This is a pre-proof corrected manuscript, as accepted for publication, of an article published by *Human Kinetics* in *International Sport Coaching Journal* on 22nd October 2016, available online at: http://journals.humankinetics.com/doi/pdf/10.1123/iscj.2016-0037

Metacognition and Professional Judgment and Decision Making in Coaching: Importance, Application and Evaluation

Loel Collins*, Howie J. Carson and Dave Collins

Institute for Coaching and Performance, University of Central Lancashire, Preston, UK

*Correspondence concerning this article should be addressed to Loel Collins, Institute for Coaching and Performance, University of Central Lancashire, Preston, UK, PR1 2HE. Email: lcollins2@uclan.ac.uk.

Abstract

Previous research has emphasised the dynamic nature of coaching practice and the need to consider both *individual* performer needs and necessary *contextual* trade-offs in providing optimum solutions. In this regard, a Professional Judgment and Decision Making framework has been suggested to facilitate an optimum blend of actions against these complex and dynamic demands. Accordingly, we extend this work and address recent calls for greater focus on expertise-oriented assessments, by postulating on the aspirant/developing coach's capacity for and development of *metacognition* (i.e., active control over cognitive processes) as a 'tool' within the reflective process. Specifically, we propose that metacognition enables essential active cognitive processing for deep learning and impactful application, together with construction and refinement of useable knowledge to inform coaching decisions. Metacognition, therefore, helps to contextualise knowledge provided in training, further optimising the experience, particularly before certification. Finally, we exemplify how metacognition can be developed in coaches through the use of cognitive apprenticeships and decision training tools; and evaluated via a series of observed coaching episodes, with reasoning articulated through pre and postsession interview. Despite challenging traditional competency-based approaches to coach education, we believe that a considered mixed approach represents a vital next step in further professionalising sports coaching.

Key words: Assessment; Coach education; Development; Expertise; Training

Metacognition and Professional Judgment and Decision Making in Coaching: Importance, Application and Evaluation

Coaching practice is recognised and demonstrated as a dynamic process (e.g., Abraham & Collins, 2011b; L. Collins & Collins, 2012, 2015; Martindale & Collins, 2012). Such work highlights the need to consider both *individual* performer needs and *contextual* trade-offs in providing optimum solutions. For example, despite a coach predominantly working to develop long-term performance, they might deviate from this approach to give a short-term boost to confidence at the expense of skill retention (i.e., a trade-off). Consequently, the ability to respond quickly and efficiently to selected, or preselected, subsets of factors is a crucial skill for any coach.

Influenced by the practices of other professions, a process of Professional Judgment and Decision Making (PJDM) has been suggested within the sport psychology and coaching literature, to facilitate an optimum blend of actions against such demands. This process, involving reflection during coaching (in action; Schön, 1983), post coaching activity (on-action; Schön, 1983) and by creating time within the coaching session/process for reflection (on-action/in-context; L. Collins & Collins, 2015; Schön, 1987) has, to date, been implicit within these suggestions. As such, this *Insights* paper extends these ideas by postulating on the requisite cognitive skills for a coach to employ a PJDM approach and, consequently, the implications for training and evaluation.

Successful operationalisation of the PJDM process relies on a coach's declarative understanding of 'what needs to be done' (e.g., blocked practice to generate a rapid performance gain *or* random practice to promote better long-term retention and transferable skills) which, in turn, cyclically links back to their intentions (Abraham, Collins & Martindale, 2006); in short, knowing *why* particular action(s) should be taken in response to the multifactorial demands of a situation (cf. Winter & Collins, 2015). Of course, knowing

how to enact those decisions is also important. We suggest that integrated application of the what, why (declarative knowledge) and how (procedural knowledge) of a PJDM approach are facilitated by metacognitive skills. Specifically, *metacognition* underpins the ability for reflection in-action, on-action and on-action/in-context, enabling the essential consideration and weighing up of alternative coaching options within the PJDM process (Cruickshank, 2013). Crucially, such reflection supports coaches to recognise and address novel or complex problems while coaching. By addressing the coach's capacity for and development of metacognition, we aim to stimulate thought and debate within this developing avenue of research.

