THE NATURE OF SOCIAL COGNITION IN HIGH PERFORMANCE ADOLESCENT TEAM ATHLETES

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Department of Educational and Counseling Psychology

and Special Education, University of British Columbia)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

May 1999

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Vancouver, Canada

Date April 27/99

DE-6 (2/88)

ABSTRACT

Fifty adolescent ice-hockey players, ranging from 13 to 15 years of age, were studied in order to determine whether high performance players differed from non-high performance players on measures of social cognition in the sport context. Two Divisions of Bantam hockey players were studied: (1) Division A or high performance players, and (2) Division B or non-high performance players. Participants were examined for differences on a measure which assessed level of Case's neo-Piagetian Central Social Conceptual Structure (CCS; Case, 1992) and for differences on three measures of elaborations on the basic structure. No differences were found between groups in a Multivariate Analysis of Variance, with participant's weight and Division of play as independent variables, on the four dependent variables. A Hotellings T^2 analysis revealed no differences between high and non-high performance players of the same chronological age on Case's CCS. Univariate ANOVAs following the main analysis revealed no differences between the two groups of players in Concentration which is the ability to detect advance cues which would predict opponent's actions. High performance players demonstrated higher levels than non-high performance players in Flexibility, which is the ability to provide adequate solutions to social game problems. High performance players also demonstrated a greater orientation toward Intensity which is an orientation toward achieving Mastery goals (Dweck, 1992) than non-high performance players. Seven factors were obtained in an oblique Principal

Components analysis of the Concentration scale. An ANOVA of Division of play on the first principal component revealed no significant differences between high and non-high performers. Number of words used in responding to the problem set assessing CCS were correlated with Structural Level (.56, p <.01) and Flexibility (.47, p <.01). The findings have the following implications for theory and practice in the area of high performance: (1) structural level, which is largely maturational, does not account for differences between high and non-high performers, (2) encapsulated abilities, which appear to have a high learning component, explain differences between high and non-high performers, (3) significant increases in performance will most likely occur as a result of efforts to develop the encapsulated component of development rather than the structural component.

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ACKNOWLEDGEMENTS

This dissertation is dedicated to my loving mother, Doreen Tench, who started me on this path and whose fondest wish was that the journey be completed. Without her love, patience and enthusiasm, this achievement would not have been possible.

It is also dedicated to my dear father, George Tench, who loved, supported and guided me along the way and encouraged me through the difficult times, even when the road seemed very long.

I would also like to thank my family who gave all of their love and support, rallied around me, offered opinions, consulted on editorial matters, and listened to my ideas. My greatest affection and appreciation go especially to my brother Anthony Tench, for his concern, patience and unflagging efforts in assisting with finishing this work, to Elaine Markin, my confidante and cheering section, to Anthea Stammers, for being the voice of reason and for loving support, to Alexandra Markin, Amy Markin, Liana Stammers, and Mark Stammers, for unqualified love and good cheer along the way, and to Ron Patch, for his love and considerable contribution to helping me complete this work. I would like to express my gratitude to the youngest family members who took a very sincere interest in becoming a part of the great adventure by asking a lot of questions and by sitting on my knee and helping me draw tables and graphs on the computer.

I would like to take this opportunity to acknowledge my committee who supported, advised and encouraged me along the way. I would like to thank Dr. Marion Porath for her unending patience, enthusiasm, humour, genuine kindness, and concern. I could not have asked for a better advisor, and I am hopeful that her enjoyment of this collaboration was equal to my own. I would also like to thank Dr. William Borgen for his patience, and for his wisdom in the guidance he provided in this work. I would like to express my appreciation to Dr. Nand Kishor for his knowledge and input, and for making sure my statistics were in order.

Finally, I would like to thank the Bantam hockey players, and their coaches, who took the time to fill out questionnaires and tell me their thoughts on things social and otherwise. Without them, this study would not have been possible.

CHAPTER I

INTRODUCTION

Social cognition has been found to be critical to the attainment of high level performance in sport through the interpretation and prediction of other's behaviour (Smith & Christensen, 1985). For the purposes of the present study, the term 'sport' refers in particular to group or team sports, in which interaction between individuals is the focus and, therefore, social cognition plays a significant role. The benefit in being able to understand and predict the behaviour of both opponents and teammates during competition lies in planning strategies to sidestep problems that arise during social interactions that are incompatible with sport goals. Social cognition is defined in the current work as an awareness on the part of the observer of aspects of another's internal states, such as traits or mood states. This knowledge permits the observer to make predictions of the other's behaviour by coordinating various bits of this type of information. High performance on a social cognition task entails the development of the ability to coordinate successively greater numbers of these pieces or units of information about the other's internal state and to then make more accurate predictions about how that state will motivate their actions (Abroms & Gollin, 1980; Case, 1993; Gardner & Hatch, 1989).

In the current study, social cognition was studied in the sport or athletic context as research has revealed the importance of this ability to high performance in sport (Smith & Christensen, 1995). At top levels of competition, athletes differ so little in terms of physical attributes affecting performance that psychological factors become critical in determining success or failure (Onestak, 1996). Anshel and Porter (1996) have indicated that the social environment can debilitate or facilitate athletes' attempts to achieve sport goals. Variations in the psychosocial climate require the athlete to utilise adaptive strategies to deal with such performance influencing events. Examples of such events are things such as emotional irritation from teammates or competitors, and demands placed on the athlete by coaches, parents, or others. It is apparent that social interaction plays a critical role in performance outcomes, and that the ability to understand and predict the behaviour of others will enhance performance.

It is the primary goal of the current study to determine the nature of social cognition in high performance athletes. The achievement of this objective is sought through an examination of the mental structures and abilities that contribute to social cognition in the sport domain. One construct proposed by Case and Marini (1984) to contribute to how such understanding increases over the course of development is that of a Central Conceptual Structure (CCS). This construct is part of a stage theory of intellectual development in which CCSs, specific to a number of domains, form the basis for how the individual understands the world (see Figure A1). The term CCS has been defined by Case (Case, 1987; Case et al., 1996) in the following way. A structure is a mental entity consisting of a set of nodes and their interrelations. The conceptual part of the definition is derived from the notion that the interrelations between the nodes are semantic, in that they consist of conceptualizations that the individual attributes to external events in the environment. The structure is central because it is the core of a wide range of specific concepts within a domain and also is essential in enabling the individual to progress to increasingly more complex stages of thought. This progression is characterized by sequences of hierarchical integrations of lower order structures into increasingly more complex structures. The result is that the individual is able to gradually operate at more abstract epistemic levels. The notion of a CCS arose from an attempt to coordinate several viewpoints that addressed the issue of whether an individual's cognition is subject to a common set of constraints across different domains of knowledge (Marini & Case, 1994).

Roots of Case's Theory

Case has referred to his conception of CCSs as a modified version of neo-Piagetian theory (Case, Okamoto, Henderson, & McKeough, 1993). It has also been described as falling under the category of Information-processing theory (Siegler, 1998) because of the emphasis on automization, working memory capacity, and the acquisition of strategies for dealing with problem situations. In fact, Case's theory has roots in several traditions. The notion of a CCS was developed out of an attempt to integrate apparent inconsistencies between Piagetian theory, neo-innatist theory, neo-Piagetian theory, and Learning Theory. Piagetian theory proposed monolithic structural changes across domains (Piaget & Inhelder, 1974). Investigations specifically within the social domain included such topics as the individual's understanding of society, interpersonal understanding, and the way in which social concepts develop (Damon, 1977; Furth, 1980; Selman, 1980; Turiel, 1978). Neo-Piagetians researched social cognition in such areas as narrative, role conception, intentions, empathy, and intrapersonal intelligence (Astington, 1975; Bruchowsky, 1992; Goldberg-Reitman, 1992; Griffin, 1992; McKeough, 1992; Porath, 1996). This line of inquiry differed from Piagetian research in that neo-Piagetians, while adhering to the concept that there were universal structural sequences which were constrained by neurological development, maintained that the nature of intellectual progress was far more modular than Piagetian theory proposed. Neo-innatists proposed that development consisted of a series of 'theory changes' related to biological mental modules (Keil, 1986) which resulted in qualitatively different ways of viewing the world. Learning theorists also saw development as being modular but did not stress the role of innate predispositions and modularity as much as they focussed on the role of learning and task domains (Chi & Rees, 1983). Case's theory of CCSs is an attempt to bridge the notions of biological constraints, modularity, and learning. The consideration of both structural development and learning factors may be useful in accounting for performance that exceeds that which is expected given age-related biological constraints.

CCS and Encapsulated Abilities

The CCS is a conceptually loaded entity that develops in a recursive fashion and is tied quite closely to chronological age due to biological developmental constraints (Case, 1985, 1993; Porath, 1992). These structures are conceptually loaded in that they have a very broad domain of application, although not system-wide, and this wide range of applicability demonstrates understanding of an underlying concept of how problems in that domain might be understood and solved. The comprehension of such a concept allows understanding and application in many situations within a given domain (Case et al., 1996). The notion of centrality is important as it allows the individual to deal with a variety of problem situations in a given domain. Case's theory of a CCS was not developed specifically to address social cognition, although he and his colleagues have completed some research in the social domain (Case et al., 1993; Case et al., 1996; Marini & Case, 1994). It appears that Case's research has, at the least, established that social cognition is domain specific (Case & Okamoto, 1996, chap. III). Further evidence for the existence of a separate conceptual structure for the social domain is apparent from the work of several researchers (Abroms & Gollin, 1980; Barnes & Sternberg, 1989; Case, 1992; Gardner, 1983).

Under the rubric of Case's work, it has been possible to begin to study how individuals who demonstrate high performance on tasks that tap social cognition differ from non-high performance individuals with respect to social cognition. Case's work has added a possible dimension of understanding of high performance within a domain that was not accounted for by Piaget's theory of development (Piaget & Inhelder, 1984). Piaget proposed cross-domain, monolithic age-constrained changes in structural development. Neo-Piagetian researchers, while concurring that there was evidence of age-constrained advances in development, attempted to account for differential rates of development in various domains between individuals (Case, 1992; Case et al., 1996). Much of the research to date has concentrated on determining that there is indeed domain specific development and efforts have also been made to describe development within particular domains. Case has found that, although relatively small differences occur within chronological age cohorts in the development of the CCSs within and across domains, there is evidence of domain specific structures. The main emphasis of the CCS theory is to describe development in terms of the growth of the conceptual structures and to emphasize that there are different CCSs for each domain. It is, therefore, a model of how conceptual development takes place across domains in which age-constraints have been proposed as the rationale for the small differences between individuals in general development across structures. In this way, Case has opened the door for elaborations on the nature of development within a particular domain. It may be suggested that structure is maintained through specific stages of development but that the content of this structure changes in some way. The manner in which such content changes may account for development which appears to exceed that of structures that is age-bound.

What has not yet been widely investigated utilising the tenets of Case's work is rapid age-inconsonant development resulting in high performance within a single domain. The ability of high performance individuals to progress rapidly well beyond age cohorts in a given domain emphasizes the need for other considerations apart from conceptual development. Given that there are maturational constraints upon conceptual development, it seems likely that factors other than conceptual ones need to be accounted for in development of high performance individuals. The lack of findings of qualitative or quantitative structural differences between high performance and non-high performance individuals indicates that non-conceptual factors may be influential in promoting the rapid development of some individuals within particular domains. A modelling of the developmental process must then account not only for changes in structural development, as outlined by Case, but include also such non-conceptual factors. The study of high performance individuals in a specific domain is most likely to illuminate such factors.

Preliminary research in the area of high performance in the social domain has already commenced and suggestions have been made as to the nature of high performance using Case's work as a theoretical basis (Porath, 1996). Porath has studied 'gifted' children who, for the purposes of the current study, may be considered high performers on the tasks she set for them. There appears to exist, in addition to the age-constrained CCSs proposed by Case, a set of non-conceptually loaded skills that can develop quickly to adultlike levels. Porath (1992, 1997) describes these abilities as being "encapsulated" and has found that such skills allow for more elaborate representations of problem situations than those of chronological-age peers and may in fact contribute to the elaboration of mental structures. Encapsulated abilities may be defined as abilities that distinguish 'giftedness' and are more to do with biologically determined points of focus regarding the internal and external world of the individual (Bekoff, 1988). In other words, encapsulated abilities may be biologically predetermined tendencies to focus on and learn specific content areas that will enhance performance in that context.

The link between the CCS and encapsulated abilities in social cognition as it pertains to high performance in athletics is therefore proposed to be the following. High performance in athletic social cognition may permit more elaboration in the representations of social problems and their solutions due to the predisposition to focus on certain aspects of the internal and external environment that, when coupled with extensive experience, can result in very high levels of performance in that environment. While structure is defined by and constrained in level by maturational factors, encapsulated abilities seem to be open to learning effects. Case (1992) has indicated that there is a ceiling on structural development that is encountered at every stage. High performers may in fact traverse each stage and reach this ceiling more quickly than non-high performers. While high performers may not greatly exceed the ceiling of the structural level appropriate for their age, they may be able to either: (1) utilise working memory resources freed from structural development processes in the development of skills specific to a particular social context, or (2) combine information contained in the structure in creative ways (Porath, 1992). In this way, encapsulated abilities can result in performance that appears to be well beyond that expected for the individual's chronological age. It seems, therefore, necessary to consider both the constraints of the Central Conceptual Social Structure (CCSS) and the unconstrained nature of encapsulated abilities as being important to social cognition as it is pertains to exceptional performance in the athletic context.

Three variables have emerged from the sport literature as being abilities that are important to social cognition in this domain and serve to distinguish high performance from non-high performance in athletics. They may be considered the encapsulated component of athletic social cognition and consist of the following: (1) focus, (2) flexibility, and (3) intensity (Kirschenbaum, 1987; Mahoney & Gabriel, 1987; Whelan & Epkins, 1990). These abilities are encapsulated in that they appear to develop rapidly, at different rates, with different endpoints in various individuals, and coupled with experience, permit development far beyond that expected for chronological age. The conception of encapsulated abilities is consonant with that of skill acquisition through 'proceduralisation' which was proposed by Anderson (1983, 1993). Proceduralisation refers to the construction of a large set of 'if-then' action plans gained through extensive experience in a domain. High level performers are characterised as being able to extract task-relevant advance cues to maximum benefit from the problem situation at hand, engaging in longterm deliberate practice in their domain, and being able to utilise short and longterm memory more efficiently than non-high performers.

In summary, the intent of this investigation to unite Case's theory of CCSS with the information-processing conception of skill or encapsulated ability development in order to describe the nature of social cognition in the athletic domain.

Importance of the Study

There are several ways in which this study makes important contributions to the understanding of conceptual development in the area of high performance, the understanding of domain specific development, and in practical terms, to the understanding of the elements that comprise outstanding athletic performance. These possible contributions are outlined in the following section. Perhaps the most important contribution is the possibility of adding support to Case's theory that gathers the primary tenets of several major developmental theories under its rubric. Learning theorists interested in modular development have expressed an interest in examining both knowledge that is specific to particular content domains and also in defining ways in which knowledge of the domain differs between experts and novices. There is also a growing interest which is typified by the neo-Piagetian viewpoint in determining whether development is at once both constrained and also open to rapid adultlike development (Case et al., 1993; Marini & Case, 1994). This proposition requires studies in varied domains to determine if in fact there are both central structures and encapsulated abilities specific to those particular domains. The athletic domain has encapsulated abilities that are unlike those previously studied under the auspices of Neo-Piagetian theory. The study of this domain will add to the existing literature on social cognition which has largely been examined in terms of narrative (Case et al., 1993; McKeough, 1992; Porath, 1996), role-playing studies (Fischer & Pipp, 1984), empathy (Bruchowsky, 1992), intentional understanding (Eikelhof, 1992, Goldberg-Reitman, 1992), and interpersonal understanding (Griffin, 1992). The need for further studies that focus on ecologically valid contexts has been emphasized by several researchers (see Porath, in press). Finally, this study is important to the education of coaches, parents of athletes, and athletes themselves. The understanding of the details of conceptual development as well as the status of encapsulated abilities in each individual would be of great benefit in tailoring instruction to the capabilities of the athlete.

Definition of Terms

1) Central Conceptual Social Structure: CCSS refers to the mental structure which develops over time and aids the individual in understanding and solving problems in the social domain. The CCSS is proposed by Case to develop at a relatively age-related pace and is closely tied to chronological age. The CCSS develops in four qualitatively different stages each of which contain three substages. Each stage is dependent upon structures built in the preceding stages. Developmental differences between chronological-age cohorts have not been found to exceed one substage (Case & Marini, 1984).

2) Encapsulated Abilities: Encapsulated abilities are unconstrained individual tendencies to focus on cues that assist in social cognition. They develop at a rapid pace relative to experience in very specific task domains. These abilities serve to elaborate the social conceptual structure by widening the breadth of meaningful experiences that speed its development within but not beyond a particular stage.

3) High Performance or Giftedness: The terms 'gifted', 'high performance', 'elite' and 'expert' are used interchangeably in this study as the sport literature usually refers to top athletes using all these terms. Giftedness, the term usually used to refer to high performance on tasks tapping such abilities as intellectual and artistic, has been defined by Case (1992) as an ability to learn at an accelerated rate within a developmental stage. High performance individuals are better able to exhibit increased understandings and therefore perform at higher levels than chronological-age peers on given tasks.

