



LEEDS
BECKETT
UNIVERSITY

Citation:

Abraham, A and Collins, D and Martindale, R (2006) The coaching schematic: validation through expert coach consensus. *Journal of sports sciences*, 24 (6). 549 - 564. ISSN 0264-0414 DOI: <https://doi.org/10.1080/02640410500189173>

Link to Leeds Beckett Repository record:

<http://eprints.leedsbeckett.ac.uk/374/>

Document Version:

Article

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

1 The Coaching Schematic: Validation Through Expert Coach Consensus

2

3 Running Head: Validation of The Coaching Schematic

4 Keywords: coach development, decision-making, coaching process

5 Andy Abraham – Bell College

6 Dave Collins - UK Athletics

7 Russell Martindale - Napier University

8 Accepted for Publication to Journal of Sport Sciences

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

26 **Introduction**

27 Examination of recent research in the area of coaching practice and development
28 reveals a position which directly (e.g., Abraham and Collins, 1998, Cushion et al., 2003,
29 Lyle, 2002, Strean et al., 1997) or indirectly (e.g., Potrac et al., 2000, Côté et al., 1995b)
30 infers that coaching is, fundamentally, a decision making process. However, while such
31 a position has been reached, the same and other related research has yet to effectively
32 inform coaching development. In short, work to date has been specific but too
33 prescriptive (e.g., Krane et al., 1991), holistic but overly complex (e.g., Lyle, 2002,
34 Lyle, 1999) or holistic but lacking a mechanism for development (e.g., Côté et al.,
35 1995b, Côté et al., 1995a, Côté and Salmela, 1996). It is perhaps for this reason that
36 current coaching development initiatives in America, Canada and the UK make no
37 reference to any big picture plan or model in their development approaches. Indeed, it
38 could be argued that their development programmes are somewhat eclectic in their
39 approach to programme design (Potrac et al., 2000). In fact, coaching associations in
40 both the UK and Canada (Canadian Coaching Association, 2005, SportscoachUK,
41 2004) are currently developing coach development programs using a competency based
42 approach. While theoretical research is available that highlights the pros and cons of this
43 approach from a generic perspective (Thomson, 2000), we are not aware of any
44 empirical research in the area of coaching that would establish this approach as being
45 optimal. Perhaps the current situation is best summed up by Vickers et al. (2004) who
46 have suggested that “a model of coaching is required that has at its heart sound
47 theoretical and research foundations, which are applicable to all sports, coaches and age
48 groups” (p. 105). While we certainly agree with this statement we would suggest that, in
49 fact, a schematic that is transferable across multiple situations and contexts through
50 reference to relevant knowledge and information processing procedures is more

51 appropriate. Furthermore, such a schematic can inform coaching development and
52 practice more effectively as it should reflect the whole coaching process. It is worth
53 noting here though that the typical coaching process of ‘plan, implement and review’
54 (Smith et al., 1997) maybe a little too simplistic to really reflect the dynamic nature of
55 coaching practice and development (NB. this statement does not preclude the use of this
56 idea as a starting point for novice coaches). We would argue that a schematic should
57 have more to do with Kolb's (1984) four stage experiential learning process cycle;
58 concrete experience, reflective observation, abstract conceptualisation, active
59 experimentation, since this process is more reflective of a dynamic and ongoing practice
60 and development cycle (Thomson, 2000). Consequently, the ultimate aim of this study
61 was to validate a coaching schematic that, through its design and content, would
62 accurately reflect the coaching process in its entirety. However, prior to outlining the
63 development and testing of the schematic there are, first, a number of philosophical and
64 theoretical issues worthy of consideration.

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

66 In contrast to the current situation in coaching, research examining practice and
67 development in similar but more established paradigms such as teaching reveal simple
68 conceptual models that characterize the qualities required in an effective schematic. In
69 short, these models have met a crucial goal in that they summarized current theoretical,
70 empirical and practical positions (Sternberg, 2003) in order to efficiently and effectively
71 inform the development of teaching and educational practice (e.g., Entwistle et al.,
72 2000, Berliner, 1991). Furthermore, research examining the definition of a profession¹
73 would both support and add to these characteristics. For example, Carr (1999) states that
74 a defining characteristic of a professional practitioner is someone who has theoretically

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.

75 as well as practically grounded expertise, allowing a high degree of individual
76 autonomy and independence of judgement resulting in effective practice. This, in turn,
77 identifies the need for a schematic to reflect a judgement process. Biggs and Collis
78 (1982) identify that quality judgement involves making multiple connections within a
79 knowledge domain (displayed by the arrows in figure 1). Furthermore Davies (1994),
80 Johnson et al. (1981) and Zeitz and Spoehr (1989) identify that experts refer to a broad
81 range of domains of knowledge when solving of problems. This would suggest that a
82 schematic should reflect an intra and multi/inter disciplinary decision making process
83 within a theoretical and practical framework. Finally a schematic needs to be
84 transferable, that is, a schematic should be applicable irrespective of the situation or
85 context. This may actually be simpler than it sounds. Given that current situations or
86 contexts increase the degrees of freedom (Abraham and Collins, 1998) that in turn affect
87 the way in which goals are achieved, these essentially represent problems for the coach
88 to overcome, e.g. player injury, keeping things fresh in the middle of the season.
89 Therefore, so long as the schematic is broad enough in its approach to allow for
90 judgement to deal with these degrees of freedom it should be transferable.

91 It is through considerations such as these that the need for a schematic becomes
92 essential, we suggest, as a structure for the operationalization and enhancement of the
93 coaching process; in short, unless you know how the process works, how can you
94 optimally develop it? Accordingly, a clear and appropriately simple schematic will
95 offer us the basis for genuine and scientifically supported performance enhancement in
96 coaching. Such ideas led us, in conjunction with other active coach researchers, to
97 summarize current sport science, coaching, educational and cognitive psychology
98 research relevant to coaching development to develop a coach decision-making
99 schematic that maps the knowledge, decision-making, concepts, and resulting

100 behavioural/observable output, requirements of all coaches. In essence, reflecting the
101 whole coaching process. This approach is summarized in Figure 1. While we have little
102 doubt that the schematic is comprehensive in its coverage and that its development is
103 theoretically, empirically, in that its development has referred to empirical research
104 (e.g., Rutt-Leas and Chi, 1993), and intuitively supported and therefore has content
105 validity, it is important for the model, indeed all academic models, to be considered and
106 judged for its ecological validity by ‘quality’ practitioners (Gilbert and Trudel, 2004a).
107 In pursuing such crucial validation however, there are three important methodological
108 considerations which must be addressed in order to ensure that the approach adopted is
109 appropriate to the stated purpose.

