An introduction to the constraints-led approach to learning in outdoor education.

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Abstract

Participation in outdoor education is underpinned by a learner's ability to acquire skills in activities such as canoeing, bushwalking and skiing and consequently the outdoor leader is often required to facilitate skill acquisition and motor learning. As such, outdoor leaders might benefit from an appropriate and tested model on how the learner acquires skills in order to design appropriate learning contexts. This paper introduces an approach to skill acquisition based on ecological psychology and dynamical systems theory called the constraints-led approach to skills acquisition. We propose that this student-centred approach is an ideal perspective for the outdoor leader to design effective learning settings. Furthermore, this open style of facilitation is also congruent with learning models that focus on other concepts such as teamwork and leadership.

In outdoor education, technical or hard skills are often fundamental to the educational process, because leaders of outdoor experiences are frequently required to facilitate the development of motor skills (Paisley, Furman, Sibthorp, & Gookin, 2008; Priest & Gass, 2005). Physical activities such as canoeing and kayaking, skiing, orienteering and climbing require the development of specific perceptual-motor skills for effective performance (Brymer, 2010; Brymer, Hughes, & Collins, 2000; Fyffe & Peter, 1990). Even carrying the humble backpack changes walking gait and requires new skill patterns (Orloff & Rapp, 2004). At a practical level understanding how learners acquire functional movement patterns is essential for: (i) selecting ergonomically designed equipment for each learner; (ii) organising and structuring learning environments and tasks; (iii) planning and management of exercise and practice programmes; (iv) prevention of injury and associated health and safety considerations; and (v), understanding the nature of individual differences at various levels of performance (Renshaw, Davids, Chow, & Hammond, 2010). However, as Paisley et al. (2008) recognised there seems to be a scarcity of research that explores the process of acquiring motor skills in the outdoor education literature.

Those studies that have outlined perspectives on pedagogy in outdoor education seem to focus on the *teaching* of skills as differentiated from how skills are *learnt* (Paisley et al., 2008). Whilst the information presented from the *teaching* perspective should not be taken lightly, there seems to be a dearth of research undertaken from the learners perspective: “Our field is rich with curricula to teach students, yet there is a lack of understanding about how students actually learn the material” (Paisley et al., 2008, p. 212). As Thomas (2007) recognised, a skill acquisition focus is fundamental to good skill instruction in outdoor education and as such, potentially valuable for the development of effective outdoor leaders. The aim of this paper is to introduce a particular learner-centred approach to skill acquisition termed the *constraints-led* approach. A growing body of evidence-based literature from other fields such as motor development, motor control and motor learning supports the notion that the constraints-led approach could provide a principled approach to skill acquisition (e.g., Davids et al., 2007; Chow et al., 2009; Renshaw et al., 2010). In this paper, we argue that the *constraints-led* model might also be appropriate for understanding and exploring motor learning in outdoor education.

Learner-centred approaches in facilitation of outdoor education experiences have been discussed in the outdoor education literature (e.g. Breunig, 2009; Estes, 2004; Gilbertson, Bates, Mclaughlin, & Ewert, 2006; Quay, 2003). When these learner-centred theories have been used to explore skill development in outdoor education a common critique is the minimisation of the role of environmental factors (Paisley et al., 2008; Thomas, 2007). Amongst other factors the *constraints-led* perspective on learning recognises the fundamental importance of environmental dynamics (Davids, 2010). Thus the *constraints-led* standpoint might augment the outdoor leader's understanding of how a learner learns as well as how to structure the learning journey.

Beyond pure skills development, outdoor education is also promoted as a medium for facilitating an understanding of the relationship between humanity and the natural world and for personal and group development (Brymer & Gray, 2006; Keighley, 1993; Martin, Cashel, Wagstaff, & Breunig, 2006; Priest & Gass, 2005). Thus, any theory purporting to explain skill development would ideally need to allow for this broader picture. This is a point eluded to by Thomas (2007) in his comparison of the direct instruction and discovery model of teaching canoeing and kayaking. In part, the authors of this paper build on the concepts outlined by Thomas (2007) by showing how the *constraints-led* approach to skill development might encompass the holistic and environmentally-focused perspective that outdoor leaders already follow. In this way the constraints-led approach might augment the outdoor leader’s ability to design effective learning experiences and frame good leadership practice.

