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Improving ‘at-action’ decision-making in team sports through a holistic coaching approach

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This article draws on Game Sense pedagogy and complex learning theory (CLT) to make suggestions for improving decision-making ability in team sports by adopting a holistic approach to coaching with a focus on decision-making “at-action”. It emphasizes the complexity of decision-making and the need to focus on the game as a whole entity where players, individually and collectively, attempt to manage disorder in the face of an opposition. It rejects the complicated, mechanistic approach to learning and cognitivist views that dominate the literature on decision-making in team sports that see it as being a linear process of conscious thinking limited to the individual mind. It offers an alternative, holistic view grounded in a practical example of how this might be achieved in coaching rugby union football and theorized within a CLT framework.

Keywords: *Complex learning theory; Rugby union; Coaching; Constructivism; At-action decision-making, Holistic coaching; Team sports*

Introduction

Great players in team sports seem to possess a sense of the game that provides them with an uncanny knack of being in the right place at the right time and of seeming to have more time than other players to perform skills and make the right decisions under pressure. The greatest players in most team sports are typically remembered, not for their superior physical capacities, but for this remarkable *sens pratique* operating as an embodied practical mastery of a dynamic physical environment (Bourdieu, 1986). This intelligent negotiation of dynamic and complex physical environments involves myriad decisions being made and enacted under extreme temporal pressure, shaped by the ‘decisional background’ (Mouchet, 2005a) comprised of such things as score-lines, time remaining, the importance of the game within the season, and agreed strategies. The speed and efficiency of decision-making that this sense of the game allows suggests an adaptation to a dynamic environment in which there is little, if any, separation between perception, decision-making and action, between mind and body, or between the player and the game environment.

The complexity of “at-action” decision-making within team sports makes it a ‘grey’ area for many coaches who believe that great decision-making is more ‘god’s gift’ rather than something that has been coached (see for an example, Light & Evans, 2010; Williams & Hodges, 2005). This narrow view of decision-making is exacerbated by the limitations of

traditional, technique-focused, direct-instruction coaching for developing decision-making. On the other hand, player-centred, inquiry-based approaches to coaching such as Game Sense (den Duyn, 1997), Teaching Games for Understanding (TGfU - Bunker & Thorpe, 1982) and Play Practice (Lauder, 2001) can provide opportunities for enhancing decision-making due to the ways in which they focus on manipulating the game environment to *structure* and *facilitate* learning. These approaches recognise the interaction of tactical knowledge, decision-making ability and the effective execution of skill instead of breaking games down into discrete components that are taught in isolation from the game. In doing so, player-centred, games-based approaches conceptualize decision-making as an interrelated aspect of game play within the game as a *complex* phenomenon while traditional technical approaches reflect a mechanistic view of it as a discrete component of game play as a *complicated* phenomenon (Davis & Sumara, 2003; Light, 2008; Gréhaigne, Richard, & Griffin, 2005). Games-based coaching such as Game Sense places the player at the centre of the learning process and focuses on the game as a whole (den Duyn, 1997; Light, in press). As Dewey (1916/97, p. 19), suggests, we do not, “educate directly, but indirectly by means of the environment”.

In this article we draw on Game Sense pedagogy and the complex learning theory (CLT) that has been suggested underpins it (Davis & Sumara, 2003; Light, 2008) to make suggestions for improving decision-making ability in team sports by adopting a holistic approach to coaching with a focus on decision-making “at-action”. In it we emphasise the complexity of decision-making and the need to focus on the game or aspects of the game as whole entities where players, individually and collectively, attempt to manage disorder when confronted with an opposition (Gréhaigne et al., 2005). We use the term holistic in reference the whole person making the decision(s), including their intellectual, emotional, affective and physical dimensions, the immediate physical context within which decisions are made, and the larger social and cultural environments that indirectly shapes this decision-making (Gréhaigne, et al., 2005). We also suggest that a competition match can be seen more as a complex

phenomenon than a collection of individual players/agents. Like school organizations and community involvement in education they are, to some extent, self-organizing, self-maintaining, adaptive and nested within other systems (Davis & Sumara, 2008). We challenge the dominant, traditional approaches taken to understanding and improving decision-making in team sports, arguing that they are reductionist and thus unable to recognize and account for the complexity of decision-making. We reject the complicated, mechanistic approach to learning and cognitivist views that dominate the literature on decision-making in team sports and which see it as being a linear process of conscious thinking limited to the individual mind. As an alternative we offer a holistic view grounded in an example of how this might be achieved in coaching rugby union and theorized within a complex learning theory (Davis & Sumara, 2003) framework.

