A Framework for Decision-Making within Strength & Conditioning Coaching

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Abstract

Decision-making is a key factor in developing coach expertise and effectiveness. This article presents a framework for enhancing coach decision-making within strength and conditioning (S&C). Based on theoretical understanding of the athlete (the 'who'), S&C training principles and sport demands (the 'what') and learning theories and behaviour (the 'how'), coaches can enhance S&C practice ('planning, delivering and reflecting'). In addition, understanding contextual challenges ('context, culture & politics') and own beliefs, values and behaviours ('self') must be considered. Recommendations are presented for implementing constructively aligned learning programmes based on the decision-making framework for enhancing coach learning and professional development within S&C.

Introduction

In recent years the popularity of strength and conditioning (S&C) has increased. This has resulted in multiple S&C educational institutions including degree programmes (e.g., 18 postgraduate degrees in the United Kingdom), coaching qualifications and accreditations with international S&C associations (e.g., National Strength and Conditioning Association; United Kingdom Strength and Conditioning Association; Australian Strength and Conditioning Association). Further, more opportunities are now available for a career in the industry across a variety of contexts (e.g., professional sport to the fitness industry). However, to maximise the development of the participant or athlete (referred to as athlete from this point forth) it is important that both S&C coaches and educational institutions work towards developing S&C coach expertise (36) and enhancing S&C coach effectiveness (35) within the industry to maximise the development of both their athletes and coaches.

There seems little doubt that decision-making plays an important part in a coaches' everyday practice, and is a significant component of both coach expertise (59) and being effective in achieving their goals (20). Within S&C, we argue that this is no different (35), with S&C coaches needing to make decisions daily for the effective implementation of their practices. Such decisions could range from intuitive, short-term, 'delivery' based decisions (e.g., providing feedback to correct an athlete's squat technique) to more classical, deliberate, 'planning' based decisions (e.g., the periodization of a 4-year training programme for an Olympic athlete (7)). Whilst decisions across this continuum will naturally occur within S&C, it has been suggested that coaches should engage in more thorough and considered decision-making processes as it supports both the coach and athlete to clarify expectations providing a reference point against which progress can be monitored and more thoughtful reflection can occur (7).

Such consideration of this decision-making process poses questions for the S&C industry. For example, what knowledge do coaches draw upon to inform their decision-making behaviours? What knowledge do educational institutions aim to develop within their programmes? Recently, a range of knowledge requirements for the S&C coach have been proposed, including professional, interpersonal and intrapersonal knowledge (35); and foundational (e.g., planning) and applied (e.g., coaching pedagogical strategies) practical knowledge (26). Furthermore, recommendations have emphasized the importance of applied coaching skills over exercise science knowledge within S&C (63, 91). Therefore, to develop S&C coaching expertise and effectiveness a combination of theoretical, applied and experiential knowledge is necessary for S&C coach education and development, potentially challenging current programmes.

To the authors' knowledge, no conceptual framework has been proposed for informing S&C coach decision-making. However, within sport coaching, Abraham, Muir and colleagues (2, 5, 7, 73, 74) have developed a framework for enhancing coach decision-making that incorporates six broad interrelated domains of theoretical and applied knowledge. This framework has been embedded within the European Sports Coaching Framework (54), the International Council for Coaching Excellence standards for higher

education sports coaching degrees (52) and has been adopted by several national governing bodies (e.g., the Football Association). However, to date the adoption and application of these principles have not yet been explored within the field of S&C.

Therefore, the primary aim of this article is to present a conceptual framework for decision-making within S&C coaching. It is suggested that this conceptual framework would be of benefit to the entire field of S&C coaches and educators for considering decision-making within S&C alongside the knowledge required for enhancing S&C learning and practice. The secondary aim is to propose how constructively aligned learning programmes, related to the decision-making framework, could be applied by S&C educators to enhance the education, learning and professional development of S&C coaches.

A Framework for Decision-Making within S&C Coaching

The framework for decision-making within S&C coaching (Figure 1) is based on the premise that S&C coaches make decisions and shape their strategies for intervention based on six broad domains of theoretical and applied knowledge. These six domains include an S&C coach's' understanding of:

1. Their athlete (i.e., the 'who').
2. The principles of S&C coupled with the demands of the sport within which the athlete competes (i.e., the 'what').
3. The principles of skill acquisition and learning (i.e., the 'how').
4. The social, cultural and political context within which they operate (i.e., 'context, culture & politics')
5. Their existing knowledge, beliefs, values and behaviours (i.e., 'self').
6. The coaching process, referred to as their 'planning, delivering and reflecting' (P-D-R) practices.