The constraints-led perspective in theory

The constraints-led perspective is learner-centred and presupposes that effective motor learning depends on a distinctive interaction between the person, the task, and the environment. Proponents of the constraints-led approach consider that learning is non-linear, that is, learning does not happen in a uniform straight line. For example, a learner might skip putative “predetermined” steps as they leap ahead or hit a plateau or regress to earlier steps as they struggle to move ahead in their skill development.

From the constraints perspective, the learner is described as a non-linear, open dynamic system (Davids, 2010). This understanding stems from ecological psychology and dynamical systems theory and is now considered one of the main approaches to understanding how people learn physical skills (Adolph & Berger, 2000; Chow et al., 2009). In theory, each learner is believed to be a unique complex system compiled of many smaller sub-systems (e.g., muscular, skeletal, cardio-respiratory). A facilitator of physical skills recognises that each learner comes to the session with a unique set of intrinsic dynamics that includes physical, cultural, social, psychological and emotional history that act as constraints to the development of any new skill. A learner on the skill development journey will pass through periods of stability and instability reflected by varying levels of variability in movement as they attempt to effectively self-organise. What this means is that each learner will find their own perfection in their own time (Renshaw & Chappell, 2010).

Individual, environmental and task constraints

Constraints have been defined as boundaries which shape the emergence of behaviour (Davids, 2010). The interaction of different constraints forces the learner to seek stable and effective movement patterns during goal-directed activity. A small change in one part of the system can lead to the emergence of large scale global changes. Newell (1986) classified constraints into three distinct categories: performer (or individual), environment, and task.

Individual constraints refer to the unique structural and functional characteristics of learners and include factors related to their physical, psychological, cognitive and emotional make up. A learner’s body shape and size, fitness level, technical abilities and psychological factors like anxiety and motivation may shape the way individuals approach a movement task. These person-related factors provide affordances (possibilities) for action and play a significant role in determining the performance style adopted by individuals. These different individual constraints illustrate the distinct strategies that may be used to solve movement problems. These unique performer characteristics can be viewed as resources for each individual that channel the way in which each learner solves particular task problems or characteristics that can lead to individual-specific adaptations.

Personal constraints are not barriers to a perceived ideal. Indeed an individual’s final solution to movement challenges satisfies their own unique constraints. Variability in movement patterning can play a functional role as each individual seeks to achieve a task goal in his/her own way

(Davids, Bennett, & Newell, 2006). In fact, research has shown that experts often have greater variability when performing a task than would be expected from novices (Bootsma, Houbiers, Whiting, & van Wieringham, 1991; Brisson & Alain, 1996; Davids, Button & Bennett, 2008; Renshaw & Davids, 2004; Schöllhorn & Bauer, 1998). From a facilitation perspective, what this indicates is that each individual's solution to a task problem will be unique. Thus, teaching techniques designed to promote *ideal* optimal movement solutions, such as modelling perfect skills, might be redundant.

For example, the first four stages of the DEDICT (Demonstration, Explanation, Demonstration, Imitation, Coaching/Correction, Trials) model (Thomas, 2007) as used in canoeing and kayaking, focuses on learners imitating instructors who have modelled the skills. If it is accepted that the fifth stage is correction then the first five stages are leader centred and based on the premise that novices should eventually perform the "perfect ideal" as defined by the leader. Yet, young learners, for example, attempting to match a demonstration of a sweep stroke provided by an adult outdoor leader may have shorter limbs, a shorter body, less flexibility or strength and so on. From the *constraints-led* perspective modelling a desired outcome might actually restrict a learner's ability to develop the most ideal solution. Consequently, demonstrations should take into account individual differences and be explicitly about developing a "rough guide" to a movement not an image of a required ideal solution (Davids, Button & Bennett, 2008).

Environmental constraints are multilayered and are most often presented as physical and socio-cultural factors. *Physical factors* comprise the immediate surroundings and include gravity, altitude, weather conditions, cold, light or terrain. *Socio-cultural* factors include the role of social contexts such as peer groups, and cultural expectations. Motor skill acquisition for young learners is often strongly influenced by group expectations, trends and fashions (Kohl & Hobbs, 1998). Powerful socio-cultural environmental constraints include critical group members such as class-mates, the presence of parental support and access to high quality facilities (Phillips, Davids, Renshaw & Portus, in press; Renshaw et al., 2010). From the *constraints-led* perspective a leader is also considered an environmental constraint. Leadership style, skill, beliefs, fears and attitudes might have a positive or negative impact on the learner. Other outdoor education specific constraints might also include the culture of the organisation facilitating the outdoor experience and perhaps even the culture of the peak or governing body responsible for the activity.