The nature of decision-making in team games

The bulk of research on decision-making has been conducted from a cognitivist perspective that reduces an essentially complex phenomenon to a comparatively simple intrapersonal, linear process of inputting, processing and acting upon information (see for example: Memmert & Furley, 2007; Johnson, 2006; Paques, Fruchart, Dru, & Mullet, 2005). It adopts 'a closed systems analysis, typical of the classical scientific method founded on a determinate world view' (Glimcher, cited in Araujo, Davids, & Hristovski, 2006, p. 654) that imposes limitations on the approach (see for example, Mann, Williams, Ward, & Janelle, 2007; Abernathy, Thomas, & Thomas, 1993).

The expertise approach aims to identify and measure the acquiring of knowledge as players progress along a continuum from 'novice' to 'expert' (Cushion, 2010). However, this approach has neither sufficiently nor specifically dealt with the critical issue of 'how' players make 'embodied' (pre reflective) decisions in game play. It has simply identified the types and amount of practice in terms of time that seems to be needed to reach an expert level by comparing the practice histories of novice and expert performers. This work does not

adequately enough account for the complex range of factors that decision-making is dependant upon and of which many are very difficult to measure and/or control in ecologically valid situations. The expertise approach and the laboratory testing approach adopted is not able to adequately account for the complexity of decision making in games because it attempts to reduce this complexity to study aspects that are often not directly related to the processes involved in decision-making (Williams & Hodges, 2005).

The third major body of research on decision-making, the ecological approach, has grown from dissatisfaction with the limitations of the information processing perspective in both methodology and epistemology (Araujo et al., 2006; Araujo, Davids, Chow, Passos, & Raab, 2009; Passos, Araujo, Davids, & Shuttleworth, 2008). It is used to study how an individual reacts to changes in his/her environment, identifying how different action possibilities persist, emerge and dissolve as a consequence of laws of motion and time evolution of observable quantities (see for example, Arujo et al., 2006). It sees decision-making as being a result of the interaction between the individual, his/her environment, and the task at hand (Arujo et al., 2006). Mathematical models or qualitative descriptions of behaviour are provided as the state of an object is seen to evolve over time through interaction with its environment. This approach is able to link perceptual processes to action, as recommended by Williams, Davids and Williams (1999) which is necessary because, as Arujo et al. (2006) note, ‘without decisions being realised through action, cognition would forever be locked in a black box’ (p. 658).

The ecological perspective is based upon the assumption that, “the capacity to be sensitive and attuned to ecological constraints... underpins successful decision-making in sport” (Arujo, et al., p. 661). However, it neglects the individual system (including cognition) and is limited in its ability to capture the complexity of everyday reality. Also, while it offers some potentially, ecologically valid explanations of decision-making behaviour in sport, research has only been conducted within laboratory settings (see Araujo et al., 2006). This is a

significant weakness in the approach because decision-making occurs *in situ*, according to the specific interactions between the context and the player's subjectivity that shape his/her actions at that particular moment (Mouchet, 2005a). That is to say that it is highly context specific. Decision-making is situated in, and specific to, the local and specific circumstances of the game situation while being located in a socio-cultural context and shaped by the 'decisional background' (Mouchet), as the strategies agreed to before the decision-making and cannot be adequately understood through laboratory-based research.

Subjectivity and decision-making

Mouchet (2008) identified variations between players' competence in being able to draw on 'decisional registers' (pre-agreed or decided strategies or tactics) during emergent decision-making in action and decision-making where deliberative or reflexive cognitive activity prevails. In reference to rugby union, he argues that this competence constitutes tactical adaptation to opportunities that the ball carrier can seize upon in the course of action during the game. Mouchet also distinguished between decision-making 'at-action' and rational decision-making well before action by using the terms, 'consciousness in action' (pre-reflective experience, implicit mode of reflection) and 'reflective consciousness' (conceptualized knowledge, judgements or explanations about a process).

