Attention Span of Grade Nine Athletic and Non-Athletic Students

A Thesis

Submitted to the Faculty of Education

In Partial Fulfillment of the Requirements

for the Degree of

Master of Education

University of Prince Edward Island

We accept the thesis as conforming

to the required standard

Natalie J. Atkinson

Charlottetown, PE

January, 2001

SIGNATURE PAGE(S)

Not numbered in thesis

REMOVED

ABSTRACT

This study examines whether there is a difference in attention span when comparing athletes and non-athletes. The specific research questions studied are: 1. Do grade nine athletes have a better attention span than non-athletes? 2. Does the gender difference in grade nine play a role in the athletes' and non-athletes' attention spans? 3. Is there a significant difference between verbal attention span and spatial attention span for both athletes and non-athletes? Forty grade nine students were chosen for this study. The subjects consisted of ten male grade nine basketball players, ten female grade nine basketball players, ten male grade nine non-athletes and ten female grade nine non-athletes. The type of sampling used in this research was purposeful sampling. The instruments used in this research were verbal and spatial tasks which were used to assess attention span. Each task was performed on an individual basis with the researcher. The data was collected over a three-day period. The statistical analysis of the research was conducted using descriptive analysis, t-tests, and one and two-way analysis of variance. It was found that this research does not indicate that there are significant differences in all the dependent variable areas between athletes and non-athletes that were tested through the spatial and verbal tasks used. However, in some of the variables such as the consistency of recurring verbal and spatial spans, there were significant differences, which indicates that further research is needed in order to pursue solutions to the questions that have arisen.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENTS

I would like to give my sincere appreciation to my advisor, Dr. Xiufeng Liu, throughout this process. I appreciated his amazing amount of support, patience and guidance during the past two years. Dr. Liu was always available for assistance and reassurance and I am grateful for that.

I am also appreciative of Dr. Gerry Hopkirk who was a member of my committee. I am thankful for his contribution and guidance towards the research study.

Sincere thanks to Philip Corsi for providing me with his instruments and guiding me in the proper implementation of these instruments.

Special recognition to all members of my family for their encouragement and sacrifices over the past two years.

CHAPTER 1

Introduction

It has been my observation as a teacher and a coach that many students have a difficult time staying on task. During classroom teaching students present visual, verbal and physical communication to the teacher that signals disinterest through posture, eye contact and through non-verbal participation. It struck me as I reflected upon my various classes that I was only able to maintain the attention of all the students for short periods of time. My first thought was, " How do I challenge myself to prepare my classroom presentation and classroom environment to enhance maximum attention span?" It was clear to me that I needed to examine the problem of maintaining student attention in the classroom.

At the same time my interest in sports has led me to become involved with the students in interscholastic school sports programs. Again, in the capacity of a coach, I found that overall, the athletes involved in the interscholastic school sports programs did appear to be very enthusiastic and participated with significantly greater enthusiasm. Of course, I realized that student athletes are involved in programs that are of a particular interest to them. One would therefore expect greater attention participating in sports of choice. As in the classroom, I did observe occasions where the student athletes presented similar signals of disinterest through posture, eye contact and non-verbal participation. Even though they demonstrated periods of poor attention span, it was clear to me that in the gymnasium environment, students maintained significantly higher attention span, when assigned new skills and when required to go to the necessary skills, techniques and

practice to achieve success. Can seemingly higher attention span in the gym be extended into regular classrooms?

From this I decided to do a cursory review of my student athlete's academic performance in the classroom against student non-athletes in the classroom because normally higher attention span is considered to be related to higher achievements. It showed that student athletes were achieving better results than student non-athletes; this essentially led me to develop my problem statement: is there a difference in attention span when comparing athletes and non-athletes?

Over the past five years I have had teaching and coaching experience at the grade nine level involving student athletes in downhill skiing, basketball, volleyball and track and field. At this level these students compete with other students through the Prince Edward Island Interscholastic School Association program of events. In the classrooms students are confined to smaller space with little physical interaction. A classroom student has been conditioned through years of traditional teaching, to expect to see the teacher at the front of a class delivering the same learning materials to all students at the same pace. In the traditional classroom environment, the teacher is faced with thirty plus students in a limited space with little or no movement, attempting to maintain attention without noise and speaking only when spoken to. In addition to this these students may be forced to experience a learning environment in which room temperature is not adequately controlled and lighting is of poor quality. Thrown into this is a room that has a very institutionalized and poorly stimulated appearance. The classroom itself presents an environment, which does not stimulate the student and therefore enhances a dull atmosphere. However, from a coach's perspective the students in the gym are freer to

interact in less confined space, there is more freedom of expression and more opportunity to verbalize and demonstrate their understanding. In the gymnasium teaching, in fact, attention span is more difficult because there are greater opportunities for distraction among students. From this experience I soon realized that in classroom and in competitive school team sports attention span differs.

Attention is a term that is widely used and enforced by teachers and coaches on a daily basis. Students are supposed to be listening to instruction, concentrating on the subject and performing or applying the desired skill asked by the teacher and coach. My initial struggle in the research work has been to find a satisfactory tool that I could use that would be a direct measure of attention span. Attention span research doesn't currently provide direct measurement tools that the researcher can apply to this study. Once I realized that there was no direct and universal measurement for attention span I began research to determine what factors affected attention span. Research has shown that there is a correlation between attention span and short-term memory (Biehler, Snowman, D'Amico & Schmid, 1999), and it was possible to find a tool to measure short-term memory using two tasks, which are: the Corsi block tapping task and the Hebb digit span task (Corsi, 1979 & Hebb 1961).

From my teaching experience in the classroom and coaching team sports I question whether classroom learning is as effective as it could be. My personal experiences as a teacher and coach indicate to me that students involved with athletic team sports have demonstrated increased attention span in the classroom. The students that I have taught and coached demonstrate an increased ability level in several important elements of attention: focus, vigilance and flexibility (Peterson & Stoiler, 1992). The student athletes

present more focus, greater concentration, and can adapt quickly by shifting their attention with much more ease than the students not involved in competitive team sports. On the other hand, participating in sports could also negatively impact attention span in the regular classroom. For example, once the subjects are presented with activities that require athletic extracurricular involvement to exceed a certain level, the end result could produce poorer attention span. What would be the appropriate amount of time for sport involvement?

In my intermediate school, student athletes have to commit to at least seven hours a week for practice. This is a significant demand of time for student athletes and may potentially impact on student attention span in the classroom. The time demand for student athletes is different in high school thus any study on the impact of sports on attention span has to be grade specific. The present study aims at comparing the attention span based on short-term memory between grade nine athletes--basketball players and grade nine non-athletes —— non- basketball players.

When comparing attention span between athletic and non-athletic students gender may be another factor that has to be considered. It is my observation that males and females differ in the classroom. Female non-athletes tend to be stronger in verbal fluency and tasks that demand accuracy. The male non-athletes tend to be stronger in areas of problem solving and the manipulation of spatial tasks. Male and female athletes in the classroom seem to have stronger abilities in both the verbal and spatial areas. From my personal experiences and observations with athletic and non-athletic students in the classroom, I am suggesting that sport involvement aids in increasing classroom attention span. Feingold in 1992, and Kimura in1992, discussed how there are cognitive

differences amongst males and females. The tasks used in this study, due to the differences in males and females, are tasks that test verbal and spatial spans.

Definition of terms

It is important to define specific terms in order to clearly understand the research problem statement. *Attention span* refers to a learner's ability to concentrate to maintain task performance, and to complete a task (Peterson & Stoiler, 1992, p.102). *Athlete* in this research is defined as a person trained to compete in exercises, sports, or games requiring physical strength, agility were standard (Copeland, 1976). Examples of athletes would be volleyball players, track and field athletes, and basketball players. An athlete encompasses a level of participation on an organized team or individual sport. These sports could be arranged through an educational system or community setting. For this study the athlete is someone who is involved in basketball for a minimum of seven hours per week. This time involved in basketball was devised by taking the average amount of time a student at the intermediate level spends while being involved in a competitive team sport. *Non-athlete* in this research is a person who is not involved in a competitive team sports and spends less than seven hours per week in any athletic activity dealing with trained exercises of physical strength, speed and skill. To clarify the definitions of athletes and non-athletes, the researcher took time to analyze the purposeful sample of the test subjects. Through this analysis I arranged to meet with the various students and questioned the individuals on their personal activities at school and in the community.

This was done to ensure that the athletes were only involved in basketball, and non-athletes were not involved in any sports that required more than seven hours of practice.

Short-term memory is important to define because of its relationship to attention span. Short-term memory is often referred to as the working memory. It holds information we are currently aware of at any given moment (Biehler, Snowman, D'Amico and Schmid, 1999).

The instruments used in this study are short-term memory instruments. After extensive research, I felt that these instruments best represented tools to measure one aspect of attention span - the student's ability to focus spatially and verbally, because the students were asked to perform verbal and non-verbal tasks in the study. Verbal memory refers to information that is verbal in form, for example: names, words or numbers. Non-verbal memory is information that is not coded by words such as patterns, faces and geographical routes.

Specific research questions

The specific research questions and statistical hypotheses are:

1. Do grade nine athletes have a better attention span than non-athletes?

   Ho_1: there is no significant difference between athletes' and non –athletes' attention spans.

   Ha_1: there would be a significant difference between athletes' and non-athletes' attention spans.

2. Does the gender difference in grade nine play a role in the athletes' and non-athletes' attention span?

Ho_2: there is no significant gender difference in athletes' and non-athletes' attention spans.

Ha_2: there would be a significant gender difference in athletes' and non-athletes' attention spans.

3. Is there a significant difference between verbal attention span and spatial attention span for both athletes and non-athletes?

Ho_3: there is no significant difference between verbal attention span and spatial attention span for both athletes and non- athletes.

Ha_3: there would be a significant difference between verbal attention span and spatial attention span for both athletes and non- athletes.

Significance of the research

The significance of the research findings is to develop and expand understanding of attention span. Grade nine students were chosen for this study because these students are more settled with themselves. As compared to students at a younger age, they show confidence in their ability, demonstrate a willingness to achieve specific tasks, commit to repeating tasks until they're mastered, continue to pursue a task even though they are not meeting with success and are not embarrassed if a mistake has been made. Grade nine students are starting to advance in maturity. Students, at this stage in development, pay attention to their grooming, dress and their physical appearance. This affirms that these individuals can begin to focus on new issues, which will be essential in this study

(Biehler, Snowman, D'Amico and Schmid, 1999). Due to the uniqueness of grade nine students a study on their attention span can help us understand them better.

Reflecting on of many years of coaching and teaching, I believe student athletes tend to be more confident and secure with themselves; they are placed in circumstances where they must perform in front of their peers and parents while at the same time demonstrating athletic skills that will show successes and failures. Each student athlete performs under stressful circumstances (Abernethy, 1987). However, with repeated situations that challenge them to perform under stress, they appear to gain experience and skill including confidence. How do these characteristics impact on attention span in the classroom? A study on the attention span of athletes and non-athletes in the classroom would provide a better understanding about the benefits of athletic activities

The practical benefit of this research project involves providing recommendations for teachers, students, parents and administrators regarding the subject of attention span. For example, a parent's concern may be that too much involvement could have an impact on students' attention spans and therefore affect student achievement, or, not enough involvement could have an impact on students' attention spans and therefore affect student achievement. As one reads the following literature review, one will realize there is a gap in the literature due to the fact that there is no information directly related to the hypothesis. This reassured me of the significance of this research study because it is so commonly assumed that better attention span increases student achievement.

CHAPTER 2

Literature Review

Attention as being a prerequisite to learning

The topic of this research is attention span and its relationship to athletes and non-athletes. Attention is a learner's ability to concentrate, to maintain task performance, and to complete a task (Peterson & Stoiler, 1992, p.102). It is universally believed that students need to pay attention in order to learn. Teachers use all kinds of gestures or signals to capture their students' attention. For example: "eyes and ears here please" or simply, "pay attention." As one reads in some secondary sources regarding the topic of attention span, one would agree these gestures are very common. Teachers demand physical acknowledgment from students before beginning or continuing to teach a lesson. This also relates to everyday life. If a person is not showing some responsiveness or acknowledgment that they're listening we feel the subject isn't "paying attention". Teachers, like most educational researchers, talk about attention as being a prerequisite to learning (Peterson & Stoiler, 1992, p.102).