Such concepts will apply across most, if not all, sports; since the PJDM process is apparent between different contexts (e.g., open vs. closed skill sports), levels of challenge (e.g., practice vs. competition) and within different environments (e.g., indoor vs. outdoor). However, our interests lead to a particular focus on Adventure Sports Coaching (ASC); a hyper-dynamic environment that is especially demanding on coaches' ability to make effective decisions (see L. Collins & Collins, 2012, 2015; L. Collins, Collins & Grecic, 2015). Accordingly, the paper is presented in two stages: (1) we introduce and explore metacognition as a 'tool' within the reflective process and (2) we propose how metacognition can be trained and evaluated in developing/aspirant coaches.

Metacognition and Reflective Thinking within the PJDM Process

In part, the practical success of a PJDM framework relies on a coach's *understanding* of the situational demands (Abraham & Collins, 2011a). However, less attention has been directed towards coaches knowing *how* to apply aspects of their knowledge, that is, the process of translating theory into practice. In offering a potential solution, Abraham and Collins (2011b) proposed that PJDM requires a process of nested decisions that are developed via nuanced in-action, on-action and on-action/in-context *reflective* processes.

Inevitably, therefore, alternative actions are always generated, contextualised and critically considered against intended outcomes when using this approach. Working without reflection could explain why coaches sometimes make suboptimal decisions based on *heuristic* constructs from personal experience (Collins & Collins, 2016b). In other words, Naturalistic Decision Making processes are potentially weakened by the coach's lack of breadth and depth in experience (Klien, 2008; Lyle, 2003). Accordingly, it would appear essential that coaches develop *metacognitive* skills as a necessary adjunct to increasing declarative knowledge (Abraham & Collins, 2011a), *if* they are to safeguard themselves against such potential pitfalls associated with narrowly formed heuristics or 'recipe coaching'.

When considering the scope of metacognition, Kruger and Dunning (1999) argue that "the skills that engender competence in a particular domain are often the very same skills necessary to evaluate competence in that domain—one's own and anyone else's" (p. 1121). Indeed, Kruger and Dunning's findings imply that those metaskills, including metacognition, are an important aspect of a coach's performance evaluation. Crucially within ASC, understanding one's own coaching and personal ability has safety implications and developmental impact (Collins & Collins, 2012). The highly-dynamic coaching environment in adventure sports, coupled with the inherent risk and requirement for the coach to engage in the adventure activity, means that the coach must comprehend the interaction between the task, environment and participant (L. Collins & Collins, 2016a). In summary, Kruger and Dunning suggest that knowledge used to produce coherent judgments about a situation is the same as that which underlies the ability to recognise good judgment.

Action, reason and deliberation are central to the Aristotelian notion of phronesis (practical wisdom). The judgements that are required to exercise practical wisdom, link the capacity to deliberate, evaluate and take action in a practical way. The constant audit of the coaching process (D. Collins, Collins & Carson, 2016; L. Collins & Collins, 2016b) includes

an evaluation of the decision making process, itself a metacognitive process. Indeed, these skills are well suited to the complex coaching environment and presumably, if they can be articulated can also be taught. Fenichel and Eggbeer (1990) described this process of enacting phronesis as "the ability to do the right thing, at the right time, for the right reason" (p. 21); notably, this quote has become increasingly synonymous with wisdom and is similarly utilised in the educational domain. In this regard, we can describe phronesis as good judgment (the *how*), which differs from the knowledge of coaching (the *what*) and could be considered a metaskill. Crucially, however, Claxton and Lucas (2007) proposed that merely being taught to think is insufficient, being taught to think *well* is most appropriate. With these distinctions in place, it is worth exploring the mechanisms which *underpin* thinking well as opposed to thinking *per se* (cf. cognition and metacognition), if we are to encourage an adaptive, flexible and creative coaching workforce.

