The Coaching Schematic: Validation Through Expert Coach Consensus

Running Head: Validation of The Coaching Schematic

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Abstract

Current research in coaching development infers that coaching is predominantly a decision making process. The same and other research is not, however, informing the coaching development process due to a lack of a big picture approach. Consequently, there is a need for a model of coaching. In this paper we offer such a model in the form of a schematic that reflects the coaching process from both a content and information-processing stance. To assess the validity of the schematic 16 expert coaches were interviewed to elicit a complete description of their coaching process. The coaches were then shown a copy of the schematic and asked to comment on its design and content with respect to its accuracy in reflecting their coaching process. Following analysis of the interviews 6 general categories emerged; Roles, Goals, Typical Actions, Required Knowledge, Support for the Schematic and Factors Influencing Development. The first four categories clearly displayed an implicit support for the schematic. Furthermore, all coaches offered explicit support for the schematic. Such a level of support confirmed that the schematic was valid and could form the basis of focused interventions in coaching development.
Introduction

Examination of recent research in the area of coaching practice and development reveals a position which directly (e.g., Abraham and Collins, 1998, Cushion et al., 2003, Lyle, 2002, Strean et al., 1997) or indirectly (e.g., Potrac et al., 2000, Côté et al., 1995b) infers that coaching is, fundamentally, a decision making process. However, while such a position has been reached, the same and other related research has yet to effectively inform coaching development. In short, work to date has been specific but too prescriptive (e.g., Krane et al., 1991), holistic but overly complex (e.g., Lyle, 2002, Lyle, 1999) or holistic but lacking a mechanism for development (e.g., Côté et al., 1995b, Côté et al., 1995a, Côté and Salmela, 1996). It is perhaps for this reason that current coaching development initiatives in America, Canada and the UK make no reference to any big picture plan or model in their development approaches. Indeed, it could be argued that their development programmes are somewhat eclectic in their approach to programme design (Potrac et al., 2000). In fact, coaching associations in both the UK and Canada (Canadian Coaching Association, 2005, SportscoachUK, 2004) are currently developing coach development programs using a competency based approach. While theoretical research is available that highlights the pros and cons of this approach from a generic perspective (Thomson, 2000), we are not aware of any empirical research in the area of coaching that would establish this approach as being optimal. Perhaps the current situation is best summed up by Vickers et al. (2004) who have suggested that “a model of coaching is required that has at its heart sound theoretical and research foundations, which are applicable to all sports, coaches and age groups” (p. 105). While we certainly agree with this statement we would suggest that, in fact, a schematic that is transferable across multiple situations and contexts through reference to relevant knowledge and information processing procedures is more
appropriate. Furthermore, such a schematic can inform coaching development and practice more effectively as it should reflect the whole coaching process. It is worth noting here though that the typical coaching process of ‘plan, implement and review’ (Smith et al., 1997) maybe a little too simplistic to really reflect the dynamic nature of coaching practice and development (NB. this statement does not preclude the use of this idea as a starting point for novice coaches). We would argue that a schematic should have more to do with Kolb’s (1984) four stage experiential learning process cycle; concrete experience, reflective observation, abstract conceptualisation, active experimentation, since this process is more reflective of a dynamic and ongoing practice and development cycle (Thomson, 2000). Consequently, the ultimate aim of this study was to validate a coaching schematic that, through its design and content, would accurately reflect the coaching process in its entirety. However, prior to outlining the development and testing of the schematic there are, first, a number of philosophical and theoretical issues worthy of consideration.

Why Do We Need Schematics and What Characterizes a Good One?

In contrast to the current situation in coaching, research examining practice and development in similar but more established paradigms such as teaching reveal simple conceptual models that characterize the qualities required in an effective schematic. In short, these models have met a crucial goal in that they summarized current theoretical, empirical and practical positions (Sternberg, 2003) in order to efficiently and effectively inform the development of teaching and educational practice (e.g., Entwistle et al., 2000, Berliner, 1991). Furthermore, research examining the definition of a profession would both support and add to these characteristics. For example, Carr (1999) states that a defining characteristic of a professional practitioner is someone who has theoretically

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1 In the UK, UK Sport developed a goal for coaching to be viewed as a profession by 2012. Similar developments are already underway in Australia and Canada.
as well as practically grounded expertise, allowing a high degree of individual autonomy and independence of judgement resulting in effective practice. This, in turn, identifies the need for a schematic to reflect a judgement process. Biggs and Collis (1982) identify that quality judgement involves making multiple connections within a knowledge domain (displayed by the arrows in figure 1). Furthermore Davies (1994), Johnson et al. (1981) and Zeitz and Spoehr (1989) identify that experts refer to a broad range of domains of knowledge when solving problems. This would suggest that a schematic should reflect an intra and multi/inter disciplinary decision making process within a theoretical and practical framework. Finally a schematic needs to be transferable, that is, a schematic should be applicable irrespective of the situation or context. This may actually be simpler than it sounds. Given that current situations or contexts increase the degrees of freedom (Abraham and Collins, 1998) that in turn affect the way in which goals are achieved, these essentially represent problems for the coach to overcome, e.g. player injury, keeping things fresh in the middle of the season. Therefore, so long as the schematic is broad enough in its approach to allow for judgement to deal with these degrees of freedom it should be transferable.

It is through considerations such as these that the need for a schematic becomes essential, we suggest, as a structure for the operationalization and enhancement of the coaching process; in short, unless you know how the process works, how can you optimally develop it? Accordingly, a clear and appropriately simple schematic will offer us the basis for genuine and scientifically supported performance enhancement in coaching. Such ideas led us, in conjunction with other active coach researchers, to summarize current sport science, coaching, educational and cognitive psychology research relevant to coaching development to develop a coach decision-making schematic that maps the knowledge, decision-making, concepts, and resulting
behavioural/observable output, requirements of all coaches. In essence, reflecting the whole coaching process. This approach is summarized in Figure 1. While we have little doubt that the schematic is comprehensive in its coverage and that its development is theoretically, empirically, in that its development has referred to empirical research (e.g., Rutt-Leas and Chi, 1993), and intuitively supported and therefore has content validity, it is important for the model, indeed all academic models, to be considered and judged for its ecological validity by ‘quality’ practitioners (Gilbert and Trudel, 2004a). In pursuing such crucial validation however, there are three important methodological considerations which must be addressed in order to ensure that the approach adopted is appropriate to the stated purpose.

