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Coaching Experience: Examining its Role in Coaches' Decision Making

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Abstract

Although the decision-making component of coaching expertise is widely recognized, empirical research on coaches' decision making is still scant. In this paper, we attempted to expand the knowledge base by examining the relationship between coaches' decision making and experience through a secondary analysis of empirical data from a telephone survey of gymnastics coaches. In a mixed methods design, 64 coaches provided numerical and verbal responses to hypothetical scenarios about an injured athlete's participation in competition. Results were analyzed by level of experience (1-5, 6-10, and 10+ years of experience). The findings indicated differences in both the amount and nature of information attended to by coaches with differing levels of experience—generally corroborating the cognitive novice-expert literature while simultaneously providing an illustration of the way in which expertise-related increases in cognitive complexity are expressed in coaches' decision making about a specific coaching problem.

Keywords: novice-expert, experience, coaching, cognitions, decision making, expertise, injury

There is an emerging body of opinion to suggest that sports coaching is a complex, "messy" process, with often irreconcilable goals (Bowes & Jones, 2006; Cushion, Armour, & Jones, 2003; Jones & Wallace, 2005), resulting in a constant series of dilemmas and decision making. Abraham, Collins, and Martindale (2006) even concluded that, fundamentally, "coaching is a decision-making process" (p. 549).

Despite the increasing acknowledgement of the cognitive and decision-making nature of sports coaching, empirical research into coaches' decision making is still extremely limited (Gilbert & Trudel, 2004). In contrast, other professional domains and academic disciplines (e.g., medicine, law, teaching, economics) have enriched the literature on decision making with both descriptive and prescriptive accounts, as well as a wide range of theories, models, and methodologies (e.g., Hastie, 2001; Patel, Kaufman, & Arocha,

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2002; Pennington & Hastie, 1992; Shavelson & Stern, 1981; Wiggins & O'Hare, 1995; Zsambok & Klein, 1997).

A commonly used approach in the study of decision making in professional domains is the expert-novice paradigm, which focuses on a comparison of processes and procedures employed by decision makers with different levels of expertise (Galanter & Patel, 2005; Ste. Marie, 2003; Westerman, 1991). This paradigm has been employed in a small number of studies on coaches' cognitions (e.g., Jones, Housner, & Kornspan, 1995, 1997). In a recent article, Abraham et al. (2006) focused specifically on decision-making characteristics of expert coaches. Combining their findings with those from the general literature on the cognitive aspects of expertise suggests that, compared to individuals with little experience in a given domain, those with considerable experience are better able to (a) define a problem and weigh the options (Hershey, Walsh, Read, & Chulef, 1990; Klein, 1998), (b) tune into the most relevant information (Araújo, Davids, & Serpa, 2005; Jones et al., 1995; Lyle, 1999), (c) perceive problems as integrated wholes, as they can link them better to already stored mental scripts or schemas derived from personal experience (Galanter & Patel, 2005; Klein, 1998; Wiggins & O'Hare, 1995), (d) act more prospectively due to their reliance on meaningful information in the wider context (Araújo et al., 2005), (e) embed their decisions in a hierarchical plan of process, outcome, long-, medium-, and short-term goals (Abraham et al., 2006), (f) break complex situations down into meaningful chunks (Abraham et al., 2006; Galanter & Patel, 2005), (g) integrate knowledge from different (and sometimes contradictory) sources (Abraham et al., 2006), and (h) consider the consequences of a decision and realize that decisions can only be 'best fit' (Abraham et al., 2006).

In contrast, (relative) novices in a given domain have limited experiential knowledge to rely on (Galanter & Patel, 2005) and lack the relevant knowledge to tune into the most relevant sources of information; therefore, they rely more on the exploration of the immediate situation (Araújo et al., 2005) and on surface information (Galanter & Patel, 2005; Wiggins & O'Hare, 1995). Extrapolating from Abraham et al.'s (2006) findings on expert coaches, it may be expected that less experienced coaches will (a) set goals more haphazardly, in a less structured and hierarchical fashion; consequently, their problem space in which to reason about and weigh decision alternatives will be less structured, (b) not be able to integrate as much information from different sources, either because they do not have (as much) access to those sources, or because they are unable to integrate it logically, creatively, or productively, and (c) have limited overview of the consequences of their decisions.

In view of the dearth of empirical research on coaches' decision making, especially from the novice-expert paradigm perspective, we decided to re-analyze the data of a coaches' decision-making study collected by the first author as part of her PhD research (Vergeer, 1994). The study entailed a mixed methods design (Tashakkori & Teddlie, 2003; Vergeer & Lyle, 2007), asking coaches to respond to hypothetical scenarios about an injured gymnast's participation in competition by providing both numerical likelihood scores (on a scale from 0-10) and reasons for their decision. The data were