Task constraints consist of the goal of the specific task, conventions of the activity and the implements or equipment used during the learning experience. In contrast to the other constraints the outdoor leader is easily able to manipulate task constraints, for example modifying equipment, deciding on facilitation style or setting boundaries and goals. Small manipulations in the task can lead to large-scale changes in a learner's behaviour (Renshaw, Davids, Phillips & Kerherve, in press). For example, in outdoor education this might be as simple as adjusting paddle length in canoeing or ski length in skiing. The manipulation of task constraints often becomes the sole focus in teaching physical skills. However, leaders can only be effective at manipulating tasks constraints that successfully guide learners towards discovering helpful coordination patterns and decision-making behaviours if they possess a mastery of knowledge and experience in specific activities (Renshaw et al., 2010).

Affordances

An *affordance* is simply a term used to describe an opportunity for action that combines the objective nature of the environment with the subjective nature of the learner (Fajan, Riley & Turvey, 2009). What this means is that a given environment will have specific properties and a person perceives opportunities for action from their own unique perspective. For example, two learners moving a canoe forward on the same stretch of flat water would be working with the same environmental properties but differences in limb length and body length would result in different perceptions and actions. The same rock climb might present different affordances for movement for someone with short limbs as opposed to someone with long limbs. At the same time an action that is simple to undertake in calm conditions, such as paddling in a crosswind might present different complexities as the wind picks up. Learners need simplified realistic learning environments where they can attune to information enabling them to make intelligent and informed decisions based on a complete understanding of their own capabilities in any given environment. Affordances are not static and may change as a function of time and context. For example, exhausted learners perceive inclines to be steeper than when they are not exhausted (Bhalla & Proffitt, 1999)

Perception and action

From the constraints-led perspective, a learner will only develop effective skills in any activity if the learning takes place within the appropriate context. What this means is that for an action to be effective a learner must first perceive and interpret relevant information, which in turn will lead to relevant action. This perception-action mutuality is understood to be a cyclical structure that is often called the information-movement coupling. This coupling is strengthened through a process of attunement to relevant information (Renshaw, Davids, Chow, Shuttleworth, 2009). In effect, for useful learning to take place the context must be representative of the activity. This does not mean that leaders should expose learners to complex or risky contexts when they are not ready but that learning activities should represent a simplified version of the task rather than a decomposed task that does not represent the intended learning context. Reducing a movement to decomposed parts and practicing them out of context breaks up this information-movement coupling (see Handford, 2006 for examples from sport). The result is an unproductive development of actions that do not fit the context. An example of this in canoeing could be teaching beginner canoeists to turn the boat by using the sweep stroke whilst spinning on the spot when the aim is to use the skill whilst moving. The stationary model does not fully represent the moving task because the stationary stroke does not take into account the fluidity of turning the boat whilst moving.

Self-organisation in movement

Motor system degrees of freedom (or parts of the body) have the neurobiological capacity to self-organise as the system re-organises in response to changing constraints. Through these inherent processes of movement systems, the interacting constraints of the individual, environment and task can lead to the spontaneous formation of movement patterns. The term *spontaneous*, as used here, should not be taken to mean that the co-ordinated pattern is randomly constructed or that there are infinite ways that the body can organise itself. Any coordination pattern that emerges during practice and learning is a function of the mechanical principles of the structure of human movement systems as well as the interacting task and environmental constraints (Williams, Davids, & Williams, 1999). Intuitively, many outdoor educators and practitioners may have understood that learners have this self organising capability, even though they may not have studied the constraints-led approach or considered the neurobiological processes involved. For example, Thomas's (2007) description of the FERAL (Frame the problem, Explore solutions, Report back with solutions, Adjust our thinking and motor plans, Learn by testing the new solutions) seems to effectively consider the environmental, task and individual constraints through a discovery approach. However, from the *constraints-led* perspective the framework for the problem should effectively match the intended outcome. For example, it may not be an effective problem to ask students to explore turning the boat without moving forward if you are intending to teach students how to turn their boat on the move. At the same time it is also important to ensure that individual constraints are accepted and valued by outdoor leaders.

How constraints decay and emerge during motor learning

Setting appropriate challenges for learners can be a confronting task for outdoor educators. A key skill is identifying the most important performance aspect that an individual or group needs to work on at any specific stage of their development. In essence, leaders need to be able to identify whether key constraints may act as *rate limiters* to improved performance. Guerin and Kunkle (2004) highlighted how task constraints themselves are dynamic and can emerge and decay over time. As an example of this concept, Chow et al. (2006) investigated how learners adapted to emerging and decaying task constraints within the same learning context. In a kicking task, novice participants practised kicking a ball over a height barrier onto specific targets for practice sessions over a four-week period. Height and accuracy constraints were evident in the kicking task, as participants attempted to kick the ball over a bar (height constraint) so that it landed on specific target positions (accuracy constraint). Performance measures were determined over practice trials. Results suggested the participants initially focused on kicking the ball over the bar with little concern for accuracy. Subsequently, as participants were able to clear the height barrier more consistently and successfully, they concentrated on ensuring that the ball landed accurately on the target. Specifically, the height constraint decayed in importance and the accuracy constraint emerged as increasingly more pertinent. An example of this process in outdoor education might be the difference between psychological and physical constraints. A learner developing their skills in climbing might focus more on brute strength to undertake a climbing move but as they become more psychologically comfortable the same learner might be able to focus more on technique. As another example, height might act as a rate limiter in mountaineering where a simple move undertaken a few feet of the ground is more difficult when undertaken 200 feet on a sheer cliff.

Manipulating task constraint to facilitate learning

Manipulating task constraints is perhaps the most common way to improve learners' performance from this theoretical viewpoint. However, according to the *constraints-led* approach there is a danger that unskilled outdoor leaders might introduce artificial constraints in order to emphasise a specific aspect of performance (e.g., requiring a learner to spin their canoe continuously on one spot). Constraint manipulation must be based on the key pillar of task representativeness (see Araújo et. al, in press) in order to provide the opportunity for learners to attune to key affordances and develop appropriate information-movement couplings.

Designing learning experiences from the constraints-led perspective

Learners acquire movement skills as a consequence of an interplay of numerous interacting constraints (Davids, 2010; Davids, Chow, & Shuttleworth, 2005). Mind, body and the environment are continuously influencing each other to shape behaviour. Motor learning is a process of acquiring movement patterns which satisfy the key constraints on each individual (Davids, Button, & Bennett, 2008). The role of the facilitator is identification and manipulation of the key constraints to facilitate the emergence of functional movement patterns and decision-making behaviours (Chow et al., 2006). Outdoor leaders should design learning experiences that recognise the constant and reciprocal nature of learner and environment, the union between perception and action, and the non-linear nature of learning. The learner is placed at the centre of the process and makes movements and decisions derived from unique interacting individual, task and environmental constraints. Small changes to individual structural or functional constraints, task rules or equipment, or environmental constraints in learning contexts can cause dramatic changes in movement patterns.

A key underpinning concept in ecological psychology is the mutuality of the individual and the environment (Gibson, 1986). The implication for outdoor leaders is the need to identify the key information sources that learners can use to co-ordinate actions and make sure that this information is made available in specific performance contexts. Learners can then attune their movements to the essential information sources through their senses (e.g., sight, sound, touch) to support movement behaviours and decision making.

From a constraints-led approach leaders need to manipulate informational task constraints to direct learners towards functional information-movement couplings that will allow them to achieve task goals (Davids, Williams, Button, & Court, 2001). Designing learning experiences that are representative of the intended task is essential if they are to take into account context and individual needs. As such, skill interjections and progressions should be based on an understanding of the key constraints acting on students at any one moment in time (Chow et al., 2009; Kidman, 2005). For example, there is evidence to suggest that expert orienteers plan routes by first using the map to identify an obvious attack point near to the control and then work backwards to the start point, novice participants tend to focus on the start point first (Eccles, Walsh, & Ingledew, 2002). With this knowledge, it might be prudent to manipulate constraints in order to instil the benefit of attack points as opposed to start points.

Thomas (2007) concluded in his analysis of two different motor learning models typically used in canoeing that “good skill instruction is grounded in sound, theoretical principles” (p. 18). So how can the constraints-model of skill acquisition help outdoor leaders recognise ineffective learning design and facilitate effective learning? To recap, according to a constraints-led approach; skill acquisition depends on self-organisation under task, individual and environment constraints, as well as the effective coupling of perception and action.

One example of how the constraints-led approach might influence facilitation is the approach to managing the information load on learners. The traditional process involves teaching technical skills by decomposing the task into convenient components as a way of managing the information load on learners. To illustrate this point, an obvious example of task decomposition occurred when the complex kayak roll was taught through the pawlata roll. This is task decomposition because the pawlata roll requires that the learner adopt a paddle grip and body position that is not used once the kayak roll is mastered (Collins, 2004; Smith & Davies, 1995; Thomas, 2007).

However, task decomposition can also happen in less obvious situations, for example, in canoeing and kayaking, instructors can be found teaching forward paddling or rescues on land as a way of managing a perceived information overload before learners' progress onto the water. In addition, as we mentioned earlier the sweep stroke is traditionally taught by asking learners to spin the boat over and over again on one spot. Yet the intended aim of the sweep stroke is to turn the boat whilst on the move, either as a means to straighten the boat if it is going off-course or to turn the boat if the learner needs to avoid an object or change direction (Bailie, 1991). The stroke is perhaps only undertaken once or if ineffective twice, not over and over again on one spot. This traditional approach is called *task decomposition* which results in a breakdown of the relevant information-movement coupling so that it becomes quite challenging for learners to perform the intended action (Handford, 2006). Expertise, on the other hand is about learning to harness and exploit relevant forces within the environment (Davids et al., 2008).

Those espousing the constraints-led perspective argue that novice learners will only have the opportunity to become attuned to these environmental forces if appropriate perception-action couplings are preserved. As such, the constraints approach encourages *task simplification,* which allows different components of complex coordination patterns to be learned together, thereby strengthening the information and movements coupling. That is, skill development should always take place in the *real-world* but on occasions the context can be simplified. For example, in canoeing, instead of teaching the sweep stroke a facilitator could set up a course, game or problem which utilises general canoeing skills but demands that the learner explores ways to turn their boat. Similarly, in climbing instead of focusing on gaining height a facilitator could set up low level games that require exploration of movement efficiency (Boniface & Bunyan, 1994). To do this effectively the outdoor leader requires a deep knowledge of the environmental and task constraints and the ability to observe and interpret individual constraints.

To summarise, Newell's (1986) constraints model provides an useful conceptualisation to guide practice because it adequately captures the rich range of diverse constraints acting on learners during skills learning. The constraints-led approach provides a framework, which highlights the importance of a balanced interaction between individual, environmental and task constraints. From this perspective, facilitators involved in promoting effective motor learning contexts should expect variability in movement solutions (Davids et al., 2008). According to the constraints-led model this would indicate that outdoor leaders planning to design effective learning experiences need to understand the unique task, environmental and individual constraints that provide a frame of reference to underpin learning design for a particular learner.

The process of practice

What does a constraints-based framework imply for the process of practice? As a result of practice and experience, successful learners undergo permanent behavioural change. This process involves learning to adapt movement patterns to achieve consistent movement outcomes in various, often unexpected, performance contexts e.g., due to rain, rough terrain, floods or other environment factors (Liu, Mayer-Kress, & Newell, 2006). The implication is that outdoor leaders need to implement (or manipulate) a variety of appropriate constraints to help learners effectively search for successful movement solutions in a practice environment. The search process should allow for flexibility and adaptability so that learners can generate a range of movement solutions that are unique to their personal, task and environmental constraints.

Developing this functional variability in movement suggests a *discovery-like approach* in outdoor education settings by allowing learners to establish effective coordination patterns, which satisfy task constraints. This viewpoint provides a tangible link with existing pedagogical practice in approaches such as experiential learning and the use of the journey and also relates to theoretical perspectives on leadership expertise (Tozer, Fazey, & Fazey, 2007). However, this approach also illustrates how some outdoor leaders might require a different perspective on movement variability. For example, the constraints-led approach indicates that the conventional demonstration which is often considered to be a model for learner imitation may need to be reconsidered as a rough outline intended only as guidance (Davids et al., 2008).

Movement variability has traditionally been viewed as dysfunctional (Slifkin & Newell, 1999), because the traditional approach emphasises the development of an *ideal* technique (Brisson & Alain, 1996). A constraints-led perspective, however, suggests that movement variability is an intrinsic feature of adaptive movement behaviour as it provides the flexibility required to consistently achieve a movement goal in dynamic environments (Williams et al., 1999). In fact, even skilled individuals find it challenging to repeat a movement pattern identically across trials (Davids et al., 2008). Variability in movement patterns permits flexible and adaptive motor system behaviour, encouraging free exploration necessary in dynamic learning and performance contexts as found in outdoor education. During skilled performance it is important to consistently repeat a performance outcome although the movement pattern used to achieve this outcome may not be, and does not need to be, repeated in an identical way every time. This feature is called *repetition without repetition* (Bernstein, 1967) which effectively mandates the invention of novel and sometimes unique adaptations to solve typical problems.