4) Concentration: Concentration is the ability to break down into very small segments, ranging between .25 and .50 seconds, (LeMire, 1997) important information being transmitted to the individual. The basic concept is that many social cues as to what another individual is going to do next are being transmitted to the individual but that (1) many are irrelevant in predicting the intentions of another person, and (2) segments must be broken down quickly enough to clearly see that particular cues in a myriad of environmental indicators are more relevant to the solution of the problem situation at hand than other

non-relevant cues. Concentration is used interchangeably with the terms 'focus' and 'attention' in this study as the sport literature usually utilises one of these two terms synonymously with 'concentration'.

5) Flexibility: Flexibility is the ability of a individual to adapt quickly to novel situations. It may be considered a response to the information gathered through intensive concentration. The concept of novelty is important to this construct as environmental variability and changes over time make reliance on standard responses inadequate when a novel problem is encountered. Several authors have noted that extensive mental preparation enhances the ability of the athlete to exhibit high performance in social athletic situations (Rushall, 1989; Whelan & Epkins, 1990). Mental practice is considered a means of developing solutions to different problems that arise in the athletic context.

6) Intensity: Intensity is defined as a desire to perform at maximal levels in situations that require problem solving. There is a notable intensity in practising and performing and considerable displeasure in making mistakes. Kirschenbaum (1987) refers to this factor as an ability that is under control of the athlete. Whelan and Epkins (1990) refer to self-generated arousal strategies that enhance performance. The importance of self-regulation in this definition is that intensity is not considered a personality trait but an ability that is open to development.

In summary, this study has several goals. The first is to describe the social conceptual structure and encapsulated abilities in high performers. A second goal is to inform Case's theory of CCSSs by studying how encapsulated abilities may be an important adjunct to fully understanding intellectual development. Another goal is to contribute to the literature on high performance by doing research in a specific domain, that of sport, which has not been studied under the rubric of a theory of social cognition. A final goal is to provide an understanding of the role of social cognition in athletic high performance in order to assist the individual and those involved in sport in helping each participant excel to the best of their abilities. In the following chapter, a detailed description of literature relevant to the stated goals will be reviewed.

CHAPTER II

LITERATURE REVIEW

Chapter Two is concerned with the task of reviewing and integrating the literature on social cognition with respect to Case's theory of CCSS and encapsulated abilities as it applies to the athletic domain. The literature review has four main parts. The first part describes in detail the roots of Case's theory and evidence that supports the theory. This discussion is followed by a description of the emerging field of study of social high performance, and in particular one conception that expands upon Case's theory. This conception, termed 'encapsulated abilities', has been proposed to account for what appears to be accelerated development in specific domains of endeavour including social cognition. The third part of Chapter Two consists of a review of the sport literature in which three encapsulated abilities are identified that serve to distinguish high performance from non-high performance athletes in the domain of athletic social cognition. The conclusion of Chapter Two outlines the hypotheses that the present study will investigate.

Studying Social Cognition in the Athletic Domain

Ways in which the understanding and prediction of others' behaviour develops over time has been a theme in both psychological and educational literature (Astington, Olson, & Harris, 1979; Case et al., 1986; Case et al., 1993). The need for studies in various contexts where social cognition contributes to the successful prediction of, and appropriate response to, the actions of others has been brought forward (Porath, in press).

It has been proposed that the difference between novices and experts, or high performers and non-high performers is a useful way in which to study most forms of intellectual change (Chi, 1988; Chi & Reeves, 1983). One of the main problems that plague the study of expert-novice performance is in the definition of what constitutes an expert, what kinds of knowledge constitute expertise, and what duration of experience is required to acquire expert status. The athletic domain is one in which interactions between team members and opponents denote the need for understanding the intentions or anticipating the actions of others. This domain provides a useful context in which to examine the nature of expertise in the social domain due to the fact that athletes are classified in ability by a number of objective competition indices. In the majority of sports, statistics such as rankings in a group of participants are available and are an indication of high performance.

This investigation is confined to young athletes who demonstrate superior performance that is not necessarily based solely on high levels of experience, but on other additional factors that may allow them to exceed the performance level of chronological age peers. In the following sections, two lines of inquiry that may be applied in the study of development in general and high performance in particular are examined. The first theory described is that of CCSSs (Case & Okamoto, 1996) which addresses structural, conceptual, age-related domain-specific changes in intellectual functioning. The second theory described concerns the development of context-specific, unconstrained skills (Anderson, 1983, 1993) or encapsulated abilities.

Application of Case's Theory to Social Cognition

Case's notion of CCSSs has been applied in the study of social cognition. The development of social cognition is an area that has been extensively studied with emphasis being placed on such concepts as social conventions (Turiel, 1978), friendships, (Damon, 1977; Selman, 1980), emotional states (Borke, 1971), narrative (Case et al., 1996; McKeough, 1991; Porath, 1996), and empathy (Bruchkowsky, 1991). Although the relationship between general intelligence and social cognition has been an area of significant interest (eg., Mayer & Geher, 1996), there has developed a greater interest in examining the personal (Luthar & Ripple, 1994), interpersonal, and cultural (Robitaille & Robeck, 1995) contexts in which such cognition takes place. Case's theory has aroused considerable interest in that it places cognitive functioning in specific domains while addressing more general issues such as working memory capacity, learning, and the development of strategies for dealing with specific types of problems.

Case's (1991; Case et al., 1996) conception of Central Conceptual Structures (CCSS) has emerged from the coalescing of several predominant theoretical viewpoints and has been supported empirically in several contexts. The theories from which the notion of CCSSs arose were: (1) the neo-innatist view, (2) the learning theory view, (3) the sociohistoric tradition, and (4) the neo-Piagetian view, the latter of which Case's theory might be considered a special case. The integrity of the theories of origin has largely been maintained, which points to a communality of understanding and indicates that Case's theory is fundamentally sound. This plus the empirical support to date, from several specific contexts, makes Case's theory attractive as a way in which to approach the description of social cognition in the athletic domain.

The neo-innatist view was based on Chomsky's (1957) proposition that the individual acquired language through an innate neurological module that functioned in an autonomous way. This viewpoint was expanded to include the idea that there were several modules with specific functions, and that for each module there was a preset disposition to pay attention to particular features of the environment (Fodor, 1982; Gardner, 1983). Although it was not discounted that there might be a set of universal structures underlying development, these structures were thought to be module specific. It was primarily experience which contributed to the increasing ability for the individual to develop more elaborate 'theories', which upon sufficient elaboration, could be considered to have made a stagelike change (Carey, 1985). This change was not considered to occur in a system-wide fashion as each module had its own specific developmental course (Spelke, 1988).

The Learning Theorists shared some similar propositions to the neo-innatist group but placed much more emphasis on the influences of experience. There was less importance placed on the contributions of biology or modules than on specific domains of expertise, such as physics or chemistry. The concept of studying the progress from novice to expert status seemed to be an ideal way in which to understand intellectual development and was developed largely from this paradigm (Simon & Simon, 1978). While adhering to the notion that modularity is important, this group was in agreement with the concept that conceptual structural change was important to development, and that these changes were domain specific rather than system-wide.

Vygotsky's (1962) work formed the basis for the sociohistoric viewpoint. Vygotsky asserted that social and cultural factors influenced development in different domains. Development was seen as being dependent on the linguistic and conceptual frameworks to which the individual was exposed in a specific culture, with particular technologies, both physical and social.

The neo-Piagetian stance on development incorporated some of the tenets of Piagetian theory. Piaget postulated that development was based on the acquisition of a single underlying structure, was invariant, and was relatively unaffected by outside influences. One of the central tenets of Piaget's theory was that expertise was achieved across a wide number of domains as the underlying structure became increasingly more sophisticated. Neo-Piagetian studies produced evidence to support the contention that, although there were constraints on development resulting from age-linked ceilings in information-processing capacity and working memory, development was much more modular than that which had been proposed by Piaget

(Inhelder & Piaget, 1958). This evidence appeared in the form of studies in which it was determined that (1) the expected correlations between tests supposedly tapping the same underlying structure were not found, (2) significant training effects could be found for logico-mathematical tasks for which problem-solving ability was proposed by Piaget to depend on the emergence of an underlying construct which was not trainable, (3) training effects occurred within a content domain but not across content domains (Case, 1985; Case et al., 1996; Marini & Case, 1994; Rich, 1982).

It is apparent from the above discussion that there has been emerging for some time a movement away from the Piagetian notion of monolithic, invariant structural changes toward a stance where domain specific development is more descriptive of the way in which development occurs. Case's theory is an attempt to integrate these perspectives without abandoning Piagets' concepts entirely. Case's solution was to develop the notion of CCSSs where structural change, constrained by neurological development, occurred within task groups or domains. Primary lines of investigation have been in the quantitative and social domains (Case, 1992, 1993; Case & Griffin, 1990; Case & McKeough, 1990; Case et al., 1996; Porath, 1996) although such domains as emotional (Griffin, 1992), and artistic/spatial development (Dennis, 1992; Porath, 1997) have been researched by others (Case, 1992; Case et al., 1996).

The wide range of quite different domains to which Case's conception has been applied has ramifications for its utility in sport research. The athletic arena provides a source of several domains of study, including social problem solving. Social cognition, which is brought about in part by solving the problem of understanding the intentions of others, is a significant component of success in the athletic context. Sport is a domain which is largely concerned with learning and the acquisition of strategies to solve complex social problems. The very basis of sport, competition, implies that a significant component of social cognition is involved. Indeed, it has been noted that athletes at the very top levels of performance are separated in achievement primarily by psychological skills (Iso-Ahola & Hatfield, 1986). Case's theory is primarily concerned with learning and the ways in which strategies are constructed; therefore these features make the conception particularly attractive as a basis for beginning to describe high performance in athletics. As Case's theory has been developed, in part, through research in the social domain, and has contributed to findings on the nature of social cognition, it seems appropriate to apply this theory in order to describe in part the nature of high performance social cognition in sport.

The notion of a CCSS can be broken down into a definition of the terms that describe the construct: (1) central, (2) conceptual, and (3) structure. Case and his colleagues (Case et al., 1996) specify that the structures are <u>central</u> in several different senses. Within a particular domain, the structures permit understanding of a wide variety of situations. The structures are central in that they form the core from which more elaborate structures will be built throughout development. Each successive structure is dependent upon the preceding one and this notion forms the basis of what Case terms 'recursive cycling'. In order to develop more sophisticated structures, the individual builds upon previously existing elements by combining them in different ways. Elaboration of preceding structures requires an expansion in working memory capacity by which the individual can hold in memory an increasing number of goals, and therefore address problems requiring greater numbers of operational steps in order to achieve a solution. Finally, structures are central in that all structures are subject to system-wide maturational constraints (Case, 1992; Case et al., 1996). These constraints are proposed to be biological limitations on working memory arising from the degree to which neural connections have formed between various parts of the brain involved in problem solving (Case, 1992).

Structures are <u>conceptual</u> in that they form the basis for the manner in which the individual internally represents problem situations in the external world. Finally, the term <u>structure</u> is meant to denote the individual's internal blueprint of the network between several concepts.

Case contends that CCSs advance through four developmental stages: (1) the sensorimotor stage, (2) the interrational stage, (3) the dimensional stage, and (4) the vectorial stage (see Figure 1). Within each of these stages a recursive progression takes place. At the first substage children are able to coordinate two executive structures that exist separately in their repertoire. At the second substage, the two structures are able to be executed in a serial manner. At the third substage, the two structures are executed simultaneously. Progression is related to the amount of working memory available and each final structure forms the basis for the next stage of development.

Each stage has characteristic developmental advances. At the sensorimotor stage, the final outcome of the substage development is the acquisition of operational reversibility. This refers to the development of the concept that there are reversible relationships between objects. At the interrelational stage, children are able to comprehend the notions of enabling or preventing relations between objects. The dimensional stage is characterised by the solving of problems requiring estimates of differences in magnitude between objects. The final stage, which Case terms the vectorial stage, is typified by the ability to understand the relations between objects in systems that have no concrete referents. The vectorial stage is the final qualitative change in cognitive development before adulthood.

Evidence to support the propositions put forward by Case have been gathered in various domains by Case and others. Case and Marini (1994) conducted an experiment to determine whether adolescents progressed through developmental stages in physical (non-social) and social reasoning at approximately the same rate. Prior studies had demonstrated that younger individuals developed in different domains at similar rates (Case, Marini, McKeough, Dennis, & Goldberg, 1986; Marini, 1992; Marini & Case, 1989). In this study the balance beam task was used to assess physical reasoning. Social reasoning was assessed with three different tasks. The first task required that the individual be able to describe traits from a description of a protagonist's behaviour. The second measure consisted of the presentation of a problem in which prediction of a character's behaviour, where there might be a problem produced by that character's response, was required. In the third task the individual was required to integrate both trait and problem information in predicting a character's intentions in a story. The tasks were devised to incorporate the proposition that thinking becomes increasingly abstract as the individual develops.

Case and Marini (1994) found that the developmental sequence proposed in Case's model was substantiated in the levels of complexity of the tasks completed successfully by the adolescents. The second finding was that although development in both domains was quite similar, a substantial minority showed differences of one substage in development between the domains. The conclusions drawn from this study were that development progresses in a monolithic way in that between-domain advances are similar, but that development is also modular in that there was some decalage between the two domain specific tasks.

In another study, Case et al. (1993) attempted to demonstrate that numerical and social domains are underpinned by two different CCSs. Two sets of tasks, one numerical and the other social, were administered to a group of individuals. It was found that intra-task correlations of moderate but significant magnitude indicated that there was domain specificity. Although there were some significant correlations found between the domains on some tasks, the majority of tasks were not significantly correlated between domains. Both orthogonal and oblique factor analyses were conducted on the tasks and reflected the results found in the simple correlational analyses.

Case et al. (1993) also successfully attempted to demonstrate that some moderate progress within but not across domains could be achieved by training. This study demonstrated two important themes of Case's model: (1) that understanding in the two domains was indeed based on different CCSs, and (2) that structural development was not greatly affected by training or learning.

Case et al. (1996) conducted a similar study in which numerical and social tasks were administered to another group of individuals. This study differed from the first in that, in order to control for method and content variance, a methodological problem that has plagued the study of this area in forming a coherent picture, numerical content was injected into the social tasks and social content was contained in the numerical tasks. It was expected that the factors would be correlated due to this procedure but that, still, two distinct factors would emerge. Correlations within the tasks were of intermediate magnitude, while inter-task correlations were less strong with a less distinctive pattern, the majority being statistically insignificant. Two clear and strong factors emerged.

The first factor was described by loadings from the numerical tasks, while the second factor was comprised of the narrative or social tasks.

To summarize, the work to date on Case's theory of CCSs indicates the following: (1) there appears to be domain specific development of structures that regulate internal representations of the environment, (2) these structures are conceptual in nature, (3) the CCSs develop at an age-constrained rate which is most likely due to maturational factors, and (4) advances over chronological age peers in CCSs are confined to one substage or approximately two years.

These findings have implications for the study of high performance in the athletic domain. Fischer and Canfield (1986) noted that high performance may be accounted for by the elaboration of structures within a stage. High performance may be partially explained by a vertical acceleration in development in that high performers are more adept at acquiring concepts within their stage. However, this notion in itself does not fully account for high performance, although it provides a basis for understanding of the phenomenon, as progression within the stage may be accelerated only to one substage beyond age-predicted norms. It is plausible to suggest that rapid vertical progression within a stage allows the high performer more resources to allocate to learning non-conceptual skills, while chronological age cohorts are still engaged in building conceptual skills. Learning then becomes a factor in development whereas in terms of conceptual development, maturation is a more significant factor. These non-conceptual, learning-based skills have been termed 'encapsulated abilities' (Porath, 1996) and may be factors that distinguish between high and non-high performance. This aspect of development is discussed here as it provides a rationale for including encapsulated abilities in the study of high performance. It is, however, not the intent of the current study to assess this proposition that indicates a need to introduce elements of learning theory to the study of high performance. The main objective is, rather, to describe the structure and abilities of which social cognition in the athletic domain are comprised.

The nature of the CCSS has been outlined in previous sections. In the following sections, Case's structural theory is united with the tenets of Learning Theory in an attempt to describe the encapsulated abilities that characterise high performance in social cognition in the athletic domain.

Encapsulated Abilities in High Performance

As noted above, and in other studies, it has been found that chronological age peers do not differ by more than one substage on tasks measuring the level of development of the CCSS (Case, 1992; Porath, 1992, 1996, 1997). Porath conducted two studies of what she termed 'gifted performers' who for the purposes of the current study are considered to be the equivalent of high performers. To account for gifted performance, Porath (1996, 1997) described an additional set of abilities that were non-conceptual, encapsulated, or crystallized. These abilities are termed 'encapsulated' in that they are proposed to be independent of the development of conceptual understanding. In a study of gifted young artists, Porath (1997) found that gifted children performed in a similar manner to non-gifted children on a picture structure task that was designed to assess the level of the CCS for spatial representation. The greatest degree of advancement within the gifted group was one substage beyond the age predicted norm. However, there were significant differences found between gifted and non-gifted children on tasks assessing encapsulated abilities, including graphic competence and creative use of space. These differences were found to be related to age in that there were periods of rapid development seen in gifted children at particular ages on some of the encapsulated abilities. In a study of narrative, Porath tentatively concluded that gifted children differed from non-gifted children in narrative structure by only one substage. The hypothesis that gifted children would differ significantly from non-gifted children on non-conceptual variables was more strongly supported. In this study, encapsulated abilities such as grammar and vocabulary, distinguished gifted from non-gifted children.