INSERT FIGURE 1 ABOUT HERE

Consideration 1: Matching Schematics to Knowledge Objects

Validating a schematic such as figure 1 is actually quite difficult since it is unlikely that an exact match exists in the minds of expert coaches. The schematic is a necessarily tidy and concise conceptual description of knowledge areas, concepts and performance environments that, we suggest, reflects the coaching process. However, research in parallel environments (e.g. teaching and learning processes in higher education; (Entwistle and Walker, 2000) suggests such concepts are “experientially… much too tidy”, and that, when thinking about their behaviour, professionals more usually make use of broader and more global structures known as Knowledge Objects (Entwistle and Martin, 1994, Entwistle and Entwistle, 2003). Knowledge objects are said to occur when there has been an integration of a breadth and depth of knowledge that covers multiple related concepts and conceptions (we will explain the distinction
between concepts and conceptions in more depth later). Furthermore, such structures
don’t underpin thoughts and decisions, but rather represent the mental workspace where
thoughts and decisions are made. Importantly, these objects are likely to be
idiosyncratic and this has major implications for testing the validity of the schematic.
Our argument would be that if the schematic were an accurate reflection of all expert
coaches’ knowledge objects, the idiosyncrasy should only relate to the storage and
retrieval of knowledge as opposed to the broad content and use of the knowledge and
concepts identified in the schematic. Given this position and since we are trying to
generate (not force!) an agreement from coaches, we will have to guide the retrieval
process to the extent that we are, ultimately, going to have to show the coaches the
schematic. Both these methodological considerations would mitigate against the use of
the grounded theory approach typically employed (at least to date) to generate
“academic” models such as Côté et al’s (1995b). Obviously we are not going to
deliberately lead, but if a “pure” grounded approach was taken we may get so many
varying accounts that developing a strong concise model becomes increasingly difficult
or even impossible. However, if we get a strong and implicit, “best fit” agreement from
expert coaches through demonstrable use of the schematic structures in their decision
making, and these coaches then give an explicit “thumbs up” to the schematic, and these
coaches come from a representative cross sample of sports, the schematic is supported
and a significant step towards forming a structure and basis for coaching development
will be taken. In short, we contend that the use of a “grounded then led” approach
offers the only practical pathway to validation studies such as the present investigation.
Consideration 2: Concepts and Conceptions: Probing for Knowledge that Underpins Decision Making

We referred earlier to the existence of concepts and conceptions and the importance of understanding the distinction between the two. Concepts can be defined through the formality of their broad procedural categorizing/scaffolding system, their specific procedural knowledge, and the declarative knowledge which underpins them (Abraham and Collins, 1998, Anderson, 1982). Almost always communicated through structured, academic-style training, concepts are particularly useful in the professional development process since they both short circuit and direct experiential learning. As such, concepts are the goal of our examination of expert coaches, in order to generate a curriculum for coach education.

In contrast, conceptions often represent an internalising of concepts, applied to a particular context that is meaningful to the practitioner. In order to make sense of any factual concepts they possess, and to create meaningful new knowledge in memory, practitioners will look for and reflect on (Cushion et al., 2003, Gilbert and Trudel, 1999, Gilbert and Trudel, 2001, Gilbert and Trudel, In press-b) patterns, orders, links, similarities and conflicts with previous experiences in order to develop a conception or a group of conceptions to help them make sense of delivered material and/or experiences (Entwistle et al., 2000, Kolb, 1984). Such conceptions are generally organized and framed around beliefs or rules about how that conception is implemented in the field (Gilbert and Trudel, 1999). For example, Calderhead (1996) has stated that teachers’ conceptions about learning have been shown to focus on two broad beliefs, namely the importance of active involvement and/or the need for an emotionally secure environment in which failure was non threatening. However, if these beliefs are provided “up front” as concepts through an educational process, teachers are both better
and more quickly prepared. Furthermore, the declarative knowledge provided with the concept offers a structure to the professionals’ subsequent critical reflection, generating a higher quality and more consistent development from ongoing experience (Thomson, 2000). Consequently, a conception is produced that is “filing cabinet” like in its organization, allowing for explicit reasoning and decision-making.

Unfortunately, formal educational processes such as the one suggested above are comparatively rare, at least in the generation of coaches from whom experts would (currently at any rate) be largely drawn. In the vast majority of coaches, progressing to the level of expert will have involved experience as being the significant contributing factor to the development of the conceptions required to be an expert (Cushion et al., 2003). Accordingly, and as a direct consequence of the lack of explicit concept teaching, conceptions are developed through trial and error and other typical weak problem solving methods (Anderson, 1987) leading to tacit knowledge being developed within the conception. The direct knock on effect is that there will be some actions developed and taken because of a tacit decision achieved without any conscious reasoning (Kerr, 1995, Sternberg et al., 1993). Furthermore, other decisions may be based on semi tacit knowledge; that is, so long as there is a meaningful context the practitioner will be able to describe the decision making process and knowledge underpinning an action, or at least this knowledge can be probed for. However, in the absence of a meaningful context and/or the guiding rule, it may well be impossible for the practitioner to verbalize the knowledge used in a decision. In fact, the reasons underlying a decision may only become obvious when the practitioner is asked to describe why an alternative action wasn’t taken. In the absence of such probing, asking a practitioner to describe what they think, or what is occurring in a context may lead to a situation where an incomplete description is given. For example, Côté and colleagues’
work with expert gymnastic coaches, using a
grounded theory approach identified that training was an important context for these
participants. However, when Côté et al.’s “consequences for intervention” results are
examined there is no mention of *instruction* and yet this behaviour has been observed in
all levels of coaches in just about all behavioural observation studies e.g. (Claxton,
1988, Smith and Smoll, 1996). Of course this could mean that these coaches do not use
this behaviour. What is more likely, however, is that they do use it but their explicit
awareness, and thus their ability to access and retrieve this knowledge (c.f. our earlier
comments), of its use is quite low and/or its use gets clumped together with “feedback”
because of a lack of definition and differentiation to the verbal behaviours used during
coaching. Furthermore, we would argue that while the most significant work in this area
since Côté et al’s work by Jones et al. (2003, 2004), provides excellent in depth insight
into the thoughts of elite coaches from a number of sports, it also suffers from similar
problems to Côté et al’s work. Consequently, significant probing, alternative giving and
in depth discussion of decisions taken is essential if we are to generate the clear
conceptual knowledge that offers the best vehicle for developing coaching prowess in
others. Accordingly, this approach was employed with the participants in this study.