Teaching techniques and styles

How do we get a student's attention fully in the classroom? Does classroom learning rely on attention span of students? Peterson and Stoiler (1992) indicated that teaching techniques and styles have an effect on the attention span of students. Clear instructions, providing feedback, lessons and routines presented consistently and managerial methods that are aimed at minimizing student distraction all have an impact. Peterson and Stoiler in 1992, discussed the relationships among teachers' instructional

behaviors and student academic achievement being very important. Teachers can increase a student's attention to engagement with academic tasks by using proper tech· · ·ies.

The ability to capture your student's attention is affected by characteristics of the information itself and is related to the learner's past experiences. Learners are more apt to attend to things that they expect to find interesting or meaningful. It is important to think of ways of relating school learning to the present and future lives of the students. If students realize that school is there to aid them there is more of a purpose to the importance of paying attention. It is important to note that students need situations to aid in improving their attention span; therefore, opportunities should be presented to the students to do so. (Biehler, Snowman, D'Amico & Schmid, 1999)

Schwartz in 1984 discussed how an animal might not pay attention to all the stimuli that are represented. One stimulus may overshadow another. If an animal does not pay attention to stimulus, it does not learn about it. Animals like humans will pay attention to stimulus depending on the animal's past experience with that stimulus and other stimuli.

Interest is very important; it is crucial that the child become aware that someone is pursuing and showing interest in what they are doing. This demonstrates to the child that the teacher or the parent is giving the child choice and meaning. Therefore it becomes meaningful to them. (Spobek, 1993)

It is important to pay attention to what the child is doing because you convey to the child that what he or she does is important. It is crucial to examine our reactions and feelings of the teacher and parents when working with the child. We must not be too quick to assume the child didn't understand because it may be due to lack of interest. Anglin and Surgent (1994) indicated that students would tend to pay attention longer if the subject at hand is

of interest. Personally, when looking back on my days as a student, my participation would differ depending on the subject and more importantly how the subject was presented. Therefore, enjoyed learning and applying new skills with creativity increases attention span (Anglin and Sargen, 1994). This theory is also supported by Moyer and Gilmer (1954) in that providing the "right toy" for a particular age may increase attention span. This is a good point. Whether it is the "right toy" or the right strategies in academic learning, there is a strong relationship. They also indicated that there is no regular increase in attention span of children from year to year. They reinforced the point by stating that it depends on the manipulative being used in relation to the appropriate age. Gutteridge (1935) also observed that children are interested in activities related to everyday life and that materials should be used to enhance this. With the discussion of manipulatives of interest and personal relations affecting and enhancing the attention span, one would think that there could be a correlation between attention span and athletes.

Motivation, reassurance and interest

Student motivation and reassurance are also key factors and strategies aimed at improving attention span. If students are confident in themselves and their work, they will probably pay more attention. Students, who supply a correct answer and are told by the teacher that the answers are correct, continue to be motivated by the activity. Rewards are also given to motivate and reassure students. The rewards usually are in the form of praise or grades and there are occasions where a token or privilege may be given. (Peterson & Stoiler, 1992)

Motivating students to learn is an important factor relating to attention span. Some suggestions made by Biehler, Snowman, D'Amico and Schmid in 1999, are to make sure students know what they are supposed to do, accommodate all the psychological needs of your students, show your students you are interested in their activity, and arrange learning experiences so that all students can gain esteem. Parker (1992) gave an example of the importance of reassurance; he discussed a bright, well-liked grade seven student who found it difficult to complete work, due to the fact that he was distracted easily and couldn't keep on task (p.18). Positive comments made in relation to this child's intelligence and great personality reinforced to him that he was a very capable young man and could do the work with some guidance and motivation. Parker demonstrates that a relationship with students can have a positive influence and effect on attention.

One wonders what the students are thinking about when they aren't engaged in the task at hand. The student's mind wanders and distractions can easily occur. Another issue that must be looked at is a difference between attention and involvement. These are two different things; a student could be paying attention but may not be involved. As one thinks back to their personal schooling, one remembers many times of actually paying attention but choosing not to participate, due to insecurities. This of course may not be the case for all students, but some students may experience this.

At the other end of the spectrum, a student could exhibit physical actions, which would make them appear involved, but they may not actually be paying attention. This was supported by Fowler (1994) who argued, " because the looking behavior that is actually manifested cannot guarantee the mental process that is presumed to operate... (P.390)".

With respect to attention span some studies indicate that these behaviors could be treated as a disorder if deemed necessary by a psychologist. This may be the case if the lack of attention is hindering performance in the school, causing difficulties with friends, and /or trouble at home. These children, or even adults, may have Attention Deficit Disorder (ADD).

Extracurricular activity performance enhances academics

Some researchers studied the relationship between extracurricular activities and student dropouts. McNeal (1995) indicated that after studying 14,249 students in fine arts and extracurricular activities, only the athletic participation related to increased dropping out. Research by Mahoney and Cairns (1997) contradict the statement of McNeal. They presented an argument that athletics contribute to reducing the dropout rates, and that non- athletic activities also assist the reduction. They argue that a range of activities (fine arts, athletics and vocational) help in the engagement of academic performance. One would assume that with increased academic performance and school involvement these reasons alone would play a vital part in reducing student dropout rates. From a personal perspective, involvement in athletic activities creates positive results including self-confidence, reassurance, motivation, respect and acknowledgment from peers, teachers and family. These findings are supported by the literature and are key factors contributing to an improved attention span, which will in turn increase academic performance.

With the discussion of manipulative of interest in personal relations affecting and enhancing attention span, one would think that there could be a correlation in attention span and athletes. Silliker and Quirk (1997) examined whether athletic activity enhanced

academic performance. They analyzed one hundred and twenty three students who played interscholastic soccer. The results noted that athletic activities and the dealings associated with these activities increase academic performance. An interesting point made by Silliker and Quirk was that performance was improved while participating in the soccer season. A speech presented by the American Sports Institute in 1996, spoke of the relationship between sports and academic achievement.

A Promoting Achievement in School through Sports (PASS) program was developed which focused on the influences of sports and academic achievement. This program incorporated a curriculum of physical, mental and behavioral relationships with an interdisciplinary approach containing core academic courses. After being observed for a period of four years, the "PASS" students were found to have significantly increased grades in comparison to the control group, due to their participation in extracurricular activities.

Rombokas (1995) also indicated that extracurricular participation influences academic growth. This author gave a questionnaire to 292 college students. The questionnaire was designed to provide responses to the student's academic extracurricular experience during high school years. The extracurricular activities included, in addition to athletics, music, dance, and theater. The data compared grade point average, educational aspirations, and various social supports that influence academic performance. Results indicated that extracurricular participation had a positive response and recommendations were made for further studies.

Abernethy (1987) stated that attention impacts sport performance and learning in a number of ways: information processing, alertness, selectivity and vigilance. He also

discusses the relationship between attention span and short-term memory. Abernethy stated, "The limited capacity space perspective of attention draws an analogy between attention in the fixed capacity of storage devices (P.127)." As a coach I have seen many of the characteristics in my players mentioned by Abernethy in 1987. They have acquired these skills through repetition and practice of the same skill.

Short-term memory plays an important role in this study because of its direct relationship to attention span. Tranel (1994) indicates that our brains are capable of storing and retrieving information provided they are in good health and are given sufficient opportunity to learn and rehearse. Retrieving is the process of reactivating information in such a way that it can be brought into consciousness or into a form that can be translated into an action of movements, speech or autonomic activity.

Recall is the process to which your conscious for instance brings up the image of the object you're trying to remember. Recognition refers to encountering a previously learned stimulus and realizing there is a match or connection. (Tranel, 1994)

This relationship to attention span is directly related because our attention depends on feedback, physical acknowledgment and responsiveness. (Peterson & Stoiler, 1992)

These examples of short-term memory also reinforce the validity of the instruments being used in this study, which will be discussed in further detail in chapter three.

The articles and abstracts that had been retrieved all support the theory of extracurricular activities enhancing attention.

Gender differences in verbal spans and spatial spans

Feingold (1992) researched and concluded that males score higher than females on tests of general knowledge, mechanical reasoning and mental rotation. Females score higher than males on tests of language usage and perceptual speed. Kimura in 1992, also discussed how these skills evolved from the past where males were more often involved in hunting and traveling long distances which would favor spatial orientation to target directed motor skills. Females stayed closer to the home tending to children and engaging in domestic activities. Most of the skills involved motor skills, speech and the ability to detect small changes within their children and their home environment. It has been argued that these differences in cognitive abilities could simply be due to the different experiences between males and females.

An interesting point to note was that Kimura in 1992, discussed how males might learn a new route of a tabletop map in fewer trials and make fewer errors than females. Interestingly once the learning process was completed, the females had more success recalling the results and remembered more landmarks on the map.

It is important to note these differences in males and females due to the instruments being used in this research study. One task determines the subject's verbal span and the other task determines the subject's spatial abilities.

Gender is a complex dimension. For example, Carol Gilligan (1982) studies men and women's approach to morality. She discusses how male morality has a justice orientation and that a female morality has a responsibility orientation. It is important to note Gilligan's research because further study in different areas of cognitive development may be beneficial in the future.

Summary and interpretation

There was no specific information found when discussing the relationship between athletes versus non- athletes and attention span. One has come to the conclusion after conducting such a search that there's a need for further research in this area since a number of focal questions are still unanswered. The question dealing with whether athletes or non-athletes have better attention spans has been discussed briefly. This topic has not been studied specifically, but research has been done which has attempted to resolve a correlation between extracurricular activities and attention span. These findings indicate, as mentioned through the summary, that academic performance is enhanced when participating in extracurricular activities. The question relating to gender differences in athletes and non-athletes has not been answered. The final question of "is there a significant difference between verbal attention and spatial attention span for both athletes and non-athletes" is also unanswered. This question needs further research because today there have been no findings published on the topic and most importantly the findings may produce results that could assist parents, coaches and teachers. Further research in this area would be interesting and definitely useful in developing the optimal academic curriculum.

Effort should be put forth in developing an appropriate methodology to collect data, which would aid us in answering some of these elusive questions. Overall, one would think that quantitative studies are the most appropriate for future research because of the tasks the students are being asked to perform. Important aspects to take into account when developing a research study include an appropriate size sample population, with both the males and females from a variety of ethnic backgrounds. The age groups being

studied would be important to identify, as well as whether the students were retained or promoted. In the study of adolescence, their stage of development would be an important factor to note, realizing that males and females develop at different stages. This factor could be evaluated by secondary growth characteristics such as growth spurts. A health questionnaire should be a part of the methodology. This could be of importance, for example, because a student could be taking medication, which may affect his or her performance, or the subject may have a medical disorder, which may necessitate eliminating him/her from the study. I believe that the affirmation points should be included in the methodology when preparing future studies.

In conclusion, there is a need for further research. I aspire to research this topic in hopes to discover some data to support the specific research questions.

CHAPTER 3

Methods

This chapter describes the subjects, the instrumentation, the procedures, the data analysis, and the limitations.

Subjects

The sample was chosen from a population of the School's Intermediate girls and boys' basketball teams which covers rural and urban communities in the eastern district. Grade nine students were chosen for this study because these students show confidence in their ability, demonstrate a willingness to achieve specific tasks, and are advancing in maturity. Biehler, Snowman, D'Amico and Schmid in 1999, confirmed that there is a greater concern about appearance, a need to be accepted by peers, and to prove that they can achieve specific tasks.