According to Mouchet (2005a, 2008), reflective, rational consciousness is dominant in moments of lesser temporal and physical pressure such as when the ball carrier in rugby is far from opponents with consciousness-in-action seen to operate when players are under temporal pressure. Consciousness-in-action is dominant during moments of high temporal pressure such as in the crucial point of meeting between the attack and defence in team sports such as rugby. These decisions made 'at-action' are also often 'impregnated' by the player's subjectivity because he/she reconstructs them in situations within a lived process, according to his/her perception, as an interpretive process, and his/her own personal logic (subjectivity) as strongly shaped by previous experience.

Given the importance of the relationship between embodied and conscious thinking in decision-making, research showing it is possible for players to switch from ‘consciousness in action’ to ‘reflective consciousnesses’ during competition rugby matches makes an important contribution toward understanding ‘at-action’ decision-making in team games (Mouchet, 2005a, 2008). This research has been conducted using psycho-phenomenological methodology (Vermersch, 1994; Petitmangin, 2006; Maurel, 2009) to help players relive experiences of decision-making in competition matches. This research assists in understanding the organisation of the players’ actions and their subjective experiences of decision-making *in the match*. The interviews used allow players to relive the subjective dimensions of decision-making in games and could also be used to improve, players’ decision-making within the coaching approach we suggest in this article.

Decision-making ‘at-action’

The relationship between conscious (reflective) cognition and embodied thinking (pre-reflective cognition) and the influence of the player’s subjectivity depends upon the time available between making the decision and enacting it as ‘time-to-action’ (Gréhaigne, Godbout, & Bouthier, 1999). Gréhaigne and colleagues make a useful distinction between strategy and tactics according to the temporal distance from action as divided into the three stages of micro, meso and macro according to the temporal distance from action. Strategy is formulated on a macro level with ample time available, tactical decisions used to achieve strategy are made closer to the action of the game at a meso level (see Figure 1) with ‘emergent’ decision occurring at a micro level *at* the point of action. For example, this might be the point at which a rugby player receives a pass under threat of a tackle and must decide and act in a split second (see Figure 1). This action is dependent upon perception that is, in turn, shaped by the individual’s embodied experiences because perception is an interpretive process influenced by subjectivity and not the mere inputting of information (Merlau-Ponty,

1962). Consciousness-in-action is dominant during these moments of high temporal pressure can be seen, as has been suggested with dance, as the body thinking (Todd, 1968).

From a situated and practical epistemological perspective, decision-making, skill performance and tactical knowledge are inseparable from the immediate situation and larger game situations ranging from the time left in the game and the score line to the team's position on the ladder or in the larger competition and the strategy agreed to before the game. From a CLT perspective, the thinking that takes place here does not occur only at an intra-individual level but is, instead, also distributed, among team mates and inextricably linked to the physical and socio-cultural environment within which it takes place. This is to say that each player is more than a mere component of a team and to emphasize the nature of competitive matches as complex entities within which players have agency but where their thinking and action unavoidably interacts with other players in the match.

Eastern perspectives on learning offer a useful way of understanding the process of decision-making as time-to-action decreases. From this perspective, the gap between thinking and action can be seen to decrease to the point where mind and body act as one with the elimination of the 'interference' of the conscious mind. Similar concepts of training decision-making at action when there is no time-to-action are implied in the traditional teaching of Japanese martial arts and their origins in the training of samurai where years of training were aimed at reaching a state of no mind (*mushin*) in which body and mind are united in action as one (for example see, Suzuki, 1959).

Player learning

The limits of deterministic and objectivist views of learning evident in information processing and ecological information processing views on decision-making mean that they are unable to adequately account for the subjective aspects of decision-making and players' 'lived

experience' (Husserl, 1962) of decision-making within an ecologically valid game context (Mouchet, 2008; 2005a). For research to make a significant contribution toward understanding how decision-making occurs and how it can be developed it needs to move beyond simply examining the 'intrapersonal' aspects of decision-making to account for the 'interpersonal' aspects of decision-making and the inter-dependability of people comprising the game environment (Gréhaigne, et al., 2005). Decision-making is dependent upon the actions and movement of other players (both team mates and opponents) as the game ebbs and flows with whole teams functioning as one entity. As Davis and Sumara (2008) suggest is the case with complex phenomena, a team is more than the mere sum of its component parts (players) that can operate as a single yet complex entity and exceed the summed capacities of its members. The application of social constructivist theories of learning in research and writing on games teaching and coaching over the past decade (see for example, Kirk & MacDonald, 1998; Rovegno & Dolly, 2006; Wallian & Chang, 2007) and, more recently, of CLT and complexity theory (see for example, Light, 2008; Jess et al., 2011) further encourages views of decision-making as being a complex interpersonal process that is highly context specific, involves distributed thinking and is inseparable from the team as a phenomenon.

Moreover, increasing attention is being paid to practical epistemologies (Quennerstedt, 2011) within the physical education and sport field as a way of understanding the nature of knowledge and knowing in the world. Practical epistemologies promote ideas of learning as being shaped over time through participation in practice, with, and alongside, others, and through reflection in and on action. Athlete/player learning is seen as being socially constructed and deeply embedded within social and cultural contexts including the relationship between the coach, the player, and the environment (Cushion, 2010). Practical epistemologies allow researchers to consider a critical analysis of how knowledge, power and politics influence athlete/player learning and their constructions of knowledge. This view is

well suited to the study of 'at-action' decision-making in team sports because it recognizes that decision-making is situated within particular social and cultural contexts and that decision-making ability is developed over time through participation in practice within these contexts (Light, 2008).

Lenzen, Theunissen and Cloes (2009) cite Clancey's contention that: "To be perceiving the world is to be acting in it—not in a linear input-output relation (act-observe-change)—but dialectically, so that what I am perceiving and how I am moving co-determine each other" (p. 95) to suggest that all action can be seen as being embodied because perception and action occur simultaneously. This notion of perception and action occurring simultaneously, and of embodied learning occurring through engagement with the environment, provides a key to understanding and enhancing decision-making in team sports. This then suggests the importance of structuring or manipulating the physical environment for developing decision-making so that players can learn the appropriate 'habits-of-action' (Quennerstedt, 2011) with learning being a process of adaptation (Davis & Sumara, 2003; Kolb, 1984; Piaget, 1974). Put simply, players improve their decision-making ability in team games by making decisions in contexts that replicate the conditions of competition matches.

Constructivist perspectives on learning

Identifying how constructivist theories of learning can explain learning in and through game-based approaches to teaching games (Kirk & Macdonald, 1998; Light, 2009) stimulated interest in the physical education field in constructivism as a means of understanding how learning takes place in games and of how it can be enhanced. Broadly, constructivism sees knowledge as being constructed through processes of the interpretation of learning experiences shaped by the learner's previous experiences and existing knowledge with language and interaction central to learning in social constructivism (Fosnot, 1996; Wallian & Chang, 2007). Knowledge is not added on to existing knowledge or acquired because learning

is seen as an interpretive, social process of change and adaptation. More recently there has been some interest in complex learning theory (CLT) as a means of circumventing the differences between diverse forms of constructivism and some of the contradictions between them and which is also informed by complexity theory (Davis & Sumara, 2003).

Complex learning theory

CLT attempts to circumvent some of the contradictions between different forms of constructivism by identifying three core ideas underpinning all constructivism that align with the ideas of complexity theory. It is not a new theory but it is more than merely a synonym for constructivism. Like complexity theory, it leans more toward the study of groups or collectives rather than individual agents as reflected in its emphasis on learning as a social process of adaptation (Davis & Sumara, 2003). However, it cannot be seen as a version of complexity theory because rather than being a discursive way of understanding the object of study it is a theory of learning. It is also an inclusive term for complex *theories* such as enactivism (Varela, Thompson & Rosch, 1991) and Lave and Wenger's concept of situated learning.

CLT rejects the idea that learning is an internal representation of an external reality and to encapsulate the notions of the body's role in learning where action and cognition are intertwined. Davis and Sumara suggested that constructivist theories of learning share three broad and interrelated elements that they nominate as being:

1. They are aligned more with a neo-Darwinist notion of learning as an ongoing process of *adaptation*
2. They see cognition as being a *social process* and not only an intra-individual one.
3. They reject objectivist "representationist" accounts of cognition in favour of the idea

that learning involves processes of *interpretation* in which there is no pre-given external reality.

In summary, CLT proposes that learning is a complex process of adaptation that is social and interpretative in nature.

The interpersonal or 'social' aspects of learning through which individuals absorb the habits and culture of their environment in a spontaneous, non-conscious and embodied way play a significant role in learning in and through sport (Light, 2005). A CLT perspective, therefore, has implications for how we understand learning/improvement in team sports and the ways in which we can teach or coach decision-making. It suggests that a re-positioning of the coach and his/her role in learning is required for players to be afforded the opportunity to make 'emergent' or 'at-action' decisions and be provided with opportunity to reflect on experience, make meaning of it and re-construct knowledge while also re-constructing themselves through manipulation of the 'story of self' (Cushion, 2010, p. 175). This reflexive dialogue between the player and the appropriate game contexts then provides a powerful tool for the development of emergent decision-making in team sports where knowledge is enacted (Mitchell, et al., 2006).

Coaching to enhance decision-making

Significant improvements can be made in off the ball and on the ball decision-making when using TGfU and similar approaches that emphasize context (Harvey, Cushion, Wegis, & Massa-Gonzalez, 2010; Allison & Thorpe, 1997; Gray & Sproule, 2011). Decisions made in games are situated, not only within the immediate physical context of games, but also within the larger concerns of the game such as pre-agreed strategy and the importance of the game in the competition (decisional background) as well as wider, social contexts that include the

social-interactive and institutional-cultural aspects of game play (see for example, MacPhail, Kirk, & Griffin, 2008). Enhancing decision-making thus requires consideration of how wider social contexts influence it as well as managing the physical-perceptual aspects of games as learning environment.

The complexity of decision-making in team games and the temporal pressure they are made under ‘‘at-action’’, suggests that it cannot effectively be improved with direct instruction (William & Hodges, 2005). Instead, coaching for decision-making in team sports needs to focus on designing an effective learning environment that replicates certain conditions in which decisions have to be made in competitive matches while considering the game context and the wider social and cultural contexts influencing it. The coach needs to manipulate the physical game environment to suit the purpose of the practice session and to find the right balance between success and challenge. Typically this would involve adjusting the ratio of defenders to attackers, the size of the space they are working in, and the time available to make decisions.

Extending the work of Dewey (see for example, 1916/97) on learning suggests that learning to make appropriate decisions is achieved through engagement with the environment and not through being told what to do. ‘Getting the game right’ is, therefore, the key to improving decision-making (Thorpe & Bunker, 2008). This means that the coach needs to be able to plan to provide opportunities for players to improve their decision-making by designing practice games to achieve specific learning outcomes while also developing more general decision-making capacities. These need to provide specific physical contexts in terms of considerations such as space, the number and ratio of players on the two teams and time available that account for the skills, knowledge and dispositions that the players bring to training. In addition to the ways in which decision-making is made in response to the dynamic nature of

the physical environment it is influenced by decisional background. This can include the agreed strategy adopted for the game and/or a game scenario set by the coach or players.

The learning arising from being placed in such environments would likely take place at a momentary, non-conscious level over time through just playing 'good' training games.

However, good pedagogy can accelerate this learning by bringing thinking up to a conscious level through the use of language. From a Game Sense perspective this would involve players practising dealing with the challenges of the game long enough to get a feel for what is going on and to respond in embodied ways. Typically the coach would then stop the game for brief questioning that would stimulate critical reflection and collaborative problem solving. This would then lead to the formulation of ideas that would be tested in the game and reflected up again to refine positive tactical responses and eliminate those that didn't work. This process highlights the central role of language in learning that requires conscious, rational processing but on a collective basis that can include the coach as a partner in learning.

Drawing on motor learning theory, some research on TGfU and the Tactical Games approach identifies how the first stage of learning involves players (or students) being able to recognize and articulate what should happen in a game and what they should do, referred to as declarative knowledge (for example see, McPherson & Kernodle, 2003). This is developed through playing the practice game, reflecting upon experience, using language to discuss and 'debate' ideas (Gréhaigne et al., 2005) and to collaborate in arriving at solutions that they test in a game context. However, this is only a stage in learning because, as Light and Fawns (2003) remind us, 'knowing the game' means being able to demonstrate knowledge-in-action (Schon, 1983). Effective coaching in decision-making must then be manifested in good player decision-making on the field in competitive matches. Effective coaching in decision-making must provide opportunities for players to engage in the 'ongoing conversation' of games that involves the interplay between action and language (Light & Fawns 2003).