**Consideration 3: Are the Participants really Expert and is the Schematic actually
needed?**

In their groundbreaking study, examining all of the current research in coaching
science, Gilbert and Trudel (2004a) identified that too few studies developed findings
from coaches who exhibited styles or practices that should be copied. Consequently,
there is a need to exhibit just ‘how good’ coaches used in studies actually are. This is
actually very difficult in the absence of a gold standard, meaning that the confirmation
of “expert” status is always a thorny issue. Importantly, the development of such a gold
standard is one of the goals of the current UK Coaching Certificate (SportscoachUK, 2004) development in the UK. However until this development is complete we had to resolve this problem through identification and development of criteria and then finding people to fit the criteria. For example, Gilbert and Trudel (2004b) identified a model youth team coach as someone who demonstrated interest in the theory and practice of coaching, was respected in the local sporting community, was a good leader, teacher and organizer, and who kept winning in perspective while encouraging children to respect the rules of the game, competitors and officials. Once these criteria were set, coaches were selected using a reputational case selection sampling procedure (Miles and Huberman, 1994). Consequently, in the present study the criteria used for peer identification of coaches considered to be experts were a) recognised as being expert coaches b) their consistent use of a critical thinking approach (Strean et al., 1997), c) their roles as mentors to developing coaches and finally d) those currently working with both elite and developmental athletes. The peers who were asked were members of the UK Sport Institute coach development team, performance directors and sport scientists. By choosing these criteria we are relying to a certain extent on an intuitive feel of people ‘in the know’ to identify expert coaches. To support this selection process we also provided more explicit criteria that would support this intuitive feel to ensure an expert is selected.

Of course our selection procedure used to access expert coaches is open to debate but we would argue that the selection criteria used was rigorous enough to ensure that expert coaches were selected. We would, however, encourage an open debate in the literature to discuss what, explicitly, constitutes an expert coach so that more explicit criteria can be used in future studies.
Once the coaches have been identified as being expert we can then meet the final check on the validity of the schematic. Even if we get agreement from the coaches that the model does reflect their job, if the coaches became expert without the schematic is it even needed? This will actually depend on how these coaches became expert. If the coaches have developed through a clear developmental pathway then the model’s importance will be diminished, however, if there appears to be no coherent pattern to their development and the schematic can provide this coherent basis then its importance will be enhanced. Although this study will, obviously, be delimited by the demographics of the coaches selected, we will go on to examine issues relating the transferability and relevance of the schematic across the coaching spectrum in the Discussion and Conclusion section.

**Summary and Research Questions**

Returning to the question originally set, we hope that the importance of an ecologically valid schematic has become obvious, in that it can codify experts’ knowledge and decision making, both explicit and implicit, enabling their effective communication to other coaches. However, in order to effectively achieve this goal there needs to be a methodology that takes account of theoretical and empirical research examining knowledge storage and retrieval as identified in the three considerations. Taking account of these considerations led to the design of a methodology that reflected the objectives of the investigation. For our present purpose, this related to exploring the match between a theoretically derived schematic with the knowledge objects used by a sample of representative practitioners. Accordingly, we used open-ended and subsequently more direct questions to address three issues pertaining to the veracity and applicability of the schematic as follows:
1. What are the typical rules, processes and content of a knowledge object required for expert coaching?
   a. What are the roles and objectives set by/for the elite coaches?
   b. What are the decision making process used
   c. What knowledge is required to perform these decisions and, therefore, to achieve these roles and objectives?

2. Does the content and flow of the model accurately match the thought process and decision making of expert coaches?

3. Does the model represent a good basis for focused development of these processes?

Methods

Participants

Based on the selection procedure outlined above, sixteen expert coaches working within the UK took part in this study. To ensure that the quality of coaches involved in this study remained high across all sports, the coaches must have been coaching for a minimum of 10 years whilst also meeting the following criteria:

- United Kingdom Sports Institute Coaching Team and/or Performance Director and/or Sport Academic were asked to recommend coaches who they thought displayed the following characteristics
  - Respected within their own sport for being top quality expert level coaches
  - Evidence of a critical thinking (will challenge norms and assumptions, Strean et al, 1997) approach to their coaching
  - Actively mentoring coaches within their own sport
Currently working with elite and developmental (i.e. those who have aspirations of becoming elite) athletes

In response to Gilbert and Trudel's (2004a) call to more clearly describe who the coaches are, the sixteen coaches, 14 male and 2 female, covered thirteen different sports as follows; athletics, canoeing, curling, cycling, equestrian, soccer (2), hockey, judo, netball, rugby (3), shooting, swimming, triathlon. Four of these coaches were non-UK nationals; 2 of the coaches were European while the other 2 coaches were Australasian.