The type of sampling used was purposeful sampling. McMillan and Schumacher in 1997, indicated in their text that purposeful sampling "is when the researcher selects particular elements from the population that will be representative or informative about the topic of interest"(p.171). On the basis of this information and my knowledge of the population, a judgment was made in that the subjects would be selected to provide the best information in order to address the purpose of the research. In1997, McMillan and Schumacher stated that the beauty of purposeful sampling is that a few subjects studied in depth may yield many insights about the topic. In quantitative study the emphasis relies more on the judgment of the researcher to select a sample that is representative of the

population. McMillan and Schumacher indicated in 1997 that purposeful samples can range from an *n= 1 to n= 40* or more.

The subjects consisted of a) ten grade nine male basketball players attending an Intermediate School, b) ten grade nine male non-athletes attending an Intermediate School, matching the characteristics of the ten male athletes, c) ten grade nine female basketball players attending an Intermediate School, and d) ten grade nine female non-athletes attending an Intermediate School, matching the characteristics of the ten female athletes. Therefore, there are four cells and each cell consists of ten students for a total of forty students. Basketball players were chosen for this study due to the fact that this is a typical sport used in all school systems and it runs over the longest time frame through the school year.

It is important to note that the female athletes used in this study were all academically strong students. The male athletes used in the study had lower academic levels than the female athletes. This was not a prerequisite to the research but, upon reflection of other students I have coached, this is consistent with other students academic abilities.

Instrumentation

Hebb (1961) and Corsi (1979) each developed a measurement instrument to measure short-term memory. These two instruments were used to obtain indices of attention span. These instruments were chosen after extensive research into the many different *Mental Measurements Yearbooks, Tests in Print* and *The ETS Test Collection Catalogue* and having found no applicable instruments because none directly measured attention span. In the digit span task, Hebb (1961) has shown and Melton (1963) has

confirmed that recall of recurring sequences improves progressively over repetitions, whereas no significant cumulative improvement occurs for the non- repeated sequences. In Hebb's text in 1972, he indicated that after studying college students using the nine-digit task that there was steady improvement with the repeated series of numbers. The block-tapping task, created by Corsi, is identical in design to the Hebb digit task but the items are spatial, not numerical, and this task demonstrates steady improvement with the repeated series of numbers.

The validity of the instrumentation being used in this research comes from the understanding of the relationship between attention span and short-term memory. According to Biehler, Snowman, D'Amico and Schmid (1999), short-term memory and its relationship to attention span is defined as the selective focusing on a portion of the information currently stored in a sense register-they call this attention. The authors suggested implications of helping your students become efficient information processors, which have been discussed in the literature review. These implications deal significantly with the importance of attention span and increasing your memory skills.

Melton (1963) discussed how within psychology several developments have focused attention on memory. Hebb (1949) and Walker (1958) have also focused attention on the theory of memory as the fundamental component of the theory of learning. Hebb (1961) discussed that learning is defined as the storing of knowledge. In his readings he discussed how, in using his digit test there is a significant difference between the non- recurring and recurring sequences. Many neuropsychologists use this instrument worldwide. The instruments devised for this research were first inspired by

Hebb in (1961). Hebb's method of digit testing, in the test of memory span, led Philip Corsi to devise the block tapping instrument being used in this research.

There was no documented information on the reliability of the two instruments, but since they are published we can assume they are reliable.

The first task was to **a.** choose sequence +1 over span. The Hebb (1961) recurring digits task was used to determine the subject's verbal memory span. The experimenter presented verbally a series of digits and the subject was asked to reproduce them in the same order. Each series contained numbers from 1-9 (for example 591452648). The series used depended on the subject's results from the digit scale test. There was one special feature about which the subject would not be informed: on every third trial (3^{rd}, 6^{th}, 9^{th}...24th) the same series of digits would be repeated, whereas the other intervening sequences would occur only once. Therefore two performance scores would be obtained for this task.

The second task was the block – tapping task. The block- tapping task was developed by Philip Corsi (1979 Ph.D. McGill University). This task is identical in design to the Hebb digit task. The difference between the two is that these items are spatial rather than numerical. This instrument consists of nine black blocks arranged impartially on a piece of black wood. The examiner taped the blocks with a stick in a particular sequence, with a 15 second interval between sequences. Each block was tapped only once. The blocks facing the examiner were numbered to aid in recording (the subject was not be able to see the numbered blocks). The examiner asked the subject to reproduce the same pattern. (The subject's immediate span would be determined by the Wechsler Memory Scale test as previously stated). As with the Hebb digit task, every

third sequence was repeated (3rd, 6th, 9th...24th) and the intervening sequences occurred only once. To record the results, both the repeated sequences and the non- recurring sequences were noted.

Procedures

This data was collected over a three-week period at the end of every school day. The atmosphere of the examination was in a regular classroom setting.

Each subject was examined individually. The first step was to: Establish a span by using the Wechsler Scale. The Wechsler Memory digit scale test was used to determine the subject's immediate digit span. A sequence of numbers was spoken aloud and the subject was asked to repeat the sequence in the same order correctly (6-4-3-9). The series of digits that was successfully repeated was used as a starting point for the Hebb digit span test.

The Hebb digit task was the second task and the block – tapping task was the third. The method of recording the data was using checklists as seen in the appendix.

Data analysis

The Statistical Analysis: the SPSS system version 7.0 was used for statistical analysis. The statistical analysis of the research was conducted using descriptive analysis, t- tests, one and two-way and analysis of variance. The significance level used in this study was .05. It is organized in terms of the three major research questions of the study: do grade nine athletes have a better attention span than non- athletes? Does gender play a role and is there a difference between verbal and spatial attention span in athletes and non-athletes?

Limitations:

This study recognizes three possible limitations: scope of study, the criteria for athletes and the design itself.

Scope of study is a limitation because the study itself focuses on one type of student athlete; it would be beneficial to determine if the results would be affected had the study group consisted of numerous sporting teams. Although this study has not measured numerous sporting teams, I am satisfied that I have identified a typical sports practice with a single sporting team as the single study group.

The criteria for athletes is a potential limitation because we have limited to student athletes' participation in sports on a weekly basis to a seven-hour time frame. Unfortunately, we have not been able to test student athletes' sport participation on a weekly basis in excess of the seven-hour time frame as outlined in the study.

Within the design of study there are four possible threats to internal validity: instrumentation, experimenter effects, subject effects, and selection.

Due to the indirect measurement of attention span, it may not be the best measurement and is deemed to be a possible threat to this study.

Experimenter effects to the testing process are recognized as a threat because of the influence the examiner may have on the subject's response. For example: tone of voice, reassurance and gestures by the experimenter can affect subjects' response, which will alter appropriate test results. The researcher taught the students which may have influenced the outcome.

Subject effects are cues received from the examiner if the setting and instructions are not presented clearly and concisely. Unless there is clear and consistent instruction the subjects may not participate favorably, and as a result, it can lessen the subjects' motivation to perform to their full potential.

Selection could pose a threat to internal validity due to purposeful sampling. My research has been limited to a single school environment. This may affect the generalizability as well.

CHAPTER 4

Results

This chapter presents the results of the data. Attention span was described by a collection of dependent variables, they are: consistency of recurring spatial span (abbreviated as Con_ spat), consistency of recurring verbal span (abbreviated as (Con_verb), level of spatial span (abbreviated as Ls_span), level of verbal span (abbreviated as Lv_ span), percentage of spatial span (abbreviated as Per_spat), percentage of verbal span (abbreviated as Per_verb), repetition of spatial span (abbreviated as Rep_spat) and repetition of verbal span (abbreviated as Rep_verb).

Con_spat is defined as the percentage of the recurring spatial sequences (eight sequences in total) spatially tapped correctly by a student. Con_verb is defined as a percentage of recurring verbal sequences (eight in total) verbally repeated correctly by a student. Ls_span is defined as the highest number of digits (maximum is nine) a student could correctly tap. Lv_span is defined as the highest number of digits (maximum nine) a student could correctly repeat verbally. Per_spat is defined as the overall percentage of correct responses of the spatial task. Per_verb is defined as the overall percentage of correct responses of verbal task. Rep_spat is defined as the number of trials it takes for the subjects to recognize the repeated sequences in the spatial task. Rep_verb is defined as the number of trials it takes for the subject to recognize the repeated sequences in the verbal task.

Descriptive statistics

Table 1 shows the means and standard deviations for athletes and non-athletes relating to the dependent variables employed in the study.

Table 1 indicates that most means for athletes on the dependant variables are higher than non- athletes. Interestingly the consistency of recurring spatial span mean (70.0) for the athletes is much higher than the non-athletes (50.0). Note also that the consistency of recurring verbal span mean (85.6) for the athletes is also much higher than

Table 1.

Descriptive statistics for athletes and non- athletes

Dependant Variable	Groups	N	M	SD
Con_spat	Athlete	20	70.0	21.6
	Non-Athlete	20	50.0	28.9
Con_verb	Athlete	20	85.6	19.9
	Non-Athlete	20	64.3	31.2
Ls_span	Athlete	20	6.0	.0
	Non-Athlete	20	6.0	.2
Lv_span	Athlete	20	6.7	.7
	Non-Athlete	20	6.7	.7
Per_verb	Athlete	20	37.2	12.4
	Non-Athlete	20	39.3	19.2
Per_spat	Athlete	20	34.5	21.2
	Non-Athlete	20	27.7	18.7
Rep_spat	Athlete	20	1.7	1.9
	Non-Athlete	20	1.8	2.7
Rep_verb	Athlete	20	.5	.8
	Non-Athlete	20	1.6	2.3

Note abbreviations.
Con_spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

the non-athletes (64.3). The means for the other dependant variables do not differ much between the two groups.

Table 2 shows the descriptive statistics for gender (male and female) relating to the dependent variables employed in the study.

Table 2 indicates that the means for the females in the consistency of recurring spatial span (66.8) and consistency of recurring verbal span (80.6) are higher than males. The male and the female results in the levels of verbal and spatial spans are very close. For the remaining dependant variables, percentage of spatial span (43.7), percentage of

verbal span (40.8), repetition of spatial (2.1), and repetition of verbal span (1.6), the male means are higher than the female means.

Table 2

Descriptive statistics by gender

Dependant Variable	Gender	N	M	SD
Con_spat	Male	20	53.1	27.6
	Female	20	66.8	26.0
Con_verb	Male	20	69.3	29.9
	Female	20	80.6	25.4
Ls_ span	Male	20	6.1	.2
	Female	20	6.0	.0
Lv_ span	Male	20	6.7	.7
	Female	20	6.8	.6
Per_verb	Male	20	40.8	20.1
	Female	20	35.8	10.5
Per_spat	Male	20	43.7	18.5
	Female	20	18.5	12.1
Rep_spat	Male	20	2.1	2.7
	Female	20	1.5	2.0
Rep_verb	Male	20	1.6	2.3
	Female	20	.5	.9

Note abbreviations.
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Figure 1 presents the frequency distribution of twenty athletes on the consistency of the recurring spatial span. Twenty five percent of athletes (5 out of 20) scored 62.5 and 75.0. Fifteen percent of the athletes scored 87.5 and 100.0 in consistency of the spatial repeated sequences. Ten percent (3 out of 20) of the athletes scored 25.0 and 50.0.

Figure 1

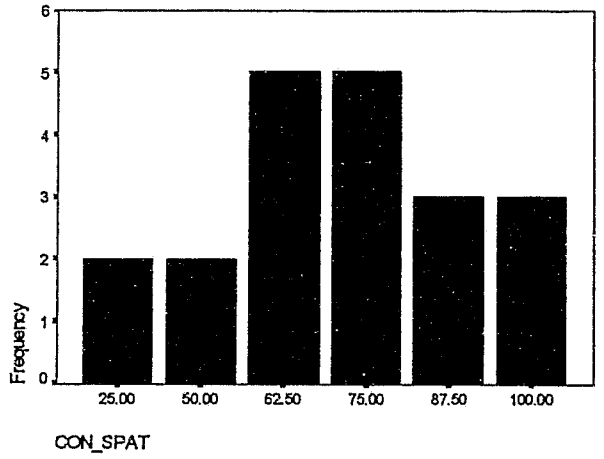

Figure 1. Frequency distribution on consistency of recurring spatial span for the athletes.