Porath (1992) also conducted a study in which individuals who were either verbally gifted, spatially gifted, generally gifted, or of average ability were compared. The intention of this study was to attempt to find children who exhibited asymmetrical developmental profiles. Such a finding would challenge the notion of generality of developmental patterns. The groups were tested on existing conceptual structures and the ability to create new knowledge structures within existing working memory utilising experimenter feedback.

With the exception of the two tests where feedback was available and could be utilised to improve performance, generally gifted individuals did not differ significantly from chronological age peers. It was determined, however, that asymmetrically gifted individuals outperformed all other groups on the tasks specific to their particular asymmetry. Porath concluded that there were several possible explanations for this finding including special achievement motivation, talent, and most relevant to the current study, an experiential advantage over the other groups. Porath proposed that gifted individuals would identify their areas of expertise early on and devote more time and energy to developing those areas. Therefore, they would bring to the task a greater amount of experience with which to address the problem. A final analysis revealed that more specific attributes of language and narrative, such as vocabulary, syntax and thematic maturity, distinguished gifted from non-gifted controls. Artistically gifted children were found to differ from the other groups on a drawing task that involved specific spatial-artistic abilities such as elaboration of figures.

In this study it was apparent that high performance individuals were not markedly different from non-high performance individuals on conceptual measures but differed significantly on specific abilities associated with a domain of expertise. The distinguishing factor appeared to be what was described above as encapsulated abilities.

The encapsulated abilities examined in the current study are posited to be predispositions to pay attention to certain cues in the environment that are relevant to solving problems in the social domain. This predisposition of attention is probably not a conceptual component but rather a propensity to notice and utilise cues in the environment. The conceptual development may not yet be in place but the predisposition to acquire experience in recognizing cues that permit some level of social prediction may catapult high performance individuals beyond non-high performance individuals. These abilities would permit the individual to focus on pertinent environmental cues that takes performance beyond the restrictions imposed on conceptual level by working memory.

Case et al. (1996) have demonstrated cultural and socioeconomical differences in the level of CCSs, which points to experiential differences affecting understanding in different domains. Both Siegler (1996) and Keating (1996) have discussed research that indicates advanced performance in areas that are culture-specific. These findings would seem to indicate that while CCSs progress at a relatively uniform rate with respect to chronological age, there is a component of experience and learning involved in the differential way in which individuals develop. What has not been clarified is the rationale for how individuals exposed to similar experiences in a given domain can demonstrate markedly different progress in solving problems in that domain. An examination of this phenomenon may provide the means for distinguishing between high performance and non-high performance individuals and may indicate the need for some elaboration on Case's theory to account for high performance. Case primarily addresses the development of CCSs in specific domains, but does not focus on exceptional development within a domain. The increments in performance noted in training studies (Capodilupo, in Case et al., 1996) are significant but do not appear to be major qualitative changes in individual functioning. It appears that some learning is possible within the structure but does not effect a substantial advance between stages of structural development.

From the findings reported so far, it is reasonable to suggest that there might be processes other than CCSS developing in the individual to account for the difference between high performance and non-high performance individuals in specific domains. These encapsulated abilities would develop at a rapid rate in high performance individuals, be non-conceptual, and most likely be related to experience. In the domain of athletic social cognition, distinctions between high performance and non-high performance appear to depend upon the following encapsulated abilities: (1) focus, (2) flexibility, and (3) drive to be the best (Kirschenbaum, 1987; Mahoney & Gabriel, 1987; Whelan & Epkins, 1990).

Encapsulated abilities appear to be similar to the skills that Anderson (1983, 1993) proposed under his theory of learning and 'proceduralisation'. Allard and Starkes (1991) developed a concept in the tradition of learning theory that refers to 'production systems' (Anderson, 1983) in describing the execution of athletic skills. Production systems are a form of procedural knowledge in which condition-action rules are stored in long-term memory. These abstract units or rules are proposed to be triggered by cues absorbed by the individual depending upon the current attentional focus. It is an automatic system in that when an 'if' is recognized a 'then' response is generated. The acquisition of procedural rules has been referred to by Anderson (1995) as 'proceduralisation'. An example of this in the athletic domain would be a breakaway in ice hockey. In a breakaway situation, a player skates in on the goaltender alone with the puck and by attending to the cues of body positioning, small movements, and gaze direction of the opponent, the goaltender can determine the intentions of the player before they are executed. A familiar tactic utilised by goaltenders is not to 'make the first move' which, in effect, decreases the number of cues available to the shooter in anticipating the goaltender's actions (Bellefleur, 1983).

In Anderson's model, procedures change over time and become composed into higher order productions. Skills are developed through the compilation of several productions. Anderson indicated that thousands of productions underlie a particular skill and develop with experience. The question then arises as to how it is possible that similar degrees of experience, along with similarities in physical factors (Ericsson & Charness, 1994), can lead some individuals and not others to the level of high performance. The answer to this question appears to lie in the manner in which the knowledge gained from experience is sought and stored. Chi (1988) refers to this as a 'knowledge strategy' in that the individual learns how to better recognize, store, and retrieve information relevant to various problem situations in a specific domain. This is in contrast to the 'power strategy' in which it is proposed that high performance is somehow based on greater processing capacity of the individual.

A review of the literature on the three abilities is now appropriate to demonstrate that these abilities are linked with high performance. It may be suggested that these three abilities assist the individual in the gathering, processing, storage, and retrieval of information in the athletic context. These abilities may resemble crystallized abilities, in that they develop at a very fast rate, are not directly related to the stagelike development of CCSs and may partially account for high performance in individuals who are moving through, but not significantly advancing beyond one substage of, Case's stages of conceptual development.

Encapsulated Abilities in the Athletic Domain

A review of the sport literature revealed many constructs that are proposed to play a part in distinguishing high performance from non-high performance athletic performance. It has been noted that at the very uppermost levels of competition, differences in physical skill are minimal, and that given a good preparation in physical conditioning, it is psychological skills that distinguish high performance from non-high performance athletes (Iso-Ahol & Hatfield, 1986). Psychological skills are of interest in that they are believed to be amenable to improvement (Boutcher & Rotella, 1987), less permanent than personality characteristics, and less transitory than mood states (Spielberger,1971). It is the intent of the current study to determine whether such cognitive skills, in conjunction with CCSS development, are characteristic of high performance in social cognition in the athletic domain. Following an extensive reading of the literature, and when non-cognitive constructs such as emotion are filtered out of the picture, the following factors appear to contribute to high performance: (1) concentration, (2) flexibility, and (3) intensity.

Concentration

Concentration, or the systematic allocation of attention to a particular set of environmental cues, has been found to distinguish elite from non-elite athletes (Mahoney, Gabriel, & Perkins, 1987). In most sport psychology studies the terms 'attention' and 'concentration' are used interchangeably (Bond & Sargent, 1995). There are two main dimensions emphasized in the definition of concentration: 1) the ability to sustain attention upon a particular cue or set of cues (also known as 'mental effort', and 2) the ability to distinguish cues that are appropriate targets of attention (Ericsson & Lehmann, 1996), which is known as 'selectivity of attention' (Orlick & Partington, 1988; Summers & Ford, 1995). 'Mental effort' consists of the controlled processing of cues relevant to the task at hand. 'Selectivity' refers to the ability to shift focus from internal to external cues, and to control the bandwidth of the focus. An athlete may be able to sustain attention on a particular cue, for example the responses of spectators to the performance, but this is not useful in allowing the individual to focus on cues from opponents which will permit successful solution of problem situations. In the same way, an athlete in a team sport may be able to focus attention on one player when it would be more beneficial to be able to divide attention between two or more opposing players. The conclusions reached in most studies of attention indicate that successful athletes can be differentiated from less successful athletes in being more focussed on the task at hand than on worrying about the outcome of the competition. At the point of peak performance, the athlete's mind is focussed completely on the task-relevant cues of the situation.

Examples of sports in which social cues would provide important clues as to strategies likely to be employed by opponents can be found in the sport literature. Gould, Eklund, and Jackson (1992) found that best performances by wrestlers in the 1988 Olympics were related to the ability to keep from engaging in task-irrelevant thoughts and to concentrate on opponents' moves. Kerr and Cox (1991) were able to distinguish skilled from less-skilled squash players based on their ability to narrow attention to cues relevant to the task such as opponent actions.

Research on attention in sport has been divided into five general categories: (1) the skill of detecting advance cues and screening out irrelevant cues, (2) the ability to divide attention which consists of performing more than one action simultaneously, (3) the effects of arousal on narrowing the span of attentional capabilities, (4) individual differences in attentional strategies between athletes, and, (5) research on the psychophysiological aspects of attention (Abernethy, 1987). In the current study, the detection of advance cues and the division of attention are of interest in distinguishing high performance from non-high performance athletes. Rather than investigating physiological aspects of attention, or patterning a multitude of individual profiles in attentional strategies, the intent is to investigate the cognitive and strategic aspects of attention that characterize high performance.

It is apparent from various studies that expert athletes appear to attend to and extract cues that indicate the intentions of others more quickly and completely than non-expert athletes (Ericsson & Lehmann, 1996). One interesting method of determining how expert performers extract such information has been utilised by Abernethy (1993) in what are termed clue-occlusion paradigms. In these experiments, experts were presented with a set of cues in a performance situation and asked to predict such events as where a ball would land after being shot. Following this, some of the cues were excluded from presentation and decrements in prediction were observed. Early and more complete cue detection was also noted in studies involving tennis (Issacs & Finch, 1983), soccer (Morris & Burwitz, 1989), and squash players (Abernethy, 1990). It appears that early detection facilitates accuracy of prediction and faster reaction times, and allows more working memory to be available to implement strategies or make changes to decision plans (Summers & Ford, 1995). These studies share the same methodological problems as many sport studies in that the athletes do not have to make a physical response to the stimulus nor do they have the added dimension of crowd and competitor effects which can produce anxiety which has been demonstrated to be linked to narrowing of attention (Summers & Ford, 1995). They do, however, demonstrate that there is a utility in early and full cue detection regardless of removal from the ecology of the performance situation.

Division of attention has been studied in sport psychology utilising the dual-task paradigm. Athletes are given a primary and secondary task to complete simultaneously and then compared in terms of task completion with respect to level of proficiency in a given sport. Parker (1981) conducted a study in which ball players of different skill levels were given an initial single task of passing the baseball between two players as many times as possible within a 30 second time period. This was the primary task and did not serve to distinguish high performance from non-high performance players. The next phase of the study included a secondary simultaneous task that consisted of executing the primary task while monitoring the position of other players on the field. When the secondary task was introduced there was a significant difference in the performance on each task and particularly so on the performance of the secondary task between highly skilled and less skilled players. Abernethy (1983) noted that this methodology was useful in that simple observations of primary tasks alone do not necessarily distinguish high performance performers. This was a secondary benefit derived from applying this methodology, the first benefit being that the results were interpreted as revealing that high performance players had more attentional capacity available to allocate to the secondary task than the less skilled players. Rose and Christina (1990) found similar results in a different form of the dual-paradigm task involving pistol shooting in which the secondary task consisted of a non-task relevant distracter. Expert shooters were able to screen out the distracter much more efficiently than the novice shooters indicating that attention was being directed toward the primary task. The dual task paradigm suffers from certain methodological flaws, the most notable being that practice enhances performance on secondary tasks. Another difficulty is that, because performance on the primary task may vary across experimental conditions, a sensitive measure of the primary task that includes a baseline must be in place in order to gather meaningful results.

Attentional processes have been regarded in several ways, one of which is as a cognitive skill (Cox, 1994). If this is the case, then it is possible to theorize that extensive practice in detecting cues that provide the greatest amount of task-relevant advance information might allow an athlete to display ability beyond those of chronological age cohorts. There seems to be scant evidence that expert performers differ from novices on such physical factors as visual acuity, depth perception, range of peripheral field, or reaction time (Regnier, Salmela, & Russell, 1993). However, there appears to be a wealth of evidence that the ability to detect advance cues and to divide attention are skills that separate high performance from non-high performance performers (Ericsson & Lehmann, 1996). This distinction between experts and novices is carried over into other cognitive domains such as chess (Allard & Starkes, 1991) in which it was found that expert players appear able to 'chunk' larger amounts of meaningful information, thereby allowing them to take in more information in a single glance than less expert performers. The next step in the process of identifying encapsulated abilities important to social cognition is to determine what high performance performers do with this richer knowledge base that results in expert performance.

Flexibility

The term 'Flexibility', as used in the current study, is derived from Webb (1974) who found that intellectually gifted children share mental structures in common with chronological age cohorts but use these structures in creative ways. Porath (1996) cites work on gifted children that gives evidence of their ability to use existing conceptual structures in flexible and elaborate ways. Flexibility in the sport context consists of the ability of a individual to adapt quickly to various combinations of cues that assist in determining the intentions of others; a skill which is essential in competitive group sports. Through experience, many athletes can become adept at anticipating actions if familiar behaviours are displayed. The question arises as to which factors contribute to the difference between elite and non-elite athletes in solving problems when unfamiliar combinations of cues are presented. Elite athletes have demonstrated superior ability in developing subjective event probabilities compared to non-elite athletes (Whiting, 1979). In a given sport, this finding appears to indicate that the elite athlete possesses a richer procedural knowledge base in comparison to a non-elite performer. What has not been widely examined are the processes which underlie 'knowing' and 'doing'.

It appears that there is a minimum amount of time in the acquisition of sport expertise of about ten years duration (Hayes, 1985). This proposition is substantiated by Bloom's (1985) work in which the role of deliberate practice in gaining expertise is emphasized. This period has been described as one consisting of ongoing selection and rejection of information during which the individual may gradually acquire the ability to exhibit expert performance (Whiting, 1978). Whiting states that the individual must learn to build the information from various sources into an internal model during the progression from novice to expert. The problem solving ability of athletes is presumed to be based upon three types of knowledge: 1) declarative knowledge which can be divided into episodic and semantic components, (2) procedural knowledge which is non-verbal, and (3) strategic knowledge which consists of heuristic techniques. Episodic knowledge would be exemplified by knowing the general rules of a particular sport while semantic knowledge would consist of such things as knowing the score at any particular time of a game. Procedural knowledge would consist of such abilities as how to shoot a puck in hockey. Strategic knowledge would include knowing when to approach the net to take a shot. Expert performance is typified by the ability to utilise all three kinds of knowledge in the solution of problems. Flexibility is a skill which entails in particular the use of declarative and procedural knowledge in developing strategic knowledge.

The ability to combine units of declarative and procedural knowledge in different ways to solve problems may be one key to expert athletic performance. Domain specificity of expert performance has been noted in many areas (Hayes, 1985; Vincente & Wang, 1998). The level of specificity within the sport environment goes from the sport domain in general, to between sports, to within sport position (Cox & Yoo, 1996), and even to the level of particular problem situations within a given event. It has been suggested that the ability to respond to very specific situations and, in fact, combinations of cues not previously experienced by the individual may separate high performance and non-high performance athletic performance (Ericsson & Lehmann, 1996). Extensive experience would allow an athlete to draw upon existing declarative and procedural knowledge and to respond to situations presenting sets of familiar cues. However, novel situations would present specific cues within an array that were not present in any meaningful pattern existing in memory.

Allard and Starkes (1991) have developed a model that might serve to explain the importance of situational specificity in developing solutions to problems in the athletic context. These authors suggest that there are situation-specific qualities of motor skills that are cognitive and different from all-purpose general motor skills. The cognitive component permits the motor skills to be effective in performing actions consistently. This dichotomy in skill performance in athletics exists in the difference between the ability to understand which action should be performed and in the actual performance of the activity. This view of problem solving lies in the realm of information processing theory rather than that of hierarchical executive processes, or schemata theory, and may serve to explain highly skilled problem solving in athletics.

The theory of schemas or hierarchical processes is probably one of the major contending viewpoints with respect to the Learning Theory approach and merits a brief discussion. Schema theory is based on the notion that centrally stored schemas dictate responses to problem solving situations. Bartlett (1932) defined a schema as 'an active organization of past reactions or past experiences, which must be operating in any well-adapted organic response'. He believed that schemas were executive strategies that governed procedural and declarative knowledge. A hockey player, for example, would require a few basic schemata for shooting the puck that could be adapted to the current circumstance. The most important features of schemata with respect to novel situations is that they are pre-packaged action plans that are holistic in nature. Due to the holistic nature of a schema, most of the adjustment to the schematic action plan appears to take place only once an outcome has been experienced (Schmidt, 1988). This implies that the schemas available to the athlete would be limited by both the structure already in place and the requirement for seeing outcomes in order to modify the initial schema in a significant way. Schemas might be practical action plans in situations fitting those already constructed in longterm memory.

It would seem, however, that a more finely tuned, immediate, and situation-specific form of processing would be required to solve novel problems. The Learning Theory model described by Anderson (1983, 1993) has provided a view of cognition that seems to better address the manner in which experts deal with the problem of novel situations. This difference is proposed to lie in the way in which information is stored and retrieved which allows for more efficient cognitive functioning in finding problem solutions.