All of the coaches were recruited by personal contact by one of the research team. After an explanation of the purposes of the research, and assurances of anonymity, all coaches consented to take part in the study

**Procedures**

In order to answer the research questions each coach underwent an interview lasting between 75 – 100 minutes. The interview took place at a time and place convenient to the coach. Each coach was sent a copy of the basic questions that were to be asked at least 5 days in advance of the visit by the interviewer. The original set of questions were deliberately broad so that the original answer given to each question was not led in any way. By taking this approach we were allowing for the scope of each coaches’ conceptions within the knowledge object to emerge. Following this original question and answer, follow up probes and prompts were used in order to ensure that a complete description was given. The original broad set of questions are outlined below. In addition to the reasoning supporting the questioning approach outlined above, questions 1 – 7 also allowed the development of the meaningful context so important to getting complete descriptions of knowledge objects and conceptions. In a further attempt to develop the meaningful context, each coach was interviewed prior to or just after a
coaching session allowing the coach to be in an environment s/he would already be in
the knowledge object mind set being examined.

1. Could you tell me about your role as an elite coach and therefore the goals and
   priorities that brings?

2. Are there any other goals that you bring to the role?

3. Could you tell me about where your aims/goals come from and who’s needs do
   you try to fulfil/prioritise?

4. Could you tell me about the types and levels of planning that you do

5. Could you take me through the process you go through when you plan from start
to end

6. Once you have your various plans (e.g., long, medium and short) what do you
do with them?

7. Could you tell me about the complexity of what you are trying to achieve?

8. What bodies of knowledge (e.g. physiology for a cycling coach) do you need to
   know about to be effective as an elite coach, and in what ways does it help you?

9. At this point in the interview we will show you a model. We will give you a few
   minutes to have a look at and consider the model and then we would like to
   comment on it.

10. Could you tell me about where all your knowledge has come from?

We took the decision to delay showing the model to the coaches until after we had
explored all aspects of the coaching process. This was implemented for two reasons;
firstly, we could check if the coaches implicitly and explicitly supported the schematic.
Secondly and consequently, the knock on effect of this implicit then explicit would be
to act as a further check on whether the coaches were giving “impression managed”
responses (Leary, 1992).
Two interviewers conducted interviews. Prior to commencement, both interviewers ran through pilot interviews with expert coaches who were made aware of the aims of the project. Feedback was then sought from these coaches as to the efficacy of the interview script and interview process and also to check on whether the coaches had felt led to a conditioned response. Both coaches suggested that the questions with supporting prompts and probes did lead them to giving a full and complete response. Importantly, neither coach felt that they had been led to give a response that did not reflect their own ideas or thoughts. Consequently, each interviewer had an interview script with the same questions and each question had a list of potential probes and prompts. This enabled both interviewers to make sure that the same prompts and probes were used in all interviews. Copies of the full interview transcript are available upon request.

**Analysis of Qualitative Data**

The analysis of the interviews was based on sound qualitative research techniques, through inductive followed by confirmatory deductive techniques (recommended by Patton, 1990 and Scanlan et al., 1989). Interviews were analysed using Atlas ti 4.2. data analysis software. Raw data themes were identified and built up into meaningful themes and categories (see Figure 2). The analysis involved three researchers independently familiarizing themselves with all of the data by reading transcriptions and listening to interview tapes. After analysing the data, raw data themes and categories were verified and checked through triangulation.

Following the approaches suggested by Krane et al. (1997), transcripts within each category were content analysed by the one member of the coaching team who had completed the interviews. Consequently, data were examined both inductively then deductively, with this deductive analysis based on the precepts of the coaching
schematic presented in figure 1. Subsequently, samples of these data sets were re-
examined by the other members of the research team, with questioning and debate used
to explore any issues of contention.

Finally, once the analysis was completed a draft report with results, discussion
of results and conclusions was written and circulated to all of the participants. All
participants were requested to read through the report and respond via email or
telephone if they felt that the report did not accurately reflect the events or their
thoughts. No such modifications were requested.

Results

Overview of results

The typical method of displaying results from interview-based fieldwork/research is
through developing a table of 1st, 2nd and 3rd order themes that become progressively
more hierarchical. These themes and hierarchy “dropped out” of the raw interview data
following the analysis procedure already discussed. In order to make it easier for the
reader to get to the point these data are presented in Figure 2. To summarise figure 2 we
will present and describe the results in an order to provide answers to each of the
research questions in turn. As we describe the results it should become obvious to the
reader that implicit support was generated prior to showing the schematic to the
coaches. This support is then made explicit in the responses of the coaches once they
had a chance to view the schematic.
What are the roles and objectives set by/for the expert coaches?

Roles.

Upon analysis of the data there were no surprises that one of the major roles that these coaches take is exactly what it says on the tin; namely acting as a coach in its purest sense and helping athletes achieve their potential as described by this individual sport coach. ‘So my job is to get them to achieve what I see as being their particular model technically, but it fits with what I see as clearly to be the right model.’ In addition to this role, one further aspect emerged; namely, that these coaches very much saw themselves as being a programme leader/manager. However, their descriptions of leadership go beyond the definitions typically applied by researchers in sport (e.g., Chelladurai, 1990). The following quote displays how these expert coaches are leaders of a team of support staff and a team/group of athletes and therefore take on the responsibility for all the human resource issues that brings.

The major input, obviously I'm a facilitator first and foremost because I run the whole programme and I bring…it's like anything, you want to bring in a psychologist. Unless you know a little bit about these things, you're maybe not necessarily going to get the best person to suit the team.

Goals and objectives.

In line with much of the research examining goals and their development, the coaches in this study are setting both process and outcome goals. All of the coaches involved in the study were fully aware that the bottom line measure of their performance was eventually results achieved. For example, the following quote displays how this team sport coach’s job depends on achieving medals since the financial support for his job is tied in with the job specification.
Well if I want to keep my job we have to win medals at major championships.

So no matter what other ideas you have when you come into a job that is, focused around that, you need to win medals. It's money for medals and we are a core sport funded by lottery.

In order to achieve these goals, however, all of the coaches recognised the importance of setting individual performance goals that, if they are achieved, will support the achievement of the outcome goal. For example, the following quote from an individual sport coach identifies that individuals have to be developed in order to meet the overall goal.

I try to think, and most of my colleagues try to think that it (the program) is centred around the athlete because if the athletes don't win medals, we have got no programme and we are out of a job. We try to satisfy the athlete's needs. It's like an athlete centred approach.

In order to support this athlete-centred, performance approach six different types of process goals were commonly set by the coaches. The first four of these relate specifically to performance and are often referred to, or classed by, using the following terms; technical, tactical, physical and mental goals. Typically, there were goals emphasized by the coaches that reflected the sport that they were coaching. So for example, the quote below comes from a throwing coach where having good technique and the power to implement that technique is very important. The second quote comes from a individual continuous skill sport (Schmidt and Wriseberg, 1999) sport where technique was considered to be already developed by the time this coach took on athletes. The final quote comes from a team sport coach where all aspects of performance are considered.
Yes, yes. It’s very process goal. If I was honest and I sat down and thought and wrote a thesis about it the way that the (technical performance) model sits in me is a series of positions which can only be achieved if you have a physical capability of achieving this. So what we’re training fits snugly into what I want to achieve. And the process by which that’s achieved is this and it’s all in there. If you can’t do it like this I can make you do it better because I can see what you’re doing.

“Yes, it can be physical it can be psychological. It can be tactical.”

…the priority is just the continued development of the player and in whatever area he needs to be supported, whether it is his skill or his confidence or his decision-making ….but I think in a team game there are so many variables, speed, strength, power, skill, timing, decision-making and so on and so on.

In addition to these process goals the some of the coaches were setting value/learning and lifestyle goals that are behavioural and metacognitive in their underpinnings as exemplified by this quote from a team sport coach

When we bring a team in to the Institute we sit down with them and we, before we get any contracts out we look for commitment from them and they can challenge us for the same amount of commitment going the other way.

Irrespective of the types of goals being set, one thing is already becoming apparent. All of the quotes used so far demonstrate how coaches very rarely consider one aspect of their job or goal in isolation highlighting the interdisciplinary nature of the
process. This is something we will return to when we present the results relating to
decision-making.

Conflict between winning and developing

While there will be a later section on decision making, it is worthwhile considering the
issue of the conflict between winning and developing at this point to keep within the
context of the situation. The issue of conflict between goals was brought up by several
of the coaches. There was a recognition that, ultimately, winning is the bottom line as
already described and that they have to work within the constraints of the system.

However, greater conflict occurs when the expectations placed on the coaches from
external sources go beyond what the coaches’ think is reasonable, such as this team
sport coach.

Yes there’s conflict because you know, you don’t get time. That’s the thing.

People will say, even now, people say that’s okay but we want you to bring
some young players through. And you go okay, give me five years and I’ll
bring some young [country] players through. I can’t bring them through in six
months and win. I don’t give them time to learn.

The method of dealing with this type of conflict irrespective of the level of
incompatibility is normally through resetting goals and working within the constraints
of the system. Such methods begin to display the decision making process that occur to
support typical actions by expert coaches. The next section of results will go on to
display the typical range of actions taken across all sports and the types of decision
making used to develop these actions.
What are the Typical Actions and Decision Making Processes Used by Expert Coaches?

Typical actions: Planning.

The previous section identified that the coaches involved in this study set process and outcome goals and this therefore would represent the first set of typical actions taken by them. Further to this, long, medium and short time periods are placed on goals produced and the planning required for their achievement. However, depending on the competition structure, these time frames differ between sports and the language may not be used or even liked. For example the next quote is a typical response from a coach who is preparing athletes for major competitions that are based a four yearly cycle; ‘but when she has her goal setting next month, her annual goal setting and review, we will definitely be looking 3 or 4 years ahead, you know we are talking about a pathway to the Olympics’. This would represent a long-term goal setting approach. Identifying medium and short-term goals as a road map to the long-term goal then supported this approach. In contrast, sports where there is a weekly competition the time frame decreases as displayed by the next quote from a team sport coach. ‘If you've been true to what you've said you're going to do and continue true to it, then there's no reason why you can't retain your intensity right to the end (of the season). So that's the long-term planning over the season.’

Typical actions: Goal development through performance analysis

In addition to setting goals, all of the coaches identified that they consistently used performance analysis to support this development. The major methods used by the coaches’ are, typically, ongoing performance analysis and end of season reviews. In completing these tasks some of the coaches appeared to be relying solely on their expert eye and memory (Chase and Simon, 1973), for example, a team coach stated ‘Again
you see, I think in these more difficult things, psychological or whatever, you get a feel as you work with the player week in week out. Sometimes it is just what you see, you know, your eye that is better’. In contrast, other coaches were using the expert eye but with the aid of video playback while other coaches were using very objective levels of analysis such as this team sport coach; ‘what we're really doing here is collecting a lot of data on the players so we can try and highlight the areas of inconsistency or weakness by using different software programmes that we've written up with an institute analyst’.

Typical actions: Effective use of support staff

All of the coaches made use of support staff in athlete development. This support could come from either assistant coaches and/or sport science/medicine support. In either case the coach would identify how to make best use of the support to achieve set goals.

The reason I've worked closely to sports psychologists is because they are the specialists and because I think it's important that the athlete has a third party so that if there are really serious doubts, issues or problems, they can talk through it. It doesn't matter how much they trust me, if they have a third party they can work through it actually helps my coaching role because I then don't get bogged down in things which then start to impede me from working with a larger group.

Decision making processes: Hierarchical, consequence considered, integrated

As identified in the methodology section, one of the aims of the interview design was to develop a context that was meaningful to the coaches. By doing this we were able to identify the thinking and decision-making methods used to carry the actions identified above. The most apparent mode of thinking used by the coaches was both hierarchical and nested in nature. That is, the coaches would start off with an idea to deal with the problem and further ideas would drop out of this as evidenced by the defining of roles.
and development of goals and plans outlined above and further outlined by the quote from individual sport coach below.

At the moment with the elite coaching of the (Sport) team I'm looking at all of those things, I'm doing administration, organisation and certainly all of the technical stuff and the detailed technical coaching for those guys. I'm doing all the other back-up support work and acting as the conduit really for the other support guys we've got working with those (performers).

In essence, this approach breaks a complex situation down into meaningful chunks. A phenomenon identified in experts in other domains such as chess (Chase and Simon, 1973) and teaching (Entwistle and Walker, 2000). Furthermore, this breaking down of problems follows the breadth first approach to problem solving observed in experts in medicine (Johnson et al., 1981) and computer programming (Zeitz and Spoehr, 1989).

The second approach identified from the analysis was that the coaches were making decisions based on an integration of different knowledge sources, c.f. our comments about knowledge structures being developed by and integration of concepts and conceptions, as evidenced by the quote below.

Are you familiar with the move towards synoptic papers at A level? Synoptic papers basically draw knowledge from all areas to answer a central question. That is what the good coach does. They have to be good at the synoptic work. They have to be able to draw things from different sports. They have to be able to bring different sciences etc to answer the central question or problem. That's what good coaches can do. You can't pigeon-hole things for a coach and if I was looking for an elite coach that's what I would be seeing, somebody who could bring a whole lot of different knowledge to solve problems.
The final decision making consideration to emerge was the idea that decisions could only be “best fit”, and that in order to make these decisions the consequences of the decisions were considered. This process is exemplified by the following quote from an individual sport coach;

All the other ‘ologies and isms and all the rest of it, well my personal view is that you need to have as broad a background as you can and have a broad range of knowledge. It's very rare that you push a button that says psychology or you push a button that says physiology or technical. Everything that you do has an implication psychologically or physiologically or whatever and you need to know how things work, the 'what ifs' so if you press that button what happens to that, what happens to that?

In summary, process goals such as technical, tactical, physical, mental, lifestyle and attitudinal are typically set. When deciding on these goals the coaches were taking account of several factors including the outcome and process, the individual and where applicable the individual within a team, external expectancies, and the short medium and long term requirements. In order to arrive at these goals, the coaches were all using some level of performance analysis in order to develop meaningful targets. All of these actions are underpinned by a hierarchical, integrated and consequence considered decision-making process.

**Required Knowledge**

When responding to the question asking about what the coaches needed to know to perform their role effectively it became apparent that a broad range of knowledge was required.
Far and away the first stated required knowledge source was that the coach needed to have an extremely good level of sport specific knowledge as exemplified by the next quote from an individual sport coach; “I would say that your sport specific knowledge is your biggest knowledge base.” It may seem obvious but you can’t make decisions about performance if you don’t understand performance.

The next most frequently mentioned required body of knowledge was pedagogy. The term pedagogy was never directly used by any of the coaches prior to seeing the model. However the terms skill acquisition and communication were widely used and we deductively placed them within the category of pedagogy. The following two quotes by two different team sport coaches are typical of the responses given by all of the coaches; ‘You've got to be able to understand how to construct the practice and increase the information load appropriately ‘til it becomes realistic and full on’. ‘You have to be able to communicate with players in a way that they believe in the, you know, they believe in your knowledge’.

The next level of required knowledge can be put under the heading of ‘ologies. These are the three basic components of sport science. The most often referred to ‘ology was physiology; the next being psychology and the least often referred to required knowledge was biomechanics. While no explicit reason was put forward for this, it is likely that user friendliness and typical setting up of support (i.e. getting the fitness guy in first) has led to this situation. The following quotes are typical of the responses gained, the first and third quote are team sport coaches while the second is from an individual sport coach.
You do have to have a knowledge of physiology, you do have to have a knowledge of nutrition. But not as much as you used to have because most clubs now have nutritionists, sports scientists, certainly physiotherapists with a sports science background, whatever. So a lot of that is taken away from the coaches. A lot of that is taken away. But when I first came in you had to go ***** fitness, physiology and nutrition. But I went and done a years course at college on food, food and nutrition. And when you’re doing the various coaching courses that you do, parts of physiology and stuff and you gain minimal knowledge I suppose in comparison to proper sports scientists, proper physiologists very minimal but maybe enough to just give you an idea of what’s required.

As I said, whether it’s sport psychology or just psychology in general, man management, call it what you like but basically that, that psychology aspect of the knowledge of players and how to handle players, how to deal with performers and the sport specific knowledge are the most important things.

Also with biomechanics we’ve got to be able to make up a clear model as far as what makes up a good technique, whether it be kicking or passing or tackling. There needs to be a clear expectation that if something goes awry you know what to look for straight away.

The final two areas, only mentioned to a small extent, were management and life skills. Does the content and flow of the model accurately match the thought process and decision making of expert coaches?
**Implicit support**

One of the reasons behind the interview design was to see if support for the model “fell out” of the responses given by the coaches before they were even introduced to it. We would suggest that the results reported thus far do support the model. That is, coaches do develop goals that are applied in nature (i.e. *technical* goals as opposed to *biomechanical* goals), they analyse and plan for performance, they make decisions from a hierarchical, integrated consequence considered approach, and they do all of this from a knowledge base. However, while that was our consideration, an individual coach summed this up very well.

This isn’t much different to what we’ve been talking about is it? You’ve got your “ologies”, your mental skills, fitness training that sort of stuff which is what you’re talking about whatever, and the coaching bits and the drills and the practices.