110

111 INSERT FIGURE 1 ABOUT HERE

112

113 **Consideration 1: Matching Schematics to Knowledge Objects**

114 Validating a schematic such as figure 1 is actually quite difficult since it is
115 unlikely that an exact match exists in the minds of expert coaches. The schematic is a
116 necessarily tidy and concise conceptual description of knowledge areas, concepts and
117 performance environments that, we suggest, reflects the coaching process. However,
118 research in parallel environments (e.g. teaching and learning processes in higher
119 education; (Entwistle and Walker, 2000) suggests such concepts are “experientially...
120 much too tidy”, and that, when thinking about their behaviour, professionals more
121 usually make use of broader and more global structures known as *Knowledge Objects*
122 (Entwistle and Martin, 1994, Entwistle and Entwistle, 2003). Knowledge objects are
123 said to occur when there has been an integration of a breadth and depth of knowledge
124 that covers multiple related *concepts* and *conceptions* (we will explain the distinction

125 between concepts and conceptions in more depth later). Furthermore, such structures
126 don't underpin thoughts and decisions, but rather represent the mental workspace where
127 thoughts and decisions are made. Importantly, these objects are likely to be
128 idiosyncratic and this has major implications for testing the validity of the schematic.
129 Our argument would be that if the schematic were an accurate reflection of all expert
130 coaches' knowledge objects, the idiosyncrasy should only relate to the storage and
131 retrieval of knowledge as opposed to the broad content and use of the knowledge and
132 concepts identified in the schematic. Given this position and since we are trying to
133 generate (not force!) an agreement from coaches, we will have to guide the retrieval
134 process to the extent that we are, ultimately, going to have to show the coaches the
135 schematic. Both these methodological considerations would mitigate against the use of
136 the grounded theory approach typically employed (at least to date) to generate
137 "academic" models such as Côté et al's (1995b). Obviously we are not going to
138 deliberately lead, but if a "pure" grounded approach was taken we may get so many
139 varying accounts that developing a strong concise model becomes increasingly difficult
140 or even impossible. However, if we get a strong and implicit, "best fit" agreement from
141 expert coaches through demonstrable use of the schematic structures in their decision
142 making, and these coaches then give an explicit "thumbs up" to the schematic, and these
143 coaches come from a representative cross sample of sports, the schematic is supported
144 and a significant step towards forming a structure and basis for coaching development
145 will be taken. In short, we contend that the use of a "grounded then led" approach
146 offers the only practical pathway to validation studies such as the present investigation.

147 **Consideration 2: Concepts and Conceptions: Probing for Knowledge that**
148 **Underpins Decision Making**

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

158 In contrast, conceptions often represent an internalising of concepts, applied to a
159 particular context that is meaningful to the practitioner. In order to make sense of any
160 factual concepts they possess, and to create meaningful new knowledge in memory,
161 practitioners will look for and reflect on (Cushion et al., 2003, Gilbert and Trudel, 1999,
162 Gilbert and Trudel, 2001, Gilbert and Trudel, In press-b) patterns, orders, links,
163 similarities and conflicts with previous experiences in order to develop a conception or
164 a group of conceptions to help them make sense of delivered material and/or
165 experiences (Entwistle et al., 2000, Kolb, 1984). Such conceptions are generally
166 organized and framed around beliefs or rules about how that conception is implemented
167 in the field (Gilbert and Trudel, 1999). For example, Calderhead (1996) has stated that
168 teachers' conceptions about learning have been shown to focus on two broad beliefs,
169 namely the importance of active involvement and/or the need for an emotionally secure
170 environment in which failure was non threatening. However, if these beliefs are
171 provided "up front" as concepts through an educational process, teachers are both better

172 and more quickly prepared. Furthermore, the declarative knowledge provided with the
173 concept offers a structure to the professionals' subsequent critical reflection, generating
174 a higher quality and more consistent development from ongoing experience (Thomson,
175 2000). Consequently, a conception is produced that is "filing cabinet" like in its
176 organization, allowing for explicit reasoning and decision-making.

177 Unfortunately, formal educational processes such as the one suggested above are
178 comparatively rare, at least in the generation of coaches from whom experts would
179 (currently at any rate) be largely drawn. In the vast majority of coaches, progressing to
180 the level of expert will have involved experience as being the significant contributing
181 factor to the development of the conceptions required to be an expert (Cushion et al.,
182 2003). Accordingly, and as a direct consequence of the lack of explicit concept
183 teaching, conceptions are developed through trial and error and other typical *weak*
184 problem solving methods (Anderson, 1987) leading to tacit knowledge being developed
185 within the conception. The direct knock on effect is that there will be some actions
186 developed and taken because of a tacit decision achieved without any conscious
187 reasoning (Kerr, 1995, Sternberg et al., 1993). Furthermore, other decisions may be
188 based on semi tacit knowledge; that is, so long as there is a meaningful context the
189 practitioner will be able to describe the decision making process and knowledge
190 underpinning an action, or at least this knowledge can be probed for. However, in the
191 absence of a meaningful context and/or the guiding rule, it may well be impossible for
192 the practitioner to verbalize the knowledge used in a decision. In fact, the reasons
193 underlying a decision may only become obvious when the practitioner is asked to
194 describe why an alternative action wasn't taken. In the absence of such probing, asking
195 a practitioner to describe what they think, or what is occurring in a context may lead to a
196 situation where an incomplete description is given. For example, Côté and colleagues'

197 (Cote et al., 1995a, Cote et al., 1995b) work with expert gymnastic coaches, using a
198 grounded theory approach identified that training was an important context for these
199 participants. However, when Côté et al.'s "consequences for intervention" results are
200 examined there is no mention of *instruction* and yet this behaviour has been observed in
201 all levels of coaches in just about all behavioural observation studies e.g. (Claxton,
202 1988, Smith and Smoll, 1996). Of course this could mean that these coaches do not use
203 this behaviour. What is more likely, however, is that they do use it but their explicit
204 awareness, and thus their ability to access and retrieve this knowledge (c.f. our earlier
205 comments), of its use is quite low and/or its use gets clumped together with "feedback"
206 because of a lack of definition and differentiation to the verbal behaviours used during
207 coaching. Furthermore, we would argue that while the most significant work in this area
208 since Côté et al.'s work by Jones et al. (2003, 2004), provides excellent in depth insight
209 into the thoughts of elite coaches from a number of sports, it also suffers from similar
210 problems to Côté et al.'s work. Consequently, significant probing, alternative giving and
211 in depth discussion of decisions taken is essential if we are to generate the clear
212 conceptual knowledge that offers the best vehicle for developing coaching prowess in
213 others. Accordingly, this approach was employed with the participants in this study.