Figure 2 presents the frequency distribution of twenty athletes on the consistency of the recurring verbal span. Forty five percent (9 out of 20) of the athletes scored 87.5 and 35% (7 out of 20) of the athletes scored 100. Five percent (1 out of 20) of the athletes scored 12.5 and 62.5.

Figure 2

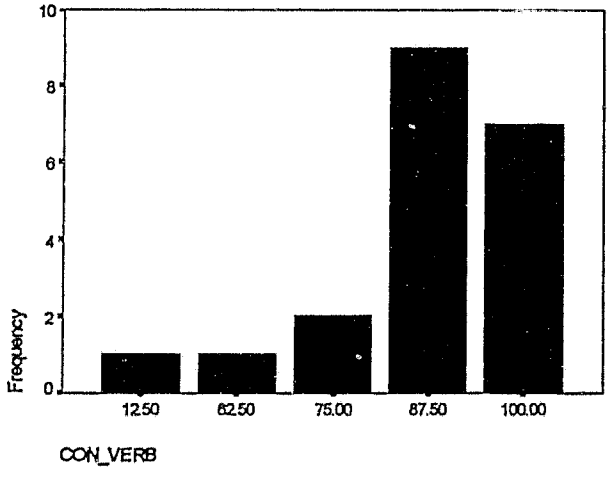

Figure 2. Frequency distribution on consistency of recurring verbal span for the athletes.

Figure 3 presents the frequency distribution of twenty athletes on the highest number of digits a student could spatially recall and indicates that the athletes spatially are more successful 100 percent of the time remembering six digits.

Figure 3

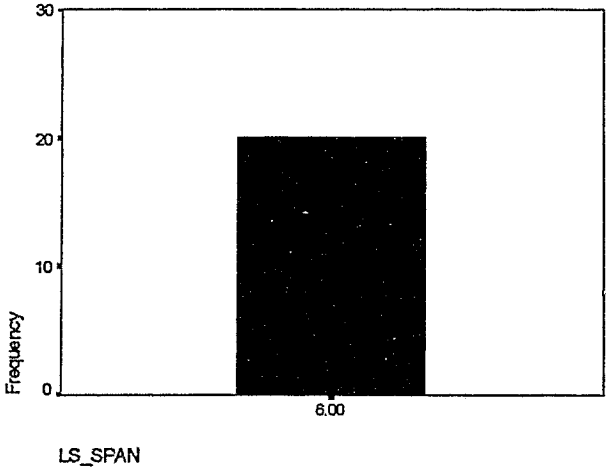

Figure 3. Frequency distribution on the highest number of digits a student could spatially recall.

Figure 4 presents the frequency distribution of twenty athletes on the highest number of digits a student could verbally recall and indicates that verbally the athletes were more skilled at remembering seven -digit numbers (45%) 9 out of 20. Forty percent (8 out of 20) of the athletes were skilled at remembering six -digit numbers. Fifteen percent (3 out of 20) of the athletes were able to recall eight -digit numbers. This represents, frequency distribution on the highest number of digits a student could spatially recall.

Figure 4

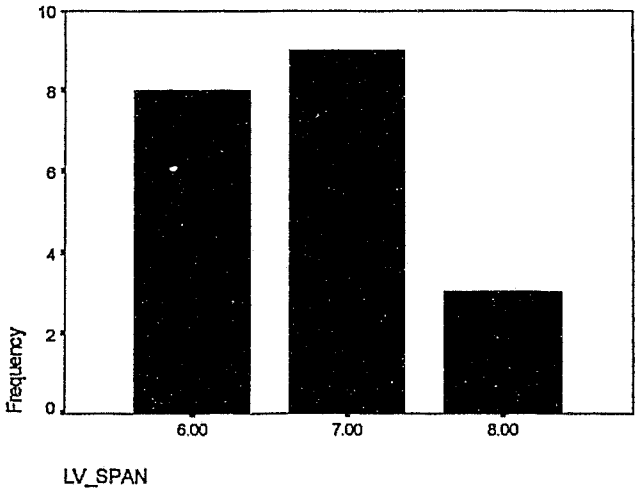

Figure 4. Frequency distribution on the highest number of digits a student could correctly repeat verbally.

Figure 5 presents the frequency distribution of twenty athletes on the percentage of spatial span and indicates that 25% (4 out of 20) of the athletes scored 54.17 in the percentage of spatial task correct. Fifteen percent (3 out of 20) of the athletes scored 8.3 and 20.83. Ten percent (2 out of 20) scored 70.83 and 29.17. The remaining five percent (1 out of 20) of the athletes' scores range from 12.25 and 62.5.

Figure 5

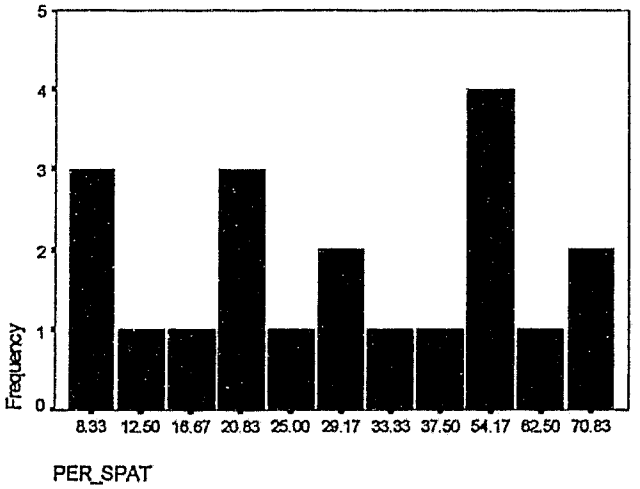

Figure 5. Frequency distribution on percentage of spatial span for the athletes.

Figure 6 presents the frequency distribution of twenty athletes on the percentage of verbal span and indicates that 35 % (7 out of 20) of the athletes scored 41.67 in the percentage of the verbal span task. The majority of the remaining scores hovered around the five to ten percent mark.

Figure 6

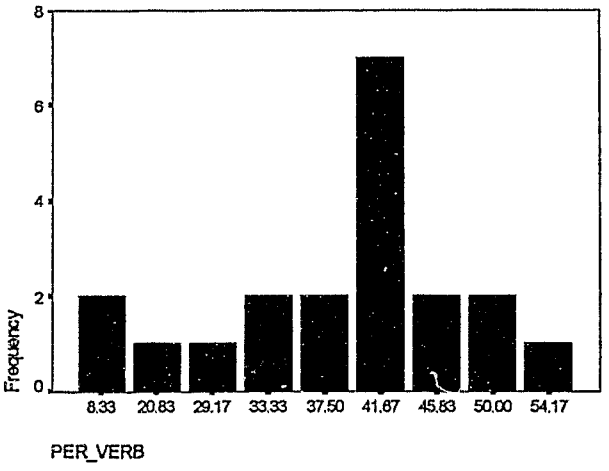

Figure 6. Frequency distribution on percentage of verbal span for the athletes.

Figure 7 presents the frequency distribution of twenty athletes on the repetition of spatial span and indicates that 30% (6 out of 20) of the twenty athletes were able to recognize the repeated sequences of the spatial span immediately. Twenty-five percent (5 out of 20) of the athletes recognized the repeated sequences of the spatial span task after one attempt. Five percent (1 out of 20) of the athletes were not able to recognize the repeated sequences of spatial span after five attempts and after eight attempts.

Figure 7

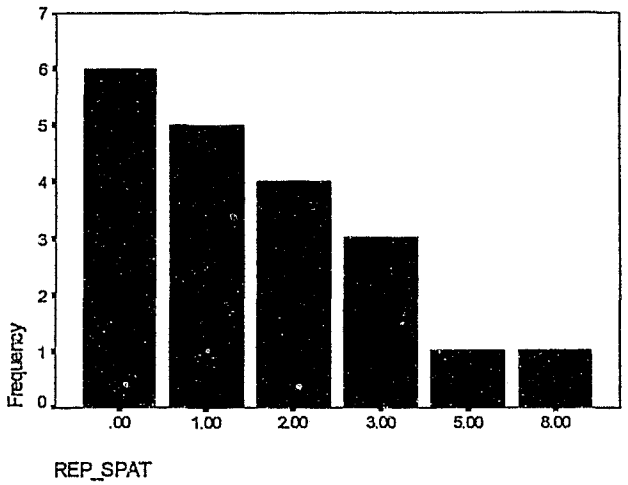

Figure 7. Frequency distribution on repetition of the spatial span for the athletes.

Figure 8 presents the frequency distribution of twenty athletes on the repetition of verbal span and indicates that 65% (13 out of 20) of the twenty athletes recognized immediately the repeated sequences of the verbal task. Twenty-five percent (5 out of 20) of the athletes recognized the repeated sequences of the verbal task after the first attempt. Five percent (1 out of 20) of all the athletes recognized the repeated sequences of the verbal task after two attempts and five percent recognized it after three attempts.

Figure 8

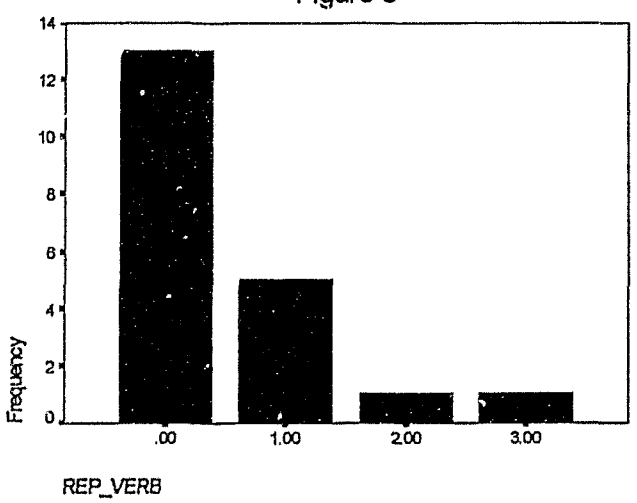

Figure 8. Frequency distribution on repetition of verbal span for the athletes.

Figure 9 presents the frequency distribution of twenty non-athletes on the consistency of recurring spatial span and indicates that the group consistency of the repeated sequences highest results were 20% (4 out of 20) of the non-athletes scored 50.0 and 75.0. Fifteen percent (3 out of 20) of the non-athletes scored 0 correct when looking at the consistency of the spatial span and 62.5 correct looking at the consistency of spatial span. Ten percent (5 out of 20) of the non-athletes scored 25 and ten percent (5 out of 20) non-athletes scored 37.5 on the consistency of the spatial span. Five percent (1 out of 20) of the non- athletes scored 87.5 and five percent scored 100.

Figure 9

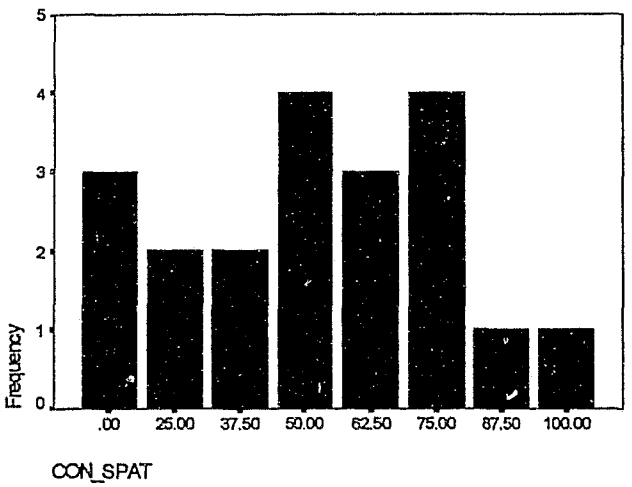

Figure 9. Frequency distribution on consistency recurring of spatial span for the non-athletes.

Figure 10 presents the frequency distribution of twenty non-athletes on the consistency of recurring verbal span and indicates that the consistency of the verbal repeated sequences highest results is that 25% (5 out of 20) of the non-athletes scored 87.5. Fifteen percent (3 out of 20) of the non-athletes scored 37.5, 15% scored 62.5, 15% scored 75, and 15% scored 100. Five percent (1 out of 20) of the non-athletes scored 0 on the consistency of the verbal repeated sequences.

