INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI

A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor MI 48106-1346 USA
313/761-4700 800/521-0600

SPORT AND DELINQUENCY:
EFFECTS OF PARTICIPATION IN SPORT
ON THE DEVELOPMENT OF
ADOLESCENT ANTISOCIAL AND DELINQUENT BEHAVIOUR

by

Paul Rapagna

Submitted to the Faculty of Graduate Studies and Research
in Partial Fulfillment of the Requirements
for the Degree of Master of Arts

Department of Physical Education

McGill University

Montreal, Quebec

August, 1996

National Library of Canada
Acquisitions and Bibliographic Services
395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale du Canada
Acquisitions et services bibliographiques
395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

0-612-29566-4

Canada

ABSTRACT

The purpose of this investigation was to examine whether sports in which boys participated spontaneously (i.e., not organized as a treatment) could be associated with the retrenchment of later adolescent delinquent behaviours. The objectives of this particular investigation were to: (i) observe how this participation might alter a negative behavioural developmental trajectory; and (ii) study the possible effects of transition in sports activity (i.e., increases or decreases in participation in sports from year to year) on current and later risk for delinquency.

This investigation utilized data obtained from the *Montréal Longitudinal-Experimental Study* of Boys which started in 1984 when the boys were six years old. Seven-hundred-eleven of the subjects met the inclusion criteria necessary to participate in the present study. Each year, from 1989 (age 11) to 1995 (age 17) the subjects were asked to complete the Self-Report-Delinquency questionnaire, a 27-item scale detailing their involvement in antisocial behaviour over the previous 12-month period. The scores of four of these years were retained for study; namely, those for 1989 (age 11), 1991 (age 13), 1993 (age 15), 1995 (age 17).

The data analyses provide descriptive statistics on the sample across the whole period using frequency distributions, as well as cross-tabulations, to reveal possible relationships among the variables. Four multiple multivariate regression analyses were used, one for each delinquency measure (dependent variables) with sport participation scores as independent variables. Significant multivariate Fs were found for three of the four analyses. When considering lifelong persistent behaviour age 6 Teacher-rated disruptiveness scores were used as an additional predictor along with the sport participation scores–significant multivariate Fs were found for the four

analyses. In an attempt to investigate whether transitions in sport participation had any impact on the amount of delinquency, the subjects were divided into two groups, i.e., those who decreased their participation in sports from one year to another and those who increased their participation. Analyses of covariance procedures were utilized to examine whether differences existed between the two groups on the delinquency variables. Although few of the results were found to be statistically significant, trends were apparent. Most salient was the observation that in practically all cases the delinquency scores for the group that increased its participation in sports were lower than those for the group that decreased its participation. This finding was consistent throughout the study for all combinations of transition scores.

RÉSUMÉ

Le but de cette étude est de déterminer si les sports auxquels les garçons participent spontanément (c'est-à-dire qui ne sont pas organisés comme traitement) ont un rapport avec la réduction des comportements délinquants plus tard dans l'adolescence. Les objectifs de cette étude étaient : i) d'observer les conséquences éventuelles d'une telle participation sur la trajectoire de développement de comportements négatifs; et ii) d'étudier les effets possibles d'une transition dans l'activité sportive (c'est-à-dire une augmentation ou une baisse du niveau de participation à des sports d'une année à l'autre) sur les risques actuels et ultérieurs de délinquance.

L'auteur de cette étude a utilisé les données provenant de l'étude longitudinale-expérimentale de jeunes garçons de Montréal qui a débuté en 1984 alors que ces garçons avaient six ans. Sept cent onze sujets satisfaisaient aux critères d'inclusion nécessaires pour participer à cette étude. Chaque année, entre 1989 (11 ans) et 1995 (17 ans), les sujets ont été invités à remplir un questionnaire d'auto-évaluation sur la délinquance, questionnaire en 27 points décrivant en détail leur participation à des comportements antisociaux au cours des 12 mois précédents. Les résultats de quatre de ces années ont été retenus pour l'étude, à savoir les résultats de 1989 (11 ans), 1991 (13 ans), 1993 (15 ans) et 1995 (17 ans).

L'analyse des données fournit des statistiques descriptives sur l'échantillon pendant toute la période en utilisant des distributions statistiques ainsi que des tableaux à multiples entrées pour révéler les rapports possibles entre les variables. Quatre analyses de régression multidimensionnelles ont été réalisées, une pour chaque mesure de la délinquance (variables dépendantes), les scores à la participation à un sport constituant les variables indépendantes. Des fonctions multidimensionnelles significatives se sont dégagées de trois des quatre analyses. Compte tenu de la persistance d'un comportement sur toute une vie, on a utilisé les scores de

perturbation attribués par l'enseignant à l'âge de six ans comme prédicteur en sus des scores de participation à un sport et on a trouvé des fonctions multidimensionnelles significatives pour les quatre analyses. Pour déterminer si les transitions dans la participation à un sport avaient un impact sur le taux de délinquance, les sujets ont été subdivisés en deux groupes, c'est-à-dire entre ceux qui ont accru leur participation à un sport d'une année à l'autre et ceux qui ont diminué leur participation. On a utilisé des analyses de covariance pour examiner s'il y avait des différences entre les deux groupes en ce qui concerne les variables de délinquance. Même si peu des résultats se sont révélés significatifs sur le plan statistique, certaines tendances s'en sont dégagées. L'observation la plus notable est que dans pratiquement tous les cas, les scores de délinquance pour le groupe qui a accru sa participation à un sport étaient inférieurs à ceux du groupe qui a diminué sa participation. Ce constat a été constant pendant toute l'étude pour toutes les combinaisons de scores de transition.

ACKNOWLEDGMENTS

A project of this magnitude could not have been realized without the support and contribution of several important individuals. These are some of the people to whom I owe a debt of gratitude.

I would like to thank Dr. L. Pagani for making sure that with her guidance and expertise as co-supervisor I produced a strong piece of research. I would also like to thank Dr. A.E. Wall for taking a leap of faith and accepting me as a graduate student. Thanks to the *Groupe de recherche sur l'inadaptation psychosociale* (GRIP) at the University of Montreal for all their help and technical support in making sense of the data. A very special thank you is extended to Dr. R.E. Tremblay for having the vision to create this study, and for allowing me to use the data. A special thank you is extended to M. Rorive for her assistance in organizing the data so that it was workable.

The Montréal Longitudinal-Experimental Study was funded by the following agencies: National Welfare Grants Program of the Canadian Ministry of Health and Welfare; Conseil Québecois de la Recherche Sociale; Fonds FCAR; Social Sciences and Humanities Research Council of Canada; Pierre Charlebois, Claude Gagnon, Serge Larivée,and Marc LeBlanc participated in the planning and implementation of parts of this study. Lucille David and Hélène Beauchesne coordinated the data collection. Special thanks to those individuals who helped create the data bank: Lyse Desmarais-Gervais and Hélène Boileau.