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

216 In their groundbreaking study, examining all of the current research in coaching
217 science, Gilbert and Trudel (2004a) identified that too few studies developed findings
218 from coaches who exhibited styles or practices that should be copied. Consequently,
219 there is a need to exhibit just 'how good' coaches used in studies actually are. This is
220 actually very difficult in the absence of a gold standard, meaning that the confirmation
221 of "expert" status is always a thorny issue. Importantly, the development of such a gold

222 standard is one of the goals of the current UK Coaching Certificate (SportscoachUK,
223 2004) development in the UK. However until this development is complete we had to
224 resolve this problem through identification and development of criteria and then finding
225 people to fit the criteria. For example, Gilbert and Trudel (2004b) identified a model
226 youth team coach as someone who demonstrated interest in the theory and practice of
227 coaching, was respected in the local sporting community, was a good leader, teacher
228 and organizer, and who kept winning in perspective while encouraging children to
229 respect the rules of the game, competitors and officials. Once these criteria were set,
230 coaches were selected using a reputational case selection sampling procedure (Miles
231 and Huberman, 1994). Consequently, in the present study the criteria used for peer
232 identification of coaches considered to be experts were a) recognised as being expert
233 coaches b) their consistent use of a critical thinking approach (Strean et al., 1997), c)
234 their roles as mentors to developing coaches and finally d) those currently working with
235 both elite and developmental athletes. The peers who were asked were members of the
236 UK Sport Institute coach development team, performance directors and sport scientists.
237 By choosing these criteria we are relying to a certain extent on an intuitive feel of
238 people ‘in the know’ to identify expert coaches. To support this selection process we
239 also provided more explicit criteria that would support this intuitive feel to ensure an
240 expert is selected.

241 Of course our selection procedure used to access expert coaches is open to
242 debate but we would argue that the selection criteria used was rigorous enough to ensure
243 that expert coaches were selected. We would, however, encourage an open debate in the
244 literature to discuss what, explicitly, constitutes an expert coach so that more explicit
245 criteria can be used in future studies.

246 Once the coaches have been identified as being expert we can then meet the final
247 check on the validity of the schematic. Even if we get agreement from the coaches that
248 the model does reflect their job, if the coaches became expert without the schematic is it
249 even needed? This will actually depend on how these coaches became expert. If the
250 coaches have developed through a clear developmental pathway then the model's
251 importance will be diminished, however, if there appears to be no coherent pattern to
252 their development and the schematic can provide this coherent basis then its importance
253 will be enhanced. Although this study will, obviously, be delimited by the
254 demographics of the coaches selected, we will go on to examine issues relating the
255 transferability and relevance of the schematic across the coaching spectrum in the
256 Discussion and Conclusion section.

257 **Summary and Research Questions**

258 Returning to the question originally set, we hope that the importance of an
259 ecologically valid schematic has become obvious, in that it can codify experts'
260 knowledge and decision making, both explicit and implicit, enabling their effective
261 communication to other coaches. However, in order to effectively achieve this goal
262 there needs to be a methodology that takes account of theoretical and empirical research
263 examining knowledge storage and retrieval as identified in the three considerations.
264 Taking account of these considerations led to the design of a methodology that reflected
265 the objectives of the investigation. For our present purpose, this related to exploring the
266 match between a theoretically derived schematic with the knowledge objects used by a
267 sample of representative practitioners. Accordingly, we used open-ended and
268 subsequently more direct questions to address three issues pertaining to the veracity and
269 applicability of the schematic as follows:

- 270 1. What are the typical rules, processes and content of a knowledge object required
271 for expert coaching?
- 272 a. What are the roles and objectives set by/for the elite coaches?
273 b. What are the decision making process used
274 c. What knowledge is required to perform these decisions and, therefore, to
275 achieve these roles and objectives?
- 276 2. Does the content and flow of the model accurately match the thought process
277 and decision making of expert coaches?
- 278 3. Does the model represent a good basis for focused development of these
279 processes?
280

281 **Methods**

282 *Participants*

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

- 287 ❖ United Kingdom Sports Institute Coaching Team and/or Performance Director
288 and/or Sport Academic were asked to recommend coaches who they thought
289 displayed the following characteristics
- 290 ○ Respected within their own sport for being top quality expert level
291 coaches
 - 292 ○ Evidence of a critical thinking (will challenge norms and assumptions,
293 Streat et al, 1997) approach to their coaching
 - 294 ○ Actively mentoring coaches within their own sport

295 ○ Currently working with elite and developmental (i.e. those who have
296 aspirations of becoming elite) athletes

297 In response to Gilbert and Trudel's (2004a) call to more clearly describe who the
298 coaches are, the sixteen coaches, 14 male and 2 female, covered thirteen different sports
299 as follows; athletics, canoeing, curling, cycling, equestrian, soccer (2), hockey, judo,
300 netball, rugby (3), shooting, swimming, triathlon. Four of these coaches were non-UK
301 nationals; 2 of the coaches were European while the other 2 coaches were Australasian.
302 All of the coaches were recruited by personal contact by one of the research team. After
303 an explanation of the purposes of the research, and assurances of anonymity, all coaches
304 consented to take part in the study

305 ***Procedures***

306 In order to answer the research questions each coach underwent an interview lasting
307 between 75 – 100 minutes. The interview took place at a time and place convenient to
308 the coach. Each coach was sent a copy of the basic questions that were to be asked at
309 least 5 days in advance of the visit by the interviewer. The original set of questions were
310 deliberately broad so that the original answer given to each question was not led in any
311 way. By taking this approach we were allowing for the scope of each coaches'
312 conceptions within the knowledge object to emerge. Following this original question
313 and answer, follow up probes and prompts were used in order to ensure that a complete
314 description was given. The original broad set of questions are outlined below. In
315 addition to the reasoning supporting the questioning approach outlined above, questions
316 1 – 7 also allowed the development of the meaningful context so important to getting
317 complete descriptions of knowledge objects and conceptions. In a further attempt to
318 develop the meaningful context, each coach was interviewed prior to or just after a

319 coaching session allowing the coach to be in an environment s/he would already be in
320 the knowledge object mind set being examined.

- 321 1. Could you tell me about your role as an elite coach and therefore the goals and
322 priorities that brings?
- 323 2. Are there any other goals that you bring to the role?
- 324 3. Could you tell me about where your aims/goals come from and who's needs do
325 you try to fulfil/prioritise?
- 326 4. Could you tell me about the types and levels of planning that you do
- 327 5. Could you take me through the process you go through when you plan from start
328 to end
- 329 6. Once you have your various plans (e.g., long, medium and short) what do you
330 do with them?
- 331 7. Could you tell me about the complexity of what you are trying to achieve?
- 332 8. What bodies of knowledge (e.g. physiology for a cycling coach) do you need to
333 know about to be effective as an elite coach, and in what ways does it help you?
- 334 9. At this point in the interview we will show you a model. We will give you a few
335 minutes to have a look at and consider the model and then we would like to
336 comment on it.
- 337 10. Could you tell me about where all your knowledge has come from?