Figure 10

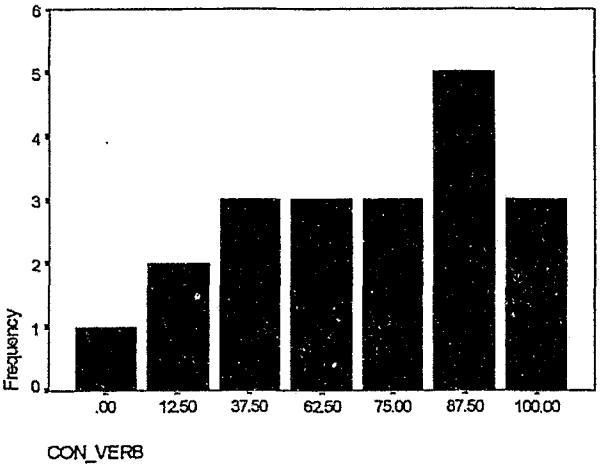

Figure 10. Frequency distribution on consistency recurring of spatial span for the non-athletes.

Figure 11 presents the frequency distribution of twenty non-athletes on the highest number of digits a student could spatially recall and indicates that the non-athletes spatially are more successful 90% (18 out of 20) of the time remembering six digits while ten percent (2 out of 20) of the non-athletes are more successful remembering seven digits.

Figure 11

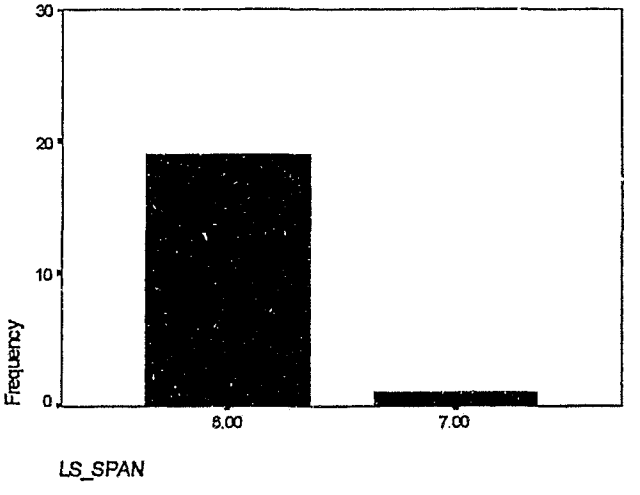

Figure 11. Frequency distribution on the highest number of digits a student could spatially repeat correctly for the non-athletes.

Figure 12 presents the frequency distribution of twenty non-athletes on the highest number of digits a student could verbally recall and indicates that they are more skilled at remembering seven -digit numbers 50% (10 out of 20) of the time. Forty percent (8 out of 20) of the non-athletes were skilled at remembering six digits numbers. Ten percent (2 out of 20) of the non-athletes were able to recall eight digits.

Figure 12

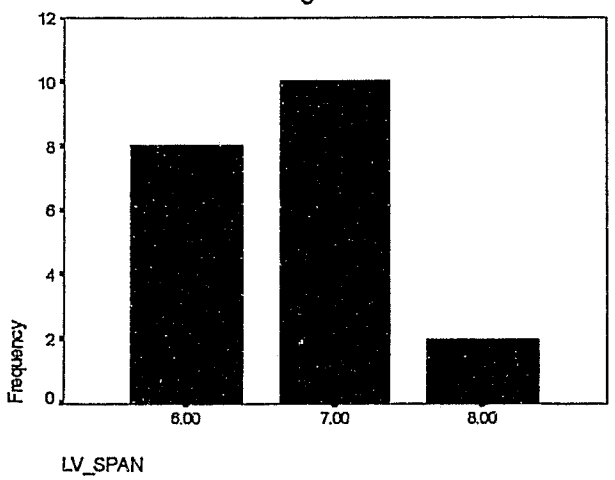

Figure 12. Frequency distribution on the highest number of digits a student could verbally repeat correctly for the non-athletes.

Figure 13 presents the frequency distribution of twenty non-athletes on the percentage of spatial span and indicates that 15% (3 out of 20) of the non-athletes scored 8.3. Ten percent (2 out of 20) of the non-athletes scored 0, 25, 33.33, 37.5,41.67 and 45.83. Five percent (1 out of 20) of the non-athletes scored 4.17, 12.5, 29.17, 54.17 and 62.5.

Figure 13

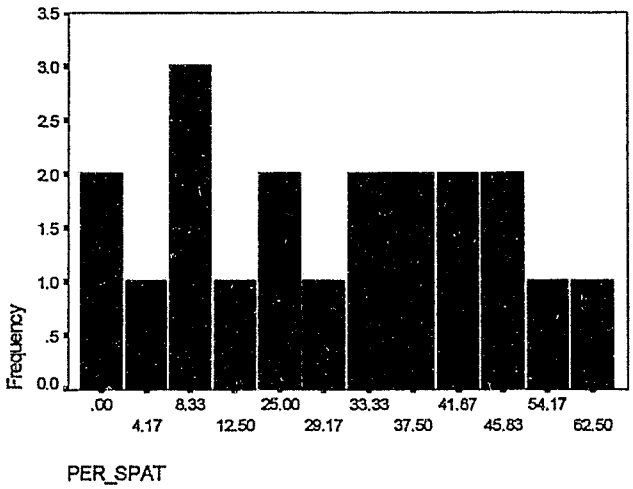

Figure 13. Frequency distribution on percentage of spatial span for the non-athletes.

Figure 14 presents the frequency distribution of twenty non -athletes on the percentage of verbal span and indicates that 35% (7 out of 20) of the non athletes scored 29.17 in the percentage of the spatial span task, 15% (3 out of 20) of the non- athletes scored 41.67 and the majority of the remaining scores hovered around the five percent mark.

Figure 14

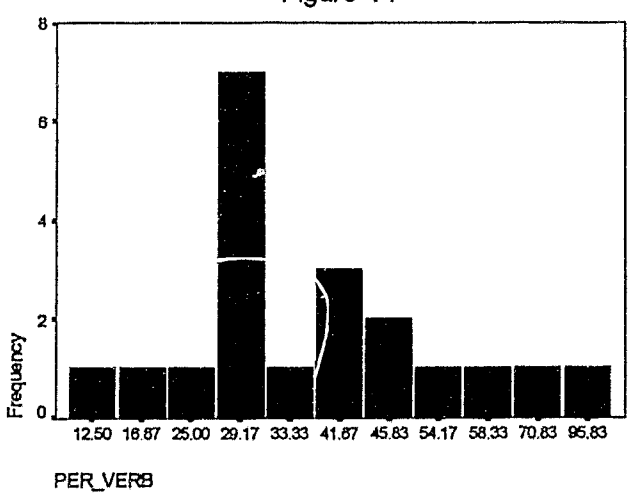

Figure 14. Frequency distribution on percentage of verbal span for the non-athletes.

Figure 15 presents the frequency distribution of twenty non- athletes on the repetition of spatial span and indicates that 40% (8 out of 20) of the non- athletes were able to recognize the repeated sequences of spatial span immediately. Twenty-five percent (5 out of 20) of the non- athletes recognized the repeated sequences of the spatial span task after the first attempt. Twenty percent (4 out of 20) of the non- athletes recognized the repeated sequences of spatial span task after the second attempt. Fifteen percent (3 out of 20) of the non- athletes did not recognize repeated sequences of the spatial span task.

Figure 15

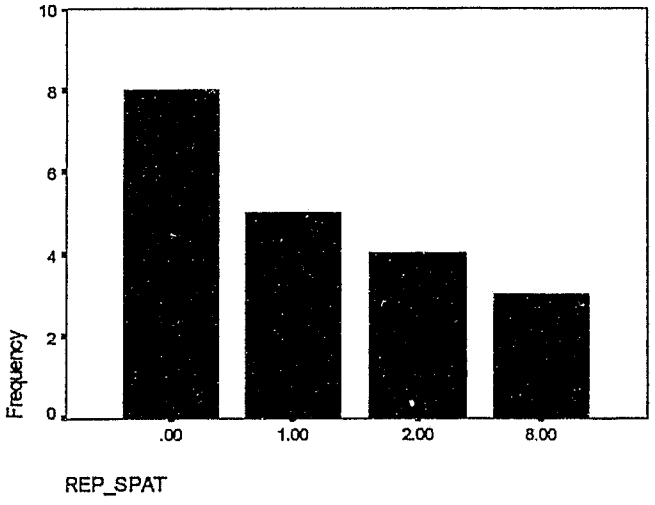

Figure 15. Frequency distribution on repetition of spatial span for the non-athletes.

Figure 16 presents the frequency distribution of twenty non- athletes on the repetition of verbal span and indicates that 60% (12 out of 20) of the non -athletes recognized the repeated sequences immediately. Ten percent (2 out of 20) of the non-athletes recognized sequences after two attempts, ten percent recognized sequences after three attempts, and ten percent recognized sequences after five attempts. Five percent (1 out of 20) of the non- athletes recognized sequences after four attempts, and five percent of the non- athletes did not recognize repeated sequences at all.

Figure 16

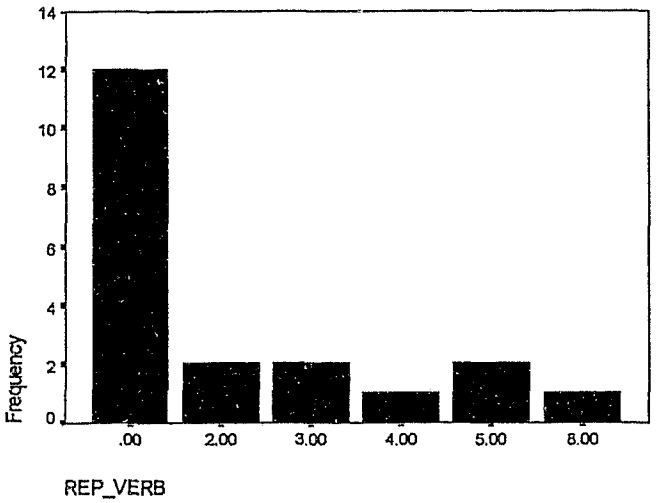

Figure 16. Frequency distribution on repetition of verbal span for the non-athlete.

Differences between spatial and verbal spans

Table 3 shows the descriptive statistics and paired sample t- tests that were performed to determine differences between student performances on the spatial and verbal tasks for the 40 students as a group.

There is a significant difference ($P < .05$) between the consistency of spatial span and the consistency of verbal span. The students tested demonstrated stronger verbal abilities ($M=75.00$) than spatial abilities ($M=60.00$). Correlation results, for the comparison between the consistency of spatial span and consistency of verbal span, are statistically significant ($P < .05$) with a correlation coefficient of 0.342.

There is also a significant difference on the levels of spans. The students' level of verbal span was higher than the level of spatial span and therefore they remembered more than they did in the level of spatial span.

Table 3

Differences between spatial and verbal spans

	M1-M2	std	std error	t	df	sig
Pair 1						
Con_spat Con_verb	-15.0	31.7	5.0	-3.0	39	.005*
Pair 2						
Ls_span Lv_span	-.70	.69	.11	-6.45	39	.000*
Pair 3						
Per_spat Per_verb	-7.2	24.2	3.8	-1.9	39	.068
Pair 4						
Rep_spat Rep_verb	.75	2.8	.45	1.7	39	.101

Note abbreviations.
*P<. 05
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Differences between athletes and non-athletes

Table 4 shows the t- test results between athletes and non-athletes relating to the dependent variables employed in the study.

The results show that the athletes and non-athletes differ significantly ($p<.05$) on only two of the variables: the consistency of spatial span and consistency of verbal span. For the consistency of spatial span the athletes have a significantly higher mean (70.0%) than the non- athletes (50.0%). For the consistency of verbal span athletes have a significantly higher mean (85.6%) than non-athletes (64.4%).

Table 4

Differences between athletes and non-athletes.

Dependant Variables	Group	N	M	SD	t	df	sig
Con_spat	Athlete	20	70.0	21.6	2.5	38	.018*
	Non-Athlete	20	50.0	28.9			
Con_verb	Athlete	20	85.6	20.0	2.6	38	.015*
	Non-Athlete	20	64.4	31.2			
Ls_ span	Athlete	20	6.0	.0	-1.0	38	.330
	Non-Athlete	20	6.0	.2			
Lv_ span	Athlete	20	6.8	.7	.2	38	.819
	Non-Athlete	20	6.7	.7			
Per_verb	Athlete	20	37.3	12.4	-.4	38	.687
	Non-Athlete	20	39.4	19.3			
Per_spat	Athlete	20	34.6	21.2	1.1	38	.284
	Non-Athlete	20	27.7	18.7			
Rep_spat	Athlete	20	1.8	2.0	-.1	38	.896
	Non-Athlete	20	1.9	2.8			
Rep_verb	Athlete	20	.50	.8	-2.0	38	.060
	Non-Athlete	20	1.6	2.3			

Note abbreviations.
*P<. 05
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Differences between males and females

Table 5 shows the t- test results between two genders relating to the dependant variables employed in the study.

The results indicate that a significant difference (P<.05) exists in two of the variables investigated. Males significantly outperformed females on percentage of spatial span, but females significantly outperformed males on consistency of spatial span.

Table 5

Differences between males and females

Dependant Variables	Group	N	M	SD	t	df	sig
Con_spat	Male	20	53.1	27.2	-1.6	38	.011*
	Female	20	66.9	26.1			
Con_verb	Male	20	69.4	29.9	-1.3	38	.209
	Female	20	80.6	25.5			
Ls_ span	Male	20	6.0	.2	-1.0	38	.330
	Female	20	6.0	.0			
Lv_ span	Male	20	6.7	.7	-.7	38	.492
	Female	20	6.8	.6			
Per_verb	Male	20	40.8	20.1	-1.0	38	.333
	Female	20	35.8	10.5			
Per_spat	Male	20	43.8	18.6	5.1	38	.000*
	Female	20	18.5	12.1			
Rep_spat	Male	20	2.1	2.7	.8	38	.432
	Female	20	1.5	2.0			
Rep_verb	Male	20	1.6	.8	2.0	38	.060
	Female	20	.50	2.3			

Note abbreviations.
*P<.05
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Interaction between athletes and gender

ANOVA on consistency of spatial span between athletes and gender demonstrates that the athlete has a significant effect (P<. 05), which is confirmed by the t-tests on table 4 that indicates that athletes outperform non-athletes. There is no interaction effect.

On the consistency of verbal span between athletes and gender, it demonstrates that the athletes have significant effect (P<. 05), which is also indicated in table four. There is no interaction effect.

On the percentage of spatial span, males outperform females (P<. 05), which is discussed in table 5. There is no interaction effect.

Table 6 indicates the means and standard deviations for male athletes relating to the dependent variables employed in the study. Table 7 indicates the means and standard deviations for female athletes relating to the dependent variables employed in the study. Table 8 indicates the means and standard deviations for male non-athletes relating to the dependent variables employed in the study. Table 9 indicates the means and standard deviations for female non-athletes relating to the dependent variables employed in the study.

Table 6

Descriptive statistics for male athletes

Dependant Variables	N	M	SD
Con_spat	10	67.5	20.6
Con_verb	10	82.5	25.8
Ls_ span	10	6.0	.00
Lv_ span	10	6.8	.7
Per_verb	10	33.3	15.3
Per_spat	10	51.7	15.4
Rep_spat	10	1.7	2.5
Rep_verb	10	.5	1.0

Note abbreviations.
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Table 7

Descriptive statistics for female athletes

Dependant Variables	N	M	SD
Con_spat	10	72.5	23.4
Con_verb	10	88.8	12.4
Ls_ span	10	6.0	.00
Lv_ span	10	6.7	.67
Per_verb	10	41.3	7.5
Per_spat	10	17.5	8.1
Rep_spat	10	1.8	1.5
Rep_verb	10	.5	.70

Note abbreviations.
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Table 8

Descriptive statistics for male non- athletes

Dependant Variables	N	M	SD
Con_spat	10	38.6	26.0
Con_verb	10	56.3	29.0
Ls_ span	10	6.1	.3
Lv_ span	10	6.5	.7
Per_verb	10	48.3	22.2
Per_spat	10	35.8	18.8
Rep_spat	10	2.5	3.0
Rep_verb	10	2.7	2.8

Note abbreviations.
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

Table 9

Descriptive statistics for female non- athletes

Dependant Variables	N	M	SD
Con_spat	10	61.3	28.5
Con_verb	10	72.5	32.7
Ls_ span	10	6.0	.0
Lv_ span	10	6.9	.6
Per_verb	10	30.4	10.6
Per_spat	10	19.6	15.6
Rep_spat	10	1.2	2.5
Rep_verb	10	.5	1.1

Note abbreviations.
Con_ spat=Consistency of recurring spatial span
Con_verb= Consistency of recurring verbal span
Ls_span= Level of spatial span
Lv_ span= Level of verbal span
Per_spat= Percentage of spatial span
Per_verb= Percentage of verbal span
Rep_spat= Repetition of spatial span
Reb_Verb=Repetition of verbal span

ANOVA analysis also found two interaction effects between gender and athletes on two variables: percentage of verbal span and repetition of verbal span. Figure 17 sents the interaction on percentage of verbal span between athletes and gender. This figure indicates that the female athletes outperform the male athletes, but the male non-athletes outperform the female non- athletes.

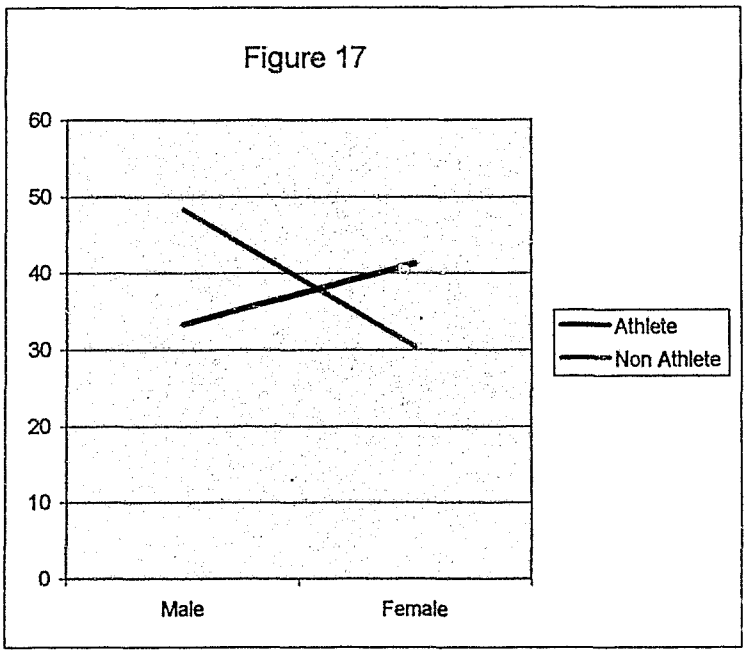

Figure 17. Main interaction effect of athletes and gender in percentage of verbal span.

Figure 18 presents the interaction on repetition of verbal span between athletes and gender. This figure indicates that the female and male athletes outperform the female and male non- athletes. This figure also shows that the male non- athletes outperform the female non-athletes in the recognition of the sequences. Interestingly, looking at Tables 4 and 5, there is not a significant difference between males and females on the dependent variable, nor between athletes and non-athletes.

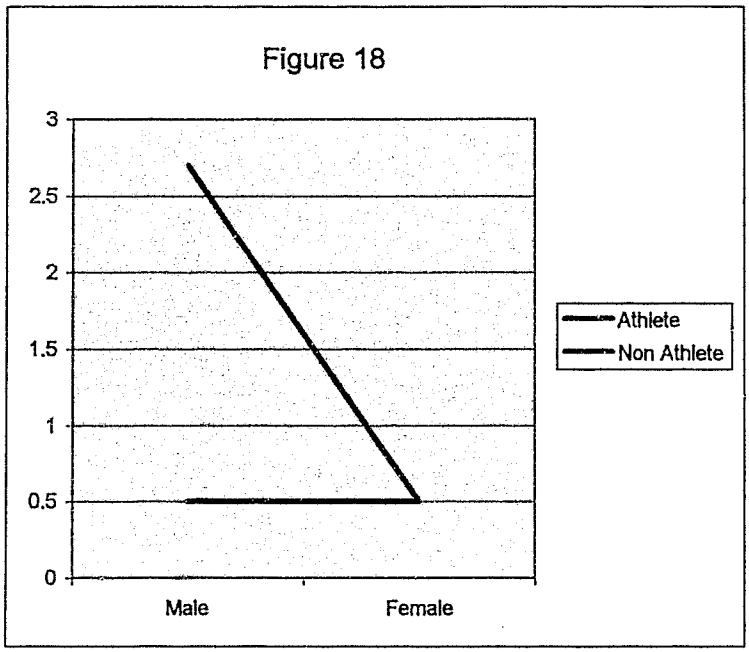

Figure 18. Main interaction effect of athletes and gender in repetition of verbal span.

CHAPTER 5

Discussion

Differences between spatial and verbal spans

The differences between spatial and verbal spans are summarized in Table 3. A significant difference between the consistency of recurring spatial span and the consistency of recurring verbal span was indicated. This result may be due to cumulative learning occurring among the subjects tested. Cumulative learning is interest that is added to the principle and draws additional interest. The observation of cumulative learning can be supported by the fact that the test subjects, on a daily basis in the classroom and athletic environments have, through prior learning experiences, made incremental changes to improve memory retention through verbal direction. We all recognize that students on a day-to-day basis must be able to retain, transfer and repeat historical dates, telephone numbers and street addresses, recall equations, memorize information, and repeat information in order to obtain desired results. Obviously, incremental learning has strengthened the verbal recalling ability (Hebb, 1961).

We must not dismiss the individual student's personal academic abilities some students, given the same tasks, will produce better results than others based on this single factor. Therefore, in isolation, students with better than average academic abilities will appear to a teacher to have better attention span by virtue of producing better results. This research report cannot offer the position that attention span on its own is the single factor that produces better results for students. It can be stated that there are other factors including motivation, interest in subject matter, maturity and ability.

The consistency of recurring spatial span visibly produced lower results, which may also be because the test subjects were not familiar with the block tapping tasks. In order for the students to score higher, their educational environment would have to have greater influence with spatial learning. Once the test subjects improve their cumulative learning in this area it would be expected that the mean scores would significantly improve. However, it is difficult to hypothesize that the cumulative learning over time with the consistency of recurring spatial tasks would exceed the results produced by the consistency of the recurring verbal span subject results.

It would seem to suggest that the cumulative learning was a greater factor for the consistency of the recurring verbal span task test subjects because they were able to apply prior learning techniques to recall the sequences quicker and more accurately. The test subjects apparently were less intimidated, less confused, and /or less interfered with when focusing on the verbal task that they were being asked to address. Conversely, the subjects, when asked to perform the block-tapping task, did appear to have more questions, and seemed to be more intimidated and confused. Thus, it could be suggested that the subject's ability to focus with good attention span was compromised by the lack of familiarity with the test process.

In the alternative, one can offer the explanation that although the test subjects were unfamiliar with the block-tapping task there was a heightened awareness of this task; consequently, the subjects did appear to question the task in more detail. Therefore, the research cannot necessarily conclude that the test subjects had less attention span and as a result produced lower scores. One can submit that even though attention span was

stimulated, it did not appear to produce better results. As a result, the task technique itself may have caused the students to feel uncertain and confused, thus creating a situation where their attention was drawn to understanding the task technique rather than concentrating on the actual tasks required.