Chase and Simon (1973) determined that, in the field of chess, experts differed from novices in the ability to find meaningful patterns in the information stored in long-term memory. Novices did not differ in the absolute number of production units available, usually between 5 and 9 units, but the units recalled were not constructed in patterns that were as useful as those recalled by experts. Kahney (1993) compared this to word recognition abilities in that novices recall letters while experts recall words. The difference between expert and novice performance on patterning abilities may be explained by findings in the study of contextual interference (Shea & Morgan, 1979). In this line of research it has been found that the order of presentation of practice trials in learning a skill affects performance and retention of the skill differentially. It was determined that when practice trials were presented in a consecutive or blocked order, performance was enhanced. When practice trials were presented in a random order performance was not as readily enhanced; however, retention of the skill was greatly increased. One explanation of this phenomenon was that much more intentional and elaborate processing strategies are required to retain several tasks in learning memory simultaneously (Gabrielle, Hall, & Lee, 1989). Another proposition entailed the notion that randomized presentation of practice trials forced the individual to produce more solutions to the problem due to the lack of an action plan. It might be suggested that expert performers learn to combine production units in a way that is more characteristic of the randomized practice trials method as they gain experience. In this manner, many more possible meaningful solutions are available to the expert and are more closely matched to the cues of the problem situation.

It appears that both concentration and flexibility are skills that allow the individual to gather and efficiently store information in the acquisition of expertise. One further construct is required to describe the ability to focus on improving these skills, that being the motivation to learn in a specific domain.

Intensity

It has been noted that extensive experience is a necessary but not sufficient prerequisite to develop expertise (Anderson, 1995). It is evident from the preceding sections that concentration and flexibility both contribute to expert performance. Another cognitive ability that appears to contribute to high performance athletes is intensity. Intensity may be defined as an intentional effort to improve one's own performance through practice, and an extreme displeasure in not performing to top capability (Kirschenbaum, 1987; Whelan & Epkins, 1990). Dweck and Leggett (1988) speak of an individual valuing challenge and seeking goals in a highly persistent manner. These authors indicate that this level of intensity in pursuit of learning new skills contributes to enhanced problem-solving abilities. Intentional effort to develop individual expertise has been observed to be one of the factors that distinguishes high performance from non-high performance in athletes (Ericsson & Charness, 1994; Ericsson & Lehmann, 1996).

The development of individual expertise may be considered as a form of goal-setting. Dweck (1992) defined goals as mental representations of outcomes which individuals strive to attain. In the case of athletics, intensity would consist of setting a goal to achieve the best personal result in terms of performance. Studies in goal setting in the athletic domain have traditionally been based on the theory of Locke and Latham (1985). A review of several studies (Kyllo & Landers, 1995) found that having no goal, or vague goals to do one's best, would not be as effective in enhancing performance as concrete, short-term, and realistic goals.

Weinberg and Gould (1995) indicated that there are two general types of goals in athletics: (1) performance goals, and (2) result goals. Result goals are those in which the outcome of a competition is the focus. An example of this would be winning a marathon or a hockey game. Performance goals emphasize personal achievement and are measured by self-referenced standards. Performance goals are thought to enhance achievement by reducing focus away from future outcomes and onto present cues, and also by shifting concentration away from uncontrollable factors such as opponents' skill. Locke and Latham (1985) maintain that performance goals are linked to concentration in that they focus the individual's attention on factors that are clearly defined and controllable. In Kyllo and Landers' (1995) review of the athletic literature on goal-setting, it was concluded that performance was improved by over one third of a standard deviation relative to baseline conditions. Winter and Martin (1991) found that elite athletes tended to use breaks in the play to review goal achievement strategies. Jackson and Roberts (1992) and Duda (1997) noted that performance and concentration were both enhanced if performance goals were maintained. Onestak (1991) concluded that mental practice involving perceptions of a positive performance appeared to affect skills having a significant cognitive component and was better used by elite than non-elite athletes. Kirschenbaum (1987) refers to this drive to realise personal potential as an ability that is under control of the athlete, while Whelan and Epkins (1990) refer to self-generated arousal strategies that enhance performance. It appears from the research described that intensity is an ability that is both under the control of the athlete and also characterises high performance.

Summary

In summary, a review of work on Case's theory of CCSSs and on encapsulated abilities in sport has lead to the following conclusions: (1) there appears to be domain specific development of structures that regulate internal representations of the environment; (2) these structures are conceptual in nature; (3) CCSSs develop at an age-constrained rate; (4) Case's theory of CCSSs may better account for high performance with the addition of the notion of encapsulated abilities; (5) encapsulated abilities which develop at a rapid, unconstrained rate may be considered as accounting for high performance, (6) the domain of social cognition is critical to high performance in athletics, (7) social cognition in the athletic domain is characterised by the development of a CCSS, (8) high performance in social cognition in the athletic domain is characterised by three encapsulated abilities that include concentration, flexibility, and intensity.

The athletic context is one in which much research has been conducted into the factors that contribute to high performance. This context is particularly conducive to studying novice versus expert performance as there are a wealth of visible and objective performance indices by which this distinction is clearly made. It has been demonstrated that the understanding and prediction of the intentions and behaviour of others is an essential factor that distinguishes high performance from non-high performance athletes (Mahoney & Gabriel, 1987; Smith & Christensen, 1995; Whelan & Epkins, 1990). Many sport studies, however, have examined individual psychological factors (Pickens & Rotella, 1996; Rushall, 1989) without a strong theoretical rationale. There is, then, both a need to expand upon the knowledge of how social cognition develops by examining quite different specific contexts, a contribution to be made to the sport literature by the linking of pertinent psychological factors to a theory of social cognition that has been substantiated in other contexts, and a contribution to be made to the understanding of high performance in any domain by the study of encapsulated abilities. It seems that factors other than those which are both conceptually and biologically constrained must be brought forward to account for such discrepancies in individual development. These are the main goals that are pursued in the current study.

Hypotheses

Hypothesis 1: Developmental Stage of the CCSS in high performance hockey players will be significantly greater than non-high performance hockey players of the same chronological age by one substage.

This hypothesis is related to the notion that high and non-high performers will function at the same structural level in solving social problems. As in prior research on Case's model (case, 1992; Porath, 1996), a certain percentage of the high performers may differ from non-high performers by more than one substage. Overall, however, there will not be a significant majority of high performers performing at one substage beyond that expected for their chronological age.

Hypothesis 2: High performance hockey players will demonstrate significantly higher levels than non-high performance hockey players of the same chronological age in the ability to detect advance cues predicting opponent's actions.

This hypothesis is related to the proposition that Concentration, or the ability to focus attention on cues relevant to predicting the behaviour of others, will be higher in high performers than in non-high performers. High performance is proposed to predict the ability to perceive clues as to another's behaviour.

Hypothesis 3: High performance hockey players will demonstrate significantly higher levels than non-high performance hockey players of the same chronological age in the ability to provide adequate solutions to social game problems.

This hypothesis is related to the proposition that Flexibility, or the ability to generate adequate solutions to social problems in the hockey context, will be higher in high performers than in non-high performers. High performance is proposed to predict the ability to generate a greater quantity of highly strategic solutions to game problems.

Hypothesis 4: High performance hockey players demonstrate significantly higher levels of Mastery goal orientation than non-high performance hockey players of the same chronological age.

This hypothesis is related to the proposition that Intensity, or the ability to direct one's attention toward improving skills rather than exhibiting acquired skills, will be higher in high performers than in non-high performers. High performance is proposed to predict the ability to direct attention towards the mastery of skills.

In the chapter that follows, a description of the methodology used in the study is presented.

CHAPTER III

METHODOLOGY

In the current study a combination of quantitative and qualitative methodologies was used to assess basic structural level as predicted by Case's theory, as well as the more exploratory encapsulated ability factors proposed to characterise high performance athletes.

Participants

The sample consisted of 50 14-15 year old male Bantam ice-hockey players (mean age was 14.22 years old). In the BC Minor Hockey League, participants who are in the 14-15 year old age range are termed 'Bantam' players. Within the Bantam age range, teams are divided into Divisions in the following calibres: (a) House, (b) C Division, (c) B division, (d) A division, (e) AA division, and (f) AAA division. The divisions range in ability from House division to AAA division, with AAA calibre being the highest level of play. In the current study, 23 individuals were drawn from House and C division teams, and 26 from AAA teams. For the purposes of this study, the House and C division players were grouped together and termed 'Division B', while the AAA players were referred to as 'Division A'. The Division A players were considered to be the high performance players playing the top Bantam calibre hockey for their age group. Demographics for the entire sample and for each Division separately are presented in Table B1.

The age-group selected was intended to allow for assessment of individuals at the vectorial stage of Case's model. It was thought that players of this age could potentially demonstrate the most advanced structural development possible within the age limits of Case's model. The selection of the 14-15 year old group, which is an approximate midpoint of Case's vectorial stage, also permitted the possibility of identifying individuals who may be advanced one substage beyond the norm for the group on Case's staircase model (see Figure 1). The vectorial stage is so termed because it is a phase of development at which the individual is able to understand that the opposition between two variables may be considered as a second order variable. This second order variable has a magnitude and direction in the same sense mathematical vectors have. For example, an individual may have two opposing traits such as being aggressive and cooperative. An individual reasoning at the vectorial stage will be able to consider the direction (type of trait) and magnitude (degree possesses trait) of the first trait in conjunction with the direction and magnitude of the second trait in predicting what the person might do in a given situation.

<u>Procedure</u>

Participation in the study was elicited by approaching the coaches of six teams who provided access to the participants and assisted with questionnaire distribution. Participants were informed of the nature of the study, that participation was voluntary, and would require approximately an hour of their time (see Appendix F) and that signed parental consent was required before filling out questionnaires. This set of instructions required approximately half an hour of the participant's and investigator's time. A questionnaire was sent home with each participant with a request to complete the form without assistance from anyone and to return the filled out form by the following practice or game session. A small pilot study, consisting of 12 participants randomly selected from the sample of 50, was conducted. Th purpose of the pilot was to: (1) ascertain if there was a difference between participants who were administered an oral form of the questionnaire and those who answered in written form, (2) develop a coding system for structural level and Flexibility. No difference was found in the detail of responses provided in either oral or written format, therefore, the more efficiently administered written format was used for the study.

Instruments

The questionnaire administered to the participants consisted of five problem scenarios and two Likert-type scales. The problem scenarios were based on work by Marini and Case (1994) and were adapted to the ice-hockey context. These five problems were presented for two purposes: (a) to assess the level of the Central Conceptual Social Structure (CCSS), and, (b) to assess the degree of Flexibility or diversity and quality of solutions to a single problem. The two Likert-type scales were intended to assess the participant's attitudes toward Intensity, or commitment to Mastery goals that involved improving hockey skills, and Concentration, or the ability to detect cues relevant to predicting other players' behaviour during a game. Two expert raters, who had coached upper level minor hockey, were involved in coding the five problems for structure and Flexibility in this analysis.

Assessment of the Central Conceptual Social Structure.

The five problems assessing development of CCSS (see Appendix F) were derived from those used by Marini and Case (1994). Marini and Case specified five levels of analysis for responses to problems with increasingly complex elements: (1) Level OA, abstraction of a single character trait, (2) Level OB, abstracting critical dimensions of a story problem, (3) Level 1, making a prediction of behaviour from one character trait, (4) Level 2, making a prediction of behaviour based on two character traits, and (5) Level 3, making a prediction of behaviour based on two character traits and a mood-altering event. Since the more advanced levels are built upon preceding levels, participants were expected to pass all problems below the highest level at which they passed. For example, if a participant passed at Level 2, they would be expected to pass at less advanced levels OA, OB and 1 as well. In Marini and Case's study, 95% of the 13-15.5 year old sample passed up to Level 1, 75% of participants passed at Level 2 while 25% passed at Level 3. The participants in this study were all between the ages of 14 and 15, therefore they were expected to pass all items up to and including the Level 1 problem. The original scoring plan was intended to follow that of Marini and Case's which was as follows: (a) '0' indicated a pass at both Level OA and Level

OB, (b) '1' reflected a pass at Level 1, (c) '2' reflected a pass at Level 2, (d) '3' reflected a pass at Level 3. This system is referred to in the current study as 'between-problem scoring'. Within each of the five levels, a 'within-problem scoring' system was devised. For each of the five problems, the following system was used: (a) '0' was given if the problem was not passed, (b) '1' was given if the problem was partially passed, and (c) '2' was assigned if the problem was passed.

The specific content for determining pass or fail at each level was established by a collaboration between the researcher and an expert Level 3 coach with 12 years coaching experience who had worked with upper level players of various ages. Coaches in Canadian Minor Hockey are certified from Level 1 to Level 5. The Levels reflect expertise in the following way: (1) Level 1 and 2 coaches are certified to coach House players, (2) Level 3 coaches are qualified to coach Rep hockey, including AAA players, (3) Level 4 coaches are qualified to coach Junior players, and (4) Level 5 coaches are certified to coach beyond Junior. Responses of six Division B and six Division A players, randomly chosen from the sample of 50, were examined for content in a small pilot study. A coding system was developed for the purposes of the current study which was based on Marini and Case's levels but was referenced to hockey-specific statements made in the assessment of the 12 participants' responses to the five problems. This coding format, presented below in detail with examples, was then given to two other expert coach raters who had not been involved in developing the coding system and who then coded the second set of problems independently of each other. These two coaches were Level 3 and Level 5 in certification and had both had approximately 10 years of coaching experience. The two raters were given the 50 questionnaires and asked to assign a code value for each of the five problems using the coding system devised from the responses of the 12 randomly chosen participants.

Description of Coding System

a) Problems Assessing Bidimensional Capabilities

i) Level OA: Abstraction of a General Trait (nine to ten year olds) This task was intended to assess the ability of the adolescent to abstract a single general dispositional quality or trait from a description of the protagonist's behaviour. Case (Marini & Case, 1994) noted that understanding of trait labels emerges in children's speech at approximately the age of nine or ten years.

Level OA Problem: During a regular season ice-hockey game, Jason was heading for the bench on a line change. An opposing team player got in his way as he was trying to get off the ice. Jason told the other team's player to get out of his way. What type of person is Jason? What makes you think he is this kind of person?

A score of 2 was given if the participant mentioned a trait and the behaviour that led to that trait extraction. A score of 1 was given if a trait was mentioned. A score of 0 was assigned if neither a trait or an explanation was given. Responses were not graded on a presumed correct trait extraction but rather on a trait extraction that was accompanied by a reasonable explanation. An example of a response to Problem 1 was as follows: "Jason is a nice person (trait) because he did not punch or get real mad at the guy (explanation)". For a glossary of terms used by the participants and equivalent trait descriptions assigned by raters(see Appendix D).

ii) Level OB: Abstracting the Critical Dimensions of a Story Problem (nine to ten year olds)

This task was designed to assess the individual's ability to predict a protagonist's behaviour in a situation where a simple response would be problematic, either through the fact that their rights were being challenged or some assistance was required. Participants were required to coordinate different dimensions of information from the problem in order to make a prediction about the protagonist's behaviour.

Level OB Problem: Tyler was dressing before a game. He was almost out of tape to put on his new stick. One of his teammates used up Tyler's tape without permission while Tyler was talking to the coach. What do you think Tyler did and why?

A score of 2 was given if the participant recognized that the tape had been taken without permission (dimension 1), that this problem needed to be solved (dimension 2), and a prediction of action on the protagonist's part was made. A score of 1 was given if either one of the problem dimensions were identified, along with a behaviour prediction. A score of 0 was given if neither facet of the problem was mentioned. An example of a response which was assigned a "2" value is as follows: "I think Tyler borrowed tape from someone else (dimension 2) and told Jay not to use his tape with out permission (dimension 1)".

b) <u>Tasks assessing Vectorial Stage</u>

Three problem situations with increasing levels of complexity were presented to assess the individual's level of development within the Vectorial stage. In this set of tasks, the individual was first presented with some information about traits of the character. In the second part of the problem, increasing levels of complication were introduced that affected decisions about the outcome of the protagonist's behaviour.

1) <u>Level 1</u>

At Level 1, one personality trait was relevant and could be inferred by the protagonist's behaviour in part one of the story.
A prediction was then required about the character's behaviour in the problem episode that made sense in light of the trait identified.

Level 1 Problem: Jonathan's team was having a practice session. They were practising breakaway drills in small groups. In Jonathan's group, one of the centres took several more shots at the goalie than Jonathan did. Jonathan told the center that next practice they would share the shooting more equally. At the next practice the center again took more shots than Jonathan. What do you think Jonathan did? Why?

A score of 2 was given if the participant identified Jonathan as having a trait, such as assertiveness, that seemed plausible given his actions in the first part of the story, as well as making a behavioural prediction which reflected knowledge of the trait described in the first part of the story. A score of 1 was assigned if either a trait was identified or a prediction was made. A score of 0 was given if neither was stated. An example of a response which was assigned a "2" value is as follows: "Jonathan wanted to be fair (trait) so next practice he again told the centre that they would share the shots more equally "prediction of behaviour from actions of protagonist in first part of story).

2) <u>Level 2</u>

At Level 2, two personality traits were relevant and could be inferred by the protagonist's behaviour. As in the Level 1 problem, a prediction was required about the character's behaviour which took into account both traits which made sense with reference to the traits identified.

Level 2 Problem: Robert was standing in the slot in front of the opposing net waiting for a quick pass from his winger, Cody. Instead of passing, Cody tried to score himself from a bad angle. On the bench, Robert told Cody that the team might have scored if the pass had been made. In the next play, Robert was close to the opposing net but was being blocked by a defenseman. He passed the puck off to Cody and they scored. Toward the end of the game, when Robert's team was down by a goal, Cody tried to carry the puck all the way down the ice and score himself. Robert's team ended up losing the game. What do you think Robert did? Why?