In applying effective decision making within a PJDM framework, we suggest that metacognition is used to operationalise the knowledge generated by coaches' reflective process. Consequently, this enables the modification of existing schema and generation of new versions through a multilooped comparative audit in which current experience and potential coaching solutions are contrasted and considered (Collins & Collins, 2013). This adaptation and generation of new, accessible and internalised schemata allows the coach to be adaptive, flexible and creative in response to situational demands as they unfold. In short, coaches become capable of accurately selecting and activating an optimum behaviour from a broader repertoire under naturalistic conditions; that is, a heuristic for *adaptive expertise* (cf. de Oliveira, Lobinger & Raab, 2014).

More specifically, metacognition utilises both analogous and metaphoric dimensions to problem solving. Using analogies, the coach is able to create understanding through a contextual relationship between the known and the newly experienced coaching scenario (cf.

Carbonell, 1985) and, from this, to select a best fit rather than optimum solution which, in turn, may be adapted in situ (adaptability and flexibility): for example, linking a carved turn on skis with a carved turn in a kayak, when a kayaker is on skis for the first time. When encountering novel and/or poorly defined challenges, the coach reconceptualises the challenge in a metaphoric way by aligning the experience more broadly with a range of known strategies and approaches, considering the challenges in a more thematic, or principled, manner; as shown when asking a skier to "crush a grape under your big toe" to encourage use of an edging with a ski. Font, Bolite and Acevedo (2010) proposed that such metaphoric thinking would enable coaches to anticipate, solve and address the novel problems that are encountered in dynamic environments. In both analogous and metaphoric thinking, however, there is a requirement for a higher level of contextual thinking skill that is fundamental to the PJDM process, namely metacognition. The coach processes the flow of information in each coaching situation (micro level), at an intervention level (meso) and programme (macro) level. Metacognitive capacity allows the coach to better organise, prioritise and make accessible (e.g., the metaphoric or analogous strategies) newly constructed or adapted information across long-term timescales, in this capacity metacognition improves the flow of information.

Despite this seeming advantage towards designing high-level practice, Collins, Collins and Carson (2016) identified that metacognition cannot always be articulated by the coach. Such inability raises concern over how the coach could communicate such nuances while training or mentoring others. In order to act as a coach educator therefore, an ability to consider and apply necessary decisions from reflections on-action/in-context (e.g., when facing new situations or the need to implement trade-off decisions) becomes a critical skill; in simple terms, an ability to provide a commentary of one's own metacognition in practice.

The need for metacognitive skills in coach educators is, therefore, an important aspect of coach education (cf. Kruger & Dunning, 1999).

Metacognition is also important because it enables the active cognitive processing that is essential for deep learning (Claxton & Lucas, 2007; Schön, 1987) and application, construction and refinement of useable knowledge. Metacognition helps the coach to contextualise the knowledge acquired in training, further optimising the experience between training and certification by providing the tools for reflection and supporting the developmental aspect of professional practice. As such, we now address how metacognition might be developed and assessed by training organisations (e.g., national governing bodies) when implementing a PJDM framework within coach education.

