the data set to look for supporting and diverging evidence. This process was repeated until we believed the text adequately captured the pupils’ sense making.

Ethical considerations

The research was conducted in accordance with the Swedish Research Council’s ethical guidelines. Participants and their guardians were informed about the project and how collected material would be used. In line with the Research Council’s guidelines for research with people aged over 15 years, informed, active consent was obtained from the participants (Swedish Research Council, 2017, p. 27). Students were able to take part in the sequence but decline participation in the research project without any adverse effects. Students also had the possibility to cease participation in the project at any time, in which case empirical material concerning them would not have been used. The use of video cameras raised issues of confidentiality, possibilities for anonymity, and privacy for all participants. The video-filmed material was only used for research purposes and was stored in a manner that prevents unauthorised use. Anonymity was not possible or desirable in the analysis of the data. Instead, we aimed for anonymity in the presentation/publication of the research results. This involves using fictitious names for schools, teachers and students and excluding information that could be used to identify participants.

Results

Although themes were identified, we have chosen to present the data according to the individual cases. In line with Flyvbjerg (2006), we believe that this form of representation provides useful insights into changes in phenomena over time – in this case, changes in individuals’ sense making over the course of the pedagogical sequence.
Anders

Anders is 18 and has several years’ experience playing basketball and handball in sports clubs. He stated that he learns sports easily, claiming that he became the best player in his basketball team after practicing for only six months. Shortly after beginning the sequence, Anders described juggling as much more difficult than he had anticipated. He said that even though he could articulate what one needed to do in order to juggle (‘toss and catch with timing and rhythm’), he was not able to juggle.

Anders practiced juggling both sitting down and standing up during lessons. He mainly used bean bags for juggling, suggesting that they ‘feel easier to catch and handle’ compared with the tennis balls. He practiced in intervals, attempting to juggle intently for a few minutes, then pausing for another few minutes. In the pauses, he appeared to reflect upon what he was doing. While juggling, Anders kept his eyes on the bean bags ascending through the air, apparently losing track of them descending. Initially, this caused him to drop the bags regularly. He increased the height of his tosses, providing more time to keep up with the objects. Bigger throws resulted in increasingly bigger arcs however, which also ended with him dropping the bags. Anders explained that focusing on catching the bean bags caused him to lose track of when to throw the subsequent one. This comment was reflected in his tendency to hold onto the bean bags so that his catching hand was ‘occupied’ when it needed to be free to catch the descending bean bag.

Anders described his movement learning capacity as ‘very good’, but stated that juggling is a different type of movement to what he is used to. He suggested that juggling is ‘not so much about movement learning, but mental control and focus’. His learning trajectory with juggling was not extraordinary compared to the rest of the group. He did however, seem to notice more aspects and was able to articulate what he was doing in more detail than many of his colleagues. He noted for example,

I don’t have a problem starting up, but I can’t keep focus [on the balls] through more than one or two cycles …

Anders’ own assessment of ‘real juggling’ revolved around ‘multitasking capacities’ and the ability to capture and control the balls and keep focus on the task in the moment. He described the foremost quality of a proficient juggler as ‘keeping track of seven to eight things at once’ as well as coordinating one’s hands to handle the juggling objects. On completion of the learning sequence, Anders did not identify as someone who knew juggling. In his terms, a juggler constitutes an ‘expert’ and an ‘artist’, who is capable of controlling and varying her or his technique and he could not do those things.

Thomas

Thomas is 17 years old with experience in American football, floorball, squash and soccer. He regarded learning sports as something that can be easy in the beginning, but difficult to become proficient in at a high level. When it came to juggling, he expressed little enthusiasm and described it as boring. He added that making progress was very hard:

It takes both physical skills and you have to think about everything, and have the timing … move your hands in a special way and so …
Despite his lack of enthusiasm, Thomas practiced with various objects including tennis balls, soft balls, and table tennis balls during the training sessions. He alternated his ‘style’ of juggling, sometimes practicing with two objects and sometimes three. Intermittently he practiced with two objects using only one hand. Going back and forth between one and two hands, he suggested that ‘if you can handle two balls with one hand … that will help you with more balls and two hands’. Thomas claimed that practicing with one type of ball made it difficult to change to another, because he got used to the ‘feel’ and ‘rhythm’ of one type. This explanation was in line with his practicing primarily with table tennis balls.