A score of 2 was given if the participant identified two of the protagonist's traits from the first part of the story and coordinated these two pieces of information in making a prediction as to how the protagonist would behave in another part of the story A score of 1 was assigned if only one trait was identified and used in predicting the protagonist's behaviour. A score of 0 was given if neither was stated. An example of a response which was assigned a "2" value is as follows: "Rob probably took Cody aside after the game (trait identified of Rob being assertive) and explained (trait identified of Rob being rational or diplomatic) that if he didn't pass the puck like a team player, then the team would lose all season".

3) <u>Level 3</u>

At Level 3, an additional item of information had to be taken into account in making a decision as to how potentially conflicting traits might be taken into account in solving a problem situation. The additional information consisted of a mood-altering event that occurred during the course of a series of events.

Level 3 Problem: Ryan was waiting in line to get his skates sharpened and just as his turn came up they announced the shop was closing. Ryan told the people at the shop that he had been waiting a long time and that he wanted his skates sharpened before they closed. After skating he went over to see his friends. Late in the afternoon while they were playing road hockey, Ryan remembered that he had to be home because relatives were coming, so he excused himself and started to leave when his friend asked him for help in how to execute a wrist shot. Ryan helped his friend with the wrist shot and then left for home. On his way home he fell off his bicycle. While he was pushing his bicycle home a person approached him asking for directions. What do you think Ryan did and why?

A score of 2 was given if the participant identified two of the protagonist's (Ryan) traits such as assertiveness and helpfulness, and an observation that he had experienced an event that could alter the expression of these traits (falling off bicycle), as well as a solution to the problem. A score of 1 was assigned if two traits or the mood-altering event were mentioned, as well as a solution to the problem. A score of 0 was given if neither of the traits or mood-altering event were mentioned. An example of a response which was assigned a score of "2" is as follows: "Ryan probably stopped and helped the people with directions because he was a good enough person (trait) to help with his friend's shots. He did this even though he was upset at all the bad things that had happened to him (recognise mood-altering events). He didn't say anything else to them because he knew he was already late to see his relatives (trait)".

Alterations to Coding of the CCSS

Difficulty in using the data as planned from the five structural problems arose during the coding process. It was found that 22% of the participants who passed the age-appropriate Level 2 problem failed to pass the Level OA, Level OB and Level 1 problems which preceded Level 2. The fact that levels are recursive and sequential, and that the 5 problems reflected this gradual increase in complex thinking, indicated the probability that a factor other than inability to pass each preceding level was operating. An inspection of the data revealed two possibilities: (a) Level OA, OB, and 1 problems were not worded in such a way as to elicit sufficient responses to code adequately, or (2) participants were often insufficiently challenged by the lower level questions to provide the necessary detail. It was decided that since the majority of participants (68%) had passed the age-appropriate Level 2 problem and all had attempted the Level 3 problem that these problems would become the focus of analysis of structural development while the three lower level problems would be omitted from analyses.

A 'Structural Level' score was calculated for each participant over the Level 2 and Level 3 problems as follows: (1) '0' was assigned if the response reflected a Level OA or Level OB response, (2) '1' was given if the response reflected Level 1 structure, (3) '2' was given if a Level 2 response was given, (4) '3' was assigned if the response reflected Level 3 structure. Once scores were obtained for

Problems 4 and 5, a 'structural score' was calculated by summing the two scores and dividing by 2. This score was thought to approximate the individual's actual structure. An individual could then receive a structural score of 0.0, 0.5, 1.0, 1.5, 2.0, or 2.5. For the purposes of comparison with Marini and Case's (1994) work on the social structure of this age group, averaged scores over Problems 4 and 5 that fell between structural levels were rounded up. Scores that were between Levels, such as 1.5 and 2.5, were rounded up to the next level. An interrater reliability of .96 (Cohen's Kappa) was calculated for the two sets of ratings on the CCSS or Level variable.

<u>Assessment of Encapsulated Abilities</u>

Evaluating elaborations upon the CCSS included assessments of Concentration, Flexibility and Intensity. The Level 2 problem was selected as the level at which elaborations would be coded. This problem assesses the achievement of Level 2 structure which is expected of the majority of the 14-15 year old sample, therefore elaborations on this level of structure would be of the greatest theoretical interest. The following assessments were used to evaluate the degree of elaboration within structural stage.

1) <u>Concentration</u>

Concentration was assessed using an adaptation of Nideffer's (1976) Testing Attention in Sport (TAIS) Scale developed specifically for the purposes of this study (see Appendix F). The TAIS has been widely used in athletic assessment and has been found to be a predictor of sport excellence (Zaichkowsky, Jackson, & Aronson, 1982). This adaptation of the TAIS was intended to measure the degree to which an individual was able to focus attention on relevant environmental cues that would aid in predicting the behaviour of other players. The Concentration Scale was comprised of 20 Likert-style items on which the participants rated themselves from a low score of 1, or "Almost Never", to 5, or "Almost Always", as to how well they could maintain their on-ice concentration. A low score on the scale reflected low ability to maintain effective concentration while a high score indicated high ability in concentrating on relevant cues to aid anticipation and performance. An alpha reliability of .69 was obtained for the Concentration scale which reflected a reasonably good tendency for self-ratings on one item to correlate with self-ratings on other items which comprised this scale.

2) Flexibility

The responses to the Level 2 problem were quantitatively and qualitatively analysed post-hoc as it was expected that specific aspects which characterise Flexibility would emerge in this process. Establishing guidelines for and carrying out of coding for Flexibility was similar to that of coding developmental level in Problem 4. Responses from the 12 randomly chosen participants, six from each of Divisions B and A, were examined and rated on a continuum thought to reflect increasing levels of flexibility, as described below. This initial coding step was carried out by the researcher and the same league coach who participated in the Developmental level coding to reflect increasing levels of flexibility. The two expert raters who had coached upper Division minor hockey and who had coded for Developmental level in Problem 4 were then involved in coding responses independently of each other. These two raters were given the 50 questionnaires and asked to assign a code value for each of the five problems using the coding system devised from the responses of the 12 randomly chosen participants. Flexibility was assessed with consideration both for (a) the number of solutions provided for the Level 2 problem and also for (b) the content of these solutions. A coding system for Flexibility was devised from a review of the responses of 12 randomly chosen participants from the sample of 50. This system was based on the progression of responses from non-strategic, emotional reactions to highly strategic, rational solutions. The continuum represented responses that ranged from physical and poorly thought-out reactions to those which implied more responsibility taken by the protagonist for solving the problem calmly and adequately. These responses were considered by the expert raters to reflect a high degree of leadership. Responses were coded on a scale of '0' to '4', with 4 representing the most strategic, rational and responsible solutions. A zero was assigned if the solution to the problem consisted of a simple emotional reaction such as "get mad", "get even" or (non-strategic) "do nothing". A value of one was assigned if the response involved a simple restatement of the solution presented initially in the problem itself ("just tell him again"). A response earned a value of two if authority was the only method used to mediate the dispute ("tell the coach") or if the participant referred to an attempt to mediate in a direct way through anger with an attached explanation ("yell at him and tell him he let the team down"). A three was assigned if an effort was made to demonstrate mediation through rational explanation ("take him aside, tell him they might have won if he'd passed") or investigation ("ask him why he didn't pass on the second play"). A value of four was given if there was evidence of sequencing or multiple solutions in the response. For example, if the respondent anticipated that direct mediation ("try talking to him one on one first") might not work and then suggested another step ("if that didn't work") such as "bringing the coach in to help explain" might be necessary, the response was considered to show "if-then' anticipatory thought and was assigned a value of four. The final category of coding reflected the importance of the ability to generate a number of solutions as well as qualitatively stronger solutions.

3) Intensity

Intensity, or the willingness to devote extensive effort to improving one's skills in a sport, was assessed using a protocol based on Leggett and Dweck's (1986) work on goal orientation which was developed specifically for use in the current study. The participants were administered a sport specific version of Leggett and Dweck's (1986) assessment of an individual's orientation toward Mastery or Performance goals. Individuals with mastery goals are oriented toward learning a new skill and perceive effort as a strategy for achieving skill in an activity. Performance-oriented individuals are oriented toward demonstrating existing ability and view effort as reflecting a lack of ability in demonstrating or practising a skill. Leggett and Dweck contended that a Mastery orientation is manifested by the endorsement of items such as "Even when you are very good at something, working hard allows you to really understand it". Performance-oriented individuals endorse items such as "If you have to work hard at some problems, you probably aren't very good at them'. A 16-item Likert-type scale was included in the assessment to determine goal orientation (see Appendix F). Participants rated themselves from 1 ('Not Very Successful') to 5 ('Very Successful') as to how they felt the 16 statements described them as hockey players. Eight items reflected Mastery goals such as feeling the most successful 'When I started to learn a new skill'. The remaining 8 items reflected Performance goals including such items as 'When others told me I had a good game'. Dweck and Bempechat (1983) referred to Mastery and Performance goals as being 'essentially opposite conditions' as if they were two ends of the same dimension and have treated them as different ends of one dimension. Accordingly, in the current study scores on the 8 Performance items were coded so that a high score on a Performance Item contributed to a low overall Mastery score when all the items were summed. A high score on the Intensity Scale reflected an orientation toward Mastery Goals in the sport. An alpha reliability of .75 was obtained for the Intensity scale which reflected a reasonably good tendency for self-ratings on one item to correlate with self-ratings on other items which comprised this scale.

Alpha reliabilities were calculated also for the Mastery subscale (.61) and the Performance subscale (.66).

Number of Words Used in Responses

The number of words used to respond to Problem 4 were counted. Porath (1996) refers to these indicators of ability as 'tokens'. Tokens are variables that do not have a strong conceptual loading and are indicators of expertise which are less bound to age expectations. Number of words were counted in the present study to provide a reasonably objective indicator of the complexity of the response. It was proposed that the number of words used to respond to a problem would be a reflection of the amount of information a participant was considering in providing a response. In the next chapter, results of the analyses of the data are described. Results are related to each research hypothesis.

CHAPTER IV

RESULTS

In the following sections, the results of investigation of assumptions underlying analyses and the main analyses are described.

Percentage of Participants Passing at Structural Levels

An analysis of the percentage of participants passing problems assessing various levels of structure was conducted. Structural Level scores were obtained by averaging scores on Problems 4 and 5. Table B2 shows percentages of participants in each Division who passed at each of the possible scores for Structural Level which included 1.0, 1.5, 2.0 or 2.5 once the two problems were averaged.

Once Structural scores were computed, it was found that 100% of the sample passed at Level 1 (obtained a Structural score of 1.0), 72% of the sample passed at Level 2 (obtained a Structural score of 1.5 or 2.0) and 16% of the sample passed at Level 3 (obtained a score of 2.5).

Correlations among the variables used in the analyses are presented in Table B3.

Investigation of Assumptions underlying Analyses

Prior to the main analyses, all variables were examined to determine if their univariate and multivariate distributions were appropriate for inclusion in the planned multivariate analyses.

Data were examined for violation of univariate assumptions for the entire sample as well as by Division. Means, standard deviations, range values, and measures of skewness and kurtosis for the entire sample are presented for Level, Concentration, Flexibility and Intensity in Table B4.

Descriptive statistics on these variables for Division B are presented in Table B5 and for Division A in Table B6.

Normality of the dependent variables was confirmed by examination of data in the form of: (1) frequency histograms, (2) normal probability plots, and (3) detrended probability plots. Linearity and homoscedascity were confirmed through investigation of bivariate scatterplots of the dependent variables. No univariate outliers were detected for any of these variables using the following: (1) presence of standardised scores in excess of -3.00 or +3.00, (2) boxplots, (3) histograms, (4) normal probability plots, and (5) detrended probability plots (see Appendix C for boxplots).

Multivariate assumptions were examined through a variety of methods. The assumption of multivariate normality was met due to having greater than the suggested 20 df for error suggested by Tabachnick and Fidell (1989). Scatterplots between all pairs of dependent variables established that linearity was not a concern. The search for multivariate outliers was conducted using regression analysis of the four variables on the dependent variable of Division. This analysis revealed no significant values of Mahalanobis distance at $p<.001$. Box's $\underline{M}$ test resulted in an $\underline{F}=1.67$, $\underline{p}>.05$, thereby confirming homogeneity of variance-covariance matrices.
The determinant of the pooled within-cells correlation matrix was

119.17. This result was judged to be sufficiently different from zero that neither multicollinearity nor singularity would present a problem. From the preceding analyses, it was concluded that the data were suitable for entry into the planned multivariate analyses.

Preliminary Analysis of Effects of Weight and Division on Dependent Variables

The planned main analysis of the study consisted of a comparison of Division B and A players on the dependent variables of Structural Level, Concentration, Flexibility and Intensity. Since an inspection of the sample demographics revealed apparent differences in physical size with respect to division of hockey, it was considered necessary to conduct a preliminary investigation as to whether this factor interacted with Division with respect to the dependent variables. A two-way MANOVA with Division and Weight as the independent variables and Structure, Concentration, Flexibility and Intensity as the dependent variables revealed no significant main effect for Weight, $F(4,43)=.49$, $p>.05$, and no significant interaction between Weight and Division, $F(4,43)=.79$, $p>.05$ using Wilk's criterion. There was a significant difference between Divisions on the dependent variables, $F(4,43)=8.34$, $p<.001$. Cell statistics are presented for categories of Weight and Division in Table B7. Box's M statistic for this analysis was $F(30, 2264)=1.27$, $p>.05$, confirming homogeneity of variance-covariance matrices. The Bartlett test of sphericity yielded a value of .921 ($p>.05$) which indicates that correlations among the dependent variables differ from zero. The pooled within-cells correlation matrix used in this analysis is provided in Table B8. A post-hoc analysis of power was conducted. Power values of the overall tests for determining differences between groups on the dependent variables were as follows: (1) Weight by Division (.23), (2) Weight (.15), (3) Division (1.0). It was determined from these results that the intended analysis of Division without regard for weight would be appropriate as planned.

Analysis of Effects of Division on Dependent Variables

The main analysis consisted of a Hotelling's T^2 analysis with Division as the independent variable and Structure, Concentration, Flexibility and Intensity as the dependent variables. Twenty-four Division B players and 26 Division A players were compared on the four dependent variables for a total N of 50 participants. Using Wilk's criterion, the linear combination of dependent variables was significantly affected by Division, $F(4,45)=10.54$, $p<.001$. In univariate ANOVAs following the main test, differences between Division B and A players were found for Flexibility, $F(1,48)=42.57$, $p<.001$, and Intensity, $F(1,48)=8.35$, $p<.01$ (see Tables B5 and B6 for means and standard deviations of dependent variables for Divisions A and B). No significant differences were found between the two Divisions for Structural Level or Concentration at $p>.05$. Box's M statistic for this analysis was $F(10, 10844)=1.67$, $p>.05$, confirming homogeneity of variance-covariance matrices. The Bartlett test of sphericity yielded a value of 11.52 ($p>.05$) which indicates that correlations among the dependent variables differ from zero. The pooled within-cells correlation matrix used in this analysis is provided in Table B9. A post-hoc analysis of power was conducted. The power value for the overall test of Division was 1.00. Power values for each dependent variable test were as follows: (1) Structural Level (.22), (2) Concentration (.05), (3) Flexibility (.99), (4) Intensity (.81). Means and standard deviations for Structural Level, Concentration, Flexibility, and Intensity appear in Table B10.

Analysis of Factor Structure of Concentration Scale

A Principal Components analysis was conducted on the 20 Concentration items to determine whether there was any meaningful structure underlying these items, as the Concentration Scale failed to reveal differences between Divisions (see Table E1). Seven oblique factors emerged from this analysis (see Table E2 for correlations between factors). Alpha reliabilities for the 7 factors were as follows: (1) .86, (2) .57, (3) .30, (4) .24, (5) .02, (6) .53, (7) .06. Factor 1 was judged to be the only factor with sufficient reliability to proceed with further analysis. Factor One had an eigenvalue of 4.30 and accounted for 21.5% of the variance. Concentration items 3, 11, 12, 15 and 16 were correlated greater than .50 with Factor One. These variables tapped into Nideffer's 'external wide focus' construct which reflects the ability to direct attention to many relevant action-predicting details of the ongoing game action as possible. Factor One was subjected to an ANOVA with Division as an independent variable. A Bartlett-Box $F(1,6880)=.31$, $p>.58$ confirmed homogeneity of variances. No significant differences between Division were found on Factor One, $F(1,48)=.04$, $p>.05$. The remaining six factors had eigenvalues which ranged from 2.58 to 1.07 None of the six ANOVAs on each of the factors with Division as an independent variable were significant.

<u>Analysis of Number of Words used in responses to Problems</u>

The number of words used to answer the Level 2 problem were calculated. Number of words used correlated positively with Flexibility (.47, $p<.01$) and Structural Level (.56, $p<.01$).

<u>Summary</u>

In summary, an initial analysis of the effects of weight and Division on the dependent variables yielded no significant findings. The main analysis revealed a significant difference between Division B and A players on Flexibility and Intensity. Division A players showed greater Flexibility in their solutions to the Level 2 problem and a Mastery rather than Performance orientation toward their sport. Structural level did not differ significantly between Divisions. Concentration was also not significantly different between Divisions.

A Principal Components Analysis on the Concentration Scale resulted in seven components. An ANOVA with Division as the independent variables and the first principal component as the dependent variable was not significant. The number of words used to respond to Problem 4 correlated significantly with Structural level and Flexibility. Implications of these findings are discussed in Chapter V.

CHAPTER V

DISCUSSION

The primary purpose of the present study was to investigate whether Bantam Division B hockey players were distinguished from Bantam Division A players in levels of social cognition. Before a discussion of the results is undertaken, limitations of the study are described which might affect interpretation of the results.

Limitations of the Study

There were some aspects of this study which limit the generalization of results to the target population of Bantam hockey players. These limitations are related to the development of methodology special to this investigation, constraints of sampling and methodology procedures. There are also some suggestions for future research guidelines which emerge from knowledge of these constraints.

The measures developed for use in this study were adapted for the most part from instruments used in previous studies in other contexts. The Concentration scale was developed in the sport context and required little adaptation for application to Bantam hockey players. The Intensity scale was adapted from work with children in classroom settings which may have had an impact on the way it was interpreted for use in the sport context. The five problems derived from Marini and Case's (1994) work were refined specifically to test the CCSS in the social domain on similar age groups and were changed very little for use in the current study. These aspects of the origins of the scales, even though the format and content was very similar, may have had some effect on the validity of the measures.

The sample of 50 Bantam hockey players was a volunteer group and therefore subject to the biases inherent in volunteer samples. Coach cooperation and parental consent were also required for the participation of this sample, which further narrowed the generalizability of the sample.

There were limits on the number of teams which could be approached and sampled in a reasonable time as the contact and instruction process was time-consuming. Ideally, a larger sample of players and a greater number of teams would have been advisable which would have increased power of the analyses which was lower than desirable in some of the analyses.

A further limitation in this study was probably due to the nature of the sample itself. In a small pilot study with an N of 12, half the participants were given the questions orally and prompts provided by the interviewer. The other half of the sample received the problems in written form and responded without the effect of having an interviewer present. There was no significant difference between the results of the two groups so the questionnaire methodology was adopted. In a future study, it would be advisable to pre-test and utilise more effective prompts in order to get detailed replies as this target population does not appear to provide a great deal of detail from the prompts used, regardless of whether they are provided orally or in written form. This was most likely the reason for the failure of many participants who passed Level 2 to pass the preceding levels.

In terms of the order of presentation of problems, it would be advisable to reverse the order or to find some other way to subsume the simple problems within more complex ones. It appeared that, for at least some of the sample, the lower level problems might have been so simple that the participant did not take them seriously. This is a threat to face validity which could be addressed in a future study.

With regard to the content of the questions, the Level 3 responses were somewhat contaminated by the fact that several of the respondents focussed on the 'stranger danger' content of the question rather than on the problem of identifying characteristics of the protagonist and the situation. These participants provided a reasonable response, if the focus of the question had been 'appropriate behaviour given approach by a stranger asking for help'. They did, in a way, indicate high performance in social cognition but not related to hockey and also these responses were uncodeable in terms of Marini and Case's coding heuristic.

In summary, there were several sampling and methodological problems with the study that could be rectified in future work. Although the sample size was adequate given the small number of variables under consideration, it may not have been adequately representative of the Bantam population due to all the levels of consent required for participation as well as the methodological problems.

Discussion of the Research Questions

The main goal of the present study was to investigate whether Bantam Division B hockey players were distinguished from Bantam Division A players in levels of social cognition. Social cognition was defined as the ability to successfully predict the behaviour of other players. Social cognition was proposed to be related to elaborations on basic cognitive structural development as defined by Case (1987). It appears from the findings of the current study that the level of CCSS was consistent with what Marini and Case (1994) predicted for the age-group being studied but that the content of this structure changes at different rates between high and non-high performers. The explicit content which changed was to be found in the elaborations on the CCSS. The elaborations which were considered as important to social cognition in the sport context were as follows: (1) Flexibility or the ability to generate adequate and diverse solutions to a given problem, (2) Concentration or the ability to maintain attention in an appropriate way in order to pick up cues that would assist in making predictions, and (3) Intensity or the commitment to Mastery goals such as improving skills, rather than Performance goals which are typified by an orientation toward demonstrating ability. Several hypotheses were generated to examine aspects of this main goal and are dealt with individually in the following sections. It is important to emphasise that power values for the individual tests of Structure and Concentration were low, and that conclusions regarding these variables are therefore tentative. The post hoc finding of low power is important in that it may be suggested that the lack of differences between groups may have been due to: (1) actual lack of differences, (2) insufficient power in the analysis to find differences when actual differences exist, or (3) other factors associated with null findings (Sternberg & Grigorenko, 1997).

Hypothesis 1

Hypothesis 1 stated that developmental stage of the CCSS would differ between high performance and non-high performance players of the same chronological age by one substage. As noted in the Results section, it was determined that problems which assessed structural levels preceding that of the age-appropriate Level 2 problem had not been responded to in a manner to allow adequate coding. Since the majority of the participants passed at Level 2, which is developmentally dependent on the preceding Levels OA, AB and 1, it was considered appropriate to address the responses to the Level 2 and Level 3 problems in determining Structural Level. This was based on the assumption that if participants passed at Level 2, then it was probable that their failure to pass Level OA, OB and 1 was not due to inability.

In Marini and Case's (1994) work, from which the five problems used in the present study were developed, 75% of the sample in the 13-15.5 year old age range passed at Level 2 on the personality task. In the current study, Structural Level scores were obtained by averaging scores on Problems 4 and 5. It was found that 100% of the sample passed at Level 1 (obtained a Structural score of 1.0), 72% of the sample passed at Level 2 (obtained a Structural score of 1.5 or 2.0) and 16% of the sample passed at Level 3 (obtained a score of 2.5). Within the Divisions, 63% of Division B players passed at the age-appropriate Level 2, while 81% of Division A players passed at this level. The figures for the overall sample rates of passing were comparable to Marini and Case's work and support Case's theory of the nature of Structure from 13-15.5 years of age. The univariate ANOVA on CCSS following the omnibus analysis between the two Divisions was not significant. This was interpreted as rejecting the hypothesis that there was a difference between the Division B and A players on basic structure. It appears that high performance emerges from a source other than advances on basic structural level within chronological cohorts.

<u>Hypothesis 2</u>

Hypothesis 2 stated that high performance hockey players would demonstrate higher levels than non-high performance hockey players of Concentration or the ability to detect advance cues predicting opponent's actions. The Univariate ANOVA following the main analysis was not significant for the Concentration variable. This variable did not relate to most other variables in the analysis. There was a positive but insignificant correlation between Concentration and the number of words used to respond to the Level 2 problem (.20, $p>.05$)

and a stronger, significant correlation between Concentration and attainment of Level 2 structure (.31, $p<.01$). Although these correlations might be interpreted as an indication of concentration in terms of the process of responding to the problem on paper, there was no evidence that Concentration was related to on-ice performance. A Principle Components Analysis of the 20 items comprising the Concentration scale yielded several factors indicating that the scale had more than one conceptual underpinning. The first factor obtained, which accounted for 21% of variance explained, was selected for interpretation and further analysis. The intention was to examine whether there was some construct underlying the set of Concentration items which might differentiate players by Division. The items which correlated with the first factor were related to the participants' ability to focus attention in a wide, external bandwidth in order to pick up important cues to predict action in a game situation. When the first factor was used as a dependent variable in an ANOVA, with Division as the independent variable, there was no significant difference between high performance and non-high performance players. It may be of note that the self-ratings on the Concentration scale were uniformly high regardless of Division, ranging around 3.5-4 out of 5 on ability to maintain concentration effectively. Although the scale was balanced with regard to positive and negative statements, it appeared that, regardless of Division, the 14-15 year olds rated themselves in a highly positive manner on this scale. It might be suggested that the emotional content of several of the items interfered with the accuracy of self-report. The Concentration scale requires participants to endorse items such as "I worry about what might happen in games" and "I tend to dwell on my feelings and miss game action". The findings may also have been related to the rather low reliability of the Concentration scale (.69).

Hypothesis 3

Hypothesis 3 stated that high performance players would demonstrate more Flexibility, or a greater number of more adequate solutions, to a social problem than non-high performance players. This finding was supported by a univariate ANOVA following the main analysis. The Level 2 problem is presented here for discussion purposes:

Level 2 Problem: Robert (protagonist) was standing in the slot in front of the opposing net waiting for a quick pass from his winger, Cody (antagonist). Instead of passing, Cody tried to score himself from a bad angle. On the bench, Robert told Cody that the team might have scored if the pass had been made. In the next play, Robert was close to the opposing net but was being blocked by a defenseman. He passed the puck off to Cody and they scored. Toward the end of the game, when Robert's team was down by a goal, Cody tried to carry the puck all the way down the ice and score himself. Robert's team ended up losing the game. What do you think Robert did? Why?

The responses to the Level 2 problem, which presented a conflict between team members, were coded on a continuum from non-strategic, emotional solutions to highly strategic, rational solutions for resolving the conflict.

The Division B players demonstrated attempts at rational problem solving, such as bringing the coach in as an authority figure, but more frequently referred to emotional reactions centered around the protagonist's rights being infringed upon. Typical responses included reactions such as yelling, physical responses, getting even by doing the same thing back to the antagonist, or simply doing nothing. The most important aspect of the responses of the Division B players was that a single solution was usually provided and, in many cases, that solution was not mediated by complex strategy.

The Division A players' responses were, for the most part, more rational, anticipatory, diversified and implied more responsibility on the part of the main character for solving the problem in a direct and efficient manner. These responses were considered by the expert raters to reflect, overall, a high degree of leadership. Division A players demonstrated, more than any other feature of their responses, a concern for the welfare of the team above any individual player. These players occasionally provided a response that was initially emotional but that was then followed by a rational strategy. These responses were typified by such statements as "Robert got mad and then he asked Cody to pass more next time so that they might win." This strategy was coded under the category of <u>mediating through emotion</u> <u>followed by rational explanation</u>.

Several of the participants indicated that the team well-being ("they could maybe have won if Cody had passed") was the first and most essential consideration, rather than any emotional reaction. They then went on to explicate a rational strategy to solve the problem so that it would not happen again. This kind of response was coded as <u>mediating primarily through rational explanation</u>. In almost every case, the Division A players took responsibility for solving the problem without deferring to another authority such as the coach. Statements such as "Robert didn't want Cody to let the team down next time so he told him that if he thought about playing as a team the next time they might score" or "He should tell Cody there is no 'I' in team and that they could win if he uses his linemates" were typical of this category of response. In these explanations there was no mention of an initial emotional response.

The highest level of response involved an initial concern for team well-being, an attempt to negotiate with the antagonist through rational explanation ("we could have scored if you had passed") or discussion with information-seeking ("get Cody to explain why he didn't pass"), followed by evidence of sequencing in the answer ("if that didn't work.."). This was coded under the category of <u>sequencing</u> and was based on the respondent anticipating that either a single or an initial solution might be ineffective. It involved either provision of a number of unrelated solutions or a sequence of attempts on the part of the protagonist to bring various factors into play which would probably solve the problem. An example of this was "take him aside and ask why he didn't pass, then if that didn't work then bring the coach in and discuss it between the three of them." An interesting feature of this level of response was a tacit recognition of an emotional reaction on the protagonist's part as being "what anybody would feel if his winger did that" but a statement that this reaction was muted in favour of rational strategy when it came to the interaction between the characters. These responses indicated that Robert might have felt justifiably angry but he suppressed it in order to solve the problem.

Perspective of antagonist. Another aspect of the Division A solutions in general was that many responses indicated a concern for the welfare of the antagonist. These solutions addressed the notion that Cody might have his own reasons for what he was doing that could be elicited by private discussion. The specification of privacy served two purposes, in the opinion of the expert raters: (1) allowing Cody to explain what might be personal reasons (upsets and other factors influencing effective performance) for disrupting team cohesion without embarrassment, and (2) maintaining team cohesion by avoiding open conflict between members.

Role of the coach. The role of the coach was considerably different between Division A and Division B responses. The Division A players depicted the coach more as an ally, or potential additional mediator, than an authority figure. Rather than seeing the coach as someone to step in and take over, the coach's role was more of a coordinator and mediator. The first reaction of most of the Division

A players was to indicate that the protagonist would take direct responsibility in mediating with the antagonist. In fact, the term 'antagonist' seems inappropriate to describe the conception of Cody presented by some participants. He was just another team member, who had made a mistake, and the objective was to identify the reasons for the mistake, restore team goals and unity and then proceed on to the next game.

Team unity. Perhaps the most significant difference between Division B and Division A players was the degree of effort expended in preserving team unity. In both levels of play it was apparent that unity was an important consideration in any team conflict. Statements such as "the team is like your family" and "the team comes before any one player" were made by both Division A and Division B players. The difference between the two Divisions was in the complexity of solutions, evidence of foresight, and intention to solve the problem and reestablish unity that was more evident in the Division A player solutions. It appeared that some of the Division B players did not perceive the actions of the antagonist as even being a problem. Responses such as "forget it and move on" indicated that a threat to team unity had not been recognised. The Division B player's strategy in this case was not aimed at solving the problem but simply to ignore it as being inconsequential. In none of the Division A responses was such an apparent breach in team unity inconsequential.

It was suggested by the expert raters that the concept of team unity can be instilled in most teams with competent coaching.

What appears to be the province primarily of high performance players is a more complex conception of what team unity means and production of appropriate strategies to solve cohesion problems. In this group there was greater recognition that the team must function as a whole in order to achieve its goals in that personal goals might need to be subjugated in order to reach team goals. Team welfare across both groups was a priority but there was evidence among the Division A players that the concept of team was not so much that of a singularity but rather a group of individuals with their own requirements and aptitudes who shared a common goal. Rather than seeing the team simply as a unit, the Division A players were able to see it as a complex combination of individual elements. This thinking is highlighted by comparing two statements about the antagonist Cody: (1) "Cody is a puckhog, there's no room for those types on a team" (Division B response), and (2) "Rob took Cody aside after the game and asked him why he didn't pass...maybe Cody had his reasons for not passing" (Division A response). In the first response Cody is assigned a 'type' (a 'puckhog' is a player who won't share possession of the puck). In the second response, Cody is considered as an individual with possibly complex motivations.

<u>Complexity and length of responses</u>. A more objective analysis of the Flexibility responses was conducted through counting the number of words contained in each response. A significant correlation between Flexibility and number of words used to describe the problem solution was found (.47, $p<.01$). This finding objectively

substantiates the notion of complexity of responses being associated with Flexibility in that it reflects the provision of more detail, the diversity of problem parameters considered, and a greater number of solutions provided by the Division A players. It may be noted, however, that in several cases, a lengthy response did not necessarily reflect attainment of the level to which the problem was linked. There were also many examples of brief responses which captured all of the elements required to pass basic structure, as well as providing several elaborations. In some cases, the challenge of coding responses came from sifting meaningful content from a long response while, in other instances, the difficulty was in ensuring that meaningful content was not missed in a brief response. As a group, the responses of the Bantam sample were described by one rater as 'succinct', although several players provided an enormous amount of detail and clarification in their responses.

Hypothesis 4

Hypothesis 4 stated that high performance players would be more Mastery goal-oriented than non-high performance players. Higher levels of Mastery goal orientation were proposed to reflect Intensity or the effort and determination to improve one's own skill level. A univariate ANOVA following the main analysis revealed that Division A players had a Mastery goal orientation when reporting what sorts of activities and outcomes make them feel the most successful at hockey. Division B players were more oriented toward Performance goals. This is an interesting finding as it might be assumed that winning

(Performance goal) is the most important goal for any player, particularly Division A players where performance is the critical determinant in maintaining position on the team. The results of the Intensity scale demonstrated that competence and learning new skills were more typical of Division A players than activities such as outperforming other players or winning without much effort. A single question was also posed in which players were forced to choose between which was more important to them: (1) "winning the game", or (2) "playing my best." The majority of Division A players (76%) endorsed the second choice. Several of the Division A players qualified the choice by adding an explanation "when I play well we often win", but still indicated that the Mastery goal was the higher priority.

Summary

This study had several important goals related to existing research on high performance in social cognition: (a) to examine whether social conceptual structure and encapsulated abilities contribute to high performance in social cognition in the athletic domain, (b) to inform Case's theory of CCSS by studying how encapsulated abilities may be an important adjunct to fully understanding intellectual development, (c) to contribute to the literature on giftedness and high performance by doing research in a specific domain, that of sport, which had not been studied under the rubric of a theory of social cognition.

The findings of the current study both confirmed and expanded on findings from much of the research on Case's theory of structural development. Smith and Christensen (1995) determined that social cognition is critical to excellence in sport. This study confirmed that the ability to participate in high performance play in hockey was related to an enhanced ability to ascertain the intentions of others and to plan strategy for coping with social problems accordingly. It was evident from the findings of the current study that performance level did not predict differences in the level of Central Conceptual Structure (CCSS) as described in Case's theory (Case, 1987, Case & Okamoto, 1996). The age-related structural levels assessed with personality tasks were found to be highly comparable to Marini and Case's (1994) work, upon which the methodology used in the present study was in part developed. This result was important as it both added confirmation to existing studies that Case's chronology of structure is appropriate and also added support to findings that his theory of CCSS is valid in quite different contexts (Bruchowsky, 1992, Griffin 1992, Mckeough, 1992, Porath, 1992, 1996). This tenet of Case's theory implies some underlying factor that contributes to universality in structural development. The notion that there may be biological constraints on structural development appear to be supported with continued findings that there are limits on the level that any individual can reach within a given age range.

Probably one of the single most important findings was that basic structure appears to be age-related and that there was no significant difference between the Division A and Division B players on this construct. It seems that, as predicted in the set of hypotheses that guided this study which are consistent with prior research findings on high performers (Porath, 1996, 1997), high performance emerges from a source other than advances on basic structural level within chronological cohorts. The notion of encapsulated abilities (Porath, 1992, 1996) which account for advances in development over basic structure was supported in the current work. Porath's research indicated that it was possible for an individual to demonstrate rapid, non-conceptual development far in advance of chronological-age cohorts. Although the particular skills involved differed between domains, as Porath had studied narrative and artistic development, there were parallels between narrative, artistic and athletic domains in the finding that a set of such skills were in place in high performers in all these contexts. Porath's work was based on a younger age cohort than the 13.5 to 15 year old age-group Bantam hockey players studied, but in all three studies there was found both an age-consonant basic structure and a set of encapsulated skills, or elaborations on that structure, which distinguished outstanding performance.

In summary, this study revealed that high performance is typified not by advances upon age-appropriate structural level but instead by elaborations on basic structure. The nature of the elaborations that distinguished high performance players were as follows: (1) Flexibility consisting of the ability to a) see the importance of team unity in achieving the overall objective of doing well, b) to see that the whole is comprised of individual parts, c) to defer emotional reaction in an attempt to solve a problem, d) to take the perspective of another individual, e) to take responsibility for solving problems in a direct manner on one's own authority, f) to develop sequences of solutions to a problem, and, g) to utilise other sources of information and influence in the mediation of conflict, and (2) Intensity which was characterised by the ascendance of Mastery goals over Performance goals in the individual's orientation to ascertaining degree of success in the sport.

Summary of Implications of the Findings for Theory and Practice

The findings of this study have implications for theories of social cognition and for application in the sport context. Case and his colleagues (Case, 1992; Case et al., 1996) determined that there is a ceiling on structural development that is encountered at every stage. He has suggested that high performers may in fact traverse each stage and reach this ceiling more quickly than non-high performers. It seems reasonable to tentatively conclude, from the work of Case and others (Case, 1992; Porath, 1992, 1996, 1997), and the from the findings of the current study, that high performers do not greatly exceed the ceiling of the structural level appropriate for their age, although they may reach it more quickly than non-high performers. The significance of this proposition that high performers may progress through a stage more quickly than non-high performers is as follows: (1) high performers may be utilising working memory resources freed from structural development processes in the development of skills specific to a particular social context, and (2) high performers may use freed working memory to combine information contained in the structure in creative ways (Porath, 1992). In this way, encapsulated abilities can result in performance that appears to be well beyond that expected for the individual's chronological age. As a result of this study, and from information derived from similar work (Porath, 1996, 1997), it is reasonable to suggest that there might be room in current theories of social cognition for a conception which takes into account both the maturational constraints of structure and also factors such as encapsulated abilities which may be open to learning effects. This way of describing the development of social cognition also has direct implications for practice. Educators and participants in the sport context may gain much by having an awareness of which aspects of performance are maturationally constrained, or relatively impervious to instruction, and which other skills may benefit from learning and rehearsal.

Directions for Future Research

One of the most important findings of this study was that Division does not predict structural level. This finding highlights one of the most fundamental contributions which this study makes to the understanding of social cognition. The identification of a set of encapsulated abilities related to high performance in the sport context adds support to Porath's (1996) finding that it is encapsulated abilities and not structure which distinguish gifted performance in narrative. Porath's work was conducted in a substantially different context than the current study. An interesting question arising from these two studies is whether the encapsulated abilities that appear to be associated with high performance in these two contexts requiring social cognition share any common features. In other words, are encapsulated abilities context-specific or is there an underlying set of abilities common to performance in social cognition in a variety of contexts. The answer to this question will require studies in varied contexts specifically designed to target factors underlying social cognitive ability which are outside the CCSS.

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APPENDIX A

CASE'S STAIRCASE MODEL

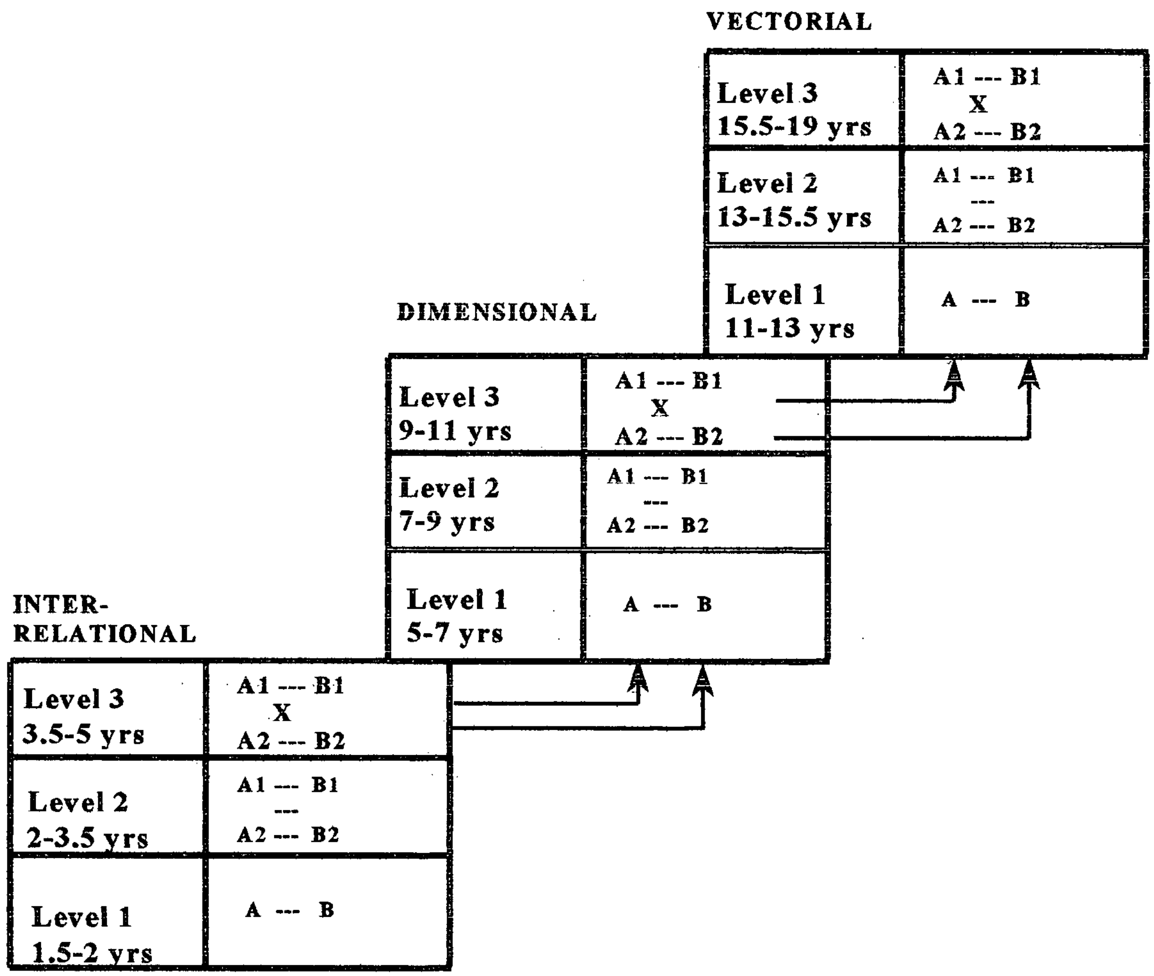


Figure 1. Case's Staircase Model
Note. Sensorimotor Stage precedes
Interrelational and is not shown

APPENDIX B

TABLES OF RESULTS

Table 1

Sample Demographics

			Mean	Std Deviation	Minimum	Maximum
Age in Years	Division of Hockey	Division B	14.48	.53	14.00	15.50
		Division A	14.98	.54	14.00	15.50
	Group Total		14.74	.59	14.00	15.50
Height in Inches	Division of Hockey	Division B	66	3	60	74
		Division A	69	2	65	75
	Group Total		68	3	60	75
Weight in Pounds	Division of Hockey	Division B	131	24	95	195
		Division A	155	24	120	240
	Group Total		144	27	95	240
Years of Playing Hockey	Division of Hockey	Division B	8.27	.57	7.00	9.50
		Division A	8.90	.57	8.00	9.50
	Group Total		8.60	.65	7.00	9.50

Note. N=24 for Division B. n=26 for Division A.

Table 2

<u>Percentages for Structural Level Scores by Division</u>

			Structural Level				
			0	1	2	3	Total
Division of Hockey	Division B	Row%	.0%	20.8%	62.5%	16.7%	100.0%
		Count	0	5	15	4	24
	Division A	Row%	.0%	3.8%	80.7%	15.4%	100.0%
		Count	0	1	21	4	26

Note. N=24 for Division B. n=26 for Division A.

Table 3

Correlations Among Variables Used in the Main Analysis

	Variables				
Variables	Number of Words In Solution	Concentration	Structural Level	Flexibility	Intensity
Number of Words	1.00				
Concentration	0.21	1.00			
Structural Level	0.56*	0.19	1.00		
Flexibility	0.47*	0.03	0.33*	1.00	
Intensity	0.10	0.14	0.29*	0.45*	1.00

Note. N=50 for all correlations

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4

<u>Means, Standard Deviations, Skewness and Kurtosis for Dependent Variables for the Entire Sample</u>

	<u>M</u>	<u>SD</u>	Skewness	Kurtosis	Minium	Maximum
Concentration	74.86	6.79	-0.10	-0.23	61.00	89.00
Structural Level	1.83	0.45	-0.33	-0.52	1.00	2.50
Flexibility	2.24	1.52	-0.46	-1.25	0.00	4.00
Intensity	51.50	3.89	0.27	-0.67	45.00	59.00

<u>Note.</u> N=50

Table 5

<u>Means, Standard Deviations, Skewness and Kurtosis of Dependent Variables for Division B</u>

	M	*SD*	Skewness	Kurtosis	Minimum	Maximum
Concentration	74.91	6.83	-0.11	-0.31	61.00	88.00
Structural Level	1.75	0.51	-0.13	-1.02	1.00	2.50
Flexibility	1.17	1.40	0.60	-1.30	0.00	4.00
Intensity	49.96	3.77	1.02	0.98	45.00	59.00

Note. N=50

Table 6

Means, Standard Deviations, Skewness and Kurtosis of Dependent Variables for Division A

	M	SD	Skewness	Kurtosis	Minimum	Maximum
Concentration	74.81	6.89	-0.09	-0.49	62.00	89.00
Structural Level	1.90	0.37	-0.28	0.11	1.00	2.50
Flexibility	3.23	0.76	-0.43	-1.11	2.00	4.00
Intensity	52.92	3.49	-0.18	-0.40	46.00	59.00

Note. N=50

Table 7

Means and Standard Deviations of Dependent Variables by Weight and Division

		Weight in Pounds					
		140 lbs or less		Over 140 lbs		Group Total	
Variable	Group	M	SD	M	SD	M	SD
Structural Level							
	Division B	1.68	.58	1.93	.19	1.75	.51
	Division A	1.95	.44	1.88	.34	1.90	.37
	Group Total	1.78	.54	1.89	.30	1.83	.45
Flexibility							
	Division B	1.00	1.00	1.00	1.00	1.00	1.00
	Division A	3.00	1.00	3.00	1.00	3.00	1.00
	Group Total	2.00	2.00	3.00	1.00	2.00	2.00
Concentration							
	Division B	73.41	6.56	78.56	6.51	74.91	6.83
	Division A	75.00	3.83	74.69	8.39	74.81	6.89
	Group Total	74.00	5.67	75.87	7.93	74.86	6.79
Intensity							
	Division B	49.35	3.76	51.43	3.64	49.96	3.77
	Division A	53.10	4.53	52.81	2.81	52.92	3.49
	Group Total	50.74	4.38	52.39	3.07	51.50	3.89

Note. n=27 for weight of 140 lbs or less; n=23 for weight of 140 lbs or more.

Table 8

Pooled Within-Cells Variance Covariance Matrix for Weight by Division

Variables	Structural Level	Flexibility	Concentration	Intensity
Structural Level	.20			
Flexibility	.14	1.29		
Concentration	.47	.22	46.30	
Intensity	.34	1.09	2.77	13.24

Note. N=50.

Table 9

Pooled Within-Cells Variance Covariance Matrix for Division A and B

Variables	Structural Level	Flexibility	Concentration	Intensity
Structural Level	.20			
Flexibility	.15	1.25		
Concentration	.58	.41	47.12	
Intensity	.39	1.12	3.77	13.14

Note. N=50.

Table 10

Means and Standard Deviations of Dependent Variables by Division

Variable	Group	M	SD
Structural Level			
	Division B	1.75	.51
	Division A	1.90	.37
	Group Total	1.83	.45
Flexibility			
	Division B	1.00	1.00
	Division A	3.00	1.00
	Group Total	2.00	2.00
Concentration			
	Division B	74.91	6.83
	Division A	74.81	6.89
	Group Total	74.86	6.79
Intensity			
	Division B	49.96	3.77
	Division A	52.92	3.49
	Group Total	51.50	3.89

Note. n=24 for Division B; n=26 for Division A.

APPENDIX C

BOXPLOTS OF DEPENDENT VARIABLES

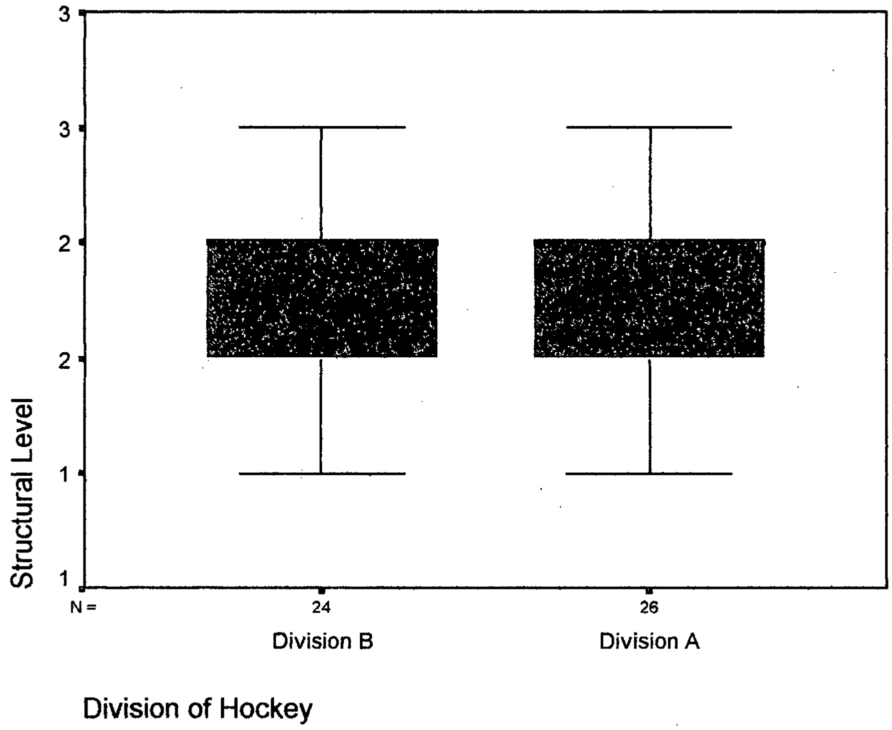
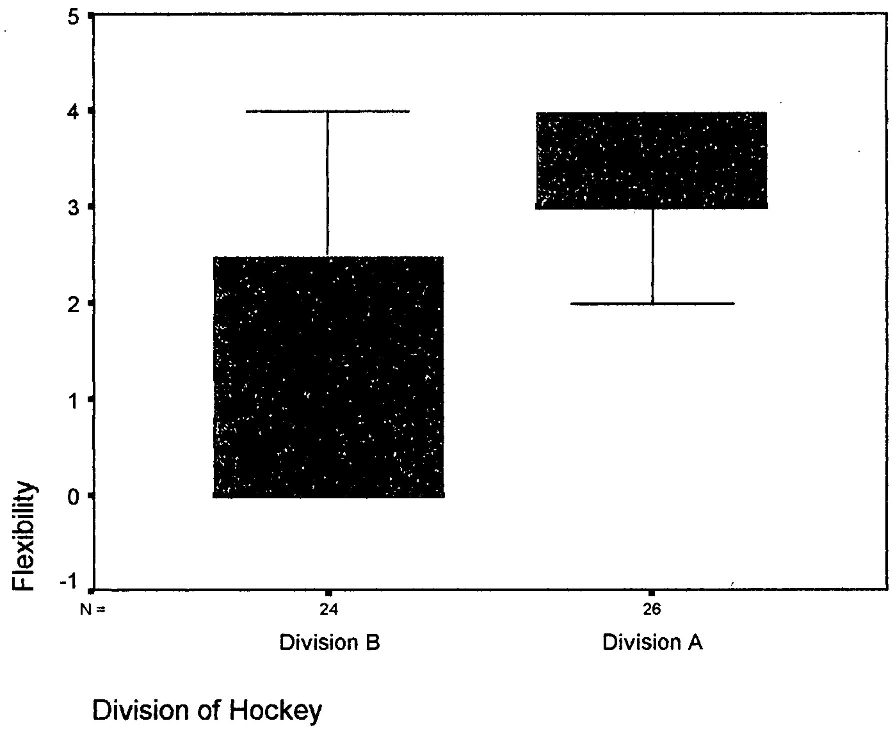
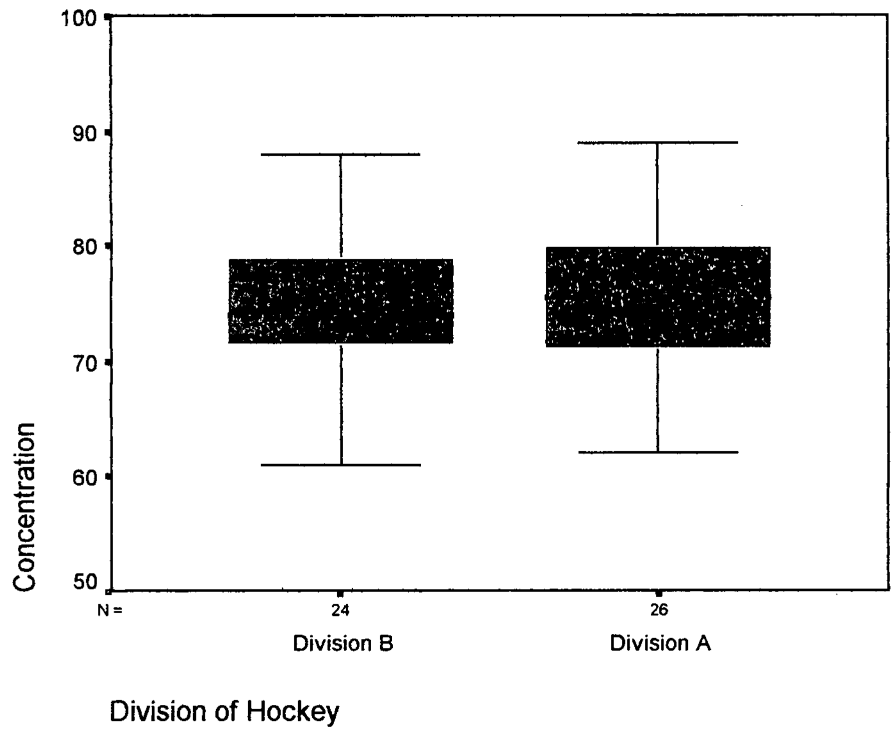


Figure 2. Boxplot of Structural Level for Divisions A and B



<u>Figure 3.</u> Boxplot of Flexibility for Divisions A and B.