338 We took the decision to delay showing the model to the coaches until after we had
339 explored all aspects of the coaching process. This was implemented for two reasons;
340 firstly, we could check if the coaches implicitly and explicitly supported the schematic.
341 Secondly and consequently, the knock on effect of this implicit then explicit would be
342 to act as a further check on whether the coaches were giving “impression managed”
343 responses (Leary, 1992).

344 Two interviewers conducted interviews. Prior to commencement, both interviewers
345 ran through pilot interviews with expert coaches who were made aware of the aims of
346 the project. Feedback was then sought from these coaches as to the efficacy of the
347 interview script and interview process and also to check on whether the coaches had felt
348 led to a conditioned response. Both coaches suggested that the questions with
349 supporting prompts and probes did lead them to giving a full and complete response.
350 Importantly, neither coach felt that they had been led to give a response that did not
351 reflect their own ideas or thoughts. Consequently, each interviewer had an interview
352 script with the same questions and each question had a list of potential probes and
353 prompts. This enabled both interviewers to make sure that the same prompts and probes
354 were used in all interviews. Copies of the full interview transcript are available upon
355 request.

356 *Analysis of Qualitative Data*

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

365 Following the approaches suggested by Krane et al. (1997), transcripts within
366 each category were content analysed by the one member of the coaching team who had
367 completed the interviews. Consequently, data were examined both inductively then
368 deductively, with this deductive analysis based on the precepts of the coaching

369 schematic presented in figure 1. Subsequently, samples of these data sets were re-
370 examined by the other members of the research team, with questioning and debate used
371 to explore any issues of contention.

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

377

378 **Results**

379 *Overview of results*

380 INSERT FIGURE 2 ABOUT HERE

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

391 ***What are the roles and objectives set by/for the expert coaches?***

392 *Roles.*

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

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

408 *Goals and objectives.*

409 In line with much of the research examining goals and their development, the coaches in
410 this study are setting both process and outcome goals. All of the coaches involved in the
411 study were fully aware that the bottom line measure of their performance was
412 eventually results achieved. For example, the following quote displays how this team
413 sport coach's job depends on achieving medals since the financial support for his job is
414 tied in with the job specification.

415 Well if I want to keep my job we have to win medals at major championships.

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

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

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

428 In order to support this athlete-centred, performance approach six different types
429 of process goals were commonly set by the coaches. The first four of these relate
430 specifically to performance and are often referred to, or classed by, using the following
431 terms; technical, tactical, physical and mental goals. Typically, there were goals
432 emphasized by the coaches that reflected the sport that they were coaching. So for
433 example, the quote below comes from a throwing coach where having good technique
434 and the power to implement that technique is very important. The second quote comes
435 from a individual continuous skill sport (Schmidt and Wrieseberg, 1999) sport where
436 technique was considered to be already developed by the time this coach took on
437 athletes. The final quote comes from a team sport coach where all aspects of
438 performance are considered.

439 Yes, yes. It's very process goal. If I was honest and I sat down and thought
440 and wrote a thesis about it the way that the (technical performance) model sits
441 in me is a series of positions which can only be achieved if you have a
442 physical capability of achieving this. So what we're training fits snugly into
443 what I want to achieve. And the process by which that's achieved is this and
444 it's all in there. If you can't do it like this I can make you do it better because
445 I can see what you're doing.

446

447 "Yes, it can be physical it can be psychological. It can be tactical."

448

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

453

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

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

460 Irrespective of the types of goals being set, one thing is already becoming
461 apparent. All of the quotes used so far demonstrate how coaches very rarely consider
462 one aspect of their job or goal in isolation highlighting the interdisciplinary nature of the

463 process. This is something we will return to when we present the results relating to
464 decision-making.

465 *Conflict between winning and developing*

466 While there will be a later section on decision making, it is worthwhile considering the
467 issue of the conflict between winning and developing at this point to keep within the
468 context of the situation. The issue of conflict between goals was brought up by several
469 of the coaches. There was a recognition that, ultimately, winning is the bottom line as
470 already described and that they have to work within the constraints of the system.
471 However, greater conflict occurs when the expectations placed on the coaches from
472 external sources go beyond what the coaches' think is reasonable, such as this team
473 sport coach.

474 Yes there's conflict because you know, you don't get time. That's the thing.
475 People will say, even now, people say that's okay but we want you to bring
476 some young players through. And you go okay, give me five years and I'll
477 bring some young [country] players through. I can't bring them through in six
478 months and win. I don't give them time to learn.

479 The method of dealing with this type of conflict irrespective of the level of
480 incompatibility is normally through resetting goals and working within the constraints
481 of the system. Such methods begin to display the decision making process that occur to
482 support *typical* actions by expert coaches. The next section of results will go on to
483 display the typical range of actions taken across all sports and the types of decision
484 making used to develop these actions.

485 ***What are the Typical Actions and Decision Making Processes Used by Expert***
486 ***Coaches?***

487 *Typical actions: Planning.*

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

504 *Typical actions: Goal development through performance analysis*

505 In addition to setting goals, all of the coaches identified that they consistently used
506 performance analysis to support this development. The major methods used by the
507 coaches’ are, typically, ongoing performance analysis and end of season reviews. In
508 completing these tasks some of the coaches appeared to be relying solely on their expert
509 eye and memory (Chase and Simon, 1973), for example, a team coach stated ‘Again

510 you see, I think in these more difficult things, psychological or whatever, you get a feel
511 as you work with the player week in week out. Sometimes it is just what you see, you
512 know, your eye that is better'. In contrast, other coaches were using the expert eye but
513 with the aid of video playback while other coaches were using very objective levels of
514 analysis such as this team sport coach; 'what we're really doing here is collecting a lot
515 of data on the players so we can try and highlight the areas of inconsistency or
516 weakness by using different software programmes that we've written up with an
517 institute analyst'.

518 *Typical actions: Effective use of support staff*

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

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

528 *Decision making processes: Hierarchical, consequence considered, integrated*

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

535 and development of goals and plans outlined above and further outlined by the quote
536 from individual sport coach below.

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

542 In essence, this approach breaks a complex situation down into meaningful chunks. A
543 phenomenon identified in experts in other domains such as chess (Chase and Simon,
544 1973) and teaching (Entwistle and Walker, 2000). Furthermore, this breaking down of
545 problems follows the breadth first approach to problem solving observed in experts in
546 medicine (Johnson et al., 1981) and computer programming (Zeitz and Spoehr, 1989).