In his early attempts, Thomas focused on the ascending balls, following them with his eyes and moving his hands accordingly. This focus was possibly related to his uneven and jerky movements. His movements sped up when tossing a ball, and slowed down while it was in the air. Later in the week, his juggling was smoother and he managed more consecutive tosses.

Thomas described timing as central to juggling more than two objects, but indicated that this was something very difficult to master. When he became more consistent with his juggling, he managed to juggle faster. He suggested that:

> At the start I had the wrong movement, the wrong timing, and I don’t think I knew where to have my eyes and where to throw the balls exactly, so it became very sketchy … And here in the last video, I know where to throw the balls, and I have pretty good timing for two balls, and I know, like, where to throw and where to have my eyes … Yeah, I would say I have improved a lot from the first video …

Thomas watched videos of jugglers on YouTube during the sequence and compared their movements to his own. He then tried to imitate both the movement of the arms as well as getting the balls’ movement pattern to match that of the other jugglers.

Noteworthy with Thomas is that midway through the sequence, he started to enjoy juggling. He stated that he liked the challenge and the idea of learning something new. He related juggling to other ‘difficult’ sports ‘like fencing, where you need to think about where to hit and defend … with a lot of thinking’. Enjoyment coincided with identifying a critical aspect of juggling. He stated that:

> The most difficult part had to do with three balls, because then it was, like, the timing and how to catch them with one ball in your hand … So I think that was the hardest part …

At the end of the sequence, Thomas compared his juggling practice with his ball sport experiences, describing himself as ‘proficient enough’. Thomas’s view of a juggler however, was someone who is found mostly in circuses. He suggested that jugglers are highly skilled and capable of controlling multiple objects after several years of practice. He did not describe himself as a juggler.

**Martin**

Martin is 17 and has experience playing soccer and performing martial arts. Before the pedagogical sequence he had tried juggling and found it very difficult. Coming into the sequence, he was anticipating a difficult time. Before starting to practice Martin explained that the handling of multiple objects was the primary challenge of juggling. Once he started practicing, he found himself learning more quickly than expected, stating that it ‘looked way more difficult than it actually felt’. Martin described his movement learning
as ‘quick’, comparing his juggling experience with his experiences in ball sports and gymnastics movements where he also learned movement patterns quickly.

Watching a film of himself juggling, Martin described his focus as being ‘scattered a little bit everywhere’. While juggling his eyes followed the top-most ball ascending through the air, and he kept his gaze steady at the peak of the balls’ cycle:

I think I keep my eyes up there, because it … Keeping your eyes at one point makes it easier … Because you don’t need to focus on where to look, so you don’t spend focus on that …

During his practice sessions, Martin moved around, keeping his body close to the balls’ cyclical pattern. During one session, he moved more to adjust for the balls’ movement, paying a lot of attention to his feet:

I focus on my feet and footwork because … If a ball goes a bit too far away, I need to move there to adjust for that mistake …

Martin stated that the adjustment of the height of the balls is important because it helps him to adjust the speed of the balls and ‘get the pattern more even’. He noted that when he managed to throw the balls with a similar height and depth, he found it easier to get a flow in the movement, proposing that ‘you can continue to juggle easier’. He attributed his development in juggling at this point to an improvement in control. Developing what he called a ‘feeling’ for how to throw the balls and how to maintain an even height and depth of the cycles, he suggested that:

If I could have kept the balls at the height of my face, I could have gone on without stopping … But I need to be able to stay focused on that … To not lose focus … When I lose focus, the balls go all over the place, in different heights and directions …

Conscious effort seemed to be important to Martin, and he attributed success or failure to his capacity to keep this focus. He deemed his skill in controlling the balls as ‘good enough’ to juggle ‘properly’, but his ability to maintain it as lacking. Maintaining focus seemed to be an issue in itself:

If I lose motivation to do something, it doesn’t go well … But if I can maintain my motivation, I could learn it very easily …

Later in the sequence, Martin described juggling as the act of ‘throwing at least three balls up in the air with timing and making sure not to drop them on the ground’. He claimed that juggling involves a lot of patterns, citing the cyclical movements of the balls and the arms as examples. He suggested that these patterns are central to both understanding how juggling works and actually juggling. Martin related his juggling practice to his experience in learning other types of movement. He likened his juggling to other movement skills, and stated that he had experienced similar learning processes before. To Martin, a juggler was someone with impressive skill, who can manage to keep control of the balls all the time. His description of jugglers was also related to circus artists who juggle with different objects. Like the other two participants, he distanced himself from the ideal juggler, suggesting that a juggler is someone who ‘pushes the limits … and goes further than would seem possible’.

**Discussion**

A range of pedagogically relevant issues can be raised from the cases above. We will however, focus on three related issues concerning sense making: (1) the movement
aspects to which the learners were attending; (2) the pupils’ capacity to articulate their knowing, and; (3) the pupils’ explanations of their juggling at the conclusion of the pedagogical sequence.

In line with the objective of the pedagogical sequence, each of the cases highlight the movement aspects to which the pupils were attending. Put differently, each case highlights aspects that the pupils believed were important at various stages of the sequence. Initially, the attention of all three were in Martin’s terms ‘scattered a little bit everywhere’. If there was any focus, it was around the height and direction of the toss. Expressions like ‘flow’, ‘pattern’, ‘rhythm’ and ‘timing’ became more frequent in the pupils’ comments as the pupils began to articulate series of tosses and catches. This process reflects certain aspects shifting into the pupils’ subsidiary awareness over time as the pupils started to integrate various aspects of the task refers to this process as ‘subception’ Polanyi 1962, 2002). This observation potentially effects a significant break from existing perspectives on movement learning in that it suggests the nature of the task changes for learners over time. While the information processing perspective holds that learners gradually refine their understandings of one ideal movement program over time (see e.g. Boyce et al., 2006; Rink, 2005), the explanation developed here implies that learners are involved in a series of unique but related movement experiences as they switch attention between different aspects. As learners experience new aspects of moving, new experiences become available. Learners may ‘forget’ old aspects and move on, both in the ways they talk and move, but this occurs reflexively rather than serially, where learning opens up possibilities for learning.

There are similarities with this explanation and non-linear thinking (Renshaw et al., 2010) and in particular, the principle of emergent behaviour (Chow, 2013). Nonetheless, the cases presented above begin to help us understand how learners’ sense making emerges. A learner who claims that controlling objects is a critical aspect of juggling is perhaps more likely to move in a jerky fashion. A learner who states that timing is a challenge might manipulate task constraints and affordances to encourage learners to rectify these ‘problems’, a pedagogue utilising an exploratory approach similar to that employed in the sequence above (see Nyberg & Carlgren, 2015; Nyberg & Larsson, 2017) would be more inclined to consider learners’ embodied knowledge, the ways that learners articulate the task corporeally and verbally, along with the aspects learners identify as critical to performance. Equipped with such an understanding, they would then attempt to facilitate further learning experiences.

The second related issue concerns the pupils’ capacity to articulate their knowing. As noted, the participants presented here were selected because of their capacity to ‘put words to their learning’. Few other pupils in the class were able to describe in as much detail their experiences of juggling. Still, these three pupils seemed to employ well-worn phrases to explain many aspects of their learning and at times struggled to find the words to describe their learning. Polanyi (1962) is categorical on this theme, claiming that ‘by acquiring a skill, we achieve an understanding which we cannot put into words and which is continuous with the inarticulate faculties of animals’ (p. 90; see also Nyberg, 2014). At the same time, our impression is that with practice, pupils could develop capacities to describe their experiences with more precision, for want of a better word. We accept that not all people have the flair of poets. Nonetheless, this sequence
was the first time these pupils had been asked to describe their movement learning. With some practice, more vivid descriptions might have been forthcoming.

The third issue that we would like to focus on relates to the pupils’ explanations of their juggling at the conclusion of the sequence. Despite being given the task of developing a sophisticated appreciation of juggling, each pupil explained their juggling knowledge in terms of their ability to juggle three balls. None of the pupils identified themselves as jugglers, citing personal dissimilarities with an imagined circus juggler. This evaluative dimension of sense making appears critical in movement learning. Without the circus juggler as a benchmark, the learners would conceivably have described themselves as jugglers. An interesting corollary to investigate based on the notion of embodied knowledge (Nyberg, 2014; Polanyi, 2002) would be whether alternative self-descriptions would be accompanied with alternative ways of moving. Our sense is that this would be the case but more research is required in this area.

Examining ideal ways of moving raises interesting questions for movement educators. Both the information processing and non-linear perspectives are based on an idea that there are more efficient or right ways of performing (Chow et al., 2007; Renshaw et al., 2010; Ward, 2013). In this respect, both perspectives fit with curricular documents that distinguish fundamental from complex ways of moving (see Janemalm, Quennerstedt, & Barker, 2018). The organic learning perspective does not assume ideal movement patterns (Baumgarten, 2006). Then again, the organic learning perspective holds little sway in today’s outcome-driven and assessment-focused educational context (Barker, Bergentoft, et al., 2017). In this context, it is unsurprising that pupils’ sense making is shaped by normative conceptions of movement excellence. It is perhaps also unsurprising that some pupils describe themselves as incapable, incompetent, or like the pupils above, just ‘good enough’. Whether sense making necessitates comparison is not clear. Kirk (2010) claims that explicit standards of excellence are crucial if physical education is to survive as a school subject. There is nothing to suggest however, that pupils must have the same standards of excellence (see Barker, Aggerholm, et al. [2017] for a discussion of this issue). Indeed, rejecting one-size-fits-all standards may be an important step in helping all pupils to identify as movers.

Conclusions

The aim of this paper was to describe how movement learners make sense of their own movement development. To do this, we presented data in the form of three cases from an investigation in which movement learning was occurring in a physical education context. Drawing on theoretical tenets of Ryle (2009) and Polanyi (1962, 1969), we identified three issues in the data that we believed were important for movement educators. These concerned: (1) the movement aspects to which the learners were attending; (2) the pupils’ capacity to articulate their knowing, and; (3) the pupils’ explanations of their juggling at the conclusion of the pedagogical sequence. We want to finish by developing some reflections regarding practical implications of the issues introduced in the previous section.

We have suggested that movement learning involves a collection of related but irregular sense making experiences. Translating this proposition into pedagogy would involve structuring movement activities in ways that enable learners to: (1) focus on varying a
quality of moving, and/or (2) identify how that quality changes across different activities. Pedagogues might for instance, ask learners to vary the rhythm in which they are jumping rope. Alternatively, pedagogues might ask learners to identify and demonstrate rhythm across rope jumping, juggling and dancing.

We have noted that it would be productive to help learners develop vocabularies for articulating movement experiences. Reading literary accounts or watching film clips would help learners consider movement learning as experiences worth describing. Written texts like Haruki Murakami’s ‘What I talk about when I talk about running’ or films such as John Avildsen’s ‘The Karate Kid’ portray the significance of moving and learning to move in emotive and sophisticated ways. Extracts from such texts could function as exemplars for student assignments. Keeping journals would also provide pupils with practice in experiential articulation of movement and allow pupils to look back on experiences and share with peers.

Finally, we have contended that movement learning might be enhanced by reconsidering standards of excellence. If demonstrations are given, it may be useful to provide a range of ideal movements. It might also be useful to include a range of ‘ideal movers’, each with characteristics with which pupils can identify. It seems to us that pupils in any class will identify with an array of different ideal movers. Of course, changing standards needs to be done in light of local governing documents. While this may be difficult in some contexts, opportunities for trialing new pedagogies can be found even in tightly defined educational environments.

These suggestions for practice contradict some traditional assumptions about movement learning. Implementation may therefore be difficult and unsuccessful. Still, continuing to question common assumptions and look for new ways of doing things, especially those surrounding a core aspect of physical education practice, would seem to be a useful way for physical educators to renew and revitalise the school subject. As such, we hope that other physical educators will continue to innovate in this area.

**Note**

1. This could make it difficult to articulate how something has been done, a point that Stride, Flintoff, Fitzgerald, Drury, and Brazier (2009) has addressed in his distinction between knowing *that* (for example, knowing in principle how a movement is done) and knowing *how* (i.e. actually performing the movement).

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