<u>Figure 4.</u> Boxplot of Concentration for Divisions A and B.

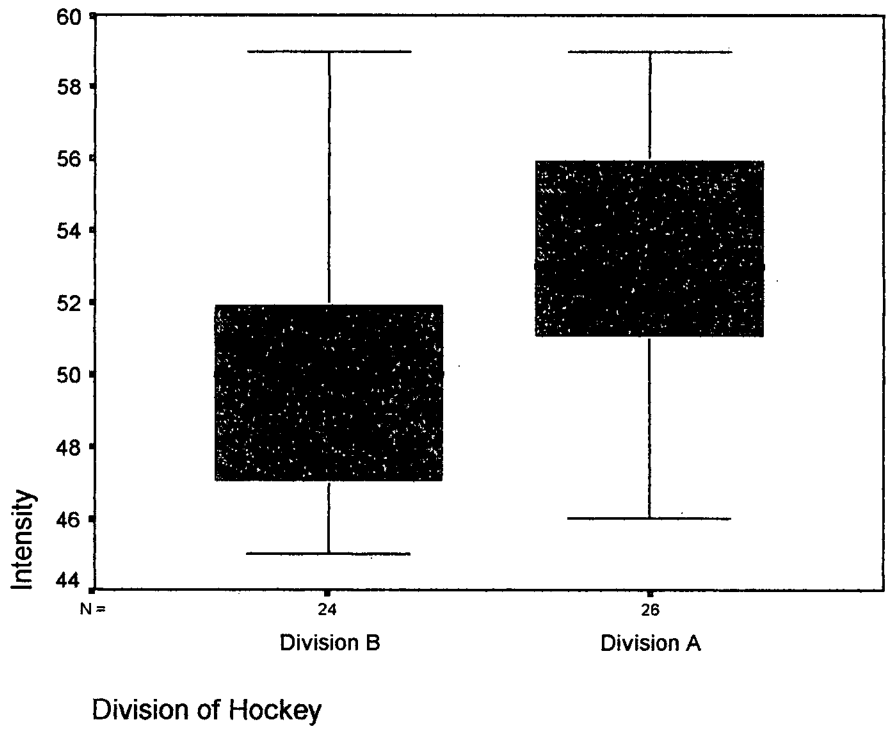


Figure 5. Boxplot of Intensity for Divisions A and B.

APPENDIX D

GLOSSARY OF TERMS USED IN CODING

<u>Trait equivalents of Terms Used by Subjects in Problems 4 and 5</u>

Subject's Term	Trait identified by Coders
nice	Responsible, Conscientious,
mean	Antisocial, Nasty
normal	Reasonable, Rational
aggressive	Competitive, Direct, Confident
impatient	Impatient
fair	Sportsmanlike
average	Reasonable
stupid	Lacking Judgement
competitive	Ambitious
frustrated	Unhappy, Frustrated
puckhog	Selfish
team player	Cooperative
reasonable	Reasonable
helpful	Helpful
sellout	Sneaky, Underhanded
baby	Immature
outgoing	Friendly
can handle himself	Mature, Competent
not a bad person	Reasonable
tough guy	Aggressive
hard working	Ambitious, Conscientious
serious	Conscientious
bossy	Domineering
coolheaded	Calm
calm	Calm
jerk	Fool
short-tempered	Volatile
troubled	Short-tempered
determined	Ambitious
intense	Serious
sticks up for self	Confident
idiot	Fool
tough	Aggressive

APPENDIX E

FACTOR ANALYSIS RESULTS

Table 11

Factor Statistics for Principal Components Analysis on Concentration Scale Items

Item	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	h^2
conc1	.00	.35	-.14	.30	-.57	.25	.70	.72
conc10	.15	.00	.00	.81	.00	.00	.00	.76
conc11	.85	.00	.00	.00	.00	.00	-.24	.82
conc12	.66	-.10	.28	.00	-.13	-.20	.00	.69
conc13	.15	-.10	.00	-.33	.00	.71	.23	.68
conc14	.00	.00	.30	.29	.68	.00	-.33	.84
conc15	.75	.11	.00	.19	.00	.10	-.20	.75
conc16	.77	.00	.00	.17	.26	.15	.00	.72
conc17	.14	.16	.80	.00	.00	.14	.00	.76
conc18	.00	.00	.75	.00	.00	.00	.00	.59
conc19	.00	.65	-.43	.00	-.18	.17	-.36	.78
conc2	-.26	.00	.31	.00	-.75	.14	-.13	.72
conc20	.16	.70	.26	.13	.00	-.23	.12	.64
conc3	.82	.00	.00	-.13	.00	.00	.00	.65
conc4	.00	.74	.00	.00	.00	.00	.40	.75
conc5	.00	.00	.12	.21	.71	.00	-.75	.73
conc6	-.25	.00	-.22	.44	.00	.43	.56	.84
conc7	.00	.12	.00	.00	.00	.00	.64	.45
conc8	.00	.00	.18	.17	.00	.81	.00	.73
conc 9	-.16	.45	.10	-.36	.37	.39	-.11	.68
% Var Expl.	21.50	12.92	9.73	8.47	7.32	6.16	5.33	
Eigen.	4.23	2.58	1.95	1.70	1.46	1.23	1.07	

Note. N=50, numbers < .005 reported as zero.

Table 12

Factor Correlation Matrix for Principal Components Analysis on Concentration Scale Items

Item	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*
1	1.00						
2	-.01	1.00					
3	.21	-.01	1.00				
4	.13	.11	.02	1.00			
5	.03	-.06	.05	-.01	1.00		
6	-.11	.17	.04	.00	-.02	1.00	
7	-.11	.06	-.15	.11	-.08	.05	1.00

Note. N=50, numbers < .005 reported as zero.

APPENDIX F

In this appendix are contained the recruitment presentation and the questionnaire that the subjects were given to complete at home and return by the next practise.

Recruitment Presentation

The following presentation was given to Bantam hockey players at the practise sessions for each team.

"I am a doctoral candidate in Educational Psychology and Special Education at the University of British Colombia. I am doing a study on the psychological skills that allow hockey players to anticipate what other players will do on the ice. This kind of anticipation is expected to improve on ice performance.

During the course of this study you will be invited to respond to a questionnaire concerning psychological skills that you use on and off the ice to improve your performance. In this questionnaire you will be asked to respond to five hypothetical problems concerning situations that arise on and off the ice specific to ice hockey. You will also be asked to fill out a series of questions about times you feel successful in hockey and how well you are able to concentrate during games. Your responses to the questionnaire will be coded and analyzed. The information you provide is expected to yield valuable information as to the psychological skills that assist in anticipating the actions of others.

You will be asked to devote one hour total of time for the questionnaire and return it at the next practise session . If at any time during the assessment you wish to withdraw from the study you are free to do so with no effect on your participation and standing in the team.

Any information resulting from this research study will be kept strictly confidential, all documents will be identified only by code number and kept in a locked filing cabinet. You will not be identified by name in any reports of the completed study. Data records contained on a computer hard disk will be identified only by coded numbers.

Your participation in this study would be much appreciated and I hope you will be interested in taking part."

Dear Hockey Player,

I am a doctoral candidate in Educational Psychology and Special Education at the University of British Columbia. I am doing a study on the psychological skills that allow hockey players to anticipate what other players will do on the ice as part of a PhD dissertation. Anticipation is an important aspect of hockey that contributes to on-ice performance. I would like to ask you to fill out the attached questionnaire in order to study how this skill is developed. Your answers to the questions, and personal input at the end of the questionnaire, will provide valuable information. Feedback following the study is expected to benefit you by providing information on improving anticipation skills. A take-home questionnaire is attached to this consent form. You will be asked to devote from a half-hour to an hour total of time at home or between on-ice sessions at the school/camp (as time permits) filling out the questionnaire. Please complete the questions carefully and return this form to either Elizabeth Tench or the hockey school directors at the next possible session in order to ensure participation in the study. Participation in this study is voluntary and if at any time during the assessment you wish to withdraw from the study you are free to do so. Any information resulting from this research study will be kept strictly confidential, You will not be identified in any reports of the completed study.

I, (please print) ______________________________ do______ do not______ (please circle one) consent to participate in the study described above.

Signature_________________________ Date_____________________

Thankyou for your participation, Sincerely, Elizabeth Tench (B.ED, M.A., PhD Candidate)

Section One: Please fill out the following before starting the questionnaire.

Name ____

Address (include postal code)____

Telephone Number (include area code) (___)______________________

Hockey School or Other Session you are completing this form in ____________________

____

1) Position <u>Mostly</u> played Last Year (goal, defence, winger, centre)__________________

2) Level of Hockey Played Last Year (Bantam, Midget; House, AAA)_________________

3) Age____________________

4) Birthdate________________

5) Height ________________

6) Weight________________

7) How many games did you play in last season_____________

8) How many years have you played hockey_____________

9) List any camps/tryouts/special competitions you participated in the past two years:

____

10) Have you ever been a Team Captain or Assistant Captain? yes ______ **no** ______

11) List any awards received in the past two years____________________________________

12) (Forwards) Number of Goals Scored Last Season __________

13) (Forwards) Number of Assists Last Season ____________

14) (Forwards) What is your plus/minus rating for Last Season __________

15) (Goalies) What is your Goals Against Average for Last Season __________

16) (Goalies) What is your personal win/loss record _______________

Section Two

In the following section, you are asked to read a description of a problem situation that a character finds themselves in. After reading the description you will be asked one or two questions about the outcome of the problem. These questions are intended to find out about how you make decisions about what other people will do in problem situations. Please read each problem carefully before answering. There is no right or wrong answer. Please keep in mind that the explanation you give for your answer is important. Think over your answers and explanations before writing and try to provide as much detail as you feel necessary to explain why you gave the answer that you did. If you need more space please use the back of each page.

1) Problem 1

During a regular season ice-hockey game, Jason was heading for the bench on a line change. An opposing team player got in his way as he was trying to get off the ice. Jason told the other team's player to get out of his way. What type of person is Jason? What makes you think he is this kind of person?

2) Problem 2

Tyler was dressing before a game. He was almost out of tape to put on his new stick. One of his teammates, Jay, used up Tyler's tape without permission while Tyler was talking to the coach. What do you think Tyler did and why?

3) Problem 3

Jonathan's team was having a practice session. They were practising breakaway drills in small groups. In Jonathan's group, one of the centres, Kyle, took several more shots at the goalie than Jonathan did. Jonathan told Kyle that next practice they would share the shooting more equally. At the next practice Kyle again took more shots than Jonathan. What do you think Jonathan did? Why?

4) Problem 4

Rob was standing in the slot in front of the opposing net waiting for a quick pass from his winger Cody. Instead of passing, the Cody tried to score himself from a bad angle. On the bench, Rob told Cody that the team might have scored if the pass had been made. In the next play, Rob was close to the opposing net but was being blocked by their defence. He passed the puck off to Cody and they scored. In the final play of the game, when Robert's team was down by a goal, Cody tried to carry the puck all the way down the ice and score himself without using his linemates. He failed to score on the play. Rob's team ended up losing the game. What do you think Rob did? Why?

5) Problem 5

Ryan was waiting in line to get his skates sharpened and just as his turn came up they announced the shop was closing. Ryan told the people at the shop that he had been waiting a long time and that he wanted his skates sharpened before they closed. The people at the skate shop said they didn't have time to sharpen his skates. Ryan went skating anyway and then left the rink to go see his friends. Late in the afternoon while they were playing road hockey, Ryan remembered that he had to be home because relatives were coming, so he excused himself and was starting to leave when his friend asked him for help in how to execute a wrist shot. Ryan helped his friend with the wrist shot and then left for home. On his way home he fell off his bicycle and bent the wheel rim. While he was pushing his bicycle home a person approached him asking for directions. What do you think Ryan did and why?

Section Three

In this section, please fill in the line provided at the end of each question with a number from '1' to '5' that indicates how much each statement generally describes you as a hockey player. Consider each statement and use the rating scale to describe <u>in general</u> when you feel the most successful as a player. For example if you feel very successful when you are learning a new skill then you would write '5' on the line after Question 1.

Not at All Successful	Not Very Successful	Somewhat Successful	Quite Successful	Very Successful
1	2	3	4	5

In general, when did you feel the most successful:

1. When I started to learn a new skill. ___
2. When a game made me think about how to improve. ___
3. When I understood a complex play for the first time. ___
4. When I was able to practice and execute a new skill. ___
5. When I was working on a challenging skating drill. ___
6. When I learned a skill I'd had a hard time with before. ___
7. When I got to use a new skill during a game. ___
8. When I played well even though we lost the game. ___
9. When others told me I had a good game. ___
10. When I didn't have to try hard but we won the game. ___
11. When I scored a goal unassisted or made a big save. ___
12. When I was one of the best players in a game or drill. ___
13. When I beat teammates in a speed drill. ___
14. When I accomplished a skill that most others could not. ___
15. When I thought my teammates played better than I did. ___
16. When we lost a game. ___

Which of the following is more important to you? Please check only <u>one</u> of the choices.

1) Winning the game ___
2) Playing my best in a game ___

Section Four

In this section, please fill in the line provided at the end of each question with a number from '1' to '5' that indicates how much each statement generally describes you during a game. Consider each statement and decide whether it is true of you 'Almost Never', 'Not Often', 'Sometimes', 'Often' or'Almost all of the Time'. For example, if you almost always miss what is going on around you during a game you would write '5' on the line after Question 1.

In general, during a game:

Almost Never	Not Often	Sometimes	Often	Almost all Of The Time
1	2	3	4	5

1. I miss what is going on around me. ___
2. I react blindly in one-on-one plays. ___
3. I am able to pick up details of game situations. ___
4. I find it difficult to forget mistakes and go on. ___
5. I am not easily distracted while following a play. ___
6. I find myself thinking about good plays I just made. ___
7. I tend to commit early during plays. ___
8. I daydream on the ice. ___
9. I worry about what's going to happen. ___
10. I am not distracted by spectators. ___
11. I know where most of the players on the ice are. ___
12. I notice when an opposition penalty is almost over. ___
13. I have to consult others about plays I didn't see. ___
14. Player's comments don't distract me from the action. ___
15. I am good at picking up on all the play action. ___
16. Most of my attention is on the present situation. ___
17. It is easy for me to stay mentally into the game. ___
18. I can keep track of action behind the play. ___
19. I tend to dwell on my feelings and miss game action. ___
20. I can't keep my thoughts focussed. ___

Section Five

In this section you are asked to provide your own input into the understanding of what helps a hockey player 'anticipate' plays or, in other words, predict what other players will do on the ice. First, please write your own short definition of what you think 'anticipation' means. Then take a few moments and consider how hockey players are able anticipate plays. Please write this information in the space provided below. This information will be very valuable to the study so as much detail as you can provide from your knowledge and experience will be of assistance.

1) Your Definition of Anticipation

2) How do hockey players anticipate plays? Feel free to provide examples of plays to assist your explanation.