analyzed quantitatively via a Conjoint Analysis procedure (Louvière, 1988) to determine the coaches' numerical "decision policies" (Vergeer & Hogg, 1999), and qualitatively via a Thematic Analysis (Smith, 1995). The qualitative data were also quantified (Tashakkori & Teddlie, 1998; Vergeer & Lyle, 2007) to allow frequency counts and comparisons of coaches' considerations and arguments across sub-groups. In the original analysis (Vergeer, 1994), comparison across coaches was conducted on the basis of (a) clusters emerging within the numerical decision policies, and (b) competitive level. The latter suggested that coaches working with national/international (elite) level athletes tended to be more cautious in their decisions about injured athletes, had less complex decision policies, used different managing strategies, and considered more alternatives to competing than coaches working with athletes at lower (intermediate and basic) levels (Vergeer, 2005). The level of experience of the coaches, however, varied across the competitive levels. Although on average, coaches at the elite level had significantly more years of coaching experience (13.7) than the coaches at intermediate (8.5) and basic (7.7) levels, there was quite a range of coaching experience even within the lower levels, and some coaches who were working with non-elite level gymnasts at the time of the study had coached elite-level gymnasts in the past. Hence, dividing the coaches according to competitive level gave some insight into the role of contextual factors impacting upon coaches' decisions, but provided a somewhat skewed perspective on the effect of coaching experience upon coaches' decision making about this type of problem. In order to create a clearer picture of the role of experience in coaches' decision making, we decided to re-analyze the data by sub-dividing the coaches according to experience—operationalized as the number of years spent in coaching.

Our purpose in doing so was to examine the possible differences between less and more experienced coaches in their numerical decision policies on the one hand, and in the arguments used to justify the decisions on the other. In accordance with the policy-capturing approach to judgment and decision making (Brehmer & Brehmer, 1988; Doherty & Brehmer, 1997; Louvière, 1988), the numerical decision policies represented the coaches' weighing of a number of situational parameters in the form of a regression model, with the regression weights indicating the importance of each parameter or combination of parameters (i.e., main and interaction effects) in relation to the decision choice (in this case the likelihood of competing). Decision policies can vary in both comprehensiveness (i.e., the number of significant regression weights indicating how many parameters are weighed in the decision policy), and complexity (i.e., the inclusion of significant interaction weights, indicating that trade-offs are made within different levels of a parameter). Based on the characteristics of expertise reported in the literature, we expected that more experienced coaches would be able to weigh more factors differentially in their decisions, and hence would have more comprehensive and complex decision policies. This should be expressed in a higher number of significant regression weights and higher order interaction effects.

With respect to the (quantified) verbal data, we expected that more experience would lead coaches to draw upon a larger number of arguments or considerations, and

that more experienced coaches would show more consideration for the wider context and consequences of the decision. Conversely, less experienced coaches were expected to show more sensitivity to the immediately available, surface, characteristics of the situation.

Method

Participants

Sixty four coaches (49 females, 15 males) of competitive female gymnasts took part in the study. They represented approximately 90% of the coaches involved in female competitive gymnastics in the province of Alberta, Canada, at the time of the study. Ages ranged from 16-57 years (M = 28.6, SD = 8.1), and coaching experience from 1 to 35 years (M = 9.5, SD = 7.1). For the purpose of the analysis presented in this paper, the coaches were divided into three groups according to years of experience. The least experienced group (n = 19) had 1-5 years (M = 2.8, SD = 1.3), the intermediate group (n = 23) 6-10 years (M = 7.8, SD = 1.4), and the most experienced group (n = 22) more than 10 years of coaching experience (M = 16.9, SD = 6.8). This division was mostly data-driven, in that the 33rd percentile fell between 5 and 6 and the 66th percentile between 10 and 11, leading to three groups of relatively equal sizes. In relation to the often-adopted "10 years of deliberate practice" criterion of expertise (Ericsson, Krampe, & Tesch-Romer, 1993), this division roughly classifies the coaches into those that are at the early-to-middle stages of expertise, those that are in the middle-to-expert stages, and those that are at the expert stage.

Data collection

Data were collected via a questionnaire, which was pilot tested for clarity on six former gymnastics coaches and was administered via telephone interviews. The study was introduced to the participating coaches via a letter explaining the purpose and background of the study and announcing that they would receive a call with the request for a telephone interview. All coaches consented to the interview being audio-taped. Interviews were transcribed verbatim. The mean duration of the interviews was 46 minutes (SD = 13.2).

Questionnaire

The questionnaire consisted of 16 hypothetical scenarios describing situations in which a gymnast sustained an injury prior to a competition, as well as a number of open and closed questions concerning socio-graphic characteristics (e.g., age, gender, years of coaching experience, education). The 16 scenarios were designed according to a full factorial design (Louvière, 1988) of four factors with two levels each: (a) competition importance (an invitational tournament versus an important qualifying competition), (b) athlete age (8 versus 15 years), (c) athlete ability (average versus best), and (d) injury severity (a moderate second-degree ankle sprain incurred one week before the

Moderate Injury 8 Year Old Athlete of Average Ability Qualifying Competition
Imagine that you have an 8 year old athlete who sprained her ankle exactly one week ago. She has recovered to the point where there is still some swelling and some minor limitation in the range of motion. She is guarding her foot a little bit and is limping after she performs one or two elements in which she needs her feet. This weekend, there is an important qualifying meet coming up, you can think of Zone Championships or Interprovincial Cup Trials. The athlete says that she is "fine" and she is eager to participate in the competition. This is an athlete of average ability, and although she is enthusiastic and loves gymnastics, you would not expect her to place in the top 8 or 10, even with her best performance. It is now the night before the competition, and you have to decide whether or not you will allow her to compete.

Severe Injury 8 Year Old One of Your Best Athletes Qualifying Competition
In this scenario there is again an important qualifying competition coming up this weekend. Now imagine that you have an 8 year old who is one of your best gymnasts. She would almost certainly place in the top 8 of her category if she could compete well. However, 3 weeks ago she severely sprained her ankle. She was on crutches for about a week. She has kept her fitness level up by swimming and riding a bike and stretching, but she has done practically no weight bearing activities. This week she has started to do some training, mostly on beam and uneven bars. She has recovered to the point where there is still some swelling and a limited range of motion. She is limping when she walks into the gym. Yet, she is eager to compete again and says that the pain does not bother her. It is now the night before the competition, and you have to decide whether or not you will allow her to compete.

Figure 1. Text of the first two scenarios.

competition versus a severe second-degree ankle sprain incurred three weeks before the competition). In all scenarios it was assumed that the athlete wanted to compete. The description of each parameter level stayed the same across all scenarios, except for the description of the injury, which was more extensive in the first two scenarios (see Figure 1 for the text of these scenarios). The 16 unique combinations of the factor levels were randomly divided over the scenarios, which were then presented in the same order to each coach. For each scenario, the coaches were told to imagine that it was the night before the competition and were asked to rate the likelihood that they would let the athlete participate in the competition on a 10-point scale (0 = highly unlikely, 10 = highly likely). In addition to their numerical responses, the coaches provided verbal comments about the reasons behind and considerations involved in their decisions.

Analysis

Numerical data. The numerical responses to the scenarios were analyzed using a Conjoint Analysis procedure (Louvière, 1988) to calculate the coaches' decision policies (i.e., the effect of each factor and combination of factors on the likelihood of competing). Based on Information Integration Theory (Anderson, 1981), this procedure employs a multi-linear polynomial mathematical function to model decision makers' policies. Individual decision policies were calculated for each coach via regression analysis with effect coding. The resulting regression weights were subsequently aggregated across coaches and examined in two ways. First, the comprehensiveness and complexity of the policies within each level of experience were examined by looking at significant

main and interaction effects per group. This was done using the multivariate General Linear Model procedure in SPSS, followed by Holm-Bonferroni corrections for multiple comparisons (Atkinson, 2002). Second, the relationship between coaching experience and decision weights was examined by correlating years of coaching experience with the regression weights for main and interaction effects.

Verbal data. The verbal responses to the scenarios were analyzed using common qualitative data analysis procedures in which categories are sought that describe the various components of a phenomenon expressed in the text (Smith, 1995). This analysis was followed by an attempt to categorize and quantify (Tashakkori & Teddlie, 1998; Vergeer & Lyle, 2007) the comments of the coaches in order to facilitate comparison of differences and similarities between the three groups. The qualitative analysis resulted in a list of 20 categories of issues mentioned by the coaches in justifying their decisions. These 20 categories were further subdivided into subcategories representing the various components and manifestations of each category. For example, the category "modifications to competing" had as subcategories: (a) compete in only one or two events, (b) water down the level of difficulty of the routine, (c) tape, support the foot well, (d) see how it goes, pull her out if necessary. The category "athlete ability" had as subcategories, among others: (a) it does not matter whether she is average or best, (b) competing is less likely because the athlete is of average ability and not expected to do well or place, (c) competing is more likely because the athlete is one of the best, it is important that she competes. Overall, this subdivision resulted in an index of 95 subcategories (referred to as "statements"), which was subsequently used to code the comments that the coaches made in responding to the scenarios. This coding was done independently by three coders. Any discrepancies were solved by using the majority vote or disregarding the statement. This procedure resulted in frequency counts representing the total number of times each statement was mentioned by each coach during the interview.

Comparison between the three groups took place with regard to (a) the total number of statements made per coach (averaged per group), using ANOVA, and (b) the frequencies with which each statement was mentioned. Because the large number of different statements and subsequent low power precluded the use of statistical tests for the latter, the following procedure was used to arrive at an impression of possible differences in statements made by each of the three groups. First, in order to compensate for the unequal number of coaches per group, average frequencies (AF) of statements rather than absolute frequencies were used for comparison. These were calculated by dividing the total number of times a statement was made within a group by the number of coaches in that group. Furthermore, in order to select statements with a reasonable frequency of occurrence, only those statements with an AF above the expected frequency (calculated by dividing the average number of statements per coach in each group by the total possible number of statements) for its group were considered for comparison. The comparison of the resulting statements between groups was then based on the relative differences [i.e., (group1 – group2)/(group1 + group2)] in AF per statement, calculated for each set of two groups. The statements reported (Figure 3) as distinguishing most between the groups

were those with a relative difference of .33 or more. A more detailed description of this procedure and its rationale can be found in Vergeer and Lyle (2007).

Results

Coaches' Personal Background

Demographics. Not surprisingly, years of coaching experience was strongly correlated with age (r = .83, p = .000). Mean age was 21.7 years (SD = 3.3) for the least experienced group, 28.4 years (SD = 6.1) for the intermediate, and 34.6 years (SD = 8.2) for the most experienced group. The majority of the coaches in this study were female (76.7%), although the male-female ratio differed significantly between the groups, χ^2 (2, N = 64) = 11.8, p = .003. The percentage of female coaches was 100% in the least experienced group, 78.3% in the intermediate, and 44.5% in the most experienced group. Coaching experience was also associated with level of competitive involvement, with more of the more experienced coaches coaching at the higher levels, χ^2 (4, N = 64) = 16.2, p = .003. See Table 1 for percentages.