A large portion of the credit for the success of this project goes to my family without whom I would not have achieved my goal of completing this thesis. I would like to thank my brother and his wife, John and Trudy Rapagna, for supporting me in this endeavor. To my sister, Margherita Rapagna, whose coattails I've been trying to catch for quite some time now,

thanks for all the great suggestions and the editing that truly made the content and the flow of this paper better. A special thanks goes to my mom, Liliana Rapagna, who never let me quit even when I was frustrated and fed-up (we won't even mention the countless free meals). A very special thank you goes to my dad, Socrates Rapagna, for all his time, effort and dedication which enabled me to see this project through to the end. Your expertise in both the process and statistics required made all aspects of this thesis much more understandable.

Finally I would like to thank two very special friends who gave me continual support and encouragement throughout my entire thesis. A million thanks to Jennifer Segal for having the undaunting faith and confidence in my ability to succeed at this and all things else. And, lastly to Michelle Simons for all her encouragement, and for understanding and accepting my crankiness throughout this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1
INTRODUCTION

In the face of a mounting problem with delinquency in adolescence, professionals have sought to find solutions to remedy this disturbing societal trend. Their goal has been to establish programs that clearly exert a positive effect on the reduction of antisocial behaviours. Solutions must, in fact, look towards prevention rather than to the correction of already existing problems. Interventive techniques employing a therapeutic perspective could help reduce or eradicate a potential antisocial developmental behavioural pattern. Experts must work with well-established interventions that have been demonstrated as having a salutary effect on the reduction of delinquent behaviour. As well, efforts should concentrate on establishing new therapeutic approaches that could exercise a preventive influence on the development of maladaptive behaviour.

Statement of the Problem

Delinquency is generally not a problem which springs out of nowhere, but is instead underlain by a host of previous maladaptive behaviours which begin early in the course of individual development (Loeber, 1988; Farrington et al., 1990; Tremblay, Mâsse, Perron, LeBlanc, Schwartzman, & Ledingham, 1992). Developmental trajectories, both prosocial and antisocial, are reflective of conditions, genetic and psychological, that may predispose an individual to particular behavioural patterns of conduct.

Strong theoretical evidence supports the belief that delinquency in adolescence is a result of a pattern of behaviour that appears early in life and increases in seriousness throughout the course of development (Achenbach, 1989; Frick et al., 1993; Lahey & Loeber, 1994). Behavioural patterns are entrenched early during the course of childhood development, and have

been shown to have a strong predictive bias for later adolescent behaviour. Early childhood assessments, therefore, are recognized by researchers as good predictors of social adjustment in later childhood and adolescence (Farrington, 1995; Loeber, 1988; Pulkinnen, 1983; Dobkin, Tremblay, Mâsse, & Vitaro, 1995; Farrington et al., 1990; Haapasalo & Tremblay, 1994; Loeber & Dishon, 1983; Stanton & Magnusson, 1989; Tremblay et al., 1992; Tremblay, Pihl, Vitaro, & Dobkins, 1994).

In order to break a potential negative behavioural pattern, interventions must be introduced early enough in the course of development to bring about potentially positive outcomes. These interventions should be geared towards creating environments that reduce deviant actions while promoting prosocial attitudes. The focus is to find strategies that attack the sources of influence responsible for negative conduct. By promoting prevention rather than treatment of an existing problem, a negative developmental trajectory is more likely to be avoided. This shift in perspective will lead to the creation of strategies which have a protective influence *vis-à-vis* negative behaviour.

Protective factors are those conditions that have a positive impact on development. They are interventive techniques created and implemented with the express purpose of promoting ambient conditions that have an incontestable and definite effect in altering a negative behavioural trajectory. Research must concentrate on discovering therapy-based strategies that yield a protective influence on the development of maladaptive behaviours.

Physical Activity as a Putative Protective Factor

Physical activity can be viewed as one such factor that could have substantive and positive impact and should not be ignored as a possible therapeutic intervention. Research illustrating the importance of regular physical activity on the physiological condition is robust. It has been well documented that physical exercise leads to physiological changes that

promote a general increase in health and well-being (American College of Sports Medicine, 1990; Wilmore & Costill, 1988). Evidence is not as conclusive, however, with respect to a beneficent effect of physical activity on the human psychological condition. Nevertheless, there is a growing body of evidence documenting a salutary impact of an active lifestyle on psychosocial adjustment (Karper, 1981; Ruhl , 1985; Burks & Keeley, 1989; Collingwood & Willett, 1971; Folkin & Sime, 1981).

Exercise is beginning to achieve acceptance among professionals for its therapeutic benefits. Because it provides an ecologically sound environment for the development of prosocial attitudes and because it promotes desirable traits, exercise is gaining popularity as an intervention that can improve the human psychosocial condition (McMahon, 1990; Smoll & Smith, 1978).

Up until now, most investigations have focused on special populations. Although these have yielded valuable information regarding the benefits of physical activity on the psychosocial condition, the results are attenuated by their lack of generalizability to different populations. It is precisely because of the lack of empirical evidence and the need for systematic investigation that this study has been proposed.

Little research has been done to specifically determine the effects of sport participation on antisocial behaviour. Few authors have systematically investigated the possible protective influence that participation in sports might exercise for the retrenchment of delinquent behaviour. The few investigations that have been carried out suggest that sport can indeed be a helpful mechanism in reducing antisocial developmental patterns of conduct (Schafer 1969a, 1969b; Segrave, 1972; Segrave, 1981; Segrave & Chu, 1978; Purdy & Richards, 1983). Therefore, it is the aim of this study to examine this relationship between sport and various manifestation of delinquent behaviour in the particular context of a population of children from

disadvantaged, lower socioeconomic conditions and who are considered at risk for the future development of maladaptive behaviours.

Scope of the Present Study

This study takes place within the context of a larger investigation and utilizes the longitudinal database from The *Montreal Longitudinal-Experimental Study* (MLES) – a research project launched in the Spring of 1984 to study the relationship between early disruptive behaviour and later delinquency in adolescence.

Francophone kindergarten teachers from *Commission des écoles catholiques de Montréal* (CECM) schools located in disadvantaged areas of Montreal were asked to complete a questionnaire detailing well-established psychometric properties to rate the behaviour of each boy in their classes. Rating scores were obtained on a total of 1161 boys from 53 schools. In order to standardize the sample, several criteria were established to control for cultural effects, which resulted in the generation of a homogeneous, white francophone sample of 1037 subjects for the larger investigation. Certain other criteria were expressly established and applied for inclusion of subjects in this particular investigation. Seven-hundred-eleven subjects satisfied these latter criteria and were retained for this follow-up investigation.

In a classic study investigating the relationship between sport participation and delinquent behaviour, Schafer (1969a) found that, while sport participation did not exercise a significant effect on the reduction of delinquency among children from a middle class background, it did produce a salient effect on the reduction of delinquent behaviours among children from disadvantaged lower socioeconomic conditions. Similarly, Segrave and Chu (1978) found that participation in athletics acted as a deterrent to delinquency in high school male athletes from lower socioeconomic backgrounds.

The children in the MLES study were not provided with any organized sport programs in which to participate. It was thought,

nevertheless, that the amount of sport activity that the children spontaneously engaged in might also have a salutary effect on later adolescent behaviour. The aim of this study, therefore, is to address whether spontaneous participation in sports would be associated with the retrenchment of later adolescent delinquent behaviours (operationally defined as theft, fighting, vandalism, and substance abuse) and how this participation might alter a negative behavioural developmental trajectory.

CHAPTER 2
LITERATURE REVIEW

There is a widespread consensus of findings demonstrating that disruptive behaviour in childhood represents a significant predictor of more serious antisocial behaviour in adolescence (Loeber, 1988; Farrington et al., 1990; Tremblay et al., 1992). The physiological and psychological make-up of an individual is constantly going through transition. This is especially true during childhood and adolescence where these developmental changes are most dramatic. Genetic and environmental factors impact heavily on the human psychosocial condition to further compound these changes. Individuals are not only influenced by their genes but are also products of their existential environments. Many conditions in the environment could have an effect on delinquent behaviours – either in solidifying or in reducing or even eliminating a potential antisocial developmental trajectory.

This literature review comprises eight sections: (i) characteristics of maladaptive, deviant, and delinquent behaviours; (ii) disruptive behavioural patterns in childhood; (iii) genetic and psychological factors in psychosocial development; (iv) environmental factors affecting psychosocial development; (v) effects of physical training on behaviour and self-attitude; (vi) relationship between sport participation and antisocial behaviour; (vii) methodological approaches to the study of juvenile delinquency; and (viii) purpose of the study.

Characteristics of Maladaptive, Deviant and Delinquent Behaviours

Any discussion regarding the possible effects of protective factors on the development of later adolescent delinquency must first examine the underlying characteristics of maladaptive, deviant and delinquent behaviours.

Lahey and Loeber (1994) suggest that behaviour changes dramatically throughout the life-span, especially during the childhood and adolescent years adding that psychological characteristics, both prosocial and antisocial, change as well. It follows, then, that psychological disorders of a maladaptive nature would also go through transition during the course of this development. According to these authors the development of antisocial behaviour progresses hierarchically. They suggest that one level of such behaviour emerging earlier in the course of development represents a precursor to more serious antisocial or problematic behaviour. In their three-level developmental model, conduct disorders (CD), both intermediate and advanced, stack up on top of oppositional defiant disorders (ODD). This model suggests that a child who exhibits antisocial behaviours could move developmentally from ODD to more serious intermediate CD, culminating in behaviours of an extreme nature of advanced CD. It is important to realize, however, that not all individuals with ODD will inevitably manifest antisocial behaviours severe enough to be categorized at either an intermediate or advanced level of CD. Classification changes in this hierarchical design are contingent upon exhibiting certain specific characteristics of maladaptive behaviour before being elevated to the next category.

Achenbach and colleagues (Achenbach, Conners, Quay, Verhulst & Howell, 1989) distinguish between two levels of deviant behaviours of ascending seriousness. Similar to the developmental levels model of Lahey and Loeber (1994), this model follows a hierarchical framework where in the course of development, maladaptive behaviours exhibit patterns of increasing levels of severity. The authors define two levels of maladaptive behaviour where delinquency is stacked developmentally on aggression.

Research supporting the notion that deviant behaviours build developmentally and hierarchically upon previous maladaptive behaviour is extensive. A meta-analytic review carried out by Frick et al. (1993) provides

evidence that serious delinquent behaviour occurs as a result of previous less severe maladaptive behaviour. This implies that all individuals who display deviant behaviours that meet the criteria for CD also have earlier manifested behaviours that met the criteria for ODD. Spitzer and Davies (1991) report a developmental and hierarchical relationship between ODD and CD. Frick et al. (1990), in an earlier study provided evidence that, developmentally, maladaptive behaviour moves from lesser to greater severity. Similarly, Achenbach (1987) observed this hierarchical association between the levels of severity for antisocial behaviour.

It is essential at this point to clarify various terms used in defining maladaptive behaviours. These are descriptive terms used to explicate the development of various manifestations of maladaptive behaviours. *Conduct disorders*, as described by the American Psychiatric Association (1987), refer to the psychiatric evaluations and diagnoses of the behaviour of individuals who typically disregard societal norms and rules and are often involved in behaviours that violate human rights. The term *antisocial behaviour* is used to describe acts of a more extreme nature, such as deliberate theft, vandalism, and physical aggression. Antisocial behaviour, however, does not involve exclusively harm to individuals, but also includes victimless behaviour which is also relevant to the development of antisocial behaviour (Loeber, 1990). *Delinquency* is a subset of antisocial behaviour and occurs as a result of violating a criminal law. The terminology used to describe maladaptive behaviours are classified under two broad categories: those that are determined and diagnosed through psychiatric evaluation (i.e., ODD, CD) and those that are defined by established legal norms of society under criminal law (i.e., antisocial behaviour and delinquency). The latter terms represent legal designations used to define maladaptive behaviours

Disruptive Behavioural Patterns in Childhood: Onset of Adolescent Delinquency

Most developmental changes occur during childhood, and behaviours exhibited during these formative years greatly influence subsequent behaviours. Juvenile behaviour is strongly reflective of previous behaviours manifested in childhood. Loeber and Stouthamer-Loeber (1987) provided evidence for this developmental relationship between early conduct problems and later delinquency. And in a later study, Lahey & Loeber (1994) found disruptive behavioural patterns in childhood to be significant predictors of later antisocial behaviour in adolescence. Further review of the literature in this area corroborates the belief that maladaptive behaviour patterns entrenched at an early age dramatically increase the risk for later antisocial behaviour (Farrington, 1991; Loeber, 1990; Tremblay et al. 1992).

The term *at-risk* implies that individuals have previously been exposed to risk factors, and that such exposure increases the likelihood that subsequent negative behaviour will occur. This exposure is not imputable exclusively to the individual's external environment, but might also be a result of internalized behaviours which compound the risk for later deviant outcomes. Risk factors predisposing negative behaviours appear reflective, therefore, of both the external and internal conditions that influence these outcomes (Werner,1986).

Research linking early-age disruptive behaviour with a risk for later delinquency in adolescence is robust (Loeber, 1988; Magnusson, 1989; McCord, 1983; Pulkinnen, 1983; Farrington et al. , 1990; Loeber & Dishion, 1983; Statin & Huesman, 1984; Tremblay et al., 1992). The comprehensive Cambridge-Somerville study on delinquent development (Farrington, 1995) observed that antisocial child behaviour is a significant predictor of adolescent delinquency. Earlier, Ensminger and his colleagues (1983) had shown aggressive behaviour at the first grade level to be a strong predictor of adolescent delinquency. Still others (Dobkin et al., 1995; Haapasalo &

Tremblay, 1994; Tremblay et al., 1994) have concluded from their studies that kindergarten assessments act as good predictors of social adjustment in later childhood and adolescence. Tremblay et al. (1992) studied delinquency in 14 year olds and obtained evidence suggesting a direct causal link between first grade disruptive behaviour and adolescent delinquency.

Genetic and Psychological Factors in Psychosocial Development

As mentioned before, many factors, both genetic and environmental, play a significant role in development. They ultimately determine the subsequent course of development of each individual. Thus, an individual will manifest either positive or negative behaviours as a consequence of both genetic and environmental influences. Not all individuals who engage in early disruptive acts will necessarily progress to subsequent levels of antisocial behaviour (Loeber, 1990). This is to say that environmental forces may cause behaviour assessed as disruptive in the early stages of a child's life to diminish or to moderate during the course of development. Consequently, there exist two groups relative to the risk for delinquency: those with early disruptive behaviour and subsequent delinquency in later adolescence; and those with early disruptive behaviour with no subsequent risk for delinquent behaviour in later adolescence. It is important to note, however, that an individual who is delinquent in adolescence will, in most cases, also have been disruptive in childhood (Frick et al., 1993).

Evidence suggests that genetic background is greatly responsible for both the physiological and psychological characteristics of an individual, but the significant contribution that the environment has on development must also be considered, especially with regards to a person's psychological make-up. The controversy of whether genetic or environmental conditions affect behavioural characteristics, one more strongly than the other, is not the objective of this discussion. Instead, our interest focuses on the influence that

environmental conditions have on the eventual psychosocial development of an individual, and, more specifically, on the role of exercise as a protective influence on the development of antisocial behaviour.

Environmental Factors Affecting Psychosocial Development

Many environmental factors affect the psychological condition of a person. These factors can promote behaviours either of an antisocial or of a prosocial nature. In order to promote prosocial behaviours, attention has to be focused on providing more positive environmental conditions. This may be achieved in two ways: (i) by altering the existing environment, thereby providing a more positive environment, or (ii) by employing strategies that may have a beneficial effect on the psychosocial development of the individual.

Patterns of behaviour are to a large extent contingent upon the environmental conditions that influence them. Consequently, when the environment is altered in a positive manner, the psychological profile of an individual within that environment should also change contemporaneously. As well, the introduction of preventative interventions may exert a protective influence on the psychological profile of an individual. The introduction of such interventions into an existing environment could result in behavioural changes that are prosocial in nature. With this objective in mind, Reid (1993) suggests that attention should focus on modifying the sources of influence that affect antisocial behaviour. In order to affect positive change during the course of development, interventions must be geared, therefore, towards promoting such factors that will modify antisocial behaviour in a positive direction (Coie & Jacobs, 1993).

The Effects of Physical Training on Behaviour and Self-Attitude

It has generally been established that a regular exercise regimen leads to physiological changes that promote a general increase in overall health and well-being. Improvements in motor ability, strength,

cardiovascular function, aerobic and anaerobic capacity occur as a consequence of regular physical activity (American College of Sports Medicine, 1990; Wilmore & Costill, 1988). Furthermore, the incidence of cardiovascular disease, hypertension, fatigue and anxiety also decrease as a direct result of engaging in physical exercise (Rowland, 1990).

This consensus of opinion is not as strong when examining the impact of exercise on the psychological development of an individual – the evidence being inconclusive as to whether exercise imparts a positive or negative impact on the psychological profile of an individual. Although many authors agree that participation in sport plays a significant and positive role in adolescent development, few studies have provided conclusive evidence for a direct causal relationship between exercise and a reduction in delinquency. In fact, the psychological factors affected by exercise may occur as a result of non-specific factors such as "mastery-goal attainment, distraction, and social support associated with the physical activity" (Dubbert, 1992, p. 616). The importance of exercise, however, as a possible vehicle for change in the psychological condition cannot be ignored. Reppucci (1987) points out that adolescents attach great importance to sport in their social-psychological development. Furthermore, the ecological environment that sport provides during adolescent development is significant: sport participation as an outlet for aggressive energy may affect behaviour positively due to its cathartic effects; "athletes may be exposed to strong social controls from coaches, peers, and community, and are less likely to become delinquent" (Donnelly, 1981, p. 424); and an active lifestyle, consuming time and energy would reduce idle time that might otherwise lead to mischievous or delinquent behaviour (Martens, 1978; Spady, 1970).

Purdy and Richard (1983) investigated some theories elucidating the potential salient outcomes that sport participation might have on delinquency in adolescence. They addressed several issues concerning the significance of sport in creating both environmental and social conditions

complementary to the psychosocial development of youth. They recognized that adolescent athletes are acutely influenced by significant others, that is, parents, friends, teachers, teammates, and coaches, who generally adhere with greater frequency to the more conventional norms of society. By virtue of this association, the adolescent athlete is more likely to adopt prosocial attitudes favouring conformity and adherence to the norms of his or her social context. In turn, these prosocial attitudes impact heavily on adolescents' psychological and social development, and can ultimately act as a deterrent to participation in delinquent behaviours.

Many professionals have utilized exercise with success as a therapeutic intervention for the reduction of anxiety, hyperactivity, disruptive behaviour, and aggression. Special education teachers have utilized physical activity for the manifest function of curtailing aggressive behaviour. Similarly, many clinically oriented professionals prescribe exercise to their patients to ease depression and anxiety (Burks & Keeley,1989). Ruhl (1985) and Karper (1981) investigated the positive impact of exercise as a treatment for psychological problems. There exists, therefore, agreement among professionals that physical exercise can provide therapeutic benefits for the human psychosocial condition.

Proponents advocating the value of exercise on the psychosocial condition argue that habitual physical activity promotes a myriad of desirable effects. Exercise offers an ecologically sound environment for the development of a variety of positive behaviours in both the competitive and cooperative domains (Smoll & Smith, 1978). McMahon (1990) demonstrates that by providing an environment where success is possible, an individual's self concept improves with a consequent possible reduction in behavioural problems as a reflection of the improved self esteem. Although many researchers (McMahon, 1990; Sonstrom, 1984; Collingwood & Willett, 1971; Folkin & Sime, 1981; Smolls & Smith, 1978) agree that self-esteem is in fact enhanced with participation in physical exercise, uncertainty exists as to

whether improved self concept promotes a reduction in maladaptive behaviour (Basile, 1993).

Relationship Between Sport Participation and Antisocial Behaviour

In a classic study, Schafer (1969a) examined the relationship between sport participation and delinquent behaviour. He found that among children from a middle class background, sport did not exercise a significant effect on the reduction of delinquency. He did, however, discover a beneficial effect of sport participation on the reduction of delinquent behaviours among children from disadvantaged lower socioeconomic conditions. Similarly, Segrave and Chu (1978) found that athletics acted as a deterrent to delinquency in high school male athletes from lower socioeconomic backgrounds.

A follow-up study by Schafer (1969b) compared participation of boys in athletics against their juvenile court records and found that only 7% of athletes as compared to 17% of non-athletes had records for delinquent offenses. Similarly, Segrave's (1972) comparative study of athletes versus non-athletes observed that athletes reported significantly fewer delinquent behaviours than non-athletes on self-reports (49% and 79%, respectively). This disparity was further compounded upon examination of more serious crimes, where athletes were considerably less delinquent than non-athletes (31% as compared to 70%, respectively).

Little substantive research has been done since Schafer (1969a, 1969b) and Segrave (1972), however, to specifically determine the effects of sport participation on delinquent behaviour in adolescence. In the light of growing delinquency among adolescents, it is surprising that experimenters may have overlooked an easily implemented and cost effective intervention in the fight against juvenile delinquency. There has been, in fact, a growing body of evidence suggesting that physical activity could have a substantive

and positive impact on the psychosocial development of adolescents, but little research has been done on the more specific area of sport participation.

Some authors do state their belief in the therapeutic efficacy of participation in sport. Donnelly (1981), for instance, suggests that by including positive activities such as sport into an individual's repertoire, it is possible to manage delinquent behaviour, and McIntosh (1971) suggests that sport participation can indeed be utilized for the manifest function of controlling deviance and reducing juvenile delinquency. Segrave (1981) claims that numerous studies on sport and delinquency demonstrate a deterrent effect of participation in interscholastic athletics on transgressions, stating that sport participation is one of the most essential and important components of the education system, and, as such, athletics provides an ecologically sound environment that promotes conformity behaviour and discourages antisocial behaviour. Purdy and Richard (1983) support this argument by asserting that interscholastic sport participation is of pivotal importance, and, therefore, can have a positive impact on adolescent psychosocial development.

These researchers agree as to the importance of an interscholastic athletic program and contend that the benefits derived from participation in sport have far reaching consequences in the development of prosocial attitudes in adolescents. However, no major systematic investigations have been conducted that would support these assertions conclusively and unequivocally. If we wish to advance our knowledge with respect to the possible preventative effect of participation in sport on the retrenchment of adolescent delinquent behaviours, more extensive and more precise empirical evidence will have to be sought that specifically targets the effect sport participation might have on juvenile delinquency. Otherwise, it will always remain impossible to determine with certainty whether participation in sport can serve to prevent, cut back, or even eradicate delinquent behaviour.

There have been some relevant studies that touch tangentially on the topic of participation in some kind of sport activity, especially in relation to emotionally handicapped individuals. Allison, Faith and Franklin (1995) in a meta-analytic review (of 42 group and single-case studies) of antecedent exercise (AE) (i.e., exercise that precedes another regular activity) in the treatment of disruptive behaviour found that "evidence suggests that AE has substantial treatment acceptability among laypersons, persons responsible for implementing behavioral interventions, and most importantly consumers" (p. 280). Duncan, Boyce, Itami, and Puffenbarger (1983) note the salutary influence of running as it relates to increased alertness and enthusiasm towards classroom tasks. Shipman (1984) used function and behavioural rating scales along with measures of sensory motor perception to assess the impact of a running program on the distractibility of emotionally disturbed youth. He observed that, following participation in such a running program, children became less distractible and were better able to maintain attention on tasks, especially immediately following the running.

A study carried out by Allen (1980) investigated the effects of a jogging program on modifying disruptive behaviour on learning disabled children. She noted a reduction in the total number of disruptions as a result of participation in a 6-week jogging program. After contingent exercise (i.e., a prescribed exercise session) was applied, the students were less disruptive , more on task, and showed a decrease in negative classroom behaviour. Her results demonstrate that in the case of special populations jogging appears to have a notable effect in reducing negative classroom behaviour. Exercise, therefore, promotes not only a host of physiological changes but also has substantial effect on behaviour.

Bass (1985) examined whether a running program administered to children with learning deficits could modify classroom behaviours. Although her sample was small, she uncovered some interesting findings concerning the possible efficacy of running as it relates to altering classroom

behaviours. She hypothesized that learning disabled children would exhibit greater attention on classroom tasks as a result of treatment (running days). Consequent improvement in attention span due to treatment was observed in five of six subjects. She further hypothesized that children would exhibit more impulse control on treatment days than on control days (non-running days). A resulting decrease in disruptive behaviour was observed in four of the six subjects due to treatment. She tempered these findings by indicating that several factors had not been controlled for, namely, diet, the existence of physical problems in two subjects, and lack of a control group in the design of the study. Moreover the study was characterized by a small sample size. Nevertheless, notable improvements were observed as a result of the treatment.

Evans, Evans, Schmid, and Pennypacker (1985) examined the effects of physical activity on classroom behaviours of emotionally handicapped adolescents. Similar to Bass' (1985) study, their sample was small, having retained only six subjects for the investigation. All subjects participated in a jogging (15-minute jogging session as treatment condition) and outdoor reading program (reading social studies books to control for the effects of being outdoors). In addition, three of the six participants engaged in a winning (to control for task success) and losing (to control for task failure) football program. Three variables were measured; namely, talking out, teacher rating of their behaviour, and percentage of problems completed per class session. As a result of either treatment (i.e., the 15-minute jogging session or the football program), they observed a reduction in verbal acting out, and increases in both teacher ratings and percentage of problems completed per class session. Their findings are important in that they suggest the possible value of physical activity as a viable therapeutic technique for improving the behaviour of emotionally handicapped adolescents.

Luce, Desquardi, and Hall (1980) performed an experiment on a single subject, assessed as being developmentally delayed, for the purpose of

determining whether contingent exercise (treatment) would tend to diminish non-verbal aggressive behaviours. Baseline measures were recorded as frequency of times a child hit another person throughout the school day. An exercise treatment was administered, and a resultant rapid reduction in hitting responses occurred. Consequent to the removal of treatment later on, hitting responses increased to levels comparable to those observed at baseline. Upon reinstatement of treatment a reduction in hitting responses was again observed. Since hitting responses were reduced immediately following treatment conditions, an argument can be made for the beneficial effects of exercise on physical aggression. While the single subject design used in this study limits the generalizability of these observations, they, nevertheless, indicate with some clarity that contingent exercise results in reduced rates of inappropriate behaviour and has a substantive capability in decreasing non-verbal aggressive behaviours in this population.

Basile (1993) investigated whether any decrease in disruptive behaviour of disturbed children could be due to the exercise itself or to the child's perception that the activity had been mastered, i.e., that mastery of the goal had been attained. His subjects consisted of 40 youth, both male and female, with behavioural disorders (i.e., ADHD [attention deficit hyperactive disorder], ODD, and CD) attending a day treatment facility. Three conditions were compared: (i) an antecedent exercise condition (AE); (ii) a non-vigorous task allowing the opportunity to achieve "mastery"; and (iii) a no-treatment control condition. No significant difference in the amount of reduction in disruptive behaviour was observed between the mastery condition and the control, nor was there a significant difference between the AE and the mastery conditions. There were, however, observable differences between the AE condition and the control, with AE subjects demonstrating significantly less disruptive behaviour than the control. Basile also studied whether mastery of a particular exercise would positively influence self concept. He obtained a measure of self-concept prior to asking the participants to perform the

exercise and then measured their self-concept again afterwards. The results did not demonstrate any influence of exercise on self-concept. In a third pre- and post-test procedure, Basile examined whether there would still be a reduction in disruptive behaviour after covarying on the changes in self-concept, and he found that, in fact, the reduction persisted.

The authors cited above have investigated hypotheses slanted towards determining a possible treatment effect of exercise on the reduction of maladaptive behaviour. Few investigations, however, have focused directly on the reduction of delinquency in adolescence contingent on sport participation. Those few that have, seem to point to significant effects of exercise in reducing delinquent behaviour, thus suggesting a relationship. Although some credence must be given to this suggestion, care must be taken to eliminate the possible confounding effects of other conditions (e.g., mastery goal attainment, attaching oneself to a significant other) that may effect delinquency. As well, studies in this area must focus on enlarging the sources from which data are obtained by reducing their heavy reliance on court documentation as the primary source. Court documents reveal facts only about those individuals convicted of offenses, and many individuals who have engaged in delinquent activities go unnoticed as a result of not being caught and prosecuted for their actions. More effort needs to be focused on finding more precise and specific measures that can play an important role in attempting to properly define the parameters of what constitutes antisocial and delinquent behaviours.

Methodological Approaches to the Study of Juvenile Delinquency

While the empirical evidence is not fully robust, the studies cited above demonstrate, albeit with some reservation, that exercise could hold promise as a preventative intervention in the reduction of disruptive behaviour. Physical activity in conjunction with other established interventions, therefore, could be an effective tool to elicit positive

behavioural changes. The observations derived from the above investigations are attenuated, however, by their lack of generalizability to other various populations, as well as by their small sample sizes. The scarcity of studies suggesting a causal relationship of sport participation with a reduction in adolescent delinquency makes it difficult to state unequivocal conclusions about the possible protective effects of participation in sport. The challenge for future investigations is to replicate these findings in other settings and with different populations. This would allow for more comprehensive statements about participation in sport as a plausible intervention technique to deter deviant behaviour.

Moreover, studies to-date have all employed a cross-sectional design in data analysis, whereby subjects of different ages are studied at only one point in time. The popularity in selecting this approach among researchers, is due to the experimental results being available in a timely fashion and not having to wait in order to assess age-related differences in subjects. These advantages, however, are moderated somewhat by the following limitations of the cross-sectional design: (i) developmental trends are not fully explored; (ii) subjects selected are not necessarily equivalent on the matching variables of interest, or at least subject characteristics are not controlled; (iii) cohorts on which comparative results are based might have considerably different characteristics; and (iv) these cohort differences may obscure the developmental changes, thus confounding age and cohort differences. These methodological limitations make it difficult to formulate clear conclusions from the observed differences between groups. Furthermore, the influence of generational differences in experience becomes confounded with age, thereby affecting the internal validity of the cross-sectional design.

On the other hand, longitudinal designs observe the same subjects repeatedly over a prescribed time period as they age. Essentially each subject acts as a control for itself, thereby eliminating cohort effects. Consequently,

developmental changes are not obscured as a result of generational differences due to age and experience. This design approach does present some problems to researchers, however, in that it is expensive and time-consuming to track people over an extended period of time. These limitations are attenuated in light of the highly valuable insights that can be drawn from good longitudinal studies. The primary advantages of a longitudinal design include the following: (i) an experimenter can observe actual changes that occur in the subjects; (ii) the effects of life events can be examined with the passing of time; (iii) the information is prospective in that a researcher can watch it unfold; and (iv) early behaviour acts as a covariate for later behaviour. Thus, longitudinal research can provide a deeper understanding of the developmental changes that occur as subjects age and gain experience. As well, researchers can arrive at stronger and more realistic conclusions regarding life events as they effect behaviours.

In the studies that have appeared to-date, the longitudinal approach has not been utilized to examine the effects of participation in sport on the reduction of delinquency in adolescence. The present research proposes to investigate the problem in a longitudinal perspective. This methodological approach is ideal because life events and developmental trends can be fully examined in a prospective manner. As well, the developmental changes that occur as a result of these life events will not be obscured due to the generational differences that plague existing cross-sectional designs.

In order to investigate the development of, and natural changes in, antisocial and delinquent behaviour, it is necessary to rely on data obtained longitudinally for a large enough sample. Thus the data will be more effective in providing a deeper understanding of the mechanisms involved in changing such behaviour, and consequently provide important direction in planning interventive techniques specifically designed for prevention and treatment of antisocial behaviour. This thesis will utilize data collected for the *Montreal Longitudinal-Experimental Study* project which was launched

in the spring of 1984 using a large number of boys from disadvantaged areas attending French-speaking schools in Montreal. Its purpose was precisely to examine possible links between early disruptive behaviour and delinquency in adolescence. The focus of this particular study will be to investigate the relationship that might exist between participation in sport as it relates to the reduction of adolescent delinquent behaviour.

Purpose of the study

The literature provides some evidence of a beneficent effect of physical activity on disruptive and delinquent behaviour. However, few systematic investigations on sport participation as a preventative intervention for the reduction of delinquency in adolescence can be found. Furthermore, those that do exist suffer from methodological issues that impact on the generalizability of the findings, such as small sample size, ambiguity in terminology used to define disruptive behaviour and delinquency, and the lack of "objective" measures used to assess this behaviour.

The aim of the present study is to address the degree to which spontaneous participation in sport is associated with the retrenchment of later adolescent delinquent behaviours (operationally defined as theft, fighting, vandalism, and substance abuse). The particular objectives are: (i) to observe how this participation might alter a negative behavioural developmental trajectory, and (ii) to study the possible effects of transitions in levels of sport participation on current and later risk for delinquency.

CHAPTER 3
METHODOLOGY

This study will examine the developmental trajectories of adolescent delinquent behaviour, and whether participation in sports is associated with the reduction of delinquent behaviour in adolescence. Its aim is to address whether sports, more specifically sports in which subjects spontaneously participate (i.e., not necessarily organized specifically as a treatment; sport done in the course of their daily routines), could be related to the retrenchment of later adolescent delinquent behaviours (operationally defined as theft, fighting, vandalism, and substance abuse). The particular objectives of the investigation are: (i) to observe how this participation might alter a negative behavioural developmental trajectory; and (ii) to study the possible effects of transitions in levels of sport participation on current and later risk for delinquency.

Subjects

The *Montreal Longitudinal-Experimental Study* is a research project that was launched in the spring of 1984 in order to investigate the possible links between early disruptive behaviour and the later onset of delinquency in adolescence. Kindergarten teachers from Francophone Schools of the *Commission des écoles catholiques de Montréal* (CECM) schools located in areas of low socioeconomic status (SES) were asked to rate the behaviour of each boy in their classroom. They were given a 38-item checklist questionnaire prepared by the researchers detailing well established psychometric properties to complete for each child; namely, the Social Behaviour Questionnaire (SBQ) (Tremblay, Loeber, Gagnon, Charlebois, Larivée, & LeBlanc, 1991). Rating scores were obtained from 87% of the Kindergarten teachers , for a total of 1161 boys from 53 schools. Subjects were

assessed initially at kindergarten (6 years of age) and have been followed up on an annual basis from ages 10 through 17.

To standardize the sample, several criteria were applied. The boys had to be white, both parents had to be born in Canada, with their mother tongue being French. As well, data on maternal education (at the time of the age 6 assessment of the child) and maternal age at birth of first child had to be available. After eliminating those subjects who fell outside the parameters established by these criteria, a total of 1037 subjects were retained for the longitudinal follow-up. These criteria helped to control for cultural effects, thus generating a homogeneous, white francophone sample, from disadvantaged areas of the city.

Four further criteria were expressly established for subjects to be included in this particular investigation: (i); cases would be dropped when delinquency data were missing at age 11; (ii) scores for a particular year would be replaced with the previous year's delinquency data if missing (i.e., when missing at age 13, the score would be replaced with age 12 data; scores missing at age 15 would be replaced with age 14; scores missing at age 17 would be replaced with age 16); (iii) when delinquency data were replaced with previous years' data, then sport participation data were also changed to match delinquency data (e.g., when delinquency data for age 13 were replaced with age 12 data, then sport participation was also replaced with age 12 scores); (iv) cases would be dropped when delinquency data were missing for two consecutive years in a row (e.g., if data were missing at both ages 12 and 13, the case would be dropped). Seven-hundred-eleven subjects satisfied the requirements established by the above criteria and were thus retained for this investigation.

Instruments

Two instruments were used in the MLES study which provide this study the raw data necessary for the analysis; namely, the *Social Behaviour Questionnaire* (SBQ), and the *Self-Reported Delinquency Scale* (SRD). In addition, the subjects were asked to answer a question on the level of participation in sports with possible responses from 1 (never) through 2 (once or twice a week), and 3 (several times a week) to 4 (very often). Although the subjects were asked to respond with respect to the previous 12-month period, the particular year in which they responded will be used to identify the various sets of data.

Social Behaviour Questionnaire (SBQ)

This instrument is important for the study only insofar as it provides a subscale on disruptiveness used in the study. The subscale consisted of a series of 13 questions. The teachers rated the children from low (0) to high (2) on each item depending on how often the subject performed the action or activity stated in the item. Those who scored above the 70th percentile were considered as more aggressive and, as such, more subject to being at risk for maladaptive and subsequent delinquent behaviour. The research group responsible for creating the SBQ decided on the 70th percentile as being an appropriate cutoff to expose those individuals who were more at risk for later deviant behaviour. Therefore, the resulting cutoff score on the *Disruptiveness Subscale* of the SBQ was 9; those at 9 or above were considered "at risk".

Self-Reported Delinquency (SRD)

Each year, from ages 11 to 17, the boys completed the *Self-Reported Delinquency* questionnaire, a 27-item questionnaire about their involvement in antisocial behaviour over the previous 12-month period (Tremblay et al., 1994). The scale comprises four subscales: Substance Abuse (three items,

alpha = .77); Theft (11 items, alpha = .86); Vandalism (seven items, alpha = .77); and Fighting (six items, alpha = .80). The aforementioned alpha values for the four subscales of the SRD (Substance Abuse ,Theft, Vandalism, and Fighting) represent average internal consistency coefficients for ages 11 through 15. Possible responses for each question were again measured on an ordinal scale: (1) never, (2) once or twice a week, (3) often during each week, and (4) very often each week. Total scores for the whole scale could, therefore, range from a minimum of 27 (for those who never engaged in maladaptive or delinquent acts) to a maximum of 108 (for those who often committed such acts): Substance Abuse, 3 to 12; Theft, 11 to 44; Vandalism, 7 to 28; and Fighting, 6 to 24.

Hypotheses

A principal objective of this study was to assess whether there is a relationship between sport participation and degree of delinquency. In addition the joint of the sport participation variables and teacher-rated disruptiveness was assessed as to its impact on delinquent behaviour. For completeness a regression analysis was conducted using disruptiveness scores alone to study its separate relationship with later delinquent behaviour. The hypothesis being put forward was that there is such a relationship. The second hypothesis addresses the question of whether level of participation in sports affects the degree of delinquent behaviour. Since the disruptiveness scale purports to measures a lasting and pervasive trait of the character of individuals, the scores on disruptiveness were used as a covariate in assessing the effect of sport participation on the delinquency variables. In this way the impact of sport participation was assessed after accounting for the influence of early disruptive behaviour on delinquency. The hypothesis was that higher levels of sport participation should match lower degrees of delinquency. This latter hypothesis was studied by exploring the effect of transitions in levels of

sport participation (i.e., of increases or decreases in participation in sports from year to year).

Data Analysis

The analysis of the data began with painting a broad picture of the sample across the whole period of the study (1989 to 1995; ages 11 to 17; in two-year intervals). Thus, frequency distributions were produced for each variable, as well as cross-tabulations of variables with other variables relevant to an understanding of key relationships (e.g., substance abuse in 1989 at age 11 with level of sport activity in the same year) and cross-tabulations of certain variables in one year with the same variable in other years (e.g., substance abuse in 1989 at age 11 with substance abuse in subsequent years).

The relationship between sport participation and delinquency was studied through the use of a regression analysis. The four scores of each of the delinquency variables (e.g., substance abuse at ages 11, 13, 15 17) were regressed on the four sport participation scores (the four scores, from 1989 to 1995, being considered as forming a pattern of sport behaviour). The analysis was completed by running four multivariate multiple regression analyses. The regression analyses were then repeated with the addition of the early age disruptiveness (initially assessed in Kindergarten at age 6) as an additional predictor, and finally with early age disruptiveness as the sole predictor. The effect of levels of sport participation were dealt with through ANCOVA. Individuals were grouped on the basis of whether they increased or decreased in the amount of sports activity from one year to another and the differences between the two groups on the various delinquency measures were assessed after accounting for the influence of Kindergarten teacher-rated disruptiveness.

CHAPTER 4
RESULTS

The results of the analyses are presented in the following order: (i) an overall profile of the sample with respect to the variables in the study; (ii) an examination of whether a relationship exists between sport participation and the various delinquency variables; and (iii) an identification of the differences existing between the various groups with regards to the level of sport participation on the key delinquency variables.

Profile of the Sample

Sport Participation and Disruptiveness Scale

Subjects were rated from low (0) to high (2) on each of 13 items of the *Disruptiveness* scale of the Social Behavioural Questionnaire (SBQ), so that total scores could range from 0 to 26 (see Appendix A for a detailed table of the distribution of the scores). Those subjects who fell at or above the 70^{th} percentile, that is an absolute cut-off score of 9, were considered at higher risk for the later onset of delinquency in adolescence. When the criteria specific to this study were applied, 711 subjects remained, that is, 511 subjects fell below the cut-off scores of <9, range 0 to 8, with a mean and standard deviation of 2.695 and 2.655; and 200 individuals were at or above the 70^{th} percentile with scores of ≥ 9, range 9 to 26 with a mean and standard deviation of 13.820 and 4.535.

Subjects were also asked a question with respect to the amount of time they spent participating in sport activity during a week. Scores ranged from 1 to 4 (1 = never, 2 = one or two hours per week, 3 = several hours per week, and 4 = many hours per week). The frequencies for each level of participation in sports for the entire sample for each of the four years under study (1989; 1991; 1993; and 1995; ages 11, 13, 15, 17) are found in part (b) of Table 1. Since later analyses compared individuals in the first two levels (never or one/two

Table 1

Frequency and Percentage of Distributions of Sport Participation for the Ages Examined in the Survey in Relation to Levels of Disruptiveness **

Disruptiveness *	Sport Participation Level	Age 11	Age 13	Age 15	Age 17
(a)					
Below 70th %ile	Never	38 (7.4)	22 (4.3)	29 (5.7)	42 (8.2)
LT 9	1 or 2 Hrs /Wk	177 (34.6)	123 (24.1)	81 (15.9)	90 (17.6)
n=511	Several Hrs/Wk	122 (23.9)	180 (35.2)	158 (30.9)	171 (33.5)
	Many Hrs/Wk	174 (34.1)	186 (36.4)	243 (47.6)	208 (40.7)
Above 70th %ile	Never	22 (11.0)	17 (8.5)	24 (12.0)	25 (12.5)
GE 9	1 or 2 Hrs /Wk	68 (34.0)	55 (27.5)	35 (17.5)	43 (21.5)
n=200	Several Hrs/Wk	39 (19.5)	60 (30.0)	57 (28.5)	70 (35.0)
	Many Hrs/Wk	71 (35.5)	68 (34.0)	84 (42.0)	62 (31.0)
(b)					
	Never	60 (8.4)	39 (5.5)	53 (7.5)	67 (9.4)
n=711	1 or 2 Hrs /Wk	245 (34.5)	178 (25.0)	116 (16.3)	133 (18.7)
	Several Hrs/Wk	161 (22.6)	240 (33.8)	215 (30.2)	241 (33.9)
	Many Hrs/Wk	245 (34.5)	254 (35.7)	327 (46.0)	270 (38.0)

* LT 9: Scores less than 9; GE 9: Scores greater or equal to 9

** Numbers within parentheses are percentages for the frequencies in the delinquency variables by level of sport participation

Table 1 (cont.)
Frequency and Percentage of Distributions of Sport Participation for the Ages Examined in the Survey in Relation to Levels of Disruptiveness **

Disruptiveness *	Level	Sport Participation Age 11	Age 13	Age 15	Age 17
(c)					
LT 9	Never and 1 or 2 Hrs /Wk	215 (42.0)	145 (28.4)	110 (21.6)	132 (25.8)
n=511	Several and Many Hrs/Wk	296 (58.0)	366 (71.6)	401 (78.5)	379 (74.2
GE 9	Never and 1 or 2 Hrs /Wk	90 (45.0)	72 (36.0)	59 (29.5)	68 (34.0)
n=200	Several and Many Hrs/Wk	110 (55.0)	128 (64.0)	141 (70.0)	132 66.0)
(d)					
n=711	Never and 1 or 2 Hrs /Wk	305 (42.9)	217 (30.5)	169 (23.8)	200 (28.1)
	Several and Many Hrs/Wk	466 (57.1)	494 (69.5)	542 (76.2)	511 (71.9)

* LT 9: Scores less than 9; GE 9: Scores greater or equal to 9
** Numbers within parentheses are percentages for the frequencies in the delinquency variables by level of sport participation

hours per week) with those in the last two levels (several or many hours per week), the combined figures required for those analyses are presented in part (d) of the table. Parts (a) and (c) present a crossing of these frequencies with the *Disruptiveness* scale divided into two categories; namely, those considered at higher risk for the later onset of delinquency in adolescence (a score greater or equal to 9) and those at less risk (a score less than 9).

Table 1 allows one to examine the relative number of individuals at each level of sport participation, to detect whether there have been any shifts from one level to another over the years, and how the relative frequency might have been affected by the *disruptiveness* variable. From a descriptive stand-point, it is clear that more subjects belonged to the last two categories of "several hours" and "many hours" per week of participation in sports than to the first two categories of "never" and "one or two hours" per week, and that this tendency was more pronounced in later years. For example, 305 individuals belonged to the first two categories and 466 to the last two categories of sport participation at age 11 (see Table 1-d). But as can be seen, these figures become 200 and 511 respectively at age 17. Part (b) of Table 1 shows that only very small numbers "never" participated in sports – from a low of 5.48% to a high of 9.42%. In general, as the subjects grew older there was more participation in sport. The subjects in the "never" category moved up marginally, but there was a marked decrease in the number of subjects in the "one or two hours" category with a consequent marked increase in the "several hours" category and a smaller increase in the number of subjects in the "many hours" category. The data, coming as they do from the same individuals, could not be subjected to an inferential procedure such as Chi-square. Thus, they are presented as background information for later discussion of the delinquency variables.

Sport Participation and Delinquency Variables

Detailed frequency distributions of the actual scores obtained for each year under investigation for the delinquency variables are reported in Appendix B. Specifically, age 11 (1989), age 13 (1991), age 15 (1993) and age 17 (1995). While actual scores were used in subsequent analyses of variance and regression, it is useful, as a first step, to view Tables 3 to 6 and Appendices C to F which report frequency data with respect to these variables over time in a more concise format.

In order to examine more closely the relationship of the delinquency variables with sport participation, the delinquency variables were divided into low (1), moderate (2), and high (3) scores in accordance with the following criteria: for substance abuse, low for actual scores of 3, moderate for scores of 4 to 6, and high for scores above 6. Recall that all the delinquency variables were scored on a scale of 1 to 4. Anyone with a total score of 3 on the three items of the *Substance Abuse* subscale had to have responded with a 1 on each item. Since 1 meant "never", then a total score of 3 connotes "never". For a subject to obtain a total score of 4, 5, or 6, the scores on some of the items had to be greater than 1. In the case of a total score of 4, only one item could be a two; in the case of a 5, two items could have been scores of 2 or one item a 3 ; and in the case of a total score of 6, only one item could be a 3 or a 4 or all could have be 2s. The same reasoning holds for the other variables. Thus, *Theft* scores of 11 are considered low; scores of 12 to 22, moderate; and above 22, high. *Vandