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Decision-Making Factors Related to a Youth Ice Hockey Coach During Games: A Case Study

by

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Abstract

The research study was part of an ongoing project on the cognitive aspect of coaching amateur ice hockey. The purpose of the current research study was to identify the decision-making factors that youth ice hockey coaches consider during games. A single case study was conducted with a coach involved with a Major PeeWee "AA" competitive hockey team. Data were obtained through one background interview, 12 game videotapes, and 12 stimulated-recall interview game transcripts. The stimulated-recall interviews were conducted based on a specific procedure, which allowed the coach to talk about (a) events that he had selected, and (b) events selected by the researcher. For each event discussed in the stimulated-recall interview, the analysis was done by referring to three questions: what is the action?, what is the goal(s)?, and what is the factor(s)? An inductive analysis of the transcripts indicated that over half of the actions ($n = 144$) took place when the coach talked to one or more players ($n = 76$) and that the main goal was to inform or give feedback to his players. A total of 466 factors were identified for an average of 3.2 factors per action. These factors were regrouped under 22 types and then divided into two main categories: (a) field information, and (b) coach knowledge. The field information category contained 70% of the factors. In general, the most common factors considered by the coach were: player(s) performance on the ice, game score/outcome, time of game/time restraints, habits/history of team or player, game official(s) performance, and skill level of team/player(s). Contrary to what has been suggested in some decision-making process models, the coach in this study used many different factors other than just players' performance in his decisions. This study also shows that by following a specific protocol, coaches are able to recall precisely, events that happened a few days before.

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Decision-Making Factors Related to a Youth Ice Hockey Coach During Games:
A Case Study

Martens (1986) estimated that 20 million children between the ages of 6 and 18 participate regularly in some form of organized sport in non-school settings in the United States. In Australia, the participation rate has been estimated to be also very high, with an involvement of 67% and 75% of preadolescent girls and boys, respectively (Robertson, 1986). The participation rate for youth 15-18 years of age in Canada, is over one million (Sport Canada, 1994). The existence of organized youth sport is often the result of the involvement of volunteer adults, among whom coaches play a critical role. Youth sport coaches, along with physical educators at school, are engaged in teaching tasks to children in an effort to develop their physical competence (Hastie & Saunders, 1992; Martens & Gould, 1978; Scott, 1979; Spallanzani, 1988; Tinning, 1982).

The roles of community coaches and physical education teachers may be similar when considering subject matter to teach but research has shown that there are a number of differences that affect how they interact with children (Hastie & Saunders, 1992; Piéron & Goncalves, 1987; Rupert & Buschner, 1989; Wandzilak, Ansorge, & Potter, 1988). These differences can be explained by variables such as dissimilar educational backgrounds and the occupational reward structures, as well as the program goals/curriculum objectives, participant numbers, and duration of time spent with the child (Chu, 1984; Telama, 1988). Also, in the sport setting, there is the existence of competition and as recently stated by Côté, Salmela, Trudel, Baria, and Russell (1995), "competition is one of the variables that is not present in teaching but is central in the coaching process" (p. 2). As a result of the differences in the sport setting, coaching as compared to teaching, requires different instructional approaches and it is expected that

factors may also differ in the decision-making.

Most studies by sport pedagogy researchers on youth sport coaches, have used a behavioral approach to analyze the instructional approach. In these studies, systematic observation techniques were used to gain insight into the behaviors of coaches during training and/or competition (Trudel & Gilbert, 1995). Today, the data base on coaching provides information on topics such as coaching intervention effectiveness (Horn, 1985; Smith, Smoll, & Curtis, 1979), the emphasis on winning versus the performance process (Chaumeton & Duda, 1988; Dubois, 1981) and the coaches' role in the players' social behaviors (Côté, Trudel, Bernard, Boileau, & Marcotte, 1993). However, Trudel, Côté, and Bernard (1996) have suggested that behavioral studies on coaching could be complemented by conducting research on their cognitive processes. Why do they do what they do? What are the factors involved in their decision-making, which has been defined as "a deliberate choice to implement a specific action" (Clark & Peterson, 1986, p. 274)?

The thinking, planning, and interactive decision-making that teachers do while interacting with students in the classroom setting has constituted a major part of the research describing teachers' thought processes (Clark & Peterson, 1986). Various techniques such as think aloud, retrospective probing, and stimulated-recall have been used to gain access to teachers' thoughts in action (Ericsson & Simon, 1993; Gilbert & Trudel, 1993; Yinger, 1986). However, the progress made in the area of thought processes of teachers has not reached the world of sport even if it seems to be an ideal setting for studying the cognitive processes, due to the complexities of sport and the many decisions required by the coach (Cratty, 1971; Gilovich, 1984; Perron & Chouinard, 1991). Perron and Chouinard for instance, recommended that ice hockey

coaches become familiar with the decision-making process of both athletes and coaches in order to help decipher ever-changing situational events. It has also been suggested that how people think, judge and analyze in the sport setting is a subject of research free of limitations existing under laboratory conditions (Tenenbaum & Bar-Eli, 1993). Thus, the sport setting can be used as a living laboratory for the study of cognitive processes (Gilovich, 1984; Gilovich, Vallone, & Tversky, 1985) with athletes and coaches alike.

According to Fairs (1987), coaching is as much involved in defining and analyzing problems as in solving them. For him, the coaching process is dynamic, organized, systematic, and deliberate. In a similar way, Woodman (1993) suggested that coaching "involves observation (information collection), assessment (problem identification), goal-setting (development of a plan of action), coaching (implementation of the plan), and reassessment (evaluation), which is an ongoing function throughout the process" (p. 5). In some sports such as basketball, football, and ice hockey, the coach, particularly during games, has to make numerous decisions quickly. However, the context prevailing when a coach makes a decision has seldom been studied and there is limited insight into how coaches themselves understand their own decision-making (Duke & Corlett, 1992).

The present research was an exploratory study with two purposes: a) To develop a methodology that allowed for the investigation of coaches' thought processes, and b) To investigate part of the cognitive aspects of coaching by analyzing elements of the interactive decision-making process of youth ice hockey coaches during games. The research questions were: a) Is the stimulated-recall interview technique appropriate for the investigation of coaches' thought processes? and b) What are the decision-making factors that youth ice hockey coaches consider during games? It was anticipated that this

insight into elements of the interactive decision-making process of youth ice hockey coaches would contribute to the coaching literature (Lacy & Darst, 1985) by providing a foundation for further studies on the cognitive processes of these coaches.

Review of Literature

The study of coaches' thought processes is very limited and there is actually no structure to organize the literature around this topic. However, Clark and Peterson (1986) have proposed a model, based on teaching research findings, to organize the literature on teacher thought and action (see Appendix A). They suggested a link between actions and interactive thought processes and their suggestion provided direction for the present study. Even if this model was not elaborated from empirical studies, according to it, teachers' interactive decisions will be influenced by many factors other than just student classroom behavior.

The model depicts two domains that are important in the study of the teaching process: (a) teachers' thought processes, and (b) teachers' actions and their observable effects. The domains differ in the extent to which the processes involved are observable. Teachers' thought processes, which group the components of planning, theories and beliefs, and interactive thoughts and decisions occur "inside teachers' heads" and thus are unobservable. In contrast, teacher behavior, student behavior, and student achievement constitute observable phenomena and can be measured (Clark & Peterson, 1986).

To adapt this model to the sport context, the word teachers can be replaced with the term "physical education teachers/coaches" and the word students with the term "physical education students/players". The model will act as an organizer for the review of literature.

Physical Education Teachers' and Coaches' Planning

Physical education teachers' planning. Fundamental to the role of the teacher is the capacity to plan quality instructional programs. According to Byra and Coulon (1994), planning seems to play a fundamental role in linking curriculum to instruction and, in turn, influences what goes on in the interactive teaching environment. Teacher preparation courses in general education and in physical education devote considerable time and effort to the planning process, which is recognized as being associated with maximizing student learning (Goc-Karp & Zakrajsek, 1987). As a result, there have been a number of studies conducted with physical education teachers in regards to planning.

The majority of research on planning by physical education teachers has focused on experienced versus inexperienced individuals (Graham, Manross, Hopple, & Sitzman, 1993; Griffey & Housner, 1991; Sherman, Sipp, & Taheri, 1987). The specific objective of these studies was to discover differences in the information gathering and decision-making phases of instructional planning. Results revealed that high-experience teachers made more decisions, planned faster (Sherman, et al., 1987) and knew what cues to gather in class (Griffey & Housner, 1991), based on past experience (Graham, Manross, et al., 1993). Secondly, experienced teachers were more keenly aware of critical moments that could arise during interactive teaching and were ready to call up contingency plans at such moments (Griffey & Housner, 1991; Sherman, et al., 1987). Thirdly, Graham, Manross, et al. concluded that both inexperienced and experienced teachers were situational decision-makers but there were differences in the way these decisions were made. They stated that inexperienced teachers were simply forced to rely more on textbooks and written materials and on what succeeded with previous classes. The experienced teachers, in contrast, based their decisions on the characteristics of the

particular class they were teaching and on their past experiences teaching a particular topic.

Other studies of physical education teachers' planning have focused on planned versus unplanned situations for teachers (Byra & Coulon, 1994) and theoretical planning models, which are taught in preservice education courses, compared to what teachers do in the actual school setting (Goc-Karp & Zakrajsek, 1987). Their findings indicated that teachers concentrated their planning decisions around time, equipment, and facilities management, and arranging these so that the students were actively participating once the unit activity and the daily skill activity were set.

Coaches' planning. The existing literature on coaches' planning contains very few empirical studies. However, many experts in the coaching domain have written applied articles about the planning process and how it relates to coaches (Bacon, 1989; Bompa, 1984; Leith, 1983; Nesbitt, 1984; Sanderson, 1989).

Leith (1983) stated that due to the multitude of factors involved in successful coaching, the development of administrative skills can aid in setting objectives as well as making day-to-day decisions on how these objectives can best be achieved. It has also been suggested that coaches must ultimately consider the physical and psychological characteristics of developing children when constructing and deciding on a systematic development plan (Sanderson, 1989). Coaches must understand their sport's physical, psychological, tactical and technical demands when designing and deciding upon a seasonal plan, which is known as periodization (Bacon, 1989; Nesbitt, 1984). Ultimately, it is the coach who must realize the implications of proper and improper planning in order to maximize the potential of their athletes (Bompa, 1986).

There is a sparse amount of research on coaches' planning as compared to

physical education teachers' planning. Côté, Salmela, and Russell (1995) have offered an insight into the planning of expert high-performance coaches but there have been few empirical studies conducted with volunteer coaches in this area (Jones, Housner, & Kornspan, 1995).

Physical Education Teachers' and Coaches' Theories and Beliefs

Physical education teachers' theories and beliefs. Many studies have been conducted in an effort to elicit responses on beliefs and theories from preservice education teachers, physical education teacher recruits/undergraduate majors, and experienced school-based physical education teachers (Doolittle, Dodds, & Placek, 1993; Fernandez-Balboa, 1991; Graham, Hohn, Werner, & Woods, 1993). Results indicated that the preservice education teachers and physical education teacher recruits/undergraduate majors expected their pupils to act as they themselves did back in high school, and, as a result, they modeled their own actions after those of their former teachers and coaches (Doolittle, et al., 1993; Fernandez-Balboa, 1991). Secondly, physical education teacher recruits with different prior experiences formed different initial beliefs about teaching. The teacher recruits accepted practices from the teacher education program that complemented their core beliefs and ignored practices that did not fit (Doolittle, et al., 1993). An additional finding from these studies was that conceptions on teaching of preservice and school-based physical education teachers were more focused pedagogically as compared to physical education teacher recruits (Graham, Hohn, et al., 1993). This may seem like an expected finding in the teaching domain but it has major implications for training and certification of both the teaching and coaching domains.

Coaches' theories and beliefs. When discussing coaches' theories and beliefs that

organize behaviors, the term "coaching philosophy" is most commonly used (Martens, 1987; Sabock, 1991; Streaan, 1993). Streaan indicated that few empirical studies have investigated coaching philosophies in relation to behaviors or decisions. Much of the literature on coaching philosophies has come from suggestions offered by people involved in the coaching field.

Lyle (1986) suggested that two coaching philosophies exist, the humanistic one, where the coach values the athlete's personal and sport development and the performance based one, in which the coach mainly focuses on outcome. It has also been suggested that important decisions made by coaches usually reflects their true philosophy (Martens, 1987) and this influences their actions (Sabock, 1991).

Streaan (1993) conducted one of the few studies which investigated coaching ideology and actions. Results suggested that contextual factors (e.g., rules, parents, facilities, persons in the environment) influenced the actions of coaches as they attempted to operate in accordance with their philosophies.

Other studies conducted with youth sport coaches have concluded that volunteer coaches of sport teams in highly organized competitive leagues have a professional orientation toward playing the game (Albinson, 1973; Martens, 1988; Vaz, 1982) and that players and coaches at higher levels of competition placed significantly greater emphasis upon winning than did the players and coaches of teams competing at lower levels (Chaumeton & Duda, 1988). Gould and Martens (1979) found that coaches have generally favorable attitudes towards youth sports, supporting the value of participation for the well-being of children. However, they also found that the coaches in their study moderately agreed that too much emphasis was placed on winning.

Physical Education Teachers' and Coaches' Interactive Thoughts and Decisions

Physical education teachers' interactive thoughts and decisions. Research on physical education teachers' interactive thoughts and decisions has primarily focused on experienced physical educators (Boggess, Griffey, & Housner, 1986; Ennis, 1994; Schempp, 1993) and on experienced versus inexperienced physical educators (Housner & Griffey, 1985). Studies conducted with experienced physical education teachers solely, have suggested that four primary knowledge sources, which are community, school, profession, and background, may influence pedagogical decisions. Schempp believed that a community's decision on facilities and equipment directly influenced curricular decisions. Boggess et al. found that the principal managerial decision-making strategy reported by experienced elementary physical education teachers was to monitor the behavior of children who were of high ability and those who were non-task-oriented or easily distracted. Additionally, Ennis suggested that content decisions of teachers indicated a strong emphasis on interpersonal skills, such as teamwork and cooperation, as the focus of the program, and these content decisions appeared to be influenced by the teachers' perceptions of student needs. Further, the social responsibility value orientation of physical educators appears to be influential in their decision-making within the school context in which they teach.

When compared with inexperienced physical education teachers, experienced teachers focused most of their attention on individual student performance, while inexperienced teachers attended most frequently to the interest level of the entire class of students. Experienced teachers seemed to possess knowledge structures rich in strategies for managing students and facilitating psychomotor performance that enabled them to attend to individual student performance and alter their lessons in accordance to student needs (Housner & Griffey, 1985).

Peterson and Clark (1978) and Shavelson and Stern (1981) designed interactive decision-making models for teachers, which were based upon yes or no judgements regarding the behaviors of students (see Appendix B and C). Hoffman (1983) proposed this type of model in the physical education research setting.

Coaches' interactive thoughts and decisions. Coaches in competition are frequently under pressure to make decisions for which they are perceived as having exclusive responsibility. However, they may often experience competitive events as uncontrollable, such as when players do not follow the coach's instructions. As a result, they may experience not only increased emotional distress and anxiety, but also the impairment of problem-solving and decision-making efficiency (Tenenbaum & Bar-Eli, 1993). As Woodman (1993) stated, "Each coaching situation is a specific environment that relies for its success on the coach taking into account the unique factors of that environment when designing an effective program" (p. 9). The extant coaching literature has seriously neglected research on coaches' interactive thoughts and decisions and much of the relevant literature stems from opinions of people in coaching as opposed to systematic research.

Several authors have stated that the coach must be aware of the many factors involved in both practice and competition (Cratty, 1971; Franks, Sinclair, Thomson, & Goodman, 1986; Grieve, 1982). Cratty stated that "Traditionally, coaches are decisive, and decisiveness in leaders (whether in war or in stressful athletic competition) is probably a desirable trait" (p. 52). He summarized the ever-changing coaching context and described the coaching process in the following manner:

They are confronted with frequent problems, and are forced to make a number of decisions when planning their seasons, conducting practice sessions, and while

competition is underway. As a game or meet progresses the coach must not only make qualitative and quantitative judgements concerning his athletes' group performance but must also evaluate the quality of the hundreds of decisions each of his players may be called upon to make. Player and coaching decisions must be made rapidly and are influenced by both the unique traits of individual athletes and by the specifics of sports situations. (p. 46)

Grieve (1982) suggested some factors which might influence a coach's ability to analyze and ultimately make a decision. The factors included: nature of the sport, influence of players, time of the season, location of the contest, weather conditions, transportation, coach's personal problems, officials, assistant coaches, season record, injuries, importance of the game, game score, pressure to win, and coach's personality characteristics. With so many factors to consider, the cognitive processes of coaches may become hindered or distorted. Cognitive distortions and disturbances in the process of decision-making have been central topics for research, particularly in the 1970s (Tenenbaum & Bar-Eli, 1993), where judgements and decisions in various environments have been studied (Tversky & Kahneman, 1974). Tenenbaum and Bar-Eli concluded that in the athletic environment, in which dynamic revision of information is continually required, decision-makers (e.g., coaches) will suffer from substantial cognitive overload and strain, which will often result in less-than-optimal decisions. Trudel, Bernard, Boileau, and Desharnais (1992) employed a yes/no model on teachers' interactive decision-making with youth ice hockey coaches when they implemented a bodychecking intervention program. The model was employed in an effort to help coaches make decisions on the performance of players. Little research has been conducted in this area however.

Among the few studies on the decision-making by coaches in games, the one by Duke and Corlett (1992) on the criteria that university women's basketball coaches used when calling a timeout must be reported. The study showed that the coaches perceived the physical state of the players as most often leading to a timeout, followed by strategic concerns and responses to offensive and defensive events. The players' attentional and emotional states were perceived as least often leading to a timeout. It was suggested that by decreasing game patterns to just a few factors, coaches have a greater opportunity to engage in rational decision-making about their interventions.

Duke and Corlett (1992) also stated that when coaching is discussed in terms of decision-making strategies, it is most frequently done in the context of leadership theory. Coaches' decision style can either be viewed as autocratic, democratic, delegative, or participative, with all of these dimensions being placed on a continuum ranging from total to no influence at all. This area of research has focused on sport leadership identifying the decision-making style of coaches. Chelladurai and Haggerty's (1978) Normative Model of Decision Styles in Coaching has been the basis for three important studies in this area (Chelladurai & Arnott, 1985; Chelladurai, Haggerty, & Baxter, 1989; Gordon, 1988). These studies used questionnaires, which described certain problem situations, and the subjects were asked to select which decision-making style (autocratic, democratic, delegative, or participative) they would use to solve the situation. Coaches were asked to respond to the questionnaire with the style they would use in making a decision. Athletes responded to the questionnaire identifying the style they thought their coach would use and what style they preferred their coach to use. The results of these studies indicated that the problem situation and its attributes influenced the type of decision-making style used. For example, coaches and players tended to prefer more

autocratic styles for dealing with complex problems requiring quality decisions and for dealing with trivial problems. Côté (1993) suggested that coaches should not be labelled as autocratic or democratic because specific situations require either autocratic or democratic decision-making styles.

In coaching, researchers have used techniques such as questionnaires to extract information on thought processes. However, in teaching, researchers have used various techniques such as think aloud, and concurrent probing, which allowed for the retrieval of data from teachers while they were planning. It has been suggested, however, that probing teachers or having them think aloud while teaching, would upset or distort classroom processes (Yinger, 1986). The investigation of the cognitive process has led to a need for special methodology such as stimulated-recall (Ericsson & Simon, 1993), which has been used to study teachers' interactive thoughts and decisions in the classroom and gymnasium (Gilbert & Trudel, 1993). The stimulated-recall interview technique might be appropriate for the investigation of coaches' interactive thoughts and decisions.

Coaches' Actions and their Observable Effects

Clark and Peterson (1986) suggested that there is a link between thought processes and actions. Due to the nature of the present study, the remainder of the literature review will focus on the actions of coaches. It has been shown that during games, youth sport coaches emphasized greatly the outcome of winning in contrast to the performance process (Chaumeton & Duda, 1988, Dubois, 1981; Hastie & Saunders, 1992). In a related study, Strong (1992) showed that although coaches may rate "developing children's sportmanship and skills" as their primary goal, their behaviors in games and practices were not always directed towards this goal, but more towards

winning. Systematic observation of coaches has been used as a way of identifying coaches' behaviors during both training and competition (Claxton, 1988; Lacy & Darst, 1985; Lacy & Goldston, 1990; Trudel, Côté, & Bernard, 1996). Studies have shown that coaches' behaviors in competition are different from those during training (Chaumeton & Duda, 1988; Horn, 1985; Wandzilak, Ansorge, & Potter, 1988). In competition, studies in tennis (Rupert & Buschner, 1989) and ice hockey (Trudel et al., 1996) have shown that coaches, in these sports, pass nearly half of their time in silence, observing without interacting with players. From these studies, it can be hypothesized that half of the time, the coach was observing the situation and analyzing factors prior to conducting an observable behavior.

From all the studies conducted examining the behaviors of coaches, Douge and Hastie (1993) identified five behaviors of effective coaches. They stated that effective coaches do the following: (a) frequently provided feedback and incorporated numerous prompts and hustles, (b) provided high levels of correction and reinstruction, (c) used high levels of questioning and clarifying, (d) were predominantly engaged in instruction, and (e) managed the training environment to achieve considerable order.

Methods

The observation of coaches' behaviors should act as a stepping stone for the proposed study on decision-making factors influencing youth ice hockey coaches in games. The adapted model of coach thought and action suggests that there is a link between how the coaches think and how they react. An innovative approach should be used to study this possible link. Instead of concentrating on one component inside one domain of the model, the process should start with an observable behavior and then investigate the component of the thought processes domain related to that behavior. It is

with this perspective in mind that the present study was conducted.

The Data Base

The research study was part of an ongoing research project on the cognitive aspect of coaching in amateur ice hockey. During the 1994-1995 ice hockey season, six youth ice hockey coaches, from two minor hockey associations, volunteered to participate. Each coach received an information sheet (see Appendix D) regarding the research project and signed a consent form (Appendix E) prior to collecting the data. Data were collected by four research assistants, including myself.

Data were obtained through: (a) transcripts of background interviews, (b) transcripts of short interviews before and after the training sessions or games, (c) videotapes of the training sessions or games, and (d) transcripts of stimulated-recall interviews using the videotapes. These different steps in the data collection process were integrated in a specific research strategy with the objective being to investigate the cognitive aspects of coaching (Trudel, 1995).

Background interviews. The first step in the data collection process was to interview each coach regarding: (a) their coaching experience, (b) playing experience, (c) description of their current team, (d) the nature of a typical game, and (e) a typical practice, and (f) the planning for training and competition. All background interviews were based on an interview guide (Appendix F). These interviews were audiotaped and later transcribed for analysis.

Pre-game/practice and post-game/practice interviews. A pre-game/practice interview was conducted with the coaches to enquire about their plan and comments regarding this plan, while a post-game/practice interview examined the decisions the coach could recall and if frequent in number, the key decisions they chose to discuss.

The post-game/practice interviews were audiotaped and used in the stimulated-recall interview sessions.

Videotapes of coaching sessions. The coaches were videotaped while coaching their team in four games and four practices. One of the coaches was videotaped for an additional eight games. Each wore a wireless microphone while coaching. The videotapes were used for the stimulated-recall interview sessions. Also, the videotapes enabled the research group to conduct systematic observation of the coaches at a later time.

Stimulated-recall interviews. After the on-ice session, a research assistant prepared the material needed to conduct a stimulated-recall interview with the coach, which occurred one to two days after the game/practice. The selection of the videotaped sequences to be shown, as well as the conduct of the interview, were based on a predetermined research protocol (Trudel, 1995). Three types of events, which were situations that occurred during the game/practice, were part of this protocol (Type I, II, and III). The Type I events referred to situations brought up by the coach in the post-game/practice interview, in which a decision was taken. These decisions made up the first part of the stimulated-recall interview session, where the research assistant asked the coach to comment upon the event. The questions asked by the research assistant contained cues mentioned by the coach in the post-game/practice interview. For example, "You mentioned in the post-game interview about a key decision that occurred late in the game. Do you recall?" The coach then had time to think and elaborate on it. The sequence of video was then presented to check the accuracy of the coach's recall and let the coach provide more explanation if needed.

The Type II events were based on the research assistant's selection of situations in

which the coach made a decision. These selected events made up the second part of the stimulated-recall interview. The questions asked by the research assistant for the Type II events, contained information cues about the situation. For example, "During the game, there was a particular time when one of your players came to the bench and there seemed to be something wrong with him. One of your players asked you what was wrong with him. Do you recall that happening and do you remember your reaction?" The coach answered the question and then the video clip was presented and the coach could add more information if he/she wished. The third type of event consisted of three, five minute video segments of the game/practice randomly selected by the research assistant. In Type III, the coach viewed the videotape and commented on his/her actions, with fewer questions from the research assistant.

The Research Study

In the present study, only a part of the data base has been used. The first decision was to limit the study to game situations, due to the differences in coaching interventions in game and training sessions (Côté, Salmela, & Russell, 1995; Wandzilak, Ansorge, & Potter, 1988). Second, the overall research project favored a case study approach. This approach suggests that a deeper understanding of one coach is more appropriate than a glance at many coaches. Based on this assumption, the coach observed during 12 games became the best candidate. This decision was also based on the fact that the data collection with the other coaches was considered to be a pilot study to develop the research strategy.

Subject. The subject in this study, who will be called Martin, was coaching a Major PeeWee "AA" ("AA" is the highest level of competitive amateur ice hockey in the region) competitive male ice hockey team (12-13 year olds). Martin was a certified

Intermediate-Level III coach through the joint National Coaching Certification Program (N.C.C.P.) and the Canadian Amateur Hockey Association (C.A.H.A.). His experience as a player was competitive "AA" ice hockey up to Midget (16-17 years old). He became an assistant coach with a Minor Bantam "AA" team (14-15 year olds) for one year and then an assistant coach with a Major PeeWee "AA" team (12-13 year olds) for another year. In his third year of ice hockey coaching, Martin became the head coach of his current team (1994-1995).

Data analysis. The data analysis favored an inductive approach and a special procedure was developed to enhance validity of the data. First, all analysis was conducted by the researcher and a fellow researcher. The two researchers involved were very knowledgeable in the area of ice hockey and played at the competitive level. Second, for each game, the corresponding video was reviewed to help become familiar with the game setting. Third, in the process of developing categories of factors, the two researchers discussed findings at weekly research group meetings.

The analyzed data consisted of one background interview transcript, 12 stimulated-recall interview game transcripts, and 12 game videotapes. The background interview of the coach was first reviewed, in an effort to gain a general context for the coach. Following this, the two researchers reviewed two stimulated-recall interview game transcripts on their own to get familiar with the content.

Following a discussion on how to code the data, McPherson's (1993) coding procedure was selected and adapted. For each event discussed in the stimulated-recall interview and that later appeared in the transcripts, three questions were asked: what is the action?, what is (are) the goal(s)?, and what is (are) the factor(s)? The action referred to the decision taken by the coach during the game, such as talking to players on the

bench. The goal referred to the purpose of an action taken by the coach, for example, to get the best players on the ice. The factor(s) referred to the element(s) taken into consideration by the coach and represented the basis for an action, such as statements concerning the score or the player(s) performance.

The initial two stimulated-recall interview game transcripts were reviewed again and analyzed by the researcher and a fellow researcher employing McPherson's (1993) coding procedure. Following discussion on their results, a preliminary list of actions, goals, and factors were prepared and presented to the research group for discussion. A consensus was then reached, within the research group, to only analyze and code the Type I and Type II events, since Type III were basically commentary remarks made by the coach about the game or remarks explaining some elements of his general style of coaching.

Throughout the analysis of the 12 stimulated-recall interview game transcripts, the preliminary list was inductively modified regarding the three dimensions (actions, goals, and factors). A data sheet was used to record the action, goal, and factor(s) for each event (see Appendix G) contained within the transcripts. Also, for each game, the researcher charted the event, the type, the time it occurred, and the score (see Appendix H for example of a game chart).

To assure the validity of the data, each interview transcript was reviewed, after finishing the 12 game analysis, to ensure that similar information was coded in the same manner and no data were left out. Moreover, to check the reliability of the procedure used to analyze the data, which consisted of two researchers independently analyzing an interview transcript and then meeting and discussing to agree on a final result, two games were randomly selected and analyzed again using the same procedure. The intra-

observer reliability score was estimated by the number of agreements: $(\text{number of agreements} \div \text{number of agreements} + \text{disagreements}) \times 100 = \text{reliability percentage}$. The estimates were based on what was coded during the first analysis versus what was coded from the reliability check in the second analysis. The percentage of agreement reached was 93% for the factors and goals and 92% for the actions.

Results

Before presenting the results, it is important to outline the context in which the 12 games were played because it has been suggested that the winning or losing record of a team and the game score differential affects coaching behaviors (Côté, Trudel, Bernard, Boileau, & Marcotte, 1993; Dubois, 1981; Weiss & Friedrichs, 1986), which implies the decision-making process. The coach's team record for the 12 games was seven wins, five ties and zero losses with 40 goals scored and 19 allowed. The score was tied at least 50% of the time and the coach's team was losing only 4.4% of the entire time.

Since the procedure used to collect the data is unique, and has never been used with volunteer coaches, the first section of the results will answer the following question: Is the stimulated-recall interview technique appropriate for the investigation of coaches' thought processes? The second part of the results will answer the second research question: What are the decision-making factors that youth ice hockey coaches consider during games? To answer that question, over 160 single-spaced pages of interview transcripts were analyzed to provide information on three dimensions: the actions, the goals, and the factors. A one-page summary of the results appears in the appendices (see Appendix I).

The Research Strategy

In the present research, three types of events were discussed with the coach

during the stimulated-recall interview. Type I events were based on the game decisions that the coach selected to discuss immediately following the game. Type II events were selected by the research assistant from the game videotape, and contained a diversity of actions taken by the coach during the game. Type III events consisted of three, five minute video segments of the game, which were randomly selected by the research assistant. Only the Type I and Type II events were analyzed in the current study. The Type III events were not analyzed since they were basically commentary remarks made by the coach about the game or his general style of coaching.

During the interview, the research assistant provided a few cues, about selected events (Type I or Type II), to let the coach try to recall the events and talk about them. The video was then presented to verify the accuracy of the coach's recall and give him the opportunity to comment further. Since the stimulated-recall interview was conducted a few days after the game, it is important to evaluate how well the coach was able to recall the events.

For Type I events, Martin was able to recall almost exactly what he had discussed in the post-game interview. The recall was generally very precise and the video acted to reinforce what the coach had just recalled and very rarely was new information given to Martin. The following is an example.

Post-game interview:

Research assistant: Are there any decisions that you took during the game that really stand out in your mind?

Martin: The only decisions that stand out in my mind are a couple at the end. At the end of the period one time, when we were killing a penalty, I put two centremen on in case one gets thrown out of the draw and he did. So I had another centerman there to take the faceoff.... The last one at the end of the game was basically taken because we've got a small centreman that is not very strong. I kept him off the

ice to put a stronger player on to try to win the faceoff because [opponents] are all strong players. I mean all our guys are physically strong but one isn't, so I kept him off just because I wanted a strong guy in for the faceoff. The other one was at the end of the game too. I pulled off a kid because he didn't get the puck out and he knew what he did wrong. I pulled him off and I explained to him that I just told you guys that I wanted you to get the puck out so I don't want you guys deaking around the defensemen to go score another goal. We are up 4-1 so let's not take any chances. I mean he took a chance so he knows why he got pulled off.

At stimulated-recall interview:

Research assistant: After the game you mentioned that near the end of the game you made the decision to pull one of your players for a certain reason. Do you recall that?

Martin: Yes I do..... It started out with about two minutes left in the game. I told the kids we have to get the puck out at all costs. We were winning 4-1 at the time. If the other team is out of our zone, they can't score a goal. I told them that if you get the puck at the hash marks, it's not time to try to deak two or three of their players to get it out. [The opponent] had pulled their goalie and I didn't want my players to try to deak some players to get a shot on net and a goal. So I specifically told them not to deak their players but to just get the puck out. You don't ice it because then the faceoff is back in our end. What you do is get the puck out. That time, one kid, after I had harped on it for about a minute and a half on the bench, he goes on and tries to make a deak on the defenseman. The defenseman steals the puck from him and our player ends up in the neutral zone. The puck is in our zone and it's a 6 on 4. [The opponent] gets a shot, our goalie makes a save, there's a whistle and there is a faceoff so I pulled that kid off and I put another kid on for the draw.

Research assistant: I will show you the video sequence and feel free to comment any further (video of event is shown to coach).

Martin: Yes, that's pretty much what I did. I didn't sit there and give the kid crap but I reminded him that he had to get the puck out.

For the Type II events, Martin's recall was very good and for the majority of the

time, he was able to recall the situation almost perfectly, based on the cues given by the research assistant. However, it should be noted that additional cues were given to the coach for the Type II events, compared to Type I events, in order to provide information on the setting. If the coach required the video, it was usually just to clarify the cues given and this measure rarely occurred. Very rarely did the coach not remember an event. The four most common sequences (in order) that evolved from the Type II events were: (a) cues given to coach with excellent recall from the coach, (b) cues given to coach, coach asks for more cues, additional cue(s) given, with excellent recall from coach, (c) cues given to coach with some recall by coach but needs video for more information, after seeing a few seconds of the sequence has better recall, and (d) cues given to coach, no recall by coach so he asks for more cues, additional cue(s) given, still no recall by coach so video was used.

The next two examples of Type II events will illustrate just how well Martin was able to recall. The first example, which was the most common sequence, shows that Martin had very good recall and that the video was only required to reinforce his comments.

At stimulated-recall interview:

Research assistant: The other team has just scored that short-handed goal that you've been talking about. Your defenseman then comes onto the bench and says something about his stick. Do you remember what you responded to there?

Martin: Oh yes. He's looking at the stick and he says I think I broke it or something like that. So I told him it's not the stick guy, it's the player. I let him know not to look at his stick because I'm not stupid.... That's the guy who loafs alot. He takes everything nonchalantly. So I wanted to show him that I was seriously pissed off. I seriously looked at him and told him that it wasn't the stick but rather the player behind the stick.... First of all, that wasn't the pass to make on the powerplay breakout. The pass to make was to the

guy curling right beside him, not to the wide guy who was going to cut up the middle after. Secondly, I didn't like the way that he made the pass. He had the puck way behind him and he just tried to flick it with the wrists. Of course it's going to get intercepted. It was a terrible pass so it really upset me.

Research assistant: Here it is (video shown).

Martin: He's saying that he cracked it (stick) but then he used it for the rest of the game. Come on guy.

The second example reveals a rare instance where Martin could not recall an event, selected by the research assistant. However, after viewing the video sequence he was able to recall the event.

At stimulated-recall interview:

Research assistant: The next event occurred during the second intermission. You gave the players a speech that was clearly motivational rather than instructional. Why did you choose to deliver that type of speech instead of touching upon certain technical aspects of their play?

Martin: What exactly did I say?

Research assistant: Seeing as you don't remember, we'll take a look at it first and then you can comment. (After viewing video) That last little point was the only instruction that was given.

Martin: I just thought that we should have been playing much better than that team so I tried to boost them. We weren't playing like we should have been.... In the second period, we came down a notch and we weren't playing better than them. So I told the guys that we we're better than them and that we had to play above them. That's why it wasn't instructional. We weren't doing anything wrong, our effort just wasn't as intense as it was during the first.

Elements of the Interactive Decision-Making Process

Actions. The actions and goals will first be presented to give information or context about the factors. A total of 144 events were discussed with Martin during the 12 stimulated-recall interviews and for each event, an action was identified. The 144

actions were divided into six categories (Table 1). The first five categories referred to verbal actions while the last one referred to non-verbal actions. A "non-verbal action" occurred when the coach intentionally said nothing or did nothing (e.g., the coach states he said nothing to player in order to remain calm). The action, "change player(s)" was considered a verbal action but distinct on its own because often the coach would not say he talked to a player(s) but just made a change. Definitions for each of the actions appear in Appendix J.

Over half of the total actions, discussed with Martin, referred to the coach talking to one or more players (52.8%). The next most discussed action was when the coach changed players. In the 12 stimulated-recall interview sessions, Martin was rarely asked to discuss the action of talking to his assistant coaches or game officials. Even more rare was the opportunity to discuss non-verbal actions.

Table 1

Distribution of Actions (n = 144) Per Type of Event

Actions	Type I		Type II		Total	
	f	(%)	f	(%)	f	(%)
Talk to 1 player	9	27.3	30	27.0	39	27.1
Talk to 2 or more players	3	9.1	34	30.6	37	25.7
Change player(s)	16	48.9	12	10.8	28	19.4
Talk to assistant coach(es)	4	12.1	14	12.6	18	12.5
Talk to game official(s)	1	3.0	12	10.8	13	9.0
Non-verbal action	0	0.0	9	8.1	9	6.3
Total	<u>33</u>		<u>111</u>		<u>144</u>	

Throughout the 12 games, there were 33 actions from Type I events discussed by

Martin. These actions were decisions, taken during the game, that he chose to discuss following the game. For these 33 actions, 29 (88%) occurred in the third period and 20 of the 29 (69%) occurred in the last 10 minutes of the game (Figure 1). Changing players (48.9%) seemed to be the dominant action that Martin recalled and discussed for the Type I events. Talking to one player was the next most discussed action.

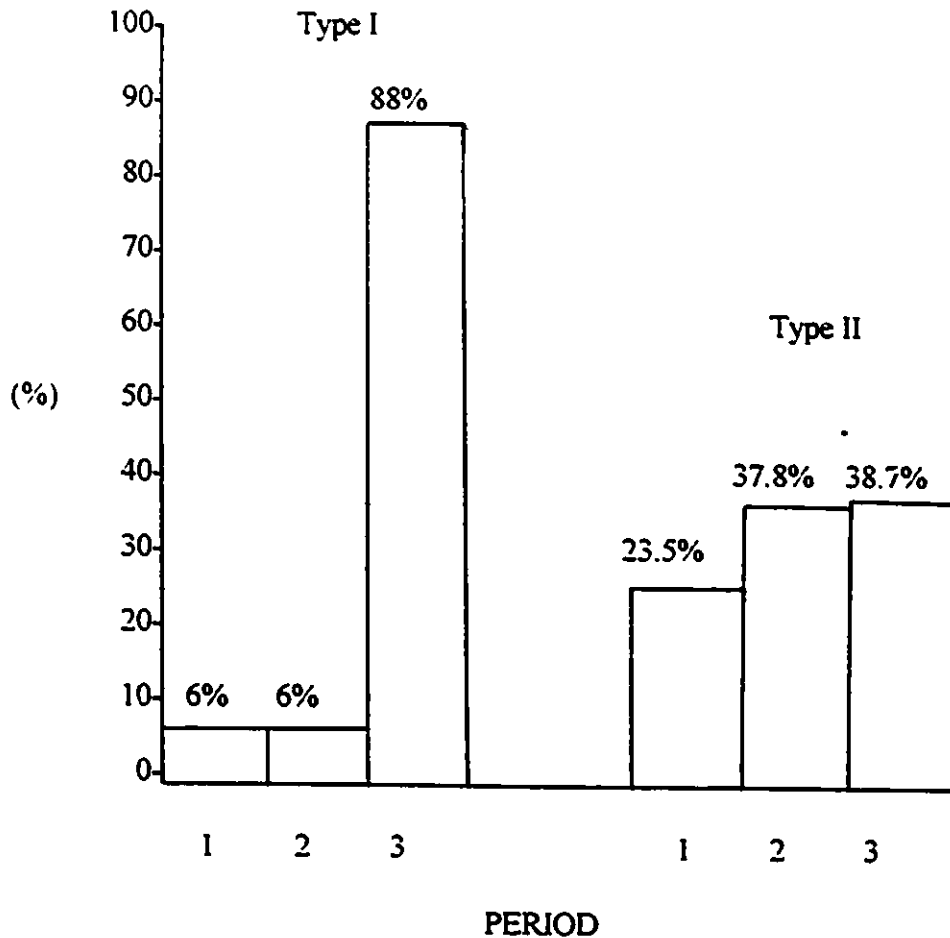


Figure 1. Distribution of Type I events ($n = 33$) and Type II events ($n = 111$) per period.

In Type II events, a total of 111 actions were recorded. The actions were selected by the research assistant after reviewing the game videotape and as shown in Figure 1, they were evenly spread throughout the game. In contrast to the actions selected by the coach to discuss, actions from Type II events were more spread over the six categories, with a predominance in talking to players. Talking to one or more players represented

57.6% of the actions from the Type II events as opposed to 36.4% for Type I. Also, the category "changing players" represented just over 10% of the actions, which contrasts with the 48.9% of the actions from Type I events.

Goals. Five major goals were identified from the transcripts. Definitions for each goal appear in Appendix K. Every action had at least one goal, with 38 actions having two goals. Table 2 presents the distribution of the five types of goals for the 144 events selected by either the coach (Type I) or research assistant (Type II). Globally, the goal "informing or giving feedback" was predominant (47.8%), followed by "organizing" (30.8%).

There were a total of 35 goals that emerged from the 33 actions in Type I events. The two most identified goals were "organize" (n=20) and "inform/feedback" (n=13). This reflects the most discussed actions in Type I events, which were to change player(s) and talk to players.

Table 2

Distribution of Goals (n = 182) Per Type of Event

Goals	Type I		Type II		Total	
	f	(%)	f	(%)	f	(%)
Inform/Feedback	13	37.1	74	50.3	87	47.8
Organize	20	57.1	36	24.5	56	30.8
Stimulate/Encourage	2	5.7	20	13.6	22	12.1
Discipline	0	0.0	14	9.5	14	7.7
Observe/Silence	0	0.0	3	2.0	3	1.6
Total	<u>35</u>		<u>147</u>		<u>182</u>	

The goals, of actions in Type II events, were different than those in Type I events. A total of 147 goals were identified for the 111 actions and the goal "inform/feedback" accounted for 50.3% of the goals. The goal "organize," was second with 24.5%. The goals "stimulate/encourage," "discipline," and "observe/silence" emerged more in the Type II events as compared to actions in Type I events.

Factors. For the 144 actions, a total of 466 factors were identified, which translated into an average of 3.2 factors per action. The number of factors per action did not seem to be affected by the type of event since for the 33 actions in Type I, 121 factors emerged ($M = 3.7$) and for the 111 actions in Type II, 345 factors were recorded ($M = 3.1$).

The first step in analyzing these factors was to regroup similar factors, which produced 22 types of factors. The 22 different types of factors were broken down into two main categories: (a) field information and (b) coach knowledge. The "field information" category referred to information accessible only during the game. The category was further divided into two sub-categories, which were identified as "indirect information" factors and "direct information" factors. The sub-category, "indirect information," referred to judgements or evaluations, made by the coach, to actions occurring during the game, such as a player's performance on the ice. The sub-category, "direct information," referred to the situation that described the game setting (e.g., short-handed/powerplay, game score). Table 3 illustrates the breakdown of the categories and sub-categories of factors.

The "coach knowledge" category referred to the knowledge that the coach brought to the game or gained from the game. The category was divided into two sub-categories: "characteristics of the players" and "knowledge of the game." The sub-

category, "characteristics of the players," referred to team or player(s) characteristics (including opponent) mentioned by the coach, such as skill level. The sub-category, "knowledge of the game" referred to the coach's past experience and/or knowledge of the game (rules, game importance). Definitions of the categories, sub-categories, and factors, appear in Appendix L.

Table 3

Distribution of the Categories and Sub-Categories of Factors Per Type of Event

Category	Type I		Type II		Total	
	f	(%)	f	(%)	f	(%)
Field Information						
Indirect Information	36	29.8	152	44.1	188	40.3
Direct Information	42	34.7	110	31.9	152	32.6
Coach Knowledge						
Characteristics of the Players	36	29.8	58	16.8	94	20.2
Knowledge of the Game	7	5.7	25	7.2	32	6.9
Total	<u>121</u>		<u>345</u>		<u>466</u>	

Of the 466 factors that emerged from the data, the sub-category of indirect information accounted for the greatest representation of factors (40.3%), followed by direct information (32.6%). If these percentages are combined, it appears that more than 70% of the factors that Martin considered, when making a decision, came from information taken during the game.

Differences were noticed regarding Type I and Type II events in that factors

related to subjective evaluation during the game (indirect information) were 14.3% higher in Type II events compared to Type I. In contrast, Martin referred to factors related to the team/player(s) characteristics 13% more in Type I events. No single sub-category of factors dominated Type I events, since the three main sub-categories were around 30%.

Table 4 presents an overview of the categories of factors considered for the discussed actions. For the 144 actions, 60.4% contained factors within both the field information and coach knowledge categories. When reporting factors related to actions in Type I events, over 75% of the time Martin considered field information factors along with coach knowledge factors. Specifically, Martin considered factors contained within both categories nearly 20% more for actions in Type I events versus Type II events. In contrast, Martin considered factors solely from the field information category 22% more for Type II events compared to Type I events. Factors related to the discussed actions rarely centred only on the coach's knowledge.

Table 4

Distribution of the Categories of Factors Considered Per Type of Event

Category	Type I (n = 33)		Type II (n = 111)		Total (n = 144)	
	f	(%)	f	(%)	f	(%)
Field Information Only	7	21.2	48	43.2	55	38.2
Coach Knowledge Only	1	3.0	1	0.9	2	1.4
Field Information and Coach Knowledge Combined	25	75.8	62	55.9	87	60.4

Factors Within Sub-Categories. Table 5 presents the distribution of the 466

followed closely by game score outcome (n=39), time of game/time restraints (n=39), habits/history of team or player(s) (n=39), game official(s) performance (n=33), skill level (n=30), and the coach's previous actions (n=29).

The dominant factor for actions in Type I events was skill level. For the 33 actions, skill level of the team/player(s) was a factor 16 times. The next most common factors were the time of the game/time restraints (n=12), game score/outcome (n=10), habits/history of the team or player(s) (n=9), physical attributes of the team or player(s) (n=8) and player(s) performance on the ice (n=8).

The most common factor that was cited by the coach for actions in the Type II events was "player(s) performance on the ice," which was considered 34 times. The next most common factors were habits/history of the team/player(s) (n = 30), game score/outcome (n = 29), game time/time restraints (n = 27), game official(s) performance (n = 26), team performance (n = 25), and the coach's previous actions (n = 24).

Discussion

The first section of the discussion will focus on the validity of the research strategy. The second part of the discussion will concentrate on the results, in particular, the factors considered by the coach during games.

Validity of the Research Strategy

As demonstrated by the interview transcript excerpts in the results section, the coach was able to recall selected events very well. The only study that investigated the subject's ability to recall was Gaier's (1954). Gaier's study on the technique of stimulated-recall revealed that subjects had 95% recall one day later after the actual event had occurred. The coach in this study had a comparable rate of recall, which was not tabulated in percentages but rather through the coach's description of an event without viewing the video. The video

offered the evidence of the coach's actions and permitted the researcher to evaluate the extent of the coach's recall.

However, there were some limits to the capability of the coach to fully remember events selected by somebody else. Researchers have discussed the possibility of some behaviors becoming "automatic" or routine, therefore limiting the subjects' recall of these events (Calderhead, 1981; Ericsson & Simon, 1993). There were a few instances, although very rare, where Martin seemed to have forgotten about his behavior, which may have been a routine or "automatic" behavior for him. For example, it was common for Martin to speak to all his players at the bench, at the end of each period, during the brief intermissions.

The results of the current research study provides support for the combination of the three types of events that can be used in stimulated-recall interviews. By employing only Type I events in a research strategy, a bias from the coach's viewpoint would exist. In this instance, 88% of the discussed actions occurred in the third period, with 69% of these actions occurring in the last 10 minutes of the game. Does this indicate that the coach only felt that decisions late in the game were important or that he couldn't recall earlier game decisions? Additionally, Type II events were selected by the research assistant to discuss with the coach. If Type II events were solely used as the research strategy then a bias may exist from the research assistant's viewpoint. The events selected may not be unique to the coach or seem unimportant to the coach. Due to the nature of the current study, the Type III events were not analyzed. It was found that the coach was commenting more on the videotape angle (as an observer) rather than a coach in action. This is in accordance to Yinger's (1986) suggested limitations of stimulated-recall where the subject had to comment while viewing a video sequence of his/her teaching.

The present methodology was employed over the course of 12 games. This required a

great deal of time on behalf of both the research assistant and the coach. How much time in the field do researchers really need in order to enquire about the thought processes of coaches? Interestingly, the methodology used in the present study elicited 21 of the 22 types of factors, considered by the coach, in the first four games. The only factor not discussed in the first four games was game importance, which wasn't discussed by the coach until much later into the study. The first four games were regular season games and occurred very early in the ice hockey season. Looking at the frequencies of factors, the top ten most discussed factors for the 12 games were also the top ten factors discussed in the first four games. The present research strategy seems to indicate that with four games, a researcher can acquire enough information to identify the main decision-making factors of coaches during games.

The adaptation of stimulated-recall with Type I and Type II events, can be a new way to study the cognitive aspect of coaching and even teaching physical activity. To date, the physical education teaching research has only employed Type III events as the methodology of choice, where the teacher comments on an entire lesson while viewing the videotape or comments on certain segments (e.g., six, four minute segments) of the lesson (Byra & Sherman, 1993; Ennis, 1994; Housner & Griffey, 1985). The combination of the three types of events will definitely allow researchers to gain a broader understanding of the cognitive processes of the coach.

Actions, Goals, and Factors

The results of the present study revealed that Martin selected to discuss the action (Type I events) of "changing a player(s)" approximately 50% of the time during the post-game interviews. Additionally, for actions in Type I events, the most identified goal was "organize." In contrast, for Type II events, communication with one or more players were the most discussed actions, occurring nearly 60% of the time, with the most identified goal being

"inform/feedback." This indicates that the actions and goals are in line and as McPherson and Thomas (1989) stated, "actions are influenced by the current goals" (p. 192).

Organization seemed to be very important to Martin for the discussed actions. This should not be a surprise since organization of the players is an important role of the coach during games. Trudel, Côté, and Bernard (1996) using an interval recording procedure to investigate ice hockey coaches behaviors during games, revealed that the two most frequent behaviors of a coach during games were "observe without talking," for 51% of the time and "organize players," which occurred 15% of the time. They concluded that this may be unique to ice hockey:

The relatively high frequency of organization behavior during games might be particular to ice hockey, a sport in which the combination of players (three forwards and two defencemen) might change rapidly according to variations in game situations (e.g., the power play or a man disadvantage). (p. 169)

In the Trudel et al. (1996) study, they also found that 10.9% of coach behaviors were spent teaching (inform/feedback), which was third in order of frequent behaviors (observe, organize, teaching). In the current study, the goal "inform/feedback" was an important one and related to the high frequency of discussed actions related to communication with players. Communication with the assistant coach(es) and game officials were selected actions discussed at a smaller level than talking to players, which is in line with the Trudel et al. study.

The current study has shown that Martin, during games, considered factors related to his knowledge and in a larger portion, to factors coming from the game itself. In many instances, he combined the two (60% of the time) or used only factors in the field information category (38% of the time). These findings are in accordance to Graham, Manross, Hopple,

and Sitzman's (1993) study where they suggested that teachers were situational decision-makers and the more experienced teachers based decisions on class characteristics and their own past experience.

The importance of the field information has been indirectly addressed by several authors. Cratty (1971) described the coaching context and suggested that a coach must make judgements about individual or team performance (indirect information factors in the current study) and that decisions are influenced by specific sports situations (direct information factors). Also, Grieve (1982) described the many factors a coach must consider during competition, in particular, information from the game itself, such as game score and outcome, injuries, time of the season, players influence and game officials' performance.

The importance given by Martin in the type of decisions he decided to talk about after the game (Type I events), might be linked with his effort to do what he can to win the game. As cited before, for the 12 games, the score was tied 50% of the time and the games were usually very close, in terms of score. The main action Martin discussed was to organize players and the factors that dominated were skill level, time of game, game score/outcome, habits/history, and physical attributes. In one sentence this can be translated into the following scenario: At the end of a game, when the score is close, Martin will organize his players by sending the best players onto the ice whom have proved to be able to perform. Martin often expressed this during the various interviews.

At post-game interview:

I double shifted them because they were playing well [players performance]. At the end, I sat three guys out because I wanted to go for the win [game score/outcome]. During the last two or three minutes [time of game/time restraints], three guys didn't see the ice because I wanted to win [game score/outcome]. It was 2-2 [game score/outcome] in a game that we should have won [game score/outcome] so I sat down the kids that I felt couldn't put the puck in the net [skill level]. So I sat them down and I took it from there.

At stimulated-recall interview:

It was a decision that I took because I was going for the win [game score/outcome]. I don't like ties [game score/outcome] and especially not against this team so I was going for the win [game score/outcome]. That's all. I always go for the win [game score/outcome]. In the last part of the game [time of game/time restraints], it is my decision to do what I think is right for the team.

This winning attitude for coaches has been found in the literature (Chaumeton & Duda, 1988; Dubois, 1981) and was expressed by Martin in this way:

At post-game interview:

I sat those three kids at the end. I still feel bad but I don't want to take a chance. It's "AA" hockey. I have to do it, I think. They played a good game but I didn't want to lose 1-0. At one point, I told one of my coaches that if I lose, I'll do it with my best six guys. I'll accept losing with those six players but if I lose because I sent on my seventh, eighth and ninth best forwards, I won't be able to live with myself. And like a lot of people say, if you can answer to the guy in the mirror, then you're okay. So that was my way of looking at it. Sometimes, I don't really like going into the canteen area for a coffee because I just sat three kids. I feel bad about it but what can I do?

The early yes/no models of decision-making (Hoffman, 1983; Peterson & Clark, 1978; Shavelson & Stern, 1981) suggested that teachers based their decisions only on students behavior and whether the behavior was within tolerance. However, it has been suggested that these early models may not be accurate reflections of the decision-making processes that teachers engage in during interactive teaching (Clark & Peterson, 1986). Marland (1977) found that the majority of teachers reported that deliberate acts did not occur solely in response to student behavior but rather in response to other factors. Factors such as judgements about the environment, the teacher's state of mind, or the appropriateness of a particular teaching strategy have been reported in various teaching studies (Clark & Peterson, 1986). Based on these findings, Clark and Peterson suggested that neither Peterson and Clark's (1978) nor Shavelson and Stern's (1981) models of teacher interactive decision-making are sufficient. They have suggested that models of teacher interactive decision-

making should "reflect the finding that the majority of teachers' reported decisions are preceded by factors other than judgements made about the student" (p. 277). Also, they suggested that a model of teacher interactive decision-making should not reflect a choice of actions from several possible alternatives but rather "reflect the definition of interactive decision-making as a deliberate choice to implement a specific action" (p. 277).

The results of the current study revealed that players' behaviors or performance were common factors related to the decisions made by the coach but there were many other factors that were just as common. This gives support to Clark and Peterson's (1986) suggestion that the majority of teachers' reported decisions included factors other than just judgements made about the behavior of students and that the yes/no models are limited when investigating thought processes. In the current study, Martin considered factors related to the game setting, characteristics of the team or players, and coach history/experience, in addition to judgements or evaluations of individuals. This excerpt is a good example.

The referee had been making so many bad calls [game official performance] that the players were blaming [players behavior on bench] all the penalties on him. But this one was not the referee's fault. This one was a big time bad play by my defenseman [player performance on ice]. It's something that he always does in practice [habits/history] and something that I always have to talk to him about [coach history/experience]. He then does the same thing in a game [player performance on ice]. It frustrated me because it was a big time penalty. The players had no reason to blame the referee on that one [players behavior on bench]. It was a good call [game official performance].... On that one I was upset with him because it was the end of the game [time of game/time restraints].... I would have told the players to stay away from penalties like that at any time in the game. It's just a bad play by my defenseman [player performance on ice].

Conclusions

The use of Type I and Type II events in the current research study is a promising step for the investigation of the cognitive aspect of coaching. The current study demonstrated that a coach can recall, with precision, events that happened a few days ago. This is very interesting for studies in the natural setting where subjects can not participate in a stimulated-recall interview immediately after their intervention.

Results on the decision-making factors used by the coach, Martin, suggests that models on decision-making during games, would have to consider many factors other than just the performance of players. Regarding which factors are the most frequently considered, one has to be careful before generalizing the results of this study, since case studies lack this dimension. However, the methodology developed in the current study, along with the list of factors identified, can be used as a basis for the investigation of the decision-making process of ice hockey coaches at different levels and even of coaches in different sports.

More case studies on the cognitive aspect of coaching should be conducted in an effort to gain a greater insight into the interactive decisions made by coaches. Additional information is required in this area, which could be beneficial in the coaching education process.

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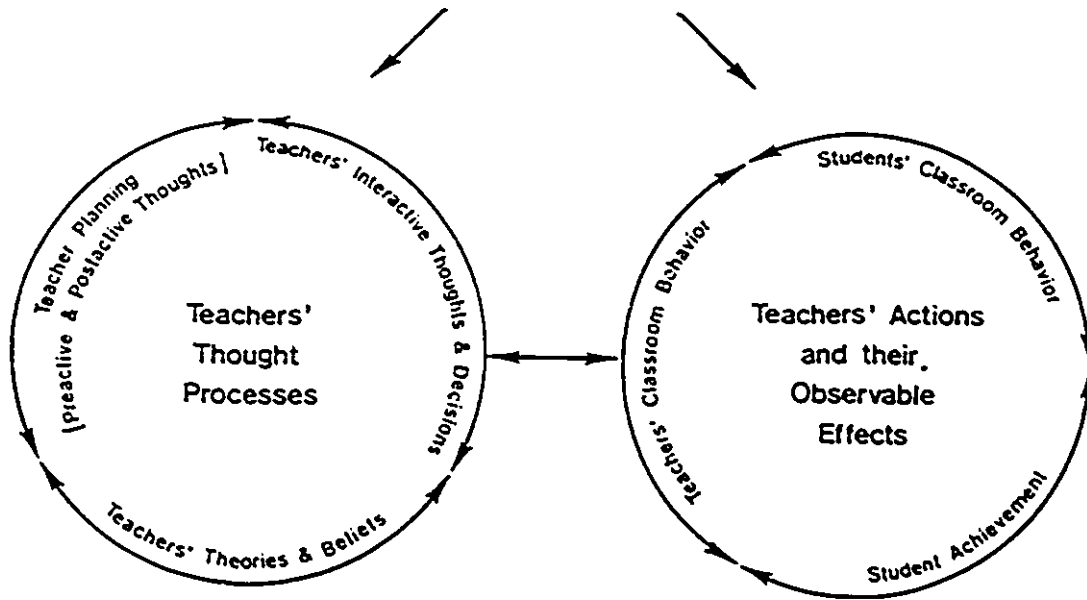
Yinger, R. J. (1986). Examining thought in action: A theoretical and methodological critique of research on interactive teaching. Teaching and Teacher Education, 2(3), 263-282.

Appendix A

Clark and Peterson's (1986) Model of Teacher Thought and Action

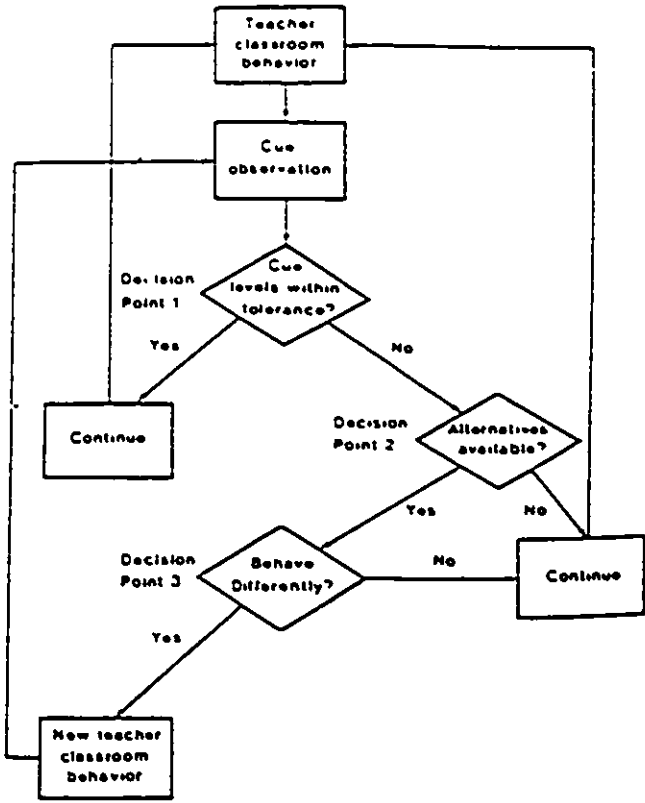
TEACHERS' THOUGHT PROCESSES

CONSTRAINTS & OPPORTUNITIES



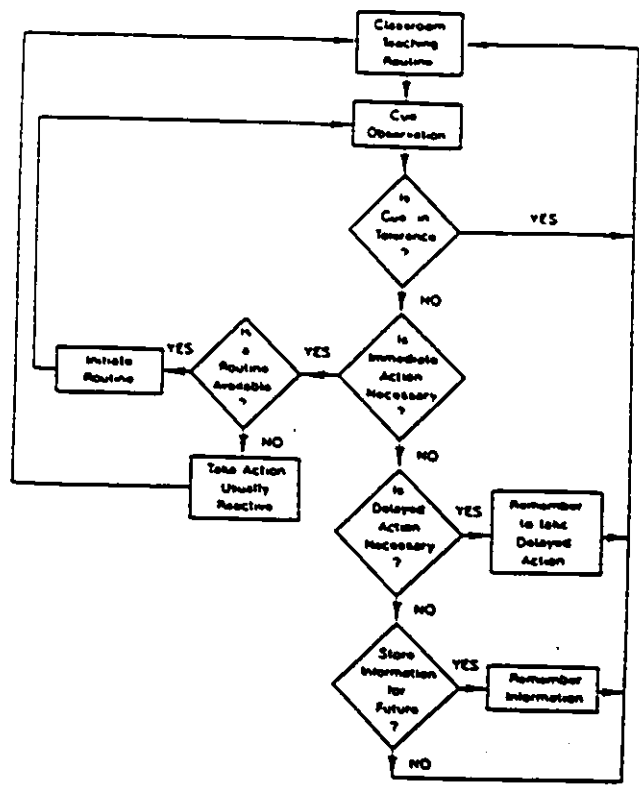
Appendix B

Peterson and Clark's (1978) Model of Teacher Interactive Decision-Making



Appendix C

Shavelson and Stern's (1981) Model of Teacher Interactive Decision-Making



Appendix D
Letter of Information



Université d'Ottawa • University of Ottawa

Faculté des sciences de la santé
Ecole des sciences de l'activité physique

Faculty of Health Sciences
School of Human Kinetics

LETTER OF INFORMATION

When a research project that studies individuals is undertaken by a member of the University of Ottawa, the Ethics Committee of the University requires the written consent of the participants. This does not imply that the project is risky; the intention is simply to assure the respect and confidentiality of the individuals concerned.

This research project is directed by Professors Pierre Trudel, Jean-Paul Dionne of the University of Ottawa and François Tochon of the University of Sherbrooke. In this project, data will be collected on the way coaches teach ice hockey (during training sessions or games). Data will be collected in four distinct contexts: (1) Before the training session or game. The coach will describe the objectives of his/her interventions during a 10 minute interview, (2) During the training session or game. The intervention will be videotaped for further analyses, (3) After the training session or game. The coach, during a 10 minute interview, will assess whether his/her objectives were reached or he/she had to modify his/her plan and (4) During retrospective interview. The coach will look at a videotape of his/her game and comment on his/her teaching. This interview will last about 60 minutes.

For each coach participating in the research, data will be collected during 4 training sessions, 4 games and 8 retrospective interviews. Video cameras will be used to record the interventions while the coach will have to wear a cordless microphone. The coach will be able to turn it off if he/she wishes.

The main objective of this research is to elaborate a coding system in order to analyze data collected in the four contexts. When coding the system becomes operational, it will be possible to obtain a general picture of the procedures used by coaches when they teach ice hockey to young people.

We want to inform you that you are free to participate and you may decline the invitation without consequential effect.

Please, feel free to contact us at any time:

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Appendix E
Consent Form



Université d'Ottawa • University of Ottawa

Faculté des sciences de la santé
École des sciences de l'activité physique

Faculty of Health Sciences
School of Human Kinetics

CONSENT FORM

After being informed on the goal of the research project directed by Pierre Trudel, François Tochon and Jean-Paul Dionne on: The analysis of the pedagogical intervention in ice hockey,

I consent to participate in this research project.

I know that, in this research project, my participation will be needed for 4 training sessions, 4 games and 8 retrospective interviews.

I can withdraw from the study at any time.

I understand that there is no direct benefit to me from participating in this study. I will be advised on my personal results when all analyses have been completed. A report of the investigation will be sent to me if I wish. Also, I understand that: (a) The results will be kept strictly confidential and that my name will not appear in any publications and (b) That the videotapes will be erased when analyses are completed.

If transcripts are appropriate to illustrate the data analysis procedures, I give my consent to have it used under the conditions that confidentiality and anonymity be safeguarded by the researchers.

Signature _____ Date _____

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Appendix F
Background Interview Guide

Interview Guideline
Background Interview with Ice Hockey Coach

Explain to coach that there are no right or wrong answers, what we need to learn about is the coaching process at the minor hockey level. We want to tap into their expertise in this area.

1. Experience as a coach (head-coach, assistant, levels, clinics).
2. Experience as a player.
3. Talk about this year's team:
 - describe the team, the group of players you have
 - expectations for the team
 - any tournaments planned
 - do you have any parents or assistants helping you
4. Some coaches like to use season plans, have you done anything like this with this team?
 - if yes, discuss
5. Do you do any preparation for your practices, do you make specific plans?
6. Same as above, but for games.
7. Could you describe to me a typical evening for you at the arena for a practice, e.g., when do you arrive at the arena, does anything happen before the practice, how do you start the practice session. Basically, I would like you to walk me through a typical practice session with your team.
8. Same as above but with a game situation.

Thank coach for assisting us in this research project.

Appendix G

Coach Decision-Making Factors Data Sheet

COACH D-M FACTORS DATA SHEET

Coach Martin Game# 1 Dec. # 1 Period/Time 3rd/56:30-57:20 Score +3 Type 1
Date 09/11/95 R/A LH

DECISION/ACTION = Talks to players (all players on bench)

GOAL(S) = Inform/Feedback

FACTOR(S) =

FIELD INFORMATION

A) Direct Information Factors

- Game Score/Outcome (winning)
- Time of Game/Time Restraints (late 3rd)
- Faceoff Location (defensive zone)

B) Indirect Information Factors

- Coaching Staff Behavior
(opposing coach pulls
goaltender)

COACH KNOWLEDGE

C) Characteristics of the Players Factors

- None

D) Knowledge of the Game Factors

- None

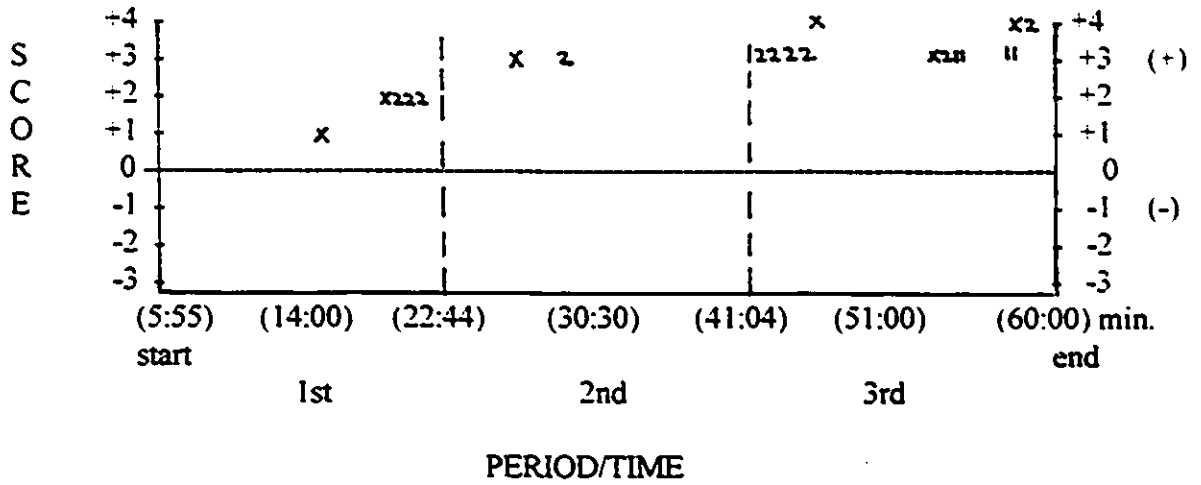
Total Factors = 4

Appendix H

Decision-Making Factors Game Chart

D-M FACTORS GAME CHART

Game #1



1 = Type I event
 2 = Type II event
 x = Goal Scored

Appendix I

Summary of Results: A Conceptual Map

Decision-Making Factors Influencing Coach Actions During Ice Hockey Games: A

Conceptual Map

ACTIONS:

- TALK TO:
 - 1 player
 - 2 or more players
 - assistant coach(es)
 - game official(s)
- CHANGE PLAYER(S)
- NON-VERBAL ACTION

GOALS:

- Inform/Feedback
- Stimulate/Encourage
- Observe/Silence
- Organize
- Discipline

FACTORS:

FIELD INFORMATION

Direct Information

- game score/outcome
- time of game/time restraints
- short-handed/powerplay
- goal scored
- faceoff location
- player(s) on ice/bench
- injury

Indirect Information

- player(s) performance on ice
- game official(s) performance
- coach's previous actions
- team performance
- player(s) behavior on bench
- opponents performance
- player(s) ice time
- coaching staff behavior

COACH KNOWLEDGE

Characteristics of the Players

- habits/history
- skill level
- physical attributes
- psychological attributes

Knowledge of the Game

- rules
- coach history/experience
- game importance

Appendix J
Definitions of Actions

DEFINITIONS OF ACTIONS

1. Talk to 1 Player - when coach speaks specifically to one player (e.g., talks to player at bench).
2. Talk to 2 or more Players - when coach specifically speaks to more than one player (e.g., coach talks to a specific forward line unit).
3. Talk to Assistant Coach(es) - coach communicates with one or more assistants.
4. Talk to Game Official(s) - coach communicates with present game officials (e.g., yells at referee or linesman).
5. Change Player(s) - coach changes one or more players on the ice (e.g., changes a winger for another winger or makes a complete line change).
6. Non-verbal action - coach intentionally says nothing or does nothing (e.g., coach states he said nothing to player in order to remain calm).

Appendix K
Definitions of Goals

DEFINITIONS OF GOALS

1. Inform/Feedback - to give feedback to or get feedback from player, assistant coach, or game official(s); evaluation of performance (e.g., coach tells player to shoot the puck more often).
2. Organize - to give player(s) the specific strategy of what to do or where to play; ice time given to players (e.g., line combinations, line matching, faceoff alignments, pull goaltender).
3. Stimulate/Encourage - to encourage or motivate player(s); coach asks player(s) to work harder or to maintain their effort; get them to relax or focus.
4. Discipline - to ask/tell player(s) to respect the rules or to behave properly; consequences of improper behavior (e.g., coach benches player).
5. Observe/Silence - to watch his player(s) in action, transition or on the bench; technique used for a purpose (e.g., said enough already so doesn't want to say anymore).

Appendix L

Definitions of Categories, Sub-Categories, and Factors

DEFINITIONS OF CATEGORIES, SUB-CATEGORIES AND FACTORS

Category:

FIELD INFORMATION - game situations, game setting, or actions of the game observed by the coach; (specific to the present game environment).

Sub-category:

Direct Information - elements or the situation(s) which describe the game setting.

Factors:

Game Score/Outcome - any reference to the game score (coach must specifically mention score) OR if coach talks about winning, losing, tied, in the lead.

Time of Game/Time Restraints - specific reference to a certain time in the game (e.g., 1st period, late 3rd); any reference to the timeclock, or general time restraints or limitations (e.g., running time v.s. stop time, lack of time to react, etc.).

Short-Handed/Powerplay - any reference to the situation of being short-handed (e.g., down a player due to penalty against) or being on the powerplay (man advantage).

Goal Scored - reference to a goal scored (for or against); also can include a disallowed goal.

Faceoff Location - specific reference to location of faceoff (e.g., offensive/defensive zone).

Player(s) on Ice/Bench - coach states decision based on WHO is on the ice or on the bench (only if coach states the specific player(s) on the ice or on bench); NOT based on actions (observation only); own team or opponent.

Injury - reference to an injury that has occurred during present game; own team or opponent.

Sub-category:

Indirect Information - judgement or evaluation, made by the coach, to ACTIONS occurring during the game observed by the coach (e.g., player's performance on the ice).

Factors:

Player(s) Performance on Ice - specific reference to on-ice actions or performance of one OR more players (OWN TEAM ONLY) but not the whole team, described by the coach; can be physical or verbal actions (e.g., goalie's performance, line unit actions, etc.).

Game Official(s) Performance - specific reference to actions or performance of game officials (referee, linesmen, timekeepers) during the game, described by the coach (e.g.,

penalty call).

Coach's Previous Actions - reference made by the coach based on the coach's PAST actions specific to the current game; includes previous instruction to player(s) during current game (e.g., game plan, pre-game or intermission speech).

Team Performance - specific reference made by the coach regarding OWN TEAM (whole team in general) actions which have occurred over the course of the game (description/evaluation, e.g., "we were playing very well").

Player(s) Behavior on/at Bench - specific reference to actions/behaviors of one or more players on OR at bench (OWN TEAM ONLY) but not the whole team, described by the coach; can be physical or verbal actions (e.g., players asks coach a question).

Opponents Performance - specific reference made by the coach regarding OPPONENTS actions (one or more players or whole team) which have occurred over the course of the game (description/evaluation, e.g., "they were all over us the last four shifts").

Player(s) Ice Time - reference to the amount of actual playing time a player has had or not had during the game (specific amount or general estimate).

Coaching Staff Behavior - reference to actions/behavior of the coach's own coaching staff and/or opponent coaches; input from coaching staff.

Category:

COACH KNOWLEDGE - reference to team or player characteristics (including opponents) OR coach's past experience, knowledge of the game; past, present, and future knowledge; knowledge coach brings to the game.

Sub-category:

Characteristics of the Players - specific reference to team OR player characteristics (including opponent) mentioned by the coach (e.g., "he's a very strong skater").

Factors:

Habits/History - comment made by the coach which refers to PAST PERFORMANCES or ACTIONS (tendencies) of player(s)/team; includes past experience v.s. opponents, suspensions, injuries, illness, practice sessions.

Skill Level - comment made by the coach which refers to technical and/or tactical skills specific to hockey (e.g., "he's got the best shot in the league").

Physical Attributes - comment made by the coach which refers to any physical feature of the player or team (e.g., size = big or small, left-handed v.s. right-handed shot).

Psychological Attributes - comment made by the coach which refers to mental intangibles (e.g., intensity, focus, effort, leadership, temperament, intelligence).

Sub-category:

Knowledge of the Game - refers to the coach's past experience and/or knowledge regarding the game.

Factors:

Rules - specific reference made by the coach describing rule infractions/interpretations; includes reference to the ice hockey rule book and/or game rule procedures.

Coach History/Experience - reference made by the coach related to the coach's PAST coaching/scouting experience NOT specific to the current game; includes practical or observational experience, previous experience with game officials, parents, etc.

Game Importance - refers to importance of the game or classification/type of game (e.g., playoff game, regular season game, 1st place showdown).