The descriptive table also suggests that test subjects, given a specific series to repeat, depend on further strengthening of memory connections to prior performances. The test subjects did appear to show improvement in each dependent variable as they became familiar with the repetition and the digit series. This seems to support the view that test subjects given cumulative learning experiences will tend to improve and demonstrate better results than test subjects who have not had the benefit of these opportunities. With regard to the level of spatial span and the level of verbal span, the subjects in the sample were able to commit to memory, on average, six digits. On the level of verbal span, some students were able to repeat seven digits. It could be argued that the subjects were able to remember seven digits due to familiarity and did not need much practice due to the fact this was not a new task. Students are asked on a daily basis to recall numbers, for example, telephone numbers and historical dates. The level of spatial span is lower than that of verbal span. This could also be due to the fact that they were unfamiliar with the spatial task.

Only with further test samples in prior cumulative learning on the test procedures could we then (from the data obtained) conclude that memory can be improved beyond the six digits. It is suggested from this purposeful sample, that with cumulative learning, the subjects will show even greater performance. The subjects' attention spans could

have possibly improved had they received prior learning experiences that would improve their cumulative learning.

The percentage and repetition of spatial and verbal span indicates from the test results that there is no significant difference between the two dependent variables. It appears that the subjects, once they became familiar with the testing process, were able to focus more on the correct sequences and possibly this resulted in similar test results.

Differences between athletes and non-athletes

Table 4 indicates that the athletes outperformed the non-athletes (on the consistency of recurring spatial and verbal spans) and that there was no significant difference on the other variables between athletes and non-athletes.

This result suggests that in some areas of attention span there are advantages to having students involved in athletic activities, which challenge their minds in other ways. The athletes, it could be assumed, because of the extracurricular time spent training, had an advantage over the non-athletes. This advantage appears to be that the student athletes in extracurricular activities receive extra training through their athletics in focusing on tasks under pressure from their peers. They are expected to be trained, to understand, and to repeat different skills in a competitive environment. Each of the athletes knows that his/her individual success depends on the ability to listen carefully to verbal instructions, repeat the verbal instructions in his/her own mind, and repeat the instructions in a physical way in order to demonstrate the skills successfully. In coaching, each athlete must understand the skill in order to successfully carry it out. Clearly, among the athletes,

there are significant differences in skill levels. Some athletes do show greater ability to adapt to new skills because of significant physical differences.

As an intermediate school teacher and coach it could be assumed that the two dependent variables showing significant differences probably are a result of the student athletes' group. Attention span for the student athletes would be more intense in the spatial and verbal areas as these students, in their athletic involvement, are constantly being coached using the aforementioned. The results suggest very significant differences between athletes and non-athletes in consistency of recurring spatial span and the consistency of recurring verbal span.

Differences between males and females

The t-test analysis conducted in Table 5 indicates a significant difference on the consistency of recurring spatial span and the percentage of spatial span between males and females. The females had higher results than the males in the consistency of recurring spatial span. The males had higher results than the females on the percentage of spatial span. The result is consistent with the research work done in cognitive variations between sexes (Kimura, 1992). Current research supports that gender differences, wherein males on average perform better than females, do so in tests that require the individual to image rotate an object or to manipulate the object in some way, to do mathematical reasoning tests, to navigate routes, and to achieve greater accuracy in target- directed motor skills, for example: shooting a basket or firing a spear. Not to be outdone, women tend to do better than men in rapidly identifying items (perceptual speed). They also demonstrate greater verbal fluency, and out-perform men in some

arithmetic calculations. Of significance is the fact that women are faster at certain precise manual tasks such as placing pegs in the designated holes on a board (Kimura 1992).

Adults (male/ female) studied in research laboratories provided statistical analysis that supports the finding that men learned new routes faster and made fewer errors. However, women, once having learned the route, remembered more of the landmarks than the men. Researchers tested the abilities of the same adults to recall objects and their locations in a confined space, for example, in a room or a laboratory. Women were better able to remember whether the item had been displaced or not. They demonstrated greater accuracy in recalling the array of objects and were better able to replace them in the exact positions (Kimura, 1992).

Looking at the results for the consistency of reoccurring spatial span, this research does support earlier theories that females do better at recognizing details once repeated faster, with precision, and more consistently than the males. For the dependent variable percentage of spatial span Table 5 shows that there is a significant difference (P=. 05) between males and females. Research theory supports that males tend to perform better than females when assigned new tasks challenging their spatial abilities (Kimura, 1992). In this block- tapping task, male subjects clearly outperformed female subjects, which is consistent with the theory that there are gender differences in specific abilities (Kimura, 1992).

Interaction between athletes and gender

Figure 17 presents an interaction effect of athletes and gender when considering the dependent variable percentage of verbal span.

The non-athletes' line on the graph indicates that non- athletic males significantly outperform non-athletic females and the female athletes outperform the male athletes on their overall results of the dependent variable percentage of verbal span. The literature review does not appear to provide guidance as to specific scientific reasoning for the outcome.

The male non-athletes did not appear to show any concern during the performance of the testing. It could be that the male non-athletes adapted more easily to the test circumstances while the female non- athletes took a greater amount of time to focus and understand the specific task. Another possible reason for the result could be the use of purposeful sampling. The male non-athletes sample could possibly not have been a good representation, which may be a limitation to the study.

The athletes' line on the graph illustrates a much smaller variation in mean scores between athletes. However, interestingly the female athletes scored higher on an overall mean score of the percentage of verbal span. This result could be attributed to the female athletes' academic abilities. The female athletes used in this study were all academically strong students. The male athletes used in this study had lower academic levels than the females. Their academic levels were not nearly as strong as the female athletes or as the male non-athletes. Therefore, the possible explanation for this result could be due to the difference in academic levels. Another possible reason for the result could be the use of purposeful sampling. The male athletes' sample could possibly not have been a good representation, which may be a limitation to the study.

The research findings, as outlined in Figure 18, demonstrate an interaction effect between athletes and gender. This interaction effect measured the repetition of verbal

span. The non-athletes' line showed that males clearly experienced significantly greater difficulty than the females in identifying the repetition of verbal span. In particular, male non-athletes demonstrated poorer performance in identifying the recurring sequence as compared to female non-athletes who did very well at identifying the same. Conversely, the female non-athletes and athletes had the same performance results.

The athletes' line produced a very interesting result. The male and female athletes showed relatively the same performance in the identification of the repetition of verbal span. It would seem that male athletes are benefiting from enhanced attention span when performing the assigned task. You will recall that all subjects in the repetition of verbal span are expected to be able to identify the repeating sequence of numbers.

Females usually outperform males when doing precision or repetitive tasks. A visual review of Figure 18 shows a main interaction effect that supports the view that females tend to outperform males in precision or repetitive tasks. However, a significant finding on reviewing the interaction effect is that male athletes showed substantial improvement over the male non-athletes. It seems that these male athletes are benefiting more than the females from prior learning experiences due to their athletics. It is possible that the exposure to these athletic endeavors provides prior learning experiences, which challenge the male athletes to focus more and to recall sequences in order to perform various athletic activities. The results suggest that once athletes master their ability to focus and to recall in athletic activities, they can easily transfer this skill to non- athletic tasks that require repetition and recall. It is important to note that the repetitive tasks performed in this study seem to indicate that with repetition of the same task several times, performance is increased.

Self-Efficacy is an important factor in the athletes' (male/female) intellectual and social behavior as compared to the non- athletes (male/female) (Biehler, D'Amico, Snowman & Schmid, 1999). It would appear that the most significant factor might be that athletes feel more capable of performing successfully, having established patterns of success in various activities and having received positive feedback, which leads to further success. As athletes present these small steps, which lead to success, they establish patterns of success that allow them to improve personal performance. The athletes then begin to firmly believe in their own ability and they tend to believe that other people believe in them as well. It would seem that athletes have learned to challenge themselves to learn new tasks. This also provides time to experience failure, and with persistence, to obtain success.

Athletes receive rewards from their performance, which generally comes from observed results that are reinforced by fellow students, teachers, coaches and family members. Non-athletes do not receive this type of reassurance, unless involved in some sort of extracurricular activity.

Athletes have a certain amount of operant conditioning meaning that all behaviors are accompanied by certain consequences and these consequences strongly influence whether these behaviors are repeated and at what intensity level (Biehler, D'Amico, Snowman & Schmid, 1999).

> " In general, the consequences that follow behavior are either pleasant and desirable or unpleasant and aversive.... When consequences strengthen a preceding behavior, reinforcement has taken place. When consequences have

weakened a preceding behavior, punishment and extinction have occurred."

(Biehler, D'Amico, Snowman & Schmid p.302, 1999).

The athletes, given their continuing learning experiences, have learned to adapt their behaviors in an effort to receive positive reinforcement and gain success in the tasks they have been assigned to do. However, the athlete has also experienced negative reinforcement used to obtain targeted behavior. It would seem that athletes are exposed to greater competitiveness and have been challenged by coaches through both positive and aversive stimuli, and they have learned to achieve success in this environment. Since these athletes have been exposed to these prior-learning experiences they find it easier to adapt, to cope and to apply them with greater tenacity while accepting setbacks until they achieve the tasks. The previous statement seems to reinforce the theory that repetition of a task increases performance.

Conclusion and Recommendations

The question that was originally asked as the general problem statement is: " Is there a difference in attention span when comparing athletes and non-athletes?"

The purpose of this study was to develop and to expand understanding of attention span of athletic and non-athletic students. Forty grade nine students were chosen for this study. There were four cells of ten students. The subjects consisted of ten male grade nine basketball players, ten female grade nine basketball players, ten male grade nine non-athletes and ten female grade nine non-athletes. The type of sampling used in this research was purposeful sampling. It was felt that this type of sampling would be representative and informative about the topic. The instruments used in this research were verbal and spatial tasks which were used to assess attention span. Each task was performed on an individual basis with the researcher. The data was collected over a three-day period. The statistical analysis of the research was conducted using descriptive analysis, t-tests, and one and two- way analysis of variance. It was organized in terms of the three major research questions of the study:

1. Do grade nine athletes have a better attention span than non-athletes?
2. Does the gender difference in grade nine play a role in the athlete's and non-athlete's attention span?
3. Is there a significant difference between verbal attention span and spatial attention span?

This research has heightened the interest in the initial question and the specific research questions. With response to the focal questions, it is impossible to come to an absolute

conclusion without referring to specific types of attention span. These results suggest that in some areas of attention span, there are advantages to having students involved in athletic activities that challenge their minds in other ways such as: the repetition of tasks, the retrieval of information, and the recognition of information. This research does not find that there are significant differences in all the dependent variable areas that were tested through the spatial and verbal tasks used. These findings indicate that further studies are required such as using a larger demographic population, as well as different statistical comparisons between university, high school and intermediate school students.

Public awareness has to be raised in attention span in the athletes versus non-athletes and in males versus females. Given that the stimuli and the environments used in sports may have an impact on increasing attention span it is possible to create attentiveness in the classroom following some sports teaching practices. Teachers need to be made conscious to possible differences in their students' short-term memory hence attention span.

It is suggested that education must create situations in the classroom to aid in improving student attention span. Methodologies of instruction will need to be incorporated to assist the students in the importance of developing the necessary behaviors that will enhance attention span. Unless the students respond to the teacher's stimuli in the classroom, student attention will be lost. Teachers must develop their own positive stimuli, to reach their students and at the same time grasp their attention.

Often teachers claim that sons or daughters fail to pay attention to classroom instructions. Self-examination must start with the teacher, as a desired job to provide the necessary stimuli to capture the student's attention span.

Classroom activities requiring the most attention must be carefully prepared so that information provided has a reasonable opportunity to be received. Timing classroom activities with creativity and participation from the students are periods for developing a rapport with the students as an audience.

Students do anything for teachers we are willing to show interest in them and if we convey to our students, individually, that we care. Teachers conveying that they care and are truly interested in their students' success will demonstrate that they are paying attention to what the student is doing. This is meaningful to each student and will capture his or her attention. Research identifies clearly that you capture the student's attention when the information is presented in an interesting and meaningful way. As teachers, we must take time to constantly develop and refine learning materials with more focus on interesting and meaningful topics.

Educators will need to use manipulative and developing strategies that will continue capturing students' attention on a daily basis. Students need to be motivated by teachers who will develop learning experiences where students succeed thus building students' self-esteem. Educators must create constant opportunities in the classroom, to reinforce their students' intelligence and positive personality traits. Developing the positive influence with students will create respect and attention from students.

Athletics is one form of extracurricular activity, within reasonable boundaries of involvement that does offer opportunities for students to develop confidence, self-esteem, self-reliance and perseverance. Armed with the aforementioned the students will concentrate to maintain the task performed and complete the task. Administrators must support and encourage the development of extracurricular activities in the schools that

will capture non-athletes' interest in areas such as: drama club, computer club, band, arts and industrial arts among others. Administrators are left with schools that must have teachers who are prepared to volunteer time, otherwise the extracurricular activities needed to create positive student interest in their school environment will be lost to the distractions available on a daily basis. Administrators must develop flexibility in the school system's work environment to reward teachers who do offer their time.

Gender differences do require continued study for validations of findings and there is significant research on the psychological development of adolescents by gender. Research testing can validate these differences and further enhance teaching methodologies that will tap into female and male abilities.

References

Abernethy, B. (1987). Attention. A physical education review. 127-135.

American Sports Institution (1996). Promoting achievement in school through sport. Promoting Achievement In School Through Sports.

Biehler, Robert F., Snowman, Jack., D'Amico, Miranda., Schmid, Richard F. (1999). Information processing theory. Psychology of Applied to Teaching, 342-379.

Burack, J. A. and the Enns J. T. (1997). Attention developments and psychopathology. New York: The Guildford Press.

Christensen, L. (1994). Book review. Child Study Journal, 24, 169- 170.

Copeland, R. (Ed.). (1976). Webster's sports dictionary. Springfield; G&C. Merriam.

Evans, J. and Pellegrini, A. (1997). Surplus energy theory: an enduring but inadequate justification for school break time. Education Review, 49, 229-236.

Feingold, Alan. (1992). Sex differences in variability in intellectual abilities: A new look at an old controversy. Review of Education Research, 62,61-84.

Fejgin, N. (1994). Participation in high school competitive sports: a subversion of school mission or contribution to academic goals? Sociology of Sport Journal, 11, 211-230.

Geber, Susan B. (1996). Extracurricular activities and academic achievement. Journal of Research and Development in Education, 30, 42-50.

Geiger, S. and Reeves, B. (1993). The effects of scene changes in semantic relatedness on attention to television. Communication Research, 20, 155-175.

Gilligan, C. (1982) In a different voice: psychological theory and human development. Cambridge, Mass.: Harvard Univeristy Press.

Gutteridge, M. W. (1935). The duration of attention in young children. Australian Council For Educational Research Senes, 41, 52. (From Psychological Info. Abstracts, 1887-1966).

Hebb, D.O. (1961). Distinctive features of learning in the higher animal in Delafresmay, J.F. (e.d.). Brain mechanisms and learning, 37-51.

Hebb, D. O. (1972). Learning, memory and forgetting, Textbook of psychology, 95-112.

Jordan, Barry D. and others. (1996). Sparring and cognitive function professional boxers. Physician and Sports Medicine, 24, 87-88.

Kimura, D. (1992). Cognitive function: Sex differences in the brain and hormonal influences. Birkhauser Boston, 41-43.

Kimura, D. (1992 September). Sex differences in the brain, Scientific American, P.119-125.

Kioumourtzoglou, and others. (1998). Cognitive, perceptual, and motor abilities and skilled basketball performance. Perceptual and Motor Skills, 86, 771-786.

Mahoney, Joseph L.; Cairns, Robert B. (1997). Do extracurricular activities protect against early school dropout? Developmental Psychology, 33, 241-253. (From Eric abstracts 1992-1998).

Mackworth, J.F. (1970). Vigilance and Attention. England: Harmondsworth.

McMillan, H. James and Schumacher, Sally. (1997). Research in Education Fourth Edition, 171, 397-401.

Melton, A. W. (1963). Implications of short-term memory for a general theory of memory. Journal of Verbal Learning and Verbal Behavior, 2, 1-21.

McNeal, R. B. (1995). Extracurricular activities in high school dropouts. Sociology of Education, 68, 62-81.

Norman, D.A. (1996). Optimal flow. Arts Education Policy Review, 97 35-38. (from Eric abstracts 1992-1998).

Parker, H. and Parker, R. (1992). Making the grade: the adolescents struggle with attention deficit disorder. Florida: Plantation.

Peterson, L. Stoiler, K. (1992). Attention and classroom learning. In encyclopedia of educational research (vol. 1, pp.102-106). New York: MacMillan Publishing Company.

Radvansky, G.A. and Wyer, Jr. R.S. Memory. In the encyclopedia of human behaviour (vol. 3, pp.137-138). California: Academic Press, Inc.

Reason. (1999). ADHD: a psychological response to and evolving concept. Journal of Learning Disabilities, 32, 85-95.

Rombokas, M. And others. (1995). High school extracurricular activities in college Grades (from Eric abstracts 1992-1998).

Sewell, D.F. (1996) Attention focusing instructions and training times competitive youth Swimmers. Perceptual and Motor Skills, 83, 915-920.

Silliker, S.Alan; Quirk, JeffreyT. (1997). The effective extracurricular activity participation on the academic performance of male and female high school students. School Counselor, 44, 288-293.

Spobek, B. (1993). Shared attention and meaning. Handbook of research on the education of young children.

Tranel, D. Memory, Neural Substrates. In the encyclopedia of human behavior (vol. 3, pp.149-156). California: Academic Press, Inc.

Appendix A. Consent Form

Dear Mike Murphy,

The results from the attached experiment will greatly assist in my investigation into attention span when comparing athletes vs. non- athletes in grade nine students. The research is an attempt to understand if the involvement in athletics increases attention span. The project will be conducted by Ms. Natalie Atkinson, a Masters of Education student and supervised by Dr. Xiufeng Liu. Both represent the Department of Education at the University of Prince Edward Island.

Purposeful sampling will be used for the research study due to the fact it is best suited for this investigation. The project involves the following procedures to short-term memory tasks, one measuring verbal span and the other measuring spatial. The time involved in completing the tasks range from fifteen to twenty minutes.

The identity of the students will not be revealed in research study. The results from the task will be kept in a locked file accessible to only Ms. Natalie Atkinson and Dr. Xiufeng Liu. It will be destroyed immediately following data analysis.

The major benefit of this project involves providing additional instructional resources to teachers, parents and administrators.

The participation in this study is voluntary. No penalty exists for refusal to participate and one is free to withdraw consents and end participation at any time. This project is minimal risk. Enclosed you'll find a sample of procedures used in the experiment.

Once the research study has been completed and approved the participants and Mr. Mike Murphy will receive a detailed summary of results.

If questions arise about the methods, procedures or any other aspect of the study I am free to contact Ms. Natalie Atkinson at 902-368-6085.

Attached you will find a permission slip and self-addressed envelope and you are asked to place the bottom portion of this form in the self-addressed envelope.

Thank you for your assistance and cooperation.

Sincerely,

Natalie Atkinson

I give permission to Natalie Atkinson to conduct her research study at Stonepark Intermediate School. I am aware that the students' names will not be revealed in the research study.

Date: _____

Signature: _____

Appendix B. Consent Form

Agreement to Serve as a Research Subject

Dear parent/guardian:

I give consent for my child to serve as a research subject in the project "attention span of grade nine athletic and non-athletic students." This project is conducted by Ms.Natalie Atkinson, a Masters of Education student, and supervised by Dr.Xiufeng Liu a professor. Both represent the Department of Education at the University of Prince Edward Island. The research is an attempt to understand if the involvement in athletics increases attention span.

I am aware that the project involves the following procedures: your child will complete two short-term memory tasks, one measuring the verbal span and the other measuring the spatial span. There are no correct or incorrect responses. Therefore, no comments will be made regarding the latter during the session. I am aware that purposeful sampling will be used for this research study due to the fact it is best suited for the investigation. Time involved in completing the tasks ranges from fifteen to twenty minutes.

I understand that my child's name will not be revealed in the research study. The results from the tasks will be kept in a locked file accessible only to Ms. Natalie Atkinson and Dr. Xiufeng Liu. It will be destroyed immediately following data analysis.

The major benefit of this project involves providing additional instructional resources to teachers, parents and administrators regarding the importance of the subject attention span.

I recognize that participation in the study is voluntary. No penalty exists for refusal to participate and I am free to withdraw my child and end participation at any time.

I understand that this project is minimal risk. I understand that once the research study has been completed and approved, I will receive a detailed summary of the results.

If questions arise about the methods, procedures or any other aspect of the study, I'm free to contact Ms. Natalie Atkinson at 902- 368-6085.

Attached you'll find a permission slip and self-addressed envelope. Please place the bottom portion of this form in the self-addressed envelope.

Thank you for your assistance and cooperation.

Sincerely,

Natalie Atkinson

I give permission to Natalie Atkinson to allow my child_____ to participate in the research study. I am assured that my child's name will not be revealed in the research study.

Date: _____

Signature: _____

Appendix C. Recording Table for Corsi Block Tapping Task

Table I

Corsi Block Tapping Sequences *Subject # ---*

									Non-recurring sequences		**Repeated Sequences**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Correct***	***Incorrect***	***Correct***	***Incorrect***
6	3	9	4	1	8	5	2	7				
7	1	6	5	4	2	3	8	9				
9	1	5	2	7	4	8	3	6				
2	7	4	6	5	9	1	3	8				
1	6	5	3	4	7	9	2	8				
9	1	5	2	7	4	8	3	6				
4	9	3	8	6	1	5	7	2				
3	6	8	4	2	1	9	5	7				
9	1	5	2	7	4	8	3	6				
6	7	2	4	8	3	1	5	9				
5	2	3	9	7	4	6	1	8				
9	1	5	2	7	4	8	3	6				
4	7	2	3	6	9	8	1	5				
2	1	6	4	8	3	9	7	5				
9	1	5	2	7	4	8	3	6				
1	5	7	3	6	4	2	8	6				
5	9	3	1	6	2	4	7	8				
9	1	5	2	7	4	8	3	6				
7	8	1	2	3	2	6	4	9				
3	9	5	5	2	1	4	7	8				
9	1	5	6	7	4	8	3	6				
4	5	9	8	3	6	2	1	7				
3	8	1	5	4	1	6	2	9				
9	1	5	2	7	4	8	3	6				

Appendix D. Recording Table for Hebb Digit Task

Table II

Hebb Digit Sequences *Subject #-----*

									Non-recurring sequences		**Repeated sequences**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Correct***	***Incorrect***	***Correct***	***Incorrect***
6	3	9	4	1	8	5	2	7				
7	1	6	5	4	2	3	8	9				
9	1	5	2	7	4	8	3	6				
2	7	4	6	5	9	1	3	8				
1	6	5	3	4	7	9	2	8				
9	1	5	2	7	4	8	3	6				
4	9	3	8	6	1	5	7	2				
3	6	8	4	2	1	9	5	7				
9	1	5	2	7	4	8	3	6				
6	7	2	4	8	3	1	5	9				
5	2	3	9	7	4	6	1	8				
9	1	5	2	7	4	8	3	6				
4	7	2	3	6	9	8	1	5				
2	1	6	4	8	3	9	7	5				
9	1	5	2	7	4	8	3	6				
1	5	7	3	6	4	2	8	6				
5	9	3	1	6	2	4	7	8				
9	1	5	2	7	4	8	3	6				
7	8	1	2	3	2	6	4	9				
3	9	5	5	2	1	4	7	8				
9	1	5	2	7	4	8	3	6				
4	5	9	8	3	6	2	1	7				
3	8	1	5	4	1	6	2	9				
9	1	5	2	7	4	8	3	6				

Appendix E. Image of the Corsi Block Tapping Task