Developing and Evaluating Metacognition within the PJDM Process

A PJDM focus in coach education would need to be in concert with the developments of an expertise focus for evaluation (EFE) of coaching practice. Furthermore, education and evaluation would need to reflect the *appropriate* synergy of skills required in the coaches' role. Realistically, and despite recent criticisms of competency-based approaches (see Collins, Bruke, Martindale & Cruickshank, 2015), *some* aspects of the coach's performance *will* be suitable for competency focused assessment methods. These are essentially the *components* of the coaching process (e.g., equipment setup, maintenance, aspects of safety), the essential content which often has a right or wrong catagorisation, while an expertise-oriented assessment would measure the interactional and decision making aspects of coaching in practice; a situation where shades of grey solutions (or 'it depends') are more appropriate. In simple terms, our proposal here is not for an either/or approach, but that current competency-based approaches, best utilised for specific and stereotypic skills, ought to *also* emphasise an expertise-based approach for the complex situations such as coaching. A mixed assessment strategy in which competency and expertise foci coexist clearly offers a

more valid and reliable assessment of requisite skills. Accordingly, the PJDM tools (e.g., metacognition, reflectivity, adaptability and flexibility) will need to be understood by educators and coaches; they will need to know how knowledge interacts between these various factors and demonstrate an ability to articulate and utilise them. Therefore, coach educators should be skilful coaches *and* educators who can articulate the dynamics of the coaching process.

Reflecting the teaching of PJDM, this would need to identify flexible, as opposed to repeated, mental processes (cf. our earlier conceptions of metacognition). In turn, these require developing coaches to plan, explain and evaluate their own thinking and learning in addition to their coaching. Both Bolton (2010) and Moon (1999) identify that nonroutine, open-ended learning tasks involving a degree of uncertainty serve to encourage higher quality thinking and metacognition. This approach may be challenging for coaches or training programmes that encourage a routine or proceduralised process. Indeed, recent study suggests that firmly fixed beliefs in one solution can counter the acceptance and implementation of others, even when the alternative is proven to be more efficacious (Yarritu, Matute & Luque, 2015). Accordingly, the shift towards PJDM enables learners to construct meaning, make judgments and produce multiple solutions to new or unique problems *and* to challenge doctrine and dogmatism; all promoted perhaps by a greater tolerance, acceptance or even pursuit of productive ambiguity. As such, upfront selling and gaining long-term commitment to this approach will be essential as a fundamental requirement for intentional, goal-directed change of well-established behaviours (cf. Carson & Collins, 2011; Prochaska, DiClemente & Norcross, 1992).

Crucially, explicit pedagogies associated with the teaching of metacognition and PJDM must ensure that the learning transfers beyond the context in which it is taught. In turn, this must be supported by suitable theoretical underpinning, metacognitive ability,

curriculum design, delivery materials, an explicit epistemology, pedagogy and infrastructure. In particular, an educational environment in which these skills are valued and demonstrated as elements of expert practice, a shift towards an adaptive notion of expertise. Notably, this may necessitate some focused work on broader coach and coach educational cultures before it can be achieved (cf. Cruickshank & Collins, 2012; Stoszkowski & Collins, 2012).

Metacognitive Approaches in Coach Education

Addressing the combined tuition of practical and cognitive performance elements, the constructivist approach of a cognitive apprenticeship (CA; Collins, Brown & Newman, 1987) offers one pedagogic mechanism to this learning. In practice, using approaches such as CA exposes the implicit processes associated with performing complex skills. In doing so, the CA approach focuses on articulating and identifying the tacit processes within the complexity, encouraging students to observe, identify and practice them with help from the tutor coach. For example, the decisions associated with selecting and placing an anchor while rock climbing provide opportunity for such an approach. CA requires the learner to consciously engage in the cognitive aspect of the process, be motivated to learn and to accurately reproduce the cognitive and motoric aspects of the skill. Adding ecological strength to such practice, the activity being taught is modelled in a real-world context utilising explicit coach–trainee interactions. Following this, situated cognition (A. Collins et al., 1987; Godden & Baddeley, 1975) then aids the development of metacognitive processes by assisting at the skill level just beyond what the learner could accomplish themselves; that is, the zone of proximal development (Vygotsky, 1978).

To exemplify how a CA may be achieved in the sporting context, consider Vickers' (2007) decision training model. Indeed, this model reflects a sophisticated epistemological position (Schommer, 1994) that accepts the integrated nature of practical and cognitive performance. It may also align with concepts such as Christensen, Sutton and McIlwain's

(2016) *mesh* theory that advocates a motoric and cognitive aspect to performance and learning. Both Vickers' decision training model and Christensen, Sutton and McIlwain's *mesh* theory provide a pragmatic integration of cognitive and motoric aspects of performance and offer an alternative to purely technically-focused syllabi. Such approaches may allow the integration of PJDM into both the education and practice of the coach.

Staying with the constructivist paradigm, problem-based learning strategies focus on engaging learners in a process of collaborative and self-directed inquiry (Jones & Turner, 2006). Here, the role of the teacher is to guide, facilitate and challenge the learning process rather than strictly provide knowledge. Accordingly, learners are presented with an authentic problem and, through discussion within their learning group, prior knowledge is used to address the problem; thus formulating a shared mental model to explain the problem (Ojala & Thorpe, 2015). This framework, on which students can construct knowledge relating to the problem, is managed by the coach educator. Following the generation of a shared mental model, students work independently in self-directed study to research the *specific* aspects of the problem. Finally, the students re-group to discuss and refine their initial explanations based on what they learnt. As such, students are agents in this socioconstructivist process in which meaning and interpretations of the world are based on experiences and interactions; learning becomes a continuous and lifelong process. Identifying a suitable line through a white water rapid prior to allowing a group to paddle it provides an opportunity with a group of trainee coaches. In this case, the problem is to descend the rapid in a safe and controlled manner with a group. Students are allowed to inspect the rapid, individually, prior to developing a strategy for descent that draws on their previous experiences. Then, the trainee coaches share each possible approach and construct a shared mental model to descend the rapid. After paddling the rapid the strategy is reviewed by the team.

As another possible method, transformative teaching strategies address psychological

and behavioural characteristics in an attempt to alter a learner's perspective relating to an experience of activity from fundamentally rational and analytical positions (Taylor & Collins, 2016). The approach focuses on altering the learner's philosophy by *challenging* the underlying premises of their perspective. Facilitating such understanding is the goal of a transformative approach and, in that respect, develops autonomous thinking. Mezirow (1997) describes the construction of dilemma by providing options and forcing a choice by the learners. In this way the teacher can facilitate transformation. Transformative approaches have value in the coach education process: For example, Taylor and Collins (2016) highlight a transformational approach in addressing a novice coach's epistemology, transforming a naive epistemological position towards a sophisticated position (Schommer, 1994).

Clearly, the development of metacognition plays a pivotal role in these approaches. However, an important aspect must also be considered, that of the right approach in the right place at the right time alluded to earlier. We have advocated that a single approach to assessment is flawed and we must, *de facto*, extend such observation to teaching approaches (Collins, Collins & Willmott, 2016); this seems to simply strengthen the need for metacognition in both coaching and coach education practice.

An EFE process (and the professional development which accompanies it) could potentially be the nature of the decisions that accompany and drive the adaptability, flexibility and creativity within the coaching process, not just the coaching tools. Aligning the philosophy of coaching, education and assessment within the scheme becomes imperative; in this context, a coaching philosophy that values and reflects adaptive expertise. This philosophical position would be aligned with a core of declarative knowledge and declarative skill. This differs from presenting basic techniques for instruction; the emphasis becomes to construct the fundamental techniques from these declarative elements.

Throughout the educative process, the explicit interaction between declarative elements is illustrated and articulated (i.e., the PJDM process). This would be achieved via a reduction in the instruction of basic content in favour of declarative content, metacognitive skills and PJDM to utilise and operationalise that knowledge. Thus, the focus of assessment becomes how and why we teach, rather than solely the what; the situation which exists at present in competency-based assessments.

What could an Evaluation of Adaptive Coaching Expertise look like?

A variety of different approaches exist, although all (we suggest) would incorporate some form of questioning on the whys of decisions taken. For example, the evaluation of adaptable coaching skills could be assessed via a series of observed coaching episodes, with reasoning articulated through pre and postsession interview. In simple terms, the coach is asked to overtly discuss the reasoning through which decisions were reached, what alternatives were considered and under what circumstances such alternatives would have been used (cf. the big five approach; Collins et al., 2015). To enhance validity, both coaching session and interview could be recorded, the footage being used to assist in stimulating the coaches' recall of the session and the audio to form part of a professional development log. Encapsulated within this concept would be the need to generate a constantly learning coach, with an improvement in thinking skill, sophistication and practice being expected at each assessed session. Evaluation would extend over a series of nonlinked sessions in which preplanning, adaptation of that plan and its underpinning rationalisation can be articulated. Indeed, distributing sessions has been shown to facilitate more accurate judgments of learning; that is, metacognition (cf. Dail & Christina, 2004). To avoid the potential for post hoc rationalisation of actions, consideration could be given to developing the reflective process as an articulation of the coach's internal dialogue (not unlike the commentary provided in advanced driver training, blue light response training or those training in

emergency care). Noninterventionist approaches to assessment may be challenged by such a notion and some would argue that this influences the coaches' performance and that the assessment is compromised. However, the focus of evaluation is not to measure performance in that instance but rather, to evaluate the rate and nature of development, the individual's trajectory of development. Consequently, evaluation and feedback would initially be largely formative, a mentoring process or the CA approach highlighted earlier, then developed to a point at which the trainee is operating with full autonomy. Alongside development in the metacognitive aspects of performance, developments in practice should be observed and greater autonomy demonstrated by the coach.

Alignment between the desired learning outcomes (adaptive expertise) and delivery (declarative knowledge and skills, PJDM (reflection and metacognition)) would need to be matched with a suitably skilled workforce of trainers, examiners and quality assurance. Indeed, the nuances of coaching and educative practices may differ such that an expert coach may not philosophically be an effective or skilled coach educator.

The use of case study approaches and constructing case formulations (Martindale & Collins, 2012) is another way in which the nested nature of planning may be evaluated. This would be particularly relevant from Level 3 upwards (based on the current UK Coaching Certification formulation of levels) as coaches' decision making becomes increasingly layered; as per the first example presented at the start of this paper. The point here is that, as the timespan of the coaching relationship extends, there is an inevitable need for long- (macro) and short- (micro) term decisions to increase in coherence. As above, metacognition on these levels is essential if such longer-term relationships (which characterise higher performance contexts) are to be optimised. These considerations notwithstanding however, we would suggest that there is strong merit in introducing elements of EFE at the earliest stages of a coach's education journey. The sense that 'it depends' is the correct answer to

many elements of the coaching process is an important consideration; not one that should suddenly appear at a specific level.

Conclusion

In this paper we have explained how coaches could develop the metacognitive skills required in adaptive and flexible coaching situations. We proposed that a mixed assessment could be employed to evaluate coaching. Developing metacognition alongside declarative knowledge and skill presents a contrast to more proceduralised notions of coach education and coaching. In this context, universal employment of competency-based approaches does not cater for the often complex reality of coaching and, we suggest, is leading to suboptimal professional standards. As such, we anticipate that adopting a mixed approach will foster and encourage adaptive expertise alongside competency, but with challenge, since the perception of performance is, in itself, influenced by a lack of metacognition. However, through our ongoing systematic, considered and applied-focussed research, we believe that this is a necessary next step in the development and further professionalisation of sports coaching.

References

Abraham, A., & Collins, D. (2011a). Effective skill development: How should athletes' skills be developed? In D. Collins, A. Button, & H. Richards (Eds.), *Performance psychology: A practitioner's guide* (pp. 207–229). Oxford: Elsevier.

Abraham, A., & Collins, D. (2011b). Taking the next step: Ways forward for coaching science. *Quest, 63,* 366–384. doi:10.1080/00336297.2011.10483687

Abraham, A., Collins, D., & Martindale, R. (2006). The coaching schematic: Validation through expert coach consensus. *Journal of Sports Sciences, 24,* 549–564. doi:10.1080/02640410500189173

Bolton, G. (2010). *Reflective practice, writing and professional development*. London: Sage.

Carbonell, J. G. (1985). *Derivational analogy: A theory of reconstructive problem solving and expertise acquisition* (1534). Retrieved from Carnegie Mellon University Computer Science Department: http://repository.cmu.edu/cgi/viewcontent.cgi?article=2533&context=compsci

Carson, H. J., & Collins, D. (2011). Refining and regaining skills in fixation/diversification stage performers: The Five-A Model. *International Review of Sport and Exercise Psychology, 4,* 146–167. doi:10.1080/1750984x.2011.613682

Christensen, W., Sutton, J., & McIlwain, D. (2016). Cognition in skilled action: Meshed control and the varieties of skill experience. *Mind and Language, 31,* 37–66. doi:10.1111/mila.12094

Claxton, G., & Lucas, B. (2007). *The creative thinking plan*. London: BBC Books.

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the craft of reading, writing and mathematics (Technical Report No. 403)*. BBN Laboratories, Cambridge, MA: Centre for the Study of Reading, University of Illinois.

Collins, D., Burke, V., Martindale, A., & Cruickshank, A. (2015). The illusion of competency versus the desirability of expertise: Seeking a common standard for support professions in sport. *Sports Medicine, 45*, 1–7. doi:10.1007/s40279-014-0251-1

Collins, D., Collins, L., & Carson, H. J. (2016). "If it feels right, do it": Intuitive decision making in a sample of high-level sport coaches. *Frontiers in Psychology, 7*, 504. doi:10.3389/fpsyg.2016.00504

Collins, D., Collins, L., & Willmott, T. (2016). Over egging the pudding? Comments on Ojala and Thorpe. *International Sport Coaching Journal, 3*, 90–93. doi:10.1123/iscj.2015-0068

Collins, L., & Collins, D. (2012). Conceptualizing the adventure-sports coach. *Journal of Adventure Education and Outdoor Learning, 12*, 81–93. doi:10.1080/14729679.2011.611283

Collins, L., & Collins, D. (2013). Decision making and risk management in adventure sports coaching. *Quest, 65*, 72–82. doi:10.1080/00336297.2012.727373

Collins, L., & Collins, D. (2015). Integration of professional judgement and decision-making in high-level adventure sports coaching practice. *Journal of Sports Sciences, 33*, 622–633. doi:10.1080/02640414.2014.953980

Collins, L., & Collins, D. (2016a). Professional judgement and decision-making in adventure sports coaching: The role of interaction. *Journal of Sports Sciences, 34*, 1231–1239. doi:10.1080/02640414.2015.1105379

Collins, L., & Collins, D. (2016b). Professional judgement and decision making in the planning process of high level adventure sports coaching practice. *Journal of Adventure Education and Outdoor Learning*, Advane online publication. doi:10.1080/14729679.2016.1162182

Collins, L., Collins, D., & Grecic, D. (2015). The epistemological chain in high-level adventure sports coaches. *Journal of Adventure Education and Outdoor Learning, 15*, 224–238. doi:10.1080/14729679.2014.950592

Cruickshank, A. (2013). Case study 1: A Professional Judgement and Decision Making (PJDM) approach to consultancy with an elite junior judo player. *Sport and Exercise Psychology Review, 9*, 15–23.

Cruickshank, A., & Collins, D. (2012). Culture change in elite sport performance teams: Examining and advancing effectiveness in the new era. *Journal of Applied Sport Psychology, 24*, 338–355. doi:10.1080/10413200.2011.650819

Dail, T. K., & Christina, R. W. (2004). Distribution of practice and metacognition in learning and long-term retention of a discrete motor task. *Research Quarterly for Exercise and Sport, 75*, 148–155. doi:10.1080/02701367.2004.10609146

de Oliveira, R. F., Lobinger, B. H., & Raab, M. (2014). An adaptive toolbox approach to the route to expertise in sport. *Frontiers in Psychology, 5*, 709. doi:10.3389/fpsyg.2014.00709

Fenichel, E., & Eggbeer, L. (1990). *Preparing practitioners to work with infants, toddlers and their families: Issues and recommendations for educators and trainers*. Arlington, VA: National Center for Clinical Infant Programs.

Font, V., Bolite, J., & Acevedo, J. (2010). Metaphors in mathematics classrooms: Analyzing the dynamic process of teaching and learning of graph functions. *Educational Studies in Mathematics, 75*, 131–152. doi:10.1007/s10649-010-9247-4

Godden, D. R., & Baddeley, A. D. (1975). Context-dependent memory in two natural environments: On land and underwater. *British Journal of Psychology, 66*, 325–331. doi:10.1111/j.2044-8295.1975.tb01468.x

Jones, R. L., & Turner, P. (2006). Teaching coaches to coach holistically: Can Problem-Based Learning (PBL) help? *Physical Education and Sport Pedagogy, 11*, 181–202. doi:10.1080/17408980600708429

Klien, G. (2008). Naturalistic decision making. *Human Factors, 50*, 456–460. doi:10.1518/001872008X288385

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties recognising one's own incompetence lead to inflated self assessments. *Journal of Personality and Social Psychology, 77*, 1121–1134.

Lyle, J. (2003). Stimulated recall: A report on its use in naturalistic research. *British Educational Research Journal, 29*, 861–878. doi:10.1080/0141192032000137349

Martindale, A., & Collins, D. (2012). A professional judgment and decision making case study: Reflection-in-action research [Special issue]. *The Sport Psychologist, 26*, 500–518.

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education, 1997*, 5–12. doi:10.1002/ace.7401

Moon, J. (1999). *Reflection in learning and professional development: Theory and practice*. London: Kogan Page.

Ojala, A.-L., & Thorpe, H. (2015). The role of the coach in action sports: Using a problem-based learning approach. *International Sport Coaching Journal, 2*, 64–71. doi:10.1123/iscj.2014-0096

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist, 47*, 1102–1114. doi:10.1037/0003-066x.47.9.1102

Schommer, M. A. (1994). Synthesising epistemological belief of research: Tentative understandings and provocative confusions. *Educational Psychology Review, 6,* 293–319. doi:10.1007/BF02213418

Schön, D. (1983). *The reflective practitioner: How professionals think in action*. Aldershot, UK: Ashgate.

Schön, D. (1987). *Educating the reflective practitioner*. San Francisco: Jossey-Bass.

Stoszkowski, J., & Collins, D. (2012). Communities of practice, social learning and networks: Exploiting the social side of coach development. *Sport, Education and Society, 19,* 773–788. doi:10.1080/13573322.2012.692671

Taylor, W. G., & Collins, L. (2016). Jack Mezirow: Transformative learning in coaching. In L. Nelson, R. Groom , & P. Potrac (Eds.), *Learning in sports coaching: Theory and application* (pp. 150–160). Abingdon: Routledge.

Vickers, J. (2007). *Perception, cognition, and decision training: The quiet eye in action*. Champaign, IL: Human Kinetics.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Winter, S., & Collins, D. (2015). Why do we do, what we do? *Journal of Applied Sport Psychology, 27,* 35–51. doi:10.1080/10413200.2014.941511

Yarritu, I., Matute, H., & Luque, D. (2015). The dark side of cognitive illusions: When an illusory belief interferes with the acquisition of evidence-based knowledge. *British Journal of Psychology, 106,* 597–608. doi:10.1111/bjop.12119