Insert Figure 1 near here

These six broad domains of knowledge illustrate the interdisciplinary nature of S&C coaching. Subsequently, S&C practice entails the constant integration of knowledge from the scientific disciplines (i.e., 'who', 'what' and 'how') alongside the application of personal knowledge (i.e., 'context, culture & politics' and 'self') to identify and solve problems and implement evidence based practice (28). This practice is implemented within the S&C coaching process whereby coaches must plan, deliver and reflect upon their progress towards the achievement of their short-, medium- and long-term goals (2, 73). In this regard, the framework for S&C coach decision-making might be thought of as a conceptual 'toolbox', supporting coaches to organise their existing knowledge by considering what it helps them to know or do, whilst also considering the relationship that exists between these six domains. For example, Figure 1 shows a number of interconnecting arrows between the knowledge domains. This demonstrates that although the domains are presented as standalone knowledge areas, there are connections between these areas. Further, the two-

way arrows between the 'who', 'what', 'how', 'P-D-R' and 'self' with the outside of the figure demonstrates that knowledge in all these areas is influenced by the understanding of 'context, culture & politics', ultimately where S&C coaching is undertaken.

The following sections summarize *some* of the existing theories, concepts and principles that might be drawn on as 'thinking tools' to inform a S&C coach's decision-making behaviour in relation to each of the six interdependent domains of the framework. The term 'thinking tool' is used to highlight the role of existing theoretical knowledge in supporting coaches' reasoning, reflecting and strategizing for action (71, 78). In this sense, 'thinking tools' are not offered as prescriptions for practice, but to stimulate reflection and creativity. However, it is important to note that whilst this paper draws on a selection of theories, concepts and principles, which 'thinking tools' are employed should be determined by the needs of the athlete and sporting context.

1. Understanding the 'who'

With the athlete central to the S&C coach's practice, developing an in-depth understanding of the 'who' is vital for all coaches in undertaking the athlete needs analysis process. Using theories or concepts from a variety of sport science disciplines - including physiology, biomechanics, psychology and sociology - allows coaches to better understand their athletes, explain differences between individuals and create individual goals (74). Thinking tools for the 'who' include: gender (56), age (i.e., chronological, biological, developmental, training age; (58)), sport and positional demands (23), injury and health history (45), athletic (fitness) profiles (68), recovery (83), wellbeing (70), sleep (86), motivations (90), psychological characteristics (61) and social support (e.g., parents, peers, coaches (94)).

The knowledge of the 'who' can be supported by principles related to child and human development, where a range of athlete developmental models have been proposed. For example, the Long-Term Athlete Development model (LTAD; (10)) and Youth Physical Development model (YPD; (57)) are popular within S&C. Although such models help describe generic needs for youth athletes, practitioners should conduct their own needs analysis through interaction, discussion and data collection to evaluate the motivations, and strengths and weaknesses of individual athletes to develop an appropriate set of physical, psychological and social goals. Within S&C, previous work (65) has proposed a physical needs analysis process including:

1. Performance Needs Analysis (Demands of the Sport/Activity and Individual)
2. Test Selection
3. Conduct Testing (Interpretation, Analysis and Evaluation of Results)
4. Programme Design and Implementation

Although this process is appropriate for S&C, and is regularly referred to when presenting needs analyses within sports (e.g., female soccer (101, 102); netball (96); rugby

league (98)) it may not fully acknowledge the complexities of understanding the holistic aspects of the individual athlete. The range of factors described above may be considered as part of the needs analysis process to allow appropriate group and individual objectives to be developed to aid practices on a short (e.g., daily) and long-term (e.g., macrocycle) basis.