Of all the games-based approaches that have been developed from TGfU, Game Sense is most clearly focused on sport coaching. Developed through collaboration between Thorpe and local coaches with the assistance of the Australian Sports Commission (ASC) it is very similar to TGfU but has no model and is significantly less structured than TGfU. It also uses practice games for developing particular aspects of play rather than introducing children to a new game as is typically the case in school based physical education.

Developing decision-making 'at-action' in secondary school rugby union

This example briefly outlines a training session for senior secondary school aged players in rugby union that is focused on improving 'at-action' decision-making ability in attack in the opposition quarter. The team is divided in half to form two practice games with each played in one half of the area between the 22-metre line and the try line. Once the players develop a feel for the practice game and have become reasonably independent learners they can run their own practice with the coach moving between the two games to monitor progress and call breaks for questioning, reflection and the formulation of ideas and tactics. For players accustomed to this approach this will be an easier task. This is where the players reflect upon their embodied responses by bringing them to consciousness through language to analyze and modify them as they work on improving performance (Gréhaigne et al. 2005; Wallian & Chang 2007).

The coach provides an advantage in numbers for the attacking team to create gaps and possibilities for two-on-one situations. For example, this might involve nine players in attack and seven in defence. Play begins with a 3 vs. 3 scrum, ruck or maul near the 22-metre line, toward the centre of the field with the attacking team given a pre-determined number of plays (say two to three) within which to score but having to restart if committing an infringement. The players use 'holding' tackles but with the ball carrier brought to ground and the defending team having to match the number of attacking players involved in the maul/ruck.

After giving the players time to get a feel for the game, and maybe asking some quick questions on the run, the coach structures opportunities and challenges for attack by directing the defensive team but without the attacking team knowing what the change(s) will be. The attacking team might be given the set play plus one or two phases of play after it to score a try. This allows the coach to structure the first play but with the next two phases being unstructured by the coach. At the end of each set of plays, whether or not a try has been scored, the coach calls in the defensive team to make modifications to their defensive play. Alternatively, the coach could give the defending team a number of defensive plays that it could choose from.

As an example of what changes the coach might make in the defensive line, it could involve one defender rushing up early and out of alignment. This puts pressure on one attacker but produces a gap that the attacking team needs to be able to recognize and take advantage of. Another change might be to have the player in the fullback position move into the defensive line. This puts an extra defender in the line but opens up space behind it for an attacking tactic. For example, a chip kick (in the air) or a 'grubber' kick (along the ground) and chase is a typical option used to exploit such an opportunity.

Learning occurs through playing the game, reflecting on decisions made as a collective, formulating ideas and solutions to problems identified, testing them and evaluating them (Gréhaigne et al. 2005). The plans decided on for attacking plays can be seen as the decisional background or register but which the player(s) with the ball or close to it must break from in response to the changes in the defensive situation. Punctuating play with tactical timeouts (Turner, 2005), debate/discussion (Gréhaigne et al.) and questioning will ensure that the coach can facilitate the development of decision-making.

A Game Sense approach to coaching involves open-ended questioning being emphasized over instruction and being used to stimulate thinking, dialogue (Light, in press; Wright & Forrest, 2007). For example, rather than telling a player that he/she should have passed to an unmarked support player the Game Sense coach might typically ask questions such as, *do you think that was a good option? What other options did you have? Which one do you think might have been better? Why? Did anyone see other possible options?* This gets players thinking and engaging intellectually and can be built upon by encouraging small team talks or whole team discussions giving the players ownership of tasks and empowering them to make their own decisions on the field (den Duyn, 1997). However, learning this way *will take time* (Gréhaigne et al., 2005) and sometimes the pressure of winning and being successful due to the cultural context in which the coach works (see, Light, 2004) may outweigh the coaches' desire or ability to 'step back' and facilitate learning.

This game develops 'vision' (perception) as the players improve in picking up cues and responding to them with opportunities for decision-making under temporal pressure provided by the coach by adjusting the pressure to suit the players and his/her intentions but, initially players may have to be encouraged to look for, and see, opportunities (Magill, 1998). The coach could directly determine what changes take place or provide a number of set changes that the defensive team can choose from themselves. Alternatively, players could have turns at running the activity when they have adapted to this coaching. The players in attack should have time to reflect upon the decisions they are making as individuals but in relation to the team and the opportunities that open up for them. Again, this could be directed by the coach or left up to the players to quickly discuss when they feel the need to. This reflection should lead to discussions about the options taken and how to improve both decision-making and skill execution in each case. The important point here is the need for the coach to ensure learning is active and player-centred by stepping back to facilitate learning instead of attempting to determine it.

Coaches who want to control decisions made in games more than we have suggested could offer the players a limited number of options for a particular situation. They could manipulate the game conditions by, for example, reducing the number of defenders to create more opportunities in attack or increasing them to apply more pressure when he/she thinks this is required. The decisions made in attack in actual competition matches are also shaped by pre-determined strategy and larger contextual factors such as the score line, time remaining in the game and the team's position in the league as the decisional background (Mouchet, 2005a: see figure 1). To bring these into play in practice games the coach decides on specific game scenarios in regard to such things as comparative scores and time remaining and the importance of the match in the season. This is what Launder (2001) considers with his 'Action Fantasy Games' where players are presented with an 'Action Fantasy Game' Card that details the teams history such as winning record, position in the league, titles won and so on, as well as setting the specific game the scenario (see figure 1).

This rugby example is a simple practice game but replicates aspects of competitive matches that the coach can easily manipulate. It involves a degree of embodied responses 'at-action' due to the lack of time available to make decisions (micro) but the lead in time before attack meets defence (meso) allows for more 'reflective consciousness' (Vermersch, 2001: see figure 1). The structured reflection, discussion and formulation of ideas involves rational and conscious processing that can accelerate improvement in decision-making and is far enough away from the action that it could be seen to be macro level decision making (Gréhaigne et al., 1999). The key features of this activity are the central role that the physical environment plays in learning and the player-centred approach used that makes the players responsible for their own learning as active learners. The coach manipulates the environment to achieve learning outcomes that he/she may have decided upon before practice and perhaps through discussions with the players, adjusts the balance of success and challenge and to suit the

skills, attitudes and knowledge of the players. This manipulation is punctuated with periods of time for questioning, tactical time-outs and player debates about strategy and tactics with reference to the players' decisional background.

From a constructivist/CLT perspective, learning is an interpretive process shaped by prior knowledge and dispositions through which unique knowledge is constructed (Fosnot, 1996) with learning occurs primarily through engagement with the environment (Dewey, 1916/97). Designing and manipulating the environment is, therefore, likely to be the most important task for the coach when taking this Game Sense approach (Light, in press). Research on the use of practice games designed to achieve particular outcomes suggest that they improve player motivation in a range of team sports (see for example, Evans & Light, 2008; Harvey, 2009; Light, 2004;). As a former Olympic team coach, Alan Launder's *Play Practice* (2001) text and the use of 'designer games' by highly successful coach of both the women's and men's national hockey teams in Australia, Ric Charlesworth (see, 2002), also suggests the efficacy of games based coaching at the most elite levels of team sport.

Practice games or activities need to match the skills, experience and capacities of the players and be able to meet the objectives of the coach. This begins with the design of the game to be used which could be the sole responsibility of the coach, done through collaboration between coach and players or could even be a task set by the coach for players when they have had enough experience with this style of coaching. As the session progresses skilled coaches should be alert to the progress of the players' decision-making and have modifications at hand to mould the basic game to the requirements of the situation. Coaches working with players experienced in this approach might even ask them for suggestions about when modifications are needed and what they should be. The two distinct features of the approach we suggest are the primacy of the learning environment and the adoption of a player-centered, inquiry-based pedagogy.

Discussion

In the rugby example we provide the central task for the coach is the construction and manipulation of an appropriate learning environment (physical and social) informed by a holistic view of decision-making that accounts for its inherent complexity, its immediate physical environment and how it is shaped by larger socio-cultural contexts. The learning process involved through playing these training games would occur primarily at a non-conscious or embodied level as a process of adaptation to a dynamic environment in which they draw on existing knowledge and skill. Through these experiences players would improve their decision-making ability, perception, the ability to pick up cues (Kirk & MacPhail, 2002) and to respond to them as interrelated aspects of play and as a process of adaptation. From this perspective there is neither separation of skill execution from tactical understanding and decision-making nor of the learner(s) and from what is learnt.

For players with appropriate skill and tactical understanding the closer this practice game is to the competition match the more likely the skill(s) and other capacities worked on are to transfer to the competition match (Lauder, 2001; Charlesworth, 2002). From another perspective, the knowledge and skills developed in this way are given meaning by the authenticity of the context within which they are learned. They can also replicate the intensity of conditions in competition matches at elite and non-elite levels (see, Harvey, 2009; Light, 2004). The extent to which the practice game replicates competition match conditions (its authenticity) would depend upon the coach's design and manipulation of the environment, the complexity of the situation and the degree of pressure that he/she places players under when they are making decisions. This ability to read the situation and make appropriate adjustments is a critical skill for coaches. There is also room here for variation in the degree to which the coach structures the learning environment. With younger players the coach might decide to construct a physical environment within which decisions are made but encourage creativity

by being open to any responses by the attacking players. Given that as much can be learnt from mistakes at training as successful responses/decisions this is a valid approach. On the other hand, with elite level players, coaches could provide a tighter structure that reduces options to those that the coach nominates.

The non-conscious/embodied learning that arises from playing training games such as the one we have outlined is further enhanced, or accelerated, through the adoption of player-centred, inquiry-based pedagogy such as that used in Game Sense where the coach ‘steps back’ (Light, 2004, 2005) to be repositioned as a facilitator, partner, or co-participant in learning (Davis & Sumara, 1997; Light 2008; Wallian & Chang, 2007). Here, the coach must also establish a socio-moral environment of support for collaborative inquiry in which players identify problems and collaborate to develop and evaluate ideas and solutions where players can make constructive errors as part of the learning process (De Vries & Zan, 1996). From a CLT and social constructivist perspective, learning is a social process within which language is central to the social interaction that it arises from (see for example, Bruner, 1996; Vygotsky, 1986).

In the coaching that we suggest here language and the social interaction that it stimulates brings learning to a conscious level as part of an ongoing ‘conversation’ between the embodied learning occurring through playing training games and the learning occurring through social interaction and language (Light & Fawns, 2003). It also requires the capacity to critically reflect upon experience and bring it to consciousness through language.

Gréhaigne, Richard and Griffin (2005) suggest that this verbalization is a first step toward developing players’ game understanding as it enables them to reflect *on*-action and move toward developing understanding *in* action (Lauder, 2001) as enacted knowledge (Light & Fawns, 2003).

Conclusion

The ideas we present here for enhancing decision-making in team sports draw on contemporary thinking in the coaching literature, the development of student-centred pedagogy in physical education and CLT. The suggestions we make emphasize player learning through engagement with the learning environment and through dialogue involved in social interaction. We propose an approach that accounts for the complexity of decision-making 'at-action' in team games and facilitates players learning how to improve it. The player-centred, inquiry-based approach we adopt stands in contrast to a 'traditional' technique-focused approach that relies on direct instruction and the mechanistic breaking up of games into discrete components. While we do not suggest that all or even most coaches exclusively adopt this mechanistic approach it does form a powerful influence on their beliefs and practices (Light, 2008). It is also very limited in its capacity to develop tactically informed decision-making ability in team sport because it attempts to reduce their inherent complexity instead of recognizing it and working to find ways of helping players make sense of it.

The coaching we suggest in this article involves a particular view of learning as a complex, process that can be enhanced or facilitated but not determined. Based on recognizing and accounting for complexity we argue for a coaching approach that is player-centred and focused on learning through engagement with the environment instead of on direct instruction from the coach. Improvements in decision-making will emerge from playing well-designed training games but the pedagogy employed has a profound influence on the quality and type of learning that unfolds from playing these games. For some coaches this may challenge their beliefs and practices, for some it may offer stimulation for thinking about incorporating some of our ideas into their training regimes while for others it may well seem to be common sense and this variation in interpretation of what we propose is to be expected. We are not here attempting to tell coaches what to do but, instead, presenting our perspective on coaching

based upon or own coaching experiences in three different countries (Australia, the UK and France), our own research, and the emerging research in this area to engage them in the debate that complex learning theory suggests is necessary for learning.

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