Another implication for outdoor leaders is to accept that movement variability may be an integral process in learning and acquiring effective movement patterns specific to a task goal. However, this is not to say that outdoor educators should merely allow *free play* and hope that learners complete a set task in whatever way the learners deem appropriate! The essence of the constraints-led perspective is to facilitate new movement solutions by designing learning environments that provide controlled boundaries of exploration in dynamic settings through the provision of relevant task constraints.

Summary of implications

This paper has reviewed the *constraints-led* approach to motor skill development in terms of its appropriateness for understanding and exploring motor learning in the outdoor environment. The authors have argued that a constraints-based perspective has the potential to provide outdoor educators with a framework for understanding how individuals learn and the individual, task and environmental constraints that shape learning. Valid categorisation of the constraints on each learner could help outdoor educators understand how differences lead to different, yet appropriate performance outcomes. We discussed how, in nonlinear pedagogy, the design of activities based on principles of ecological psychology and dynamical systems approach such as task representation, self organisation and the need to provide opportunities for attunement to affordances can provide a conduit for appropriate manipulation of task, individual and environmental constraints on each learner.

Learners do not present themselves as a blank slate and it is essential that outdoor leaders are aware that every individual enters a new learning situation with a pre-existing set of physical attributes as well as skill capabilities. Moreover, interactions with the environment and task constraints in a learning context will shape the emergence of movement behaviours that may or may not meet the task goal. The challenges for outdoor educators include understanding how to manipulate constraints and identifying key individual constraints that can be presented in order to encourage effective learning. Task constraints should be manipulated so that information-movement couplings are maintained in a learning environment that is approximate to a real performance situation. Outdoor educators should also understand that movement variability may not necessarily be detrimental to learning and could be an important phenomenon prior to the acquisition of a stable and functional movement pattern.

In summary, the theoretical concepts that underlie the constraint-led approach might help the outdoor leader develop a model of the learner and of the learning process that will further enhance their practice. For example, a good understanding of the concepts of decaying and emergent constraints can help the facilitator construct practice sessions that are more attuned to an individual’s current developmental status.

Learning activities should encourage self-organisation under constraints by providing repetition without repetition whilst creating high levels of variability in representative tasks that enable the participants to become attuned to key affordances and develop a repertoire of solutions to solve problems in real world environments where constraints are constantly changing. Activity design is not based on prescribing specific solutions, but encourages the development of adaptive performers who are able to find the best solution at any one moment in time (Button, Chow, & Rein, 2008). An important pedagogical practice underpinning non-linear pedagogy is that verbal instructions and feedback should not prescribe movement solutions but encourage exploration and use of learning strategies to allow natural self-organisation processes to take place. Forcing learners to attend to inappropriate information sources should be avoided and good practice would direct individuals to search for the most useful information to underpin their actions and decisions and develop autonomous, intelligent performers who understand their own capabilities.

This nonlinear pedagogical approach is student-centred and empowers individuals to become active learners. Manipulation of constraints encourages self-discovery, which might also lead to greater psychological engagement. This approach has important psychological benefits as it facilitates student achievement at a level appropriate to their unique intrinsic dynamics. However, while numerous studies have demonstrated the efficacy of the constraint-led model to explain performance in motor skill development; more research is needed in outdoor education settings to determine how key principles from the constraints-based framework might be adapted to facilitate learning.

Conclusion

The constraints-led approach has become a widely accepted theoretical exploration of effective motor skills learning. This student-centred perspective is an ideal perspective for the outdoor leader to design effective learning settings. Furthermore, this open style of facilitation also allows for the potential for learners to acquire skills in other concepts such as teamwork and leadership. The research described in this paper offers considerable support for this approach in a variety of other settings where motor learning is crucial to successful action. However, the evidence presented in this article also points to the need for further research into the *constraints-led* approach in the development of motor skills in outdoor education. For instance, further empirical research might investigate the specific role of the physical environment. In this way evidence can better inform outdoor education leaders.

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