2. Understanding the 'what'

Within S&C the 'what' relates to understanding the scientific principles and exercise techniques for implementation within practice alongside understanding the athlete's sport or activity. The scientific principles are usually the predominant subject matter within S&C education programmes (63) and key S&C resources (e.g., (38)). Thinking tools for the 'what' include: physiology (e.g., metabolic demands (32)), biomechanics (e.g., muscular action (64)), principles of training, periodization and adaptation (13), measurement and evaluation (66, 67), training modalities (e.g., warm up; (40)), exercise technique (17), injury and injury prevention (80) and other areas (e.g., nutrition (89); psychology (90)).

The 'what' knowledge is therefore the scientific knowledge that underpins training programme design for optimising physical adaptation and prescribing safe and effective S&C practices. Such understanding should link to the athletes needs to achieve the desired outcomes (e.g., if we want to develop strength what is the most effective way to achieve this [biomechanically and physiologically]), be appropriate for the athletes age and stage of development and within the athlete's context. Here it is important to consider that there may be multiple methods to achieve the same outcome (e.g., endurance performance could be enhanced via continuous training, interval training or small sided games). Further, the understanding of technical efficiency and a technical model for exercises (e.g., weight lifting, speed agility, plyometrics) should be developed with a range of examples within S&C available (e.g., Back Squat (76); Athletic Ability Assessment (69)).

In addition to this scientific and exercise knowledge, the 'what' domain also entails specific knowledge of the sport (or activity) in which the coach works. For example, S&C coaches working in rugby need to understand the impacts endured in games, the frequency and length of high-intensity efforts, how these vary by position (27) and even by team, according to the head coach's playing style (95). An approach to the P-D-R of physical training that is led by an analysis of the tactical demands of sport is becoming popular in soccer (16). This so-called 'tactical periodization' (93) approach assumes that all coaching staff in a professional setting share an understanding of the demands of the game, with integrated technical, tactical and physical training to help players meet those demands. For example, a soccer team that plays an aggressive, high-pressing style of defense will need players who can maintain high-intensity, intermittent bursts of speed for long periods of the game. It is arguably up to the lead coaching staff (e.g., head coach) to define a clear 'performance model' and share this with S&C coaches in order to achieve such integration (82, 95).

Finally, understanding the 'what' may also apply to the roles of the S&C coach based on the analysis of the job (9, 103). Such analysis suggests that further education of 'what'

aspects may be necessary for enhanced coach expertise and effectiveness. For example, it has been suggested that knowledge of select psychological techniques (81) are required due to the high contact demand of S&C coaches with their athletes. Therefore, education and coach development content around coach decision-making may not just be related to the traditional scientific knowledge of S&C and broadening coach's understanding may equip coaches with more methods to implement within practice (i.e., more tools within their toolbox).

3. Understanding the 'how'

Recent arguments have suggested that S&C coaching is a form of teaching (39) and appropriate pedagogies may enhance S&C coaches' practice. Drawing on theories and learning from skill acquisition allows S&C coaches to design and shape the training environment and align appropriate behaviours to support player engagement, generate feedback and make sense of progress towards the athlete's goals (74). Coaches need to make decisions on what practice activities are most suitable to meet the needs of their 'who' and the desired adaptation they require for the 'what'. Therefore, coaches may spend more time planning and thinking about their activity structure and associated coaching behaviours to achieve specific objectives. For example, if strength development is the goal then the activity structure and coaching behaviours will differ between an elite adult and inexperienced youth athlete due to their physical, psychological and social needs. An elite adult performer may require low volume, high-intensity sessions with large rest periods supported by motivational (i.e., encouragement) coach behaviours to elicit strength development. However, such approaches within large groups of young athletes may not be appropriate with more 'time on task' required to stimulate adaptations alongside the learning of technique supported by direct observation, cueing and correction of movement, to enhance athlete competence and autonomy (84).

S&C coach's behavioural strategies have been evaluated (62) showing silent monitoring, session management and hustle were the most popular coach behaviours within elite S&C coaches. Holt (39) recently proposed a range of pedagogical methods for S&C coaches including instructional technique, scaffolding, session organisation and management, communication (e.g., facial expression, gesture, positioning and posture (8)), demonstration and questioning. Tod and colleagues (99) reported that S&C coaches cited developing trust, being flexible and motivating athletes as the most influential aspects of their coaching, over scientific principles, emphasising the importance of learned practical knowledge for effective coaching. Further, Szedlak et al. (92) interviewed athletes to understand their perceptions of S&C coach behaviours showing coaches relationships (e.g., trust, approachability, sense of humour) and actions (e.g., feedback, instruction, communication and organisation) may enhance the S&C coach's effectiveness and may be a model for self-reflection. In addition, recent research has evaluated the effects of cueing (105) and visual feedback (104) on athlete physical performance as ways of assessing the 'how' within S&C. Although a complex and developing area, it is important for the S&C

coach to judge and plan 'how' strategies based on their understanding of the 'who' and 'what' to ensure appropriate pedagogical approaches are implemented. Such concepts have recently been promoted within the S&C industry (11).