Coach education. Almost all coaches (96.6%) were certified through the Canadian National Coaching Certification Program (NCCP). Their credentials varied from the lowest level (I), basic coaching skills, to the second highest level (IV), leadership skills for working with national and international athletes. The majority of the least (68.4%) and intermediate (73.9%) experienced coaches were certified at level II. Of the most experienced coaches, 36.4% were certified at level II, 45.4% at level III, and 9.1% at level IV. The groups also showed some differences in levels of general education as more coaches in the most experienced group had completed university degrees (63.3%) than in the intermediate (43.5%) and least experienced (26.3%) groups.

Education in injury care and management. In terms of learning how to care for and manage sports injuries, the coaches reported both formal and informal educational experiences. The majority of coaches (75%) had taken a first aid course. Overall, the

Table 1. Highest competitive level coached within each group of coaching experience, divided into highest level coached at the time of the study ("now") and highest level ever coached ("ever").

	Coaching Experience					
	1-5 years		6-10 years		> 10 years	
Level	now	ever	now	ever	now	ever
Basic (Local & Provincial)	66.7	52.6	36.4	17.4	31.6	13.6
Intermediate (Canada-West)	33.3	42.1	36.4	43.5	31.6	27.3
Elite (National/International)	0.0	5.3	27.3	39.1	36.8	59.1

Note. The numbers represent percentages within each level of coaching experience.

number of coaches who had received any formal sports-specific injury education was rather low (40.6%), but it was evident that growing experience was associated with increased exposure to such instruction; 63.6% of the more experienced coaches had attended at least one, if not many, injury courses or workshops, while this figure was 39.1% and 15.8% for the intermediate and least experienced coaches, respectively. In a similar pattern to the more formally acquired knowledge, a greater proportion of the more experienced (40.9%) coaches, compared to the intermediate (26.1%) and least experienced (21.1%) ones, also reported making use of informally acquired knowledge about injury management. This included, for example, personally having had many injuries, talking with medical professionals at any opportunity, extensive reading about injuries, learning about anatomy and physiology through vocational training (e.g., dental assistant, physiotherapist, fitness instructor), and "being around people who know a lot about injuries and how to deal with them."

Numerical Decision Policies

Following Louvière's (1988) procedure, individual "decision policies" were determined for each coach by calculating regression weights for the intercept (the overall likelihood of competing), each of the main effects, and all of the interaction effects. These individual policies were subsequently aggregated per group to examine any significant weighing of main and interaction effects per level of experience. Multivariate ANOVAs, followed by Holm-Bonferroni corrections for multiple comparisons (Atkinson, 2002), resulted in four significant weights for the least experienced group (intercept, $p = .000$; injury[1], $p = .016$; ability, $p = .016$; and ability-competition interaction, $p = .016$), five significant weights for the intermediate group (intercept, $p = .000$; injury, $p = .000$; age, $p = .000$; ability, $p = .000$; and competition, $p = .000$), and six significant weights for the most experienced group (intercept, $p = .000$; injury, $p = .032$; age, $p = .000$; ability, $p = .032$; competition, $p = .048$; and ability-competition interaction, $p = .016$) (see also Table 2 and Figure 2). These results indicate that the more experienced coaches tended to weigh more factors in their decision-making policies, but that their decisions were not necessarily more complex as expressed in higher order interactions.

Pearson's correlations between coaching experience and the various decision weights showed a significant inverse relationship of experience with the intercept ($r = -.36$, $p = .003$), indicating a tendency for the more experienced coaches to assign lower likelihood scores to the scenarios. Conversely, none of the correlations with main effect or interaction weights were significant, suggesting that the weighing of the various factor levels did not become stronger or more complex with increasing years of experience.

Quantified Verbalizations

Total number of statements. Coaching experience was not significantly correlated with the number of statements made in response to the scenarios ($r = .04$, $p = .763$). Although the most experienced group made the highest total number of statements (on average

Table 2. Conjoint decision weights per group.

	1-5 years	6-10 years	> 10 years
Intercept	3.76 ***	3.57 ***	2.79 ***
Injury	0.56 *	1.14 ***	0.65 *
Age	0.34	0.62 ***	0.63 ***
Ability	0.56 *	0.38 ***	0.35 *
Competition	0.47	0.51 ***	0.55 *
Injury-Age	0.08	0.13	0.18
Injury-Ability	0.08	0.18	0.10
Injury-Competition	0.23 *	0.06	0.12
Age-Ability	0.06	0.04	0.07
Age-Competition	0.05	0.11	0.21
Ability-Competition	0.46	0.26	0.26*
Injury-Age-Ability	0.04	0.20	0.02
Injury-Age-Competition	0.00	0.02	0.17
Injury-Ability-Competition	0.18	0.13	0.20
Age-Ability-Competition	0.04	0.06	0.04
Injury-Age-Ability-Competition	0.10	0.16	0.20

Weights significant at: *** $p < .001$, ** $p < .01$, * $p < .05$

29.9 per coach, *SD* = 15.4), the smallest number (23.8, *SD* 9.3) was made by the intermediate group, with the least experienced group making 25.5 statements on average (*SD* = 16.3). These averages were not significantly different from each other ($F(2, 61) = 1.133$, $p = .329$), which refutes the assumption that more experience would lead coaches to draw upon a larger number of arguments or considerations.

Comparisons of statement content. Following the procedures outlined earlier, the content of the statements made by the coaches was compared between each pair of groups. Figure 3 shows the statements that distinguished the least experienced group from the intermediate group, and the intermediate group from the most experienced group. The statements differentiating between the most and least experienced groups are not shown, as these statements were mostly similar to the ones distinguishing the most experienced from the intermediate group—albeit with slightly different numbers and with some additional disparities. In particular, in comparison with the least experienced group, the most experienced group more often mentioned obtaining medical advice through direct communication with a medical professional (R.D. = .33), talking with the athlete to explain why she would not compete (R.D. = .48), considering the risk of doing permanent damage (R.D. = .35), and taking account of the athlete's keenness or

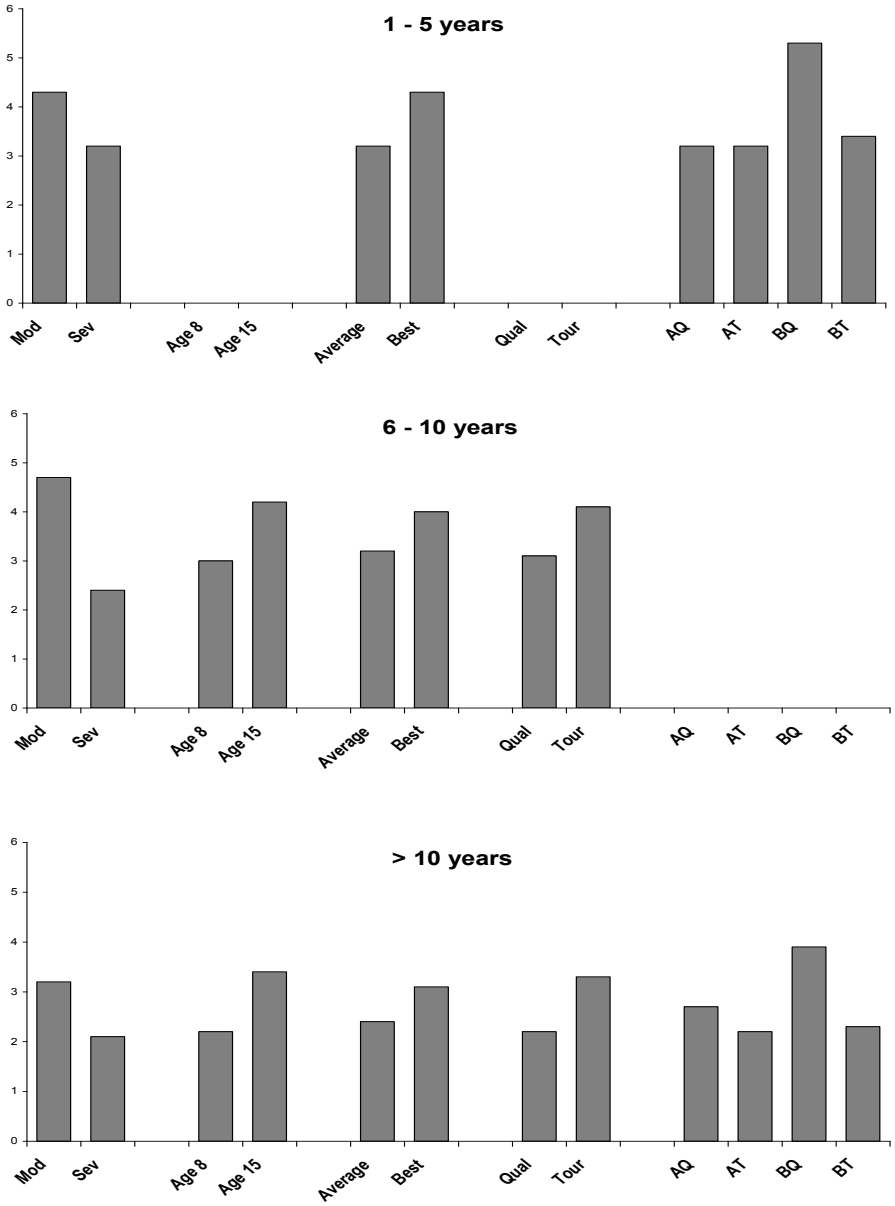

Figure 2. Averages for significant weights for each level of experience. Weights for main effects are abbreviated as follows: Mod = moderate injury, Sev = severe injury, Age 8 = 8-year-old athlete, Age 15 = 15-year-old athlete, Average = athlete of average ability, Best = one of the best athletes, Qual = important qualifying competition, Tour = invitational tournament. Weights for interaction effects are abbreviated as follows: AQ = average athlete – qualifying competition, AT = average athlete – tournament, BQ = best athlete – qualifying competition, BT = best athlete – tournament

Statements made more often by coaches with 1-5 years experience than by coaches with 6+ years experience

A.D.	R.D.	
.52	.41	tape; support the foot well; do a good warm-up
.45	.56	obtaining medical advice, but not obviously through direct personal contact with the doctor or physio involved (e.g., "What did the doctor say?")
.21	.41	it is up to the athlete and/or her parents
.30	.45	less likely if it hurts; if there is still pain
.26	.54	less likely, at 8 years of age kids are psychologically not ready to handle an injury, to provide reliable information, to compete under stress
.54	.43	more likely, because at 15 she is getting near the end of her competitive career; she won't have many opportunities for competing left
.28	.61	less likely, because it may be a negative experience (in terms of a sense of personal failure; might undermine her confidence, motivation)

Statements made more often by coaches with 6-10 years experience than by coaches with 1-5 years experience

A.D.	R.D.	
.21	.66	it is the coach's decision, but there is the possibility that the parents will veto or reverse the decision
.21	.66	It does not matter whether she is average or best
.70	1.00	depending on characteristics of the competition (type, timing, importance, etc)
.33	.61	less likely, because it is unlikely that she will be able to do her moves/routines/skills well enough to make it worthwhile; to get through her routines
.25	.71	depending on the athlete's motivation, keenness, eagerness, ambition
.27	.39	depending on the athlete's pain tolerance; mental toughness
.33	.61	the athlete's competitive level makes a difference

Statements made more often by coaches with >10 years experience than by coaches with 6-10 years experience

A.D.	R.D.	
.50	.74	find an alternative to competing, e.g., get a medical bye; take her to the meet to watch
.71	.40	obtain medical advice, directly or indirectly
.52	.40	the athlete has input in the decision; coach and athlete make the decision together; a shared decision
.19	.42	make decision earlier than the night before
.23	.47	talk with athlete to assure she has realistic expectations about competing (e.g., "we are not going in this to win")
.33	.39	there has not been enough time to recover; it has only been a week / 3 weeks
.23	.57	less likely, we don't compete kids that young
.19	.35	age-related physical reasons (e.g., risk of growth plate injuries; healing faster when younger; being heavier when older)
.28	.45	more likely, because she is one of the best, it is important that she competes; this meet is important for her; she might do well in this meet
.46	.73	depending on when this qualifying meet is, how important it is, whether it can be petitioned
.59	.77	take into account what the doctor says
.45	1.00	if the doctor said okay, then competing would depend on other factors (e.g., if her routines can be watered down)

Figure 3. Statements differentiating most between the least and intermediate experienced groups, and between the intermediate and most experienced groups. The first column (A.D.) denotes the absolute difference in average frequency (AF) scores between the groups, the second column (R.D.) the relative difference. The statements are ordered by topic.

ambition (R.D. = .77) and competitive level (R.D. = .68). Furthermore, arguments related to characteristics of the competition, such as type of competition, timing, or importance, were never mentioned by the least experienced group (R.D. = 1.00).

Closer inspection of the differences in statements made by the three groups suggests that the least experienced coaches focused their strategies and arguments more often on directly available or obtainable information, such as the amount of pain the athlete was experiencing, or medical advice. They also tended to emphasize psychological arguments, for example, about the experience the athlete might have if she did compete, or how the athlete's psychological characteristics would impact the trustworthiness of the information. In terms of strategies, they were more likely to mention physical support strategies to be used when competing injured, and to relinquish responsibility for the decision by leaving it up to the athlete and/or her parents. In comparison, coaches in the intermediate group showed more sensitivity to the factors that may affect an athlete's capacity to compete successfully with an injury, such as ambition, pain tolerance, competitive level, and the injury's impact on the ability to execute full routines. The type, timing, and relative importance of the competition also factored into their considerations, in contrast to the least experienced group, where such considerations were not found at all.

Further inspection suggests that the considerations of the most experienced group displayed more emphasis on the managerial aspects of the decision. This is evident in strategies like finding alternatives to competing, sharing the decision with the athlete and/or parents, taking care of the consequences of the decision by talking with the athlete to assure understanding and/or realistic expectations, making sure medical advice is acquired, and taking doctor's recommendations into account—whether following them as given or considering them as one of the factors affecting the decision. These most experienced coaches also were more likely to invoke rules around the decision-making process, such as making the decision earlier than the night before the competition, or not letting 8-year-olds compete in general. Furthermore, they were more likely to interpret the recovery time for the injury as insufficient. Attention to the characteristics of the competition was also strong for this group, especially to the characteristics of a qualifying competition.

Discussion

In this paper, we attempted to expand the empirical literature on the role of experience in coaches' decision making by examining this role, operationalized as number of years in coaching, in previously collected mixed-method data (Vergeer, 1994) on coaches' decisions about the participation of an injured athlete in competition. On the basis of the literature on cognitive differences between experts and novices (e.g., Araújo et al., 2005; Galanter & Patel, 2005; Jones et al., 1995), we expected that the greater cognitive complexity and deeper knowledge structures associated with expertise would enable the more experienced coaches to consider and integrate a larger number of factors in their decisions. This would be evidenced in more comprehensive and complex numerical decision policies, a higher number of statements, and attention to deeper rather than surface characteristics of the situation. In comparison, coaches with less experience

were expected to use less comprehensive and complex decision policies, make less statements, and pay more attention to surface characteristics. The findings supported these expectations to a reasonable extent, and also revealed some additional insights.

The least experienced coaches did indeed show the least comprehensive decision policies, not significantly weighing the age and competition parameters. The lack of attention paid to the characteristics of the competition was also borne out by the verbal data, which showed a clear absence of any competition-related considerations within this group. At the same time, with increasing experience the numerical decision policies showed an increase in the number of significant decision weights, suggesting that more experienced coaches took account of a larger number of factors in their decisions. The strength of the decision weights and the complexity of the decision policies (i.e., the number of significant interaction effects, indicating a differential influence of different combinations of parameter levels), however, were not linearly related to experience. The strongest (i.e., most significantly different from zero) main effect decision weights were found in the intermediate group, and both the most and the least experienced group recorded a significant weight for the ability-competition interaction.

These findings imply that the increasing cognitive complexity may not express itself in a straightforward numerical manner in the weighing of the decision parameters, an issue earlier alluded to by Shanteau and Stewart (1992). Closer inspection of the significant ability-competition interaction in the most and least experienced groups suggests that this interaction in fact represented qualitatively different uses of the informational parameters in these two groups. Where the least experienced group only differentiated best athlete/important competition from the other combinations and did not mention considerations involving the role of competition characteristics, the most experienced group showed more differentiations between the parameter levels, and mentioned a variety of considerations related to both athlete and competition characteristics. This suggests that the interaction effect in the least experienced group was probably more due to surface interpretations of the information (athlete is important, competition is important), while in the most experienced group the interpretations were regulated via a range of additional considerations.

The verbal data also indicated that the least experienced group showed more sensitivity to the surface characteristics of the problem, paying attention to the most obvious or most immediate information, such as pain and medical opinion. Athletes' emotional reactions, which coaches would have to deal with in face-to-face interactions with the athlete, may also be classified as surface characteristics, and may explain this group's greater preoccupation with psychological arguments and the stronger tendency to relinquish responsibility for the decision. Most of the considerations in this group were also short-term, concerned with the immediate situation.

The intermediate group showed the strongest main effect weights in their decision policies, indicating the importance of each of the parameters' dimensions in the decision choice. The verbal data of the intermediate group, in comparison to the least experienced group, indicated a move away from concerns with surface characteristics of the situation to a more in-depth and structured problem representation that takes into

account the importance and type of the competition, and a range of factors likely to impact the injured athlete's ability to produce a performance that is still worthwhile within the athlete's goals. This shift in emphasis is in line with the commonly identified ability of experts to focus in on the most pertinent problem information (Araújo et al., 2005; Jones et al., 1995). With 6 to 10 years of experience within the coaching domain, these coaches seemed to be particularly focused on taking into account the range of factors that impact on an athlete's performance, weighing the pros and cons and deliberating about the decision within a problem frame structured around performance parameters.

Coaches in the most experienced group, compared to those in the least and intermediate groups, did indeed show consideration of a larger range of factors in their argumentation. These factors related to a variety of characteristics of both the athlete and the situation, and of short- as well as long-term consequences. In accordance with Abraham et al.'s (2006) findings, the coaches in this group more often mentioned concern with the consequences of the decision, and invoked more rules in their decision making. This illustrates at the same time a widening of cognitive capacity to include more issues in one's considerations, and a narrowing of options by invoking certain decision rules or managing strategies to facilitate the decision process. This simultaneous widening and narrowing may explain why we did not find an association between coaching experience and the number of statements made. Although more issues were taken into consideration, the application of decision rules may have served to reduce uncertainty, thereby decreasing the need for more extensive deliberation in the form of describing information-gathering procedures, weighing pros and cons, or engaging in assumption-based reasoning (Lipshitz & Strauss, 1997).

As Lipshitz and Strauss (1997) noted, decision makers often face uncertainty, in the form of inadequate understanding of the problem, lack of information, or the inability to differentiate between equally (un-)attractive alternatives. A common tactic in response to uncertainty is to delay the decision. The fact that the most experienced coaches were more likely to do the opposite—by invoking the decision rule of making the decision earlier (than the night before the competition)—is an indication that these coaches have learned to reduce uncertainty at an earlier stage of the decision process, by what Lipshitz and Strauss (1997) called "controlling the sources of variability which reduce predictability" (p. 153). This may be linked to the fact that they pay greater attention to the consequences of the decision, and are consistent with the ability to take a more managerial approach, where the concern is less with the immediate presenting characteristics and short-term consequences of the situation and more with the underlying issues and longer-term consequences.

The tactic of reducing uncertainty by relinquishing the responsibility for the decision found in the least experienced group may reflect a differentiation in the degree of general confidence and control that coaches may experience as a function of the duration of their involvement in coaching. Jones et al. (1995) reported, for example, that inexperienced coaches showed higher anxiety levels in comparison to experienced coaches, and Weiss, Barber, Sisley, and Ebbeck (1991) reported a number of perceived inadequacies in coaching competence that undermined the confidence of novice female coaches.

In this study we operationalized experience as the number of years spent in coaching. Although several authors have argued that accumulating experience is not necessarily the same as developing expertise (e.g., Abraham et al., 2006; Eells, Lombart, Kendjelic, Turner, & Lucas, 2005), it could be contended that prolonged involvement in a given domain provides the prerequisite circumstances for developing expertise, by supplying more opportunities to (a) attend courses and workshops and gain declarative and procedural knowledge, (b) learn from exposure to and interaction with other coaches, and (c) encounter problems and, hence, learn from searching solutions and reflecting on chosen actions, and by doing so deepen existing knowledge structures (Werthner & Trudel, 2006). The higher number of formal and informal injury-education experiences reported by the more experienced coaches support the first two of these assumptions.