**Explicit support**

While it was important to get a level of implicit support for the model, the real crux of the validation of the schematic would come when the coaches could comment specifically on the model: specifically whether they thought the model accurately reflected the requirements and decision making of expert coaching. This exemplar quote, from a team sport coach, displays that the coaches thought the Model did reflect content process and complexity of coaching process.

It does (reflect what I do) but because it reflects what I do and I have done it, hands on and I am doing it and improving on it, I can understand that. Someone who doesn’t, wouldn’t necessarily quite so easily. Because it is complex, how does all that come together and I suppose I liken it to, when someone says to you what do you do. I find myself having to make a fairly
kind of unrelated explanation because it is not a simple thing. Pulling in this
support and that support and focussing on the player and what does that mean
and before you know you spend half an hour telling someone what you have
done. You can't just say I am a [sport] coach and just leave it at that. That
here (referring to the schematic), that's it. I just think that if this was
something that you were producing for coaching, league coaches, whatever,
that some sort of examples, this is what this means this is what that means
would just clarify it but it sums up what is done, what I do. It is complex
though isn't it.

What this quote also clearly identifies is the non-systematic manner in which these
go, organised their knowledge, highlighting the concerns put forward in
Consideration 2. While this clearly does not affect their decision-making in context it
does create problems if these coaches are put in a position of being ‘gatekeepers to
knowledge’ (Cushion et al, 2003) for other coaches, such as mentors or tutors, in a
coach education context.

Does the model represent a good basis for focused development of these processes?

There were a variety of development methods acknowledged by the coaches when they
were asked where their knowledge had come from. However what quickly becomes
clear is that their development has occurred through serendipitous methods as opposed
to a structured program – in short, these coaches are magpies and not filing cabinets as
clearly identified within the previous quote.

Knowledge sources and development: Experience, courses, other coaches,
serendipitous

It will be of no surprise that performing and coaching experience represent two of the
biggest sources of knowledge for the coaches. It was clear that all of the coaches had
learned from their experience because of their self-reflective nature as exemplified by the following quote from an individual sport coach.

I think again it's just that raw brush with knowledge and having been there, you've seen so many situations and you've had to deal with them that if you've got half a brain you learn how to deal with them. Sometimes it doesn't work so at least you know you don't do that again, and you think that, "perhaps I should have done this," etc so the feedback is important.

In addition to learning from experience, formal coach education qualifications were also cited as being a source of knowledge, although, as the next quote from an individual sport coach suggests, some reservations were expressed about the usefulness of some of these courses. This finding would complement the findings of Jones et al. (2003) when interviewing an expert football coach.

Whilst I'll probably be the first person to criticise the governing body award courses I suppose they give me a grounding, just a very very basic grounding. I think they were key. Unfortunately that's all they gave me was a very very basic working knowledge to start with in the employment.

Furthermore, academic qualifications were perceived to be important by several of the coaches; however, they were recognised as only being part of the overall development picture. The quote below from an individual sport coach also reinforces the need for a reflective and critical thinking approach to ensure the most is made of experience.

Two definite pathways. First of all the degree. Well, going back before that, the club level Coach Award I took before the degree, the Sport Science degree. That was the basic understanding - anatomy, exercise physiology and then almost a distinct pathway actually in the job. Some of the stuff didn't
apply; some of the stuff was outdated. There are some different ideas for
training. For example, endurance work for a ***** was frowned upon on
my degree and yet in the field the sprinter, a ***** needs it. Yes I think the
two distinct pathways, the degree - I don't think you could do this job without
the Sport Science background, the Sport Science degree and yet it isn't the be-
all and end-all. There is a lot in the job, learning. Trial and error, once you
are I the job, trial and error with the athletes.

Gaining knowledge from others was another method of development described
by the coaches and was very often seen as being invaluable as described by this team
sport coach.

I would think that [coach’s name] influenced me a great deal. With the work
that he did and the way that he did it. In other words making the practices
more enjoyable and going both ways. In other words it wasn't attack versus
defence and you all walk out and go again like phases of play which is how
I've been taught to coach, but he went maybe down the right side and back up
the right side or end to end so the practices flowed more. They were still
practices but they flowed more. And also with the detail. The little details
and little things he was doing I learnt all the time from him.

All of the coaches identified the importance of constantly trying to search out
information that could enhance their coaching and that, consequently, much of their
development had come through serendipitous means such as reading books, encounters
with sport scientists, other coaches and experiences outside sport. This approach is
typified by the following quote from an individual sport coach.

I read a lot of research stuff and I read a lot about sports, I listen to a lot of the
guys. I'm just picking up ideas from people who know a lot more about it
than I do. I just find that fascinating. I'm just like a sponge like that, everywhere absorbing and picking up all the stuff and sometimes I think I'll try it. Other people take away things that I do, what goes around comes around. I like to think I'm reasonably open-minded and I just keep listening and watching.

**Discussion and Conclusions**

Before discussing results in the context of answering the research questions posed, it is worth revisiting some issues that dropped out of the introduction and, therefore, the methodological approach adopted. We obviously took an approach that could be interpreted as leading the participants during the interview. We were keen therefore to display that this approach actually generated meaningful focused responses as opposed to forced answers. Having completed the study we would certainly assert our belief that the former was the case, and this contention would be supported by the response given in the pilot interviews where the participants were explicitly asked if they felt they had been led to give a response that did not reflect their thoughts and understandings. In fact, we would argue that the approach taken, especially the alternative giving questions, led to more focused interviews where a full exploration of conceptions was achieved and misunderstandings were quickly addressed and resolved. Additionally, and as previously stated, following the draft report being sent to them, none of the coaches reported that, the results and their interpretation did not reflect their thoughts and understandings of the coaching process. The next question, therefore, is how transferable are the results to expert coaching in elite and pre elite settings in general? Given the representative spread of sports, nationality and number of coaches we would argue that the transferability of the findings is strong. Consequently, the following discussion of the results is assumed to be representative and valid.
What are the typical rules, processes and content of a knowledge object required for expert coaching?