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

551 Are you familiar with the move towards synoptic papers at A level? Synoptic
552 papers basically draw knowledge from all areas to answer a central question.
553 That is what the good coach does. They have to be good at the synoptic work.
554 They have to be able to draw things from different sports. They have to be
555 able to bring different sciences etc to answer the central question or problem.
556 That's what good coaches can do. You can't pigeon-hole things for a coach
557 and if I was looking for an elite coach that's what I would be seeing,
558 somebody who could bring a whole lot of different knowledge to solve
559 problems.

560 The final decision making consideration to emerge was the idea that decisions
561 could only be “best fit”, and that in order to make these decisions the consequences of
562 the decisions were considered. This process is exemplified by the following quote from
563 an individual sport coach;

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

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

579 ***Required Knowledge***

580 When responding to the question asking about what the coaches needed to know to
581 perform their role effectively it became apparent that a broad range of knowledge was
582 required.

583 *Sport Specific*

584 Far and away the first stated required knowledge source was that the coach needed to
585 have an extremely good level of sport specific knowledge as exemplified by the next
586 quote from an individual sport coach; “I would say that your sport specific knowledge is
587 your biggest knowledge base.” It may seem obvious but you can’t make decisions about
588 performance if you don’t understand performance.

589 *Pedagogy: Communication and skill acquisition*

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

599 *‘Ologies*

600 The next level of required knowledge can be put under the heading of ‘ologies. These
601 are the three basic components of sport science. The most often referred to ‘ology was
602 physiology; the next being psychology and the least often referred to required
603 knowledge was biomechanics. While no explicit reason was put forward for this, it is
604 likely that user friendliness and typical setting up of support (i.e. getting the fitness guy
605 in first) has led to this situation. The following quotes are typical of the responses
606 gained, the first and third quote are team sport coaches while the second is from an
607 individual sport coach.

608 You do have to have a knowledge of physiology, you do have to have a
609 knowledge of nutrition. But not as much as you used to have because most
610 clubs now have nutritionists, sports scientists, certainly physiotherapists with
611 a sports science background, whatever. So a lot of that is taken away from the
612 coaches. A lot of that is taken away. But when I first came in you had to go
613 ***** fitness, physiology and nutrition. But I went and done a years course at
614 college on food, food and nutrition. And when you're doing the various
615 coaching courses that you do, parts of physiology and stuff and you gain
616 minimal knowledge I suppose in comparison to proper sports scientists,
617 proper physiologists very minimal but maybe enough to just give you an idea
618 of what's required.

619
620 As I said, whether it's sport psychology or just psychology in general, man
621 management, call it what you like but basically that, that psychology aspect of
622 the knowledge of players and how to handle players, how to deal with
623 performers and the sport specific knowledge are the most important things.

624
625 Also with biomechanics we've got to be able to make up a clear model as far
626 as what makes up a good technique, whether it be kicking or passing or
627 tackling. There needs to be a clear expectation that if something goes awry
628 you know what to look for straight away.

629 The final two areas, only mentioned to a small extent, were management and life skills.

630 *Does the content and flow of the model accurately match the thought process and*
631 *decision making of expert coaches?*

632 *Implicit support*

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

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

645 *Explicit support*

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

652 It does (reflect what I do) but because it reflects what I do and I have done it,
653 hands on and I am doing it and improving on it, I can understand that.

654 Someone who doesn't, wouldn't necessarily quite so easily. Because it is
655 complex, how does all that come together and I suppose I liken it to, when
656 someone says to you what do you do. I find myself having to make a fairly

657 kind of unrelated explanation because it is not a simple thing. Pulling in this
658 support and that support and focussing on the player and what does that mean
659 and before you know you spend half an hour telling someone what you have
660 done. You can't just say I am a [sport] coach and just leave it at that. That
661 here (referring to the schematic), that's it. I just think that if this was
662 something that you were producing for coaching, league coaches, whatever,
663 that some sort of examples, this is what this means this is what that means
664 would just clarify it but it sums up what is done, what I do. It is complex
665 though isn't it.

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

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

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

678 *Knowledge sources and development: Experience, courses, other coaches,*
679 *serendipitous*

680 It will be of no surprise that performing and coaching experience represent two of the
681 biggest sources of knowledge for the coaches. It was clear that all of the coaches had

682 learned from their experience because of their self-reflective nature as exemplified by
683 the following quote from an individual sport coach.

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

689 In addition to learning from experience, formal coach education qualifications
690 were also cited as being a source of knowledge, although, as the next quote from an
691 individual sport coach suggests, some reservations were expressed about the usefulness
692 of some of these courses. This finding would complement the findings of Jones et al.
693 (2003) when interviewing an expert football coach.

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

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

703 Two definite pathways. First of all the degree. Well, going back before that,
704 the club level Coach Award I took before the degree, the Sport Science
705 degree. That was the basic understanding - anatomy, exercise physiology and
706 then almost a distinct pathway actually in the job. Some of the stuff didn't

707 apply; some of the stuff was outdated. There are some different ideas for
708 training. For example, endurance work for a ***** was frowned upon on
709 my degree and yet in the field the sprinter, a ***** needs it. Yes I think the
710 two distinct pathways, the degree - I don't think you could do this job without
711 the Sport Science background, the Sport Science degree and yet it isn't the be-
712 all and end-all. There is a lot in the job, learning. Trial and error, once you
713 are I the job, trial and error with the athletes.

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

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

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

730 I read a lot of research stuff and I read a lot about sports, I listen to a lot of the
731 guys. I'm just picking up ideas from people who know a lot more about it

732 than I do. I just find that fascinating. I'm just like a sponge like that,
733 everywhere absorbing and picking up all the stuff and sometimes I think I'll
734 try it. Other people take away things that I do, what goes around comes
735 around. I like to think I'm reasonably open-minded and I just keep listening
736 and watching.

737 **Discussion and Conclusions**

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

757 ***What are the typical rules, processes and content of a knowledge object required for***
758 ***expert coaching?***

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

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

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

773 This use of a hierarchical set of rules helps organize the coaches' decision making. This
774 appeared to be crucial to the coaches because of the complexity of achieving the goals
775 outlined. By taking a hierarchical approach the coaches take account of a broad range of
776 information relating to identifying the problem and then developing a solution to the
777 problem. Such a process has been referred to as being a breadth first approach to
778 problem solving (Abraham and Collins, 1998, Zeitz and Spoehr, 1989, Johnson et al.,
779 1981). Indeed, even with the process mapped out the coaches were making decisions
780 within this structure that called upon several, sometimes competing knowledge bases, at
781 once in order to make a best fit decision. Such a situation would tie in with the work of

782 Biggs and Collis (1982) who have identified problem solving procedures with school
783 children. In this work they noted that children with higher level problem solving skills
784 would connect a greater number of concepts within a domain to first understand and
785 then solve problems. While this work has not yet been extended to coaches it would
786 appear that these coaches are using similar approaches. Furthermore, this appears to be
787 not only within domains but also between domains of knowledge. Finally, the coaches
788 also acknowledge that one decision can have multiple consequences in terms of
789 achieving the set goals. Obviously examining the decision making processes of coaches
790 was not the sole objective of this paper. However, we do believe that there is sufficient
791 evidence here to suggest that the number and interconnected nature of the arrows in
792 figure 1 are representative of the methods of decision making used by expert coaches.
793 Therefore the explicit development of problem solving and decision making must be
794 part of coach development programmes. We would suggest though that further work
795 such as Gilbert et al (1999) is needed to get a more in depth understanding of expert
796 problem solving and decision making within a coaching context.