On a related note, the finding that increased experience was associated with more education in injury care and management on the one hand, with a decrease in likelihood ratings on the other, tentatively suggests that injury education plays a role in sensitizing coaches to the risks of competing injured. This is further supported by the finding that coaches in the most experienced group were more likely to interpret recovery time as insufficient and to mention the risk of doing permanent damage. The extent and quality of this relationship are far from clear, however, and are likely to be complex, in particular the role of formal versus informal educational experiences. Earlier results showed, for example, that coaches with more cautious decision policies were more likely to have had bad personal or vicarious experiences with competing injured in the past (Vergeer & Hogg, 1999)—emphasizing the role of personal history in coaching practice (Cushion et al., 2003). There are ample indicators in the recent literature that the development of coaching knowledge and expertise is highly unstructured and serendipitous in nature (Abraham et al., 2006; Cushion et al., 2003). Even in more formally institutionalized professional training practices, like medicine and psychotherapy, it is recognized that the progression from novice to expert is not necessarily characterized by a gradual and steady accumulation of skills and knowledge, but rather as "an arduous process of continually learning, re-learning and exercising new knowledge" (Galanter & Patel, 2005, p. 682), a process further influenced by the specific learning environment and opportunities offered to the developing professional in various internships (Eells et al., 2005). Untangling the specific contributions of formal versus informal educational experiences may prove challenging; however, the results of this study suggest that the accumulation of these experiences over time is associated with a more cautious approach to decision making about injured athletes.

Overall, we did find indicators of increasing cognitive complexity and a move from attention to surface characteristics toward attention to performance-related considerations—reflecting at the same time an increased ability to focus on the most relevant performance-injury related information and a stronger absorption of the values of the sub-culture (Cushion et al., 2003). Beyond this, we found a further move toward consequence-considered argumentation in a wider context. Experienced coaches appeared to "frame the problem" within a broader context and were able to bring to bear a number of already-stored solutions. This efficiency in narrowing hypotheses and selecting

options in decision making may be a confounding factor in representing complexity and depth of knowledge in research into expertise.

Can any implications for coaching practice be derived from this study? Generally speaking, coach development is geared toward providing coaches with experiences that will help them build relevant and complex cognitive structures that should enhance their decision making. Are there possibilities to expedite this process? One strategy that may be applied in formal coach education is exposure to complex (hypothetical or real) scenarios that include not only varied injury characteristics, but also different athlete characteristics (e.g., body composition, personality, career stage, competitive goals), and various competition characteristics. Examining and debating such complex scenarios may help less experienced coaches to develop sensitivity to the complexities of the situation, enabling them to rely less on surface information and possibly apply more advanced decision strategies. In a more informal way, working alongside experienced coaches and operating within an environment with clearly defined decision rules may accelerate the use of more advanced strategies. This was evidenced, despite the group differences, by a few of the lesser experienced coaches who did in fact demonstrate use of decision rules that were more commonly found among the more experienced group, such as making the decision earlier in the week or not competing younger gymnasts. These coaches tended to be working in more structured club environments and alongside more experienced coaches. Coaching practice, therefore, may benefit from interventions targeting both formal and informal education; the first through the dissemination of complex injury decision scenarios, the latter through the establishment of social and environmental structures that allow less experienced coaches exposure to more experienced coaches and more advanced decision environments.

As several authors (Abraham et al., 2006; Jones et al., 1997; Lyle, 2002) have argued, coaching expertise is multi-dimensional and complex, and the use of both quantitative and qualitative methods has been recommended to shed light on the nature of coaching expertise (Jones et al., 1997). By employing a mixed methods design, we combined quantitative and qualitative methods to elucidate coaches' decision making about a specific problem. The use of scenarios, vignettes, or attribute/case descriptions is very common in the judgment and decision-making literature (e.g., Brehmer & Brehmer, 1988; Eells et al., 2005; Patel et al., 2002), and offers an opportunity for systematic variation of parameter levels, although it has its limitations by reducing complex real-life decision situations to hypothetical scenarios and numerical likelihood ratings. The fact that we conducted a secondary analysis on data already collected for a different purpose also resulted in a somewhat forced translation of cognitive complexity into the numerical data. However, the collection of the qualitative data within the quantitative structures allowed for more systematic examination of arguments in relation to coaches' levels of experience and other attributes, and perhaps led to the most insightful information in this study.

Much of the literature on expertise and expert-novice differences is cognitive in nature, emphasizing the development from superficial and limited cognitive structures to highly complex and integrated cognitive structures. Even so, when investigating the

role of experience and the development of expertise in specific professional domains such as coaching, there is likely to be merit in expanding the view beyond the cognitive perspective to include other psychological components as well, for example, coaches' perceptions of competence, ambivalence, anxiety, and confidence in relation to their role. Such concepts have been incorporated in various stage models of professional expertise development in psychotherapy (Watkins, 1995), describing trajectories of initial insecurities, dependence, and ambivalence via experimentation and differentiation to increased independence, integration, awareness, confidence, and professional identity. Such research would help situate the cognitive development of expertise in a broader psychological context. Further expansions to include social, environmental, and career development (e.g., promotion to head coach) contexts would also enrich our knowledge of the development of coaching expertise. The greater emphasis on managerial aspects found among the most experienced group may, for example, reflect the assumption of a strategic coordination role for more senior coaches.

This study has provided some empirical information about the relationship between coaching experience and decision making with respect to a specific coaching problem: the participation of an injured athlete in competition. Given that we conducted a secondary analysis on data originally collected from a different perspective, there were a number of limitations to this study. Nevertheless, we do believe, considering the dearth of empirical research on the novice-expert paradigm in coaching, that this paper adds to our understanding of the role of experience in coaches' decision making. In particular, the qualitative data collected within the quantitative framework provided insights into the way in which the increasing cognitive complexity associated with growing experience is expressed in the decision making about a particular coaching problem.

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Endnotes

[1] For brevity sake we refer to the various parameters as "injury" (injury severity), "age" (athlete age), "ability" (athlete ability), and "competition" (competition importance).

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