Coaches identify and develop outcome and process goals taking a hierarchical approach.

The coaches within this study considered themselves to be leaders of a group of performers and support staff whose combined job it was to achieve an outcome goal that was either externally set or expected. In order to achieve the outcome goals, the coaches all adhered to a number of hierarchical rules that would deliver the goals. In general, one rule centred on the need to develop the performance of the athletes through the identification and setting of individual performance goals in technical, tactical/strategic, physical, mental, lifestyle, and metacognitive areas. In order to achieve these performance goals, the coaches were all planning for the short and medium and long term. Within this planning, coaches planned how to make best use of their physical and human resources within competition and training, and the athletes’ time away from these environments.

Coaches use a hierarchy to make decisions in an integrated fashion.

This use of a hierarchical set of rules helps organize the coaches’ decision making. This appeared to be crucial to the coaches because of the complexity of achieving the goals outlined. By taking a hierarchical approach the coaches take account of a broad range of information relating to identifying the problem and then developing a solution to the problem. Such a process has been referred to as being a breadth first approach to problem solving (Abraham and Collins, 1998, Zeitz and Spoehr, 1989, Johnson et al., 1981). Indeed, even with the process mapped out the coaches were making decisions within this structure that called upon several, sometimes competing knowledge bases, at once in order to make a best fit decision. Such a situation would tie in with the work of
Biggs and Collis (1982) who have identified problem solving procedures with school children. In this work they noted that children with higher level problem solving skills would connect a greater number of concepts within a domain to first understand and then solve problems. While this work has not yet been extended to coaches it would appear that these coaches are using similar approaches. Furthermore, this appears to be not only within domains but also between domains of knowledge. Finally, the coaches also acknowledge that one decision can have multiple consequences in terms of achieving the set goals. Obviously examining the decision making processes of coaches was not the sole objective of this paper. However, we do believe that there is sufficient evidence here to suggest that the number and interconnected nature of the arrows in figure 1 are representative of the methods of decision making used by expert coaches. Therefore the explicit development of problem solving and decision making must be part of coach development programmes. We would suggest though that further work such as Gilbert et al (1999) is needed to get a more in depth understanding of expert problem solving and decision making within a coaching context.

Coaches use a broad range of knowledge sources to underpin their decision-making. The two most important sources of knowledge identified by the coaches were Sport Specific and Pedagogic in nature. Simply put, it is very hard to develop performance if you don’t know the make up of that performance and you don’t know how to teach that performance. This finding reflects research in teaching by Berliner (1991) who suggests that an effective teacher needs a knowledge of content (i.e. the subject to be taught) and pedagogy, methods of teaching and learning. However, the incomplete nature of these ideas for coaching is brought to light by the idea that the coaches further identified the need to have knowledge of physiology, psychology, and biomechanics. The level and depth of knowledge in these disciplines varied between sport and coach, based on their
perceived efficacy. However, the stated importance of having at least a working
knowledge acknowledges that sport science is now an important factor in the decision
making of coaches developing pre elite and elite athletes. But it is important to note that
this knowledge is used to understand their athletes better, supporting Potrac et al's
(2000) notion that teaching the sport sciences to coaches must go beyond a technical
rationality in order that this knowledge is fully understood and integrated to the
coaching process.

Does the Content and Flow of the Model Accurately Match the Thought Process and
Decision Making of Expert Coaches?
The conclusion developed to the questions above clearly supports the schematic at an
implicit level. That is, on the basis of the results discussed so far, a schematic not
dissimilar to figure 1 could easily be developed. However, as stated in the introduction
to the paper we were never going to get anything other than a best fit through interview
because of the idiosyncratic nature of knowledge development. It was, therefore,
important that there was also a high level of explicit support for the schematic from all
of the coaches. Indeed some of the coaches found that the model actually allowed them
to get a better understanding of what they were doing. Such an explicit level of support
confirms that the schematic does indeed accurately match the thought process and
decision making of expert coaches.

Does the model represent a good basis for focused development of these processes?
It is clearly apparent from the results that there were a broad range of methods of
development across the coaches, such as coaching courses, academic qualifications,
playing and coaching experience, reading etc., and that there was a genuine desire
amongst all of the coaches to become better and continually improve. However, what
was equally apparent was the lack of any underlying structure that brought all of these
development methods together. Consequently, the interdisciplinary nature of the decision making of these coaches has developed through their own diligence as opposed to an explicit, “big picture” approach. In short, these coaches are knowledge magpies and not filing cabinets! Therefore, since the schematic is an accurate match to the knowledge, thought processes and decision making of expert coaches, it does represent a good basis for the focused development of expert coaches working with elite and sub elite athletes. However, to be truly useful the schematic must be able to transfer to the development of an ‘intermediate’ volunteer coach or the development of the expert coach working with young pre-pre-elite athletes etc. Our argument would be that, given the broad range of concepts and conceptions and knowledge within the schematic it should represent a good starting point, through context specific targeting of the most relevant factors, for the design of effective coach development curricula and practices for volunteer through to expert coaches. This is especially important when the, admirable, idea of current coach education practice in the UK is that a Level 1 (novice) coach should be able to progress all the way through to level 5 (expert) (SportscoachUK, 2004). Ideally then, this progress would be mapped out from the same big picture. Our future work will look to exploit this training potential across the ability spectrum.


Figure 1: The Coaching Schematic illustrating, at a conceptual level, the coaching process. This is achieved through referral to the required knowledge, concepts, decision-making and resulting behavioural/observable output, of all coaches. Bolded Arrows display how major contributions are made directly across the cycle. The smaller arrows indicate how each area can make a contribution to the thinking and decision making processes in each other area.
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Figure 2. Results of qualitative analysis of interviews displaying hierarchical themes developed through to categories (numbers in brackets display how many coaches contributed to each raw data).