4. Understanding the 'context, culture & politics'

S&C coaches' practice will always be shaped and influenced by the context within which they work. This can include the organisation's values, accepted practices and traditions, resources, physical constraints (e.g., facilities), and, most of all, other people (e.g., players, other coaches, club officials, support staff, parents). For example, the playing level of the athlete (e.g., adult professional club vs. junior community club) significantly influences the player and development context with differing aims, resources and abilities. Further, the values and current practices of the head coach within a sports organization will influence the context and culture of the daily practices of the S&C coach. Therefore, practitioners can draw on a range of theories and concepts from social science to understand this layered context (77). This could include the theories of policy, power and politics (42) or philosophical work around the theory and concept of ethics (24). Further, understanding the dynamics of power relationships and the subtle influences that dominant traditions have on the behaviour of athletes and the conduct of coaches may be useful in identifying and overcoming flawed approaches to S&C training (34). Strategies coaches could utilize to achieve success within their context and against these constraints could include developing a shared vision and purpose, establishing role clarity across the group, aligning behaviours that contribute to the achievement of the goals and nested thinking and planning (see the Understanding the coaching process: Planning, delivering and reflecting section).

5. Understanding 'self'

The S&C coach's understanding of their own beliefs, behaviours and values is crucial in determining quality coaching practice and ongoing personal development (15). Previous work (35) has highlighted the importance of both interpersonal (e.g., social context, relationships) and intrapersonal (e.g., coaching philosophy and values, self-reflective and self-monitoring, lifelong learning, self-regulation) skills and knowledge. Grant and Dorgo (35) suggested individuals thirst for knowledge (e.g., reading, observing, discussing) combined with application through the coaching process (P-D-R) are essential in the development of expertise within S&C. Interviews with serial winning coaches (consistently high performing coaches) identified four common themes: Philosophy, Vision, Environment and People (53). The philosophy related to the coaches having clear values, beliefs and goals alongside a desire for coaching, a thirst for knowledge and a quest for self-improvement. These elements need to be considered within an S&C coach's development and therefore should be a focus of education programmes and professional development opportunities. Such activities to support this professional development include undertaking a coach self-evaluation and needs analysis (106), using the Coaching Practice Planning and Reflective

Framework (CPPRF; see the Understanding the coaching process: Planning, delivering and reflecting section) or by S&C educators developing and implementing constructively aligned learning programs (see the Developing the S&C Coach section).

6. Understanding the coaching process: Planning, delivering and reflecting (P-D-R)

The preceding sections have outlined a number of theories, concepts and principles that can be used as 'thinking tools' to facilitate S&C coaching practice. Given the breadth and depth of factors that have been considered, the expertise that S&C coaches exhibit is the ability to integrate ideas from these interdependent areas to inform their reasoning and decision-making when P-D-R (1, 2, 73). It is of note, therefore, that decision-making in P-D-R occurs in two broad forms; slow and deliberate or fast and intuitive (46). A third form known as recognition primed decision-making (55) may occur where some time is available for thought, but the required response time is relatively short. A full discussion of these forms of decision-making is beyond the remit of this paper but it is worth noting the alignment of these with the commonly held view of coaching being about planning (i.e., slow and deliberative), delivering (i.e., fast and intuitive) and reflecting (i.e., slow and deliberative).

A key aspect of effective planning is 'beginning with the end in mind' (22); identifying the target performance relative to the athlete's current context in order to formulate outcome, performance and process goals over varying timescales. This entails a conscious and thoughtful consideration of the 'who', 'what' and 'how' to develop a coherent, progressive and 'nested' coaching plan (2). Within the S&C literature, an extensive body of work refers to the principle of periodization when considering medium to long-term planning strategies (e.g., (14, 37)). This body of work and the broader principles of periodization provide a useful platform upon which training plans can be developed. Done well, planning provides a 'tentative' map to follow. In this sense, planning might be more usefully thought of as a navigation device that provides a sense of direction and clarifies expectations against which progress can be continually monitored, and alternative strategies, to accommodate and respond to the changing needs of athletes (71).

Indeed, S&C coaches can only intervene, halt proceedings or change direction within a training session, if they notice the need to act in the first place. Noticing relies on coaches consciously attending to moments of importance or disruption. What is worth noticing then becomes an important matter for S&C coaches to consider. Engaging in deliberate and purposeful planning enables coaches to clarify their expectations and begin to notice things that might otherwise go unnoticed (41, 71). Writing a training programme therefore constitutes only a small part of the planning process. The planning strategy advocated here is one that is ongoing, dynamic and adaptive, enabling coaches to respond to the changing needs of their athletes and the sporting context (2, 47, 48).

A thinking tool that S&C coaches can use to clarify expectations and promote connections between the desired objectives and the associated coaching strategies is the Coaching Practice Planning and Reflective Framework (CPPRF: (71, 73, 74)). The CPPRF has been used to support the P-D-R practices of a number of National and Olympic coaches in a

range of sports (e.g., boxing, sailing (71)). The CPPRF was developed to encourage coaches to consider the relationship between their P-D-R practices. More specifically, it encourages coaches to explore the relationship between their: 1) coaching objectives (goals), 2) training activities, 3) behavioural strategies, and 4) athlete engagement and learning. As such, the CPPRF is structured around these four interdependent areas (Figure 2).

Insert Figure 2 near here

As described above, S&C coaches are essentially equipped with two pedagogical strategies to support athlete learning and development:

1. The way they structure the learning experience for their athletes through their training activities (e.g., circuits, weight programmes, drills, games). Such strategies could range from game centred to technique centred approaches based upon the session objectives.
2. The behavioural strategies they employ to support athletes before, during and after each training activity. This could range from a problem solving to problem setting approach using a range of behaviours (e.g., timing and type of feedback; open or closed questioning; demonstrations; hustles; instructional prompts)

Thus, employing the CPPRF as a 'thinking tool' encourages S&C coaches to deliberately plan, manipulate and align their training activity structure and their behavioural strategies to maximise athlete engagement and development opportunities (72).

As a planning tool the CPPRF encourages coaches to spend time considering their coaching goals and how these align with the needs of their athletes (i.e., the 'who'), the demands of the sport (i.e., the 'what') and the learning environment they orchestrate (i.e., the 'how') to clarify expectations in training. This planning process should entail the constant integration and alignment of these interdependent areas. Spending time considering these factors enables coaches to explicitly plan for and implement S&C coaching that is developmentally appropriate, builds on where the athlete has come from and helps prepare them for where they wish to go (73). Furthermore, a clear understanding of how each coaching interaction is nested within the long-, medium- and short-term objectives of an overall developmental performance system enables S&C coaches to make more informed adjustments from predetermined plans based on observations, evaluations and reactions to 'goings on' within the training and performance environment (2, 44, 47). Our capacity to 'think on our feet' in this manner is often referred to as a process of reflection-in-action (51, 87). Reflection-in-action assumes that problems do not always present themselves but arise because of a mismatch between the session goals/expectations and the reality that has emerged from putting the plan into practice. By increasing the clarity of our expectations before a coaching event we increase our opportunity to reflect-in-action, which in turn also provides a powerful stimulus for reflection-on-action (i.e., after the coaching event).

Reflective practice is generally characterised as a conversation between planning and delivery through which we can develop a better appreciation of our experience and become more skilful in our practice (88). Reflective practice therefore provides a vehicle to question and re-examine the reasoning and strategies that underpin our practice; to consider the 'what', 'how' and 'why', providing the opportunity to evaluate what benefits our current practice brings and what might be better for ourselves and the athletes we work with. This could involve reflection and evaluation of training sessions or training programmes from a meso and macro level. Programme reflection and evaluation may entail S&C coaches assessing the physical changes that have occurred due to their programme to evaluate the improvement of their athletes. For example, S&C coaches may evaluate the medium (i.e., 6 weeks) and seasonal changes in sprint speed and strength within their athletes. Such evaluations will likely display large variability in response (97) but S&C coaches need to not only consider the data but reflect upon the implementation of the programme related to the 'who' (e.g., athlete's motivation), 'what' (e.g., exercise selection) and 'how' (e.g., feedback provided) of their programme design.