797 *Coaches use a broad range of knowledge sources to underpin their decision-making.*

798 The two most important sources of knowledge identified by the coaches were Sport
799 Specific and Pedagogic in nature. Simply put, it is very hard to develop performance if
800 you don't know the make up of that performance and you don't know how to teach that
801 performance. This finding reflects research in teaching by Berliner (1991) who suggests
802 that an effective teacher needs a knowledge of *content* (i.e. the subject to be taught) and
803 *pedagogy*, methods of teaching and learning. However, the incomplete nature of these
804 ideas for coaching is brought to light by the idea that the coaches further identified the
805 need to have knowledge of physiology, psychology, and biomechanics. The level and
806 depth of knowledge in these disciplines varied between sport and coach, based on their

807 perceived efficacy. However, the stated importance of having at least a working
808 knowledge acknowledges that sport science is now an important factor in the decision
809 making of coaches developing pre elite and elite athletes. But it is important to note that
810 this knowledge is used to understand their athletes better, supporting Potrac et al's
811 (2000) notion that teaching the sport sciences to coaches must go beyond a technical
812 rationality in order that this knowledge is fully understood and integrated to the
813 coaching process.

814 ***Does the Content and Flow of the Model Accurately Match the Thought Process and***
815 ***Decision Making of Expert Coaches?***

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

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

827 It is clearly apparent from the results that there were a broad range of methods of
828 development across the coaches, such as coaching courses, academic qualifications,
829 playing and coaching experience, reading etc., and that there was a genuine desire
830 amongst all of the coaches to become better and continually improve. However, what
831 was equally apparent was the lack of any underlying structure that brought all of these

832 development methods together. Consequently, the interdisciplinary nature of the
833 decision making of these coaches has developed through their own diligence as opposed
834 to an explicit, “big picture” approach. In short, these coaches are knowledge magpies
835 and not filing cabinets! Therefore, since the schematic is an accurate match to the
836 knowledge, thought processes and decision making of expert coaches, it does represent
837 a good basis for the focused development of expert coaches working with elite and sub
838 elite athletes. However, to be truly useful the schematic must be able to transfer to the
839 development of an ‘intermediate’ volunteer coach or the development of the expert
840 coach working with young pre pre-elite athletes etc. Our argument would be that, given
841 the broad range of concepts and conceptions and knowledge within the schematic it
842 should represent a good starting point, through context specific targeting of the most
843 relevant factors, for the design of effective coach development curricula and practices
844 for volunteer through to expert coaches. This is especially important when the,
845 admirable, idea of current coach education practice in the UK is that a Level 1 (novice)
846 coach should be able to progress all the way through to level 5 (expert)
847 (SportscoachUK, 2004). Ideally then, this progress would be mapped out from the same
848 big picture. Our future work will look to exploit this training potential across the ability
849 spectrum.
850

851 Abraham, A. and Collins, D. (1998) Examining and extending research in coach
852 development. *Quest*, **50**, 59-79.

853 Anderson, J. R. (1982) Acquisition of a cognitive skill. *Psychological Review*, **89**, 369-
854 406.

855 Anderson, J. R. (1987) Skill acquisition: Compilation of weak-method problem
856 solutions. *Psychological Review*, **94**, 192-210.

857 Berliner, D. C. (1991) Educational psychology and pedagogical expertise: New findings
858 and new opportunities for thinking about training. *Educational Psychologist*, **26**,
859 145-155.

860 Biggs, J. B. and Collis, K. F. (1982) *Evaluating the quality of learning: The solo*
861 *taxonomy (structure of the observed learning outcome)*, Academic Press,
862 Sydney.

863 Calderhead, J. (1996) Teachers: Beliefs and knowledge. In *Handbook of educational*
864 *psychology* (edited by, D. C. Berliner and R. Calfree),pp.709-725. Macmillan,
865 New York.

866 Canadian Coaching Association. (2005). National coaching certification program:
867 Program overview. February 11th 2005, from
868 <http://www.coach.ca/e/nccp/index.htm>

869 Carr, D. (1999) Professional education and professional ethics. *Journal of Applied*
870 *Philosophy*, **16**, 33-46.

871 Chase, W. G. and Simon, H. A. (1973) The mind's eye in chess. In *Visual information*
872 *processing*(edited by, W. G. Chase),pp.215-227. Academic Press, New York.

873 Chelladurai, P. (1990) Leadership in sports: A review. *International Journal of Sport*
874 *Psychology*, **21**, 328-354.

875 Claxton, D. B. (1988) A systematic observation of successful and less successful high
876 school tennis coaches. *Journal of Teaching in Physical Education*, **7**, 302-310.

877 Côté, J. and Salmela, J. (1996) The organizational tasks of high performance gymnastic
878 coaches. *The Sport Psychologist*, **10**, 247-260.

879 Côté, J., Salmela, J. and Russell, S. (1995a) The knowledge of high performance
880 gymnastic coaches: Competition and training considerations. *The Sport*
881 *Psychologist*, **9**, 76-95.

882 Côté, J., Salmela, J., Trudel, P., Baria, A. and Russell, S. (1995b) The coaching model:
883 A grounded assessment of expert gymnastic coaches' knowledge. *The Journal of*
884 *Sport and Exercise Psychology*, **17**, 1-17.

885 Cushion, C. J., Armour, K. M. and Jones, R. L. (2003) Coach education and continuing
886 professional development: Experience and learning to coach. *Quest*, **55**, 215-
887 230.

888 Davies, S. P. (1994) Knowledge restructuring and the acquisition of programming
889 expertise. *International Journal of Human-Computer Studies*, **40**, 703-726.

890 Entwistle, N. and Entwistle, D. (2003) Preparing for examinations: The interplay of
891 memorising and understanding, and the development of knowledge objects.
892 *Higher Education Research and Development*, **22**, 19-41.