A final consideration for S&C coaches in shaping their P-D-R strategies is the insights, ideas and understanding of the other practitioners that they invariably work alongside (e.g., head coach, physiotherapists, sport scientists). Each disciplinary perspective offers a great deal and should be harnessed to formulate a shared understanding within a multidisciplinary team about 'what' to prioritise and work on, and 'how' to support the athletes' in order to meet their needs. This is exemplified within the idea of 'tactical periodization' (16, 93) and the development of a 'performance model' (82) when working with the head coach and other sports coaches. In this regard, communication, openness and collaboration within a culture of working towards the same goal are essential for an effective high performing team in sport (33).

Developing the S&C Coach: Constructive Aligned Learning Programs and Professional Development

Thus far in this paper the role of the six broad domains of the decision-making framework for guiding the practice of the S&C Coach have been discussed. This framework demonstrates the S&C coach as an interdisciplinary practitioner working in complex environments who has to think in complex ways to practice effectively. Clearly, this level of practice does not simply appear one day, it is the result of significant periods of learning. That is not to say that any S&C coach, regardless of level (i.e., novice to expert) cannot benefit from considering S&C practice as a decision-making activity using 'thinking tools' from the six domains discussed. Therefore, a question that arises is how does this learning take place and what role can educational institutions (i.e., higher education and national associations) play in this learning?

Within the coach development literature three broad approaches to supporting learning are identified; formal (e.g., institutionalized accredited learning), non-formal (e.g., conferences) and informal (e.g., tacit, experiential, self-directed learning). Furthermore,

there will be some level of blurred boundaries between these learning approaches (e.g., gaining accreditation points for attending a conference; formal/non-formal), Therefore, it is important to consider how institutions can facilitate formal learning to support non-formal and informal learning opportunities for enhancing S&C coach development. As the coach learning, and more broadly, adult learning literature is large and varied it is not possible to capture all this literature here. Instead, a pragmatic path that is utilized extensively within higher education is proposed; constructive alignment of learning. Constructive alignment was originated by Biggs (12) and has been adapted for providing a basis for thinking about coach learning (60).

Constructive alignment is displayed in Figure 3 and discussed in the following sections. Constructive alignment refers to how all aspects of an educational program design should align from one consideration to the next. Furthermore, any decisions on program design should be informed by external standards such as policy, research and the coach's needs.

Insert Figure 3 near here

Program learning outcomes and guidance capabilities

Table 1 summarizes numerous ways in which program learning outcomes and/or guidance capabilities can be informed through published work within coaching and S&C (4, 6, 31, 100). This work identifies some key themes that appear to be important in S&C coaching, including; problem solving, program planning and delivery, relationships, safe practice, sound knowledge base, session delivery, reflection, self-improvement and maintaining currency. Therefore, such information should be used to develop learning outcomes and guidance capabilities for S&C education. The language used in the creation of these outcomes is important, as it is typically focused on those who are 'high-achieving' or beyond graduate level. For example, the UKCCE and Professional practice statements reflect a 'professional' level of practice that is achieved after previous formal development. As such, some reverse engineering would be required to consider creating steps (e.g., levels of development) to high achievement (e.g., guidance capabilities) between novice (e.g., undergraduate students) and expert coaches. For a discussion of levelness in creating learning outcomes see (19, 30).

Assessment

The assessment stage is probably the most counterintuitive of the constructive alignment process. Many educators will want to think about assessment after they have considered what is being taught. However, within constructive aligned programs, assessment becomes more about '*assessment for learning*' rather than '*assessment of learning*' (3). Assessment is the means of evidencing the achievement of the desired outcomes to both learner and tutor. It also means that feedback should be facilitative of future development. For example, if *Build and maintain effective coach-participant*

relationships is a learning outcome then this should drive the assessment alongside the criticality of the thinking. Relationships don't occur in a single session, nor are they things that can just be 'seen' by an assessor. They are the result of judgements and interactions informed by an ongoing knowledge and awareness of knowing the 'who', 'how' and 'self'. It is therefore recommended that assessments attempt to draw upon these factors within the assessment process.

Necessary learning activities

This is a hugely complex area as learning activities should be considered based on an interaction between the needs of the learner, the knowledge and/or skills being developed, learning theory and available resources. In keeping with the pragmatic approach of this paper, some key principles that can guide thinking in this area can be achieved by simplifying coaching to the P-D-R process. This process relies on~~f~~ coaches having professional knowledge and skills to engage in each part of this process. Planning and reflecting are the analytical and thoughtful parts of the process. These rely on the capacity to know and assimilate knowledge from the six domains and the 'thinking tools' presented in this paper. Within learning activities, these 'thinking tools' are recommended to be introduced in classroom sessions (21).

Progressing beyond this approach, creating opportunities to engage in the actual problem of P-D-R, by drawing on realistic and meaningful contexts (ideally the coach's own), is crucial (43). This could include practicums, internship and mentorships (25, 85) allowing coaches the opportunity to apply ideas, experiment and learn through applied practice grounded in the coach decision-making framework. For example, inexperienced coaches may benefit from practicum activities within educational settings (i.e., delivering sessions to peers, observation) leading to applied internships within sport for postgraduate students to mentorship opportunities for experienced coaches (75). Regardless of the level, opportunities to discuss, reflect and challenge S&C practice should be integrated within education programmes to enhance learning rather than just providing practice-based opportunities alone.

Delivery is the more naturalistic element of coaching due to being in the moment, and reading and reacting to situations (e.g., perceptual skills). This is a concept known as sense making (49, 50). Phillips and colleagues (79) identified the need for engaging in;

- deliberate practice, this is one reason why planning is so important as it raises expectations of what goals are and what the perceptual cues will be.
- obtaining feedback that is accurate and timely
- reflect on expectations and perceived reality to seek out and explore uncertainty in practice

In reality, people are constantly attempting to make sense of their reality, whether that is in P-D-R. This is often the most confusing part of learning for learners. Consequently,

numerous researchers (e.g. (18, 29)) have discussed the role of mentors in supporting learners in engaging in this sense making process.

Packaging units of learning

For many in formal education this is often the starting place of creating learning programmes in the form of units, modules or classes. However, it is hopefully clear why this in fact should be final part of the puzzle (not withstanding that the whole process is both feed-forward and feed-back). This is the part where curriculum, delivery and assessment come together to ensure alignment. For example, whether an expected professional skill has been sufficiently supported by aligned professional knowledge and/or the opportunity to develop this in the field (or assessment) is required.

Conclusion

This article presents a conceptual framework for decision-making within S&C coaching. Based on theoretical understanding of the athlete (the 'who'), the sport and S&C training principles (the 'what') and learning theories and their behaviour (the 'how'), coaches can enhance S&C practice ('planning, delivery, reflecting'). In addition, S&C coaches can consider their integration with other practitioners while considering the contextual challenges (the 'context, culture & politics') and their own beliefs, values and behaviours ('self') for enhancing coach expertise and effectiveness. Based on this framework, coach educational institutions should aim to utilise this coach decision-making framework for improving S&C education and professional development within the field. The implementation of constructively aligned formal learning programmes would allow implementation of learning outcomes, assessment and learning activities related to the responsibility of the S&C coach. Such programmes would then have knock on effects to how organizations may then engage in the creation of continued professional development (i.e. non-formal) or how coaches decide on which informal learning opportunities they seek. Essentially, a well-developed formal structure based on the decision-making framework should allow for the enhancement of S&C coach learning.

Conflicts of Interest

There are no conflicts of interest

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Figure Legends

Figure 1. A Framework for Decision-Making within S&C Coaching (adapted from (2, 73, 74))
Figure Caption: The interconnecting arrows between the knowledge domains demonstrate that although the domains are presented as standalone knowledge areas, there are connections between each of them. The two-way arrows between the 'who', 'what', 'how', 'P-D-R' and 'self' with the outside of the figure demonstrate that knowledge in all these areas is affected and influenced by the 'context, culture & politics', within which S&C coaches work.

Figure 2. The Coaching Practice Planning and Reflective Framework (71)

Figure 3: A Schematic of Constructive Alignment (12, 60).