893 Entwistle, N. and Martin, F. (1994) Knowledge objects: Understandings constituted
894 through intensive academic study. *British Journal of Educational Psychology*,
895 **64**, 161-178.

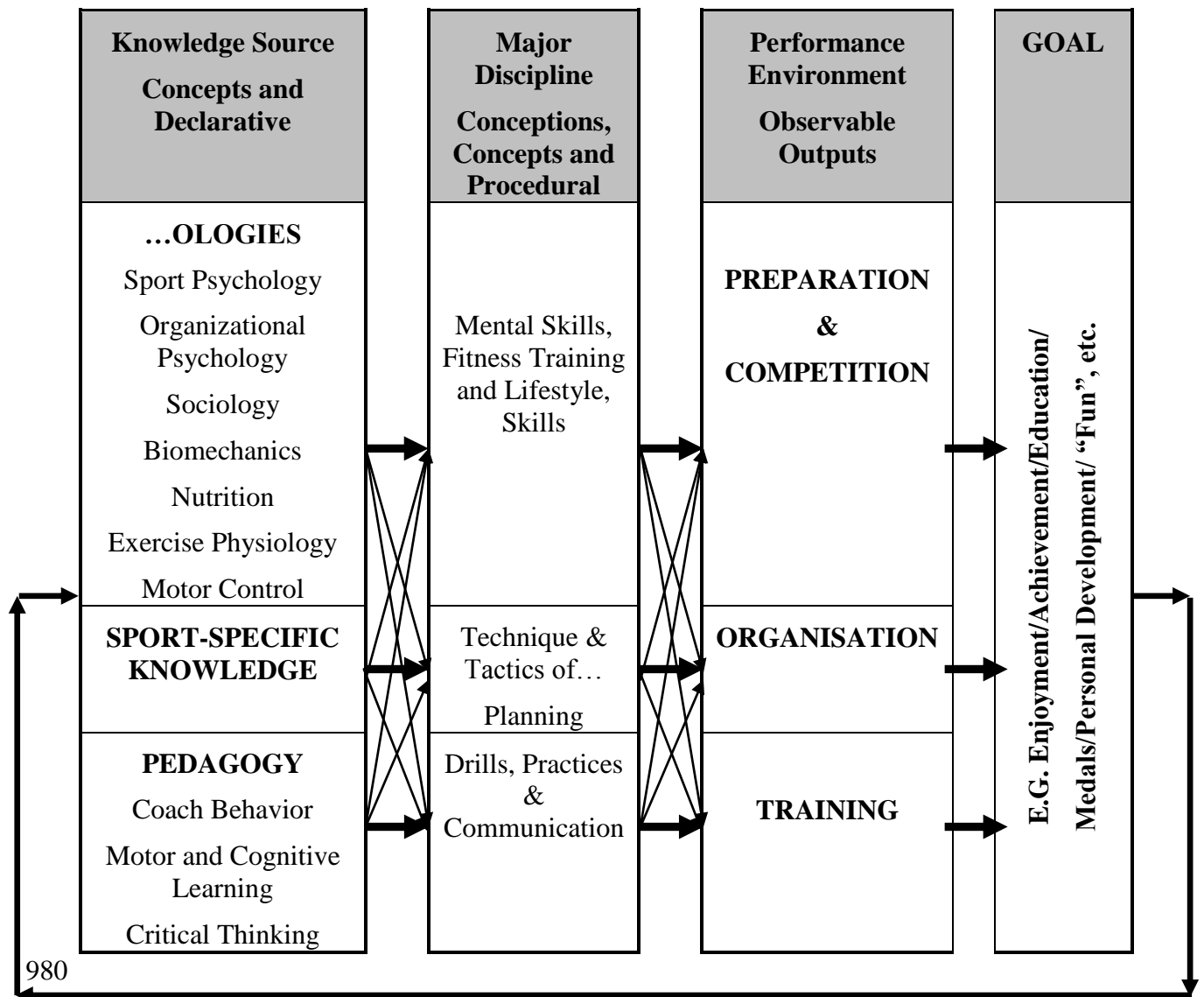
896 Entwistle, N., Skinner, D., Entwistle, D. and Orr, S. (2000) Conceptions and beliefs
897 about "good teaching": An integration of contrasting research areas. *Higher*
898 *Education Research and Development*, **19**, 5-26.

- 899 Entwistle, N. and Walker, P. (2000) Strategic alertness and expanded awareness within
900 sophisticated conceptions of teaching. *Instructional Science*, **28**, 335-361.
- 901 Gilbert, W. D. and Trudel, P. (1999). Framing the construction of coaching knowledge
902 in experiential learning theory. *Sociology of Sport On-Line*, **2** (1). Retrieved
903 May 9, 2003, from <http://physed.otago.ac.nz/sosol/v2i1/v2i1s2.htm>
- 904 Gilbert, W. D. and Trudel, P. (2001) Learning to coach through experience: Reflection
905 in model youth sport coaches. *Journal of Teaching in Physical Education*, **21**,
906 16-34.
- 907 Gilbert, W. and Trudel, P. (2004a) Analysis of coaching science research published
908 from 1970-2001. *Research Quarterly for Exercise and Sport*, **75**, 388-399.
- 909 Gilbert, W. D. and Trudel, P. (2004b) Role of the coach: How model youth team sport
910 coaches frame their roles. *The Sport Psychologist*, **18**, 21-43.
- 911 Gilbert, W. D. and Trudel, P. (In press-b) Learning to coach through experience:
912 Conditions that influence reflection. *The Physical Educator*.
- 913 Gilbert, W. D., Trudel, P. and Haughian, L. P. (1999) Interactive decision making
914 factors considered by coaches of youth ice hockey during games. *Journal of*
915 *Teaching in Physical Education*, **18**, 290-311.
- 916 Johnson, P. E., Duran, A., Hassebrock, F., Moller, J., Prietula, M., Feltovich, P. J. and
917 B.Swanson, D. (1981) Expertise and error in diagnostic reasoning. *Cognitive*
918 *science*, **5**, 235-283.
- 919 Jones, R., Armour, K. and Potrac, P. (2004) *Sport coaching cultures: From practice to*
920 *theory*, Routledge, London.
- 921 Jones, R. L., Armour, K. M. and Potrac, P. (2003) Constructing expert knowledge: A
922 case study of a top-level professional soccer coach. *Sport, Education and*
923 *Society*, **8**, 213-229.

- 924 Kerr, M. R. (1995) Tacit knowledge as a predictor of managerial success: A field study.
925 *Canadian journal of behavioral science*, **27**, 36-51.
- 926 Kolb, D. A. (1984) *Experiential learning: Experience as the source of learning and*
927 *development*, Prentice Hall, Englewood Cliffs, New Jersey.
- 928 Krane, V., Anderson, M. B. and Streat, W. B. (1997) Issues of qualitative research
929 methods and presentation. *Journal of Sport and Exercise Psychology*, **19**, 213-
930 218.
- 931 Krane, V., Eklund, R. and McDermott, M. (1991) Collaborative action research and
932 behavioral coaching intervention: A case study. *Applied Research in Coaching*
933 *and Athletics Annual*, 119-147.
- 934 Leary, M. R. (1992) Self-presentational processes in exercise and sport. *Journal of*
935 *Sport and Exercise Psychology*, **14**, 339-351.
- 936 Lyle, J. (1999) Coaches' decision making. In *The coaching process: Principles and*
937 *practice for sport*(edited by, N. Cross and J. Lyle),pp.210-232. Butterworth-
938 Heinemann, Oxford.
- 939 Lyle, J. (2002) *Sports coaching concepts: A framework for coaches' behaviour*,
940 Routledge, London.
- 941 Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis: An expanded*
942 *sourcebook*, Sage, Thousand Oaks, CA.
- 943 Patton, M. Q. (1990) *Qualitative evaluation methods*, Sage, Newbury park, CA.
- 944 Potrac, P., Brewer, C., Jones, R., Armour, K. and Hoff, J. (2000) Toward an holistic
945 understanding of the coaching process. *Quest*, **52**, 186-199.
- 946 Rutt-Leas, R. and Chi, M. T. H. (1993) Analyzing diagnostic expertise of competitive
947 swimming coaches. In *Cognitive issues in motor expertise*(edited by, J. L.
948 Starkes and F. Allard),pp.75-94. Elsevier Science Publishers B.V., Amsterdam.

- 949 Scanlan, T. K., Ravizza, K. and Stein, G. L. (1989) An indepth study of former figure
950 skaters: 1. Introduction to the project. *Journal of Sport and Exercise Psychology*,
951 **11**, 54-64.
- 952 Schmidt, R. A. and Wrisberg, C. (1999) *Motor learning and performance*, Human
953 Kinetics, Champaign.
- 954 Smith, N., Handford, C. and Priestley, N. (1997) *Sport analysis in coaching*, The
955 Manchester Metropolitan University, Alsager.
- 956 Smith, R. E. and Smoll, F. L. (1996) Behavioral assessment and interventions in youth
957 sport. *Behavior Modification*, **20**, 3-44.
- 958 SportscoachUK (2004) United kingdom coaching certificate endorsement criteria (level
959 1-3) (edited pp. 35. The National Coaching Foundation, Leeds.
- 960 Sternberg, R. J. (2003) *The psychologists companion: A guide to scientific writing for*
961 *students and researchers*, Cambridge University Press, Cambridge.
- 962 Sternberg, R. J., Wagner, R. k. and Okagaki, L. (1993) Practical intelligence: The nature
963 and role of tacit knowledge in work and at school. In *Mechanisms of everyday*
964 *cognition*(edited by, J. M. Puckett and H. W. Reese),pp.205-227. Lawrence
965 Erlbaum Associates, Inc, Hillsdale, New Jersey.
- 966 Streat, W. B., Senecal, K. L., Howlett, S. G. and Burgess, J. M. (1997) Xs and os and
967 what the coach knows: Improving team strategy through critical thinking. *The*
968 *Sport Psychologist*, **11**, 243-256.
- 969 Thomson, N. (2000) *Theory and practice in the human services*, Open University Press,
970 Buckingham.
- 971 Vickers, J. N., Reeves, M.-A., Chambers, K. L. and Martell, S. (2004) Decision
972 training: Cognitive strategies for enhancing motor performance. In *Skill*

973 *acquisition in sport: Research theory and practice*(edited by, A. M. Williams
974 and N. J. Hodges),pp.103-120. Routledge, London.
975 Zeitz, C. M. and Spoehr, K. T. (1989) Knowledge organization and the acquisition of
976 procedural expertise. *Applied Cognitive Psychology*, **3**, 313-336.
977
978



981 Figure 1: The Coaching Schematic illustrating, at a conceptual level, the coaching
 982 process. This is achieved through referral to the required knowledge, concepts, decision-
 983 making and resulting behavioural/observable output, of all coaches. Bolded Arrows
 984 display how major contributions are made directly across the cycle. The smaller arrows
 985 indicate how each area can make a contribution to the thinking and decision making
 986 processes in each other area.
 987

Raw Data	1 st Order Themes	2 nd Order Themes	3 rd Order Themes	Category
Role as developing performers (15)	Role as coach	Roles		
Role as role model (9)	Role as leader			
Role as coordinator and leader(13)				
Improve Performance (13)	Improve Performance	Process	Goals,	
Technical (12)	Player and Team Development			
Tactical/Strategical (11)				
Mental (13)				
Physical (14)	Outcome			
Winning (15)				
Position (13)				
Values (5)	Professionalism	Time locked		
Lifestyle (7)				
Organizational (10)	Organizational			
Long Term (16)	Time locked			
Medium Term (10)				
Short Term (12)				
Observational (16)	Expert Eye	Ongoing Performance Analysis	Goal Development and Checking	Typical Actions
Notational (5)	Evidenced based			
Biomechanical (4)				
Expert eye video analysis (13)	Periodic performance reviews			
Periodic performance reviews (16)				
Long term (15)		Planning		
Medium – Short Term (16)				
Passed to player (6)				
Hierarchical (16)	Thinking and Decision Making			
Integrated (16)				
No Right Answer (6)				

Raw Data	1 st Order Themes	2 nd Order Themes	3 rd Order Themes	Category
Sport Specific (15)	Sport Specific	Must Have and/or Need working knowledge of		Required Knowledge
Creating Understanding (4)	Pedagogy			
How people Learn (5)				
Skill Acquisition (10)				
Communication (6)				
Physiology (16)	'Ologies			
Psychology (16)				
Biomechanics (6)				
Management (4)	Management			
Lifeskills (9)	Lifeskills			
Roles (16)	Implicit Support of Schematic			Support for Schematic
Goals(16)				
Typical Actions (16)				
Required Knowledge(16)				
Explicit Support of Schematic(16)				
Importance of continuing to learn (16)	Importance of continuing to learn	Importance of continuing to learn		Factors Influencing Coach development
Playing Experience (13)	Experience			
Coaching Experience (16)				
Coach education (10)	Courses			
Academic (12)				
Other Coaches/Mentoring (14)	Serendipitous			
Books (15)				
Sport Scientists (9)				
Barriers to development (10)	Barriers to development			

989 Figure 2. Results of qualitative analysis of interviews displaying hierarchical themes

990 developed through to categories (numbers in brackets display how many coaches

991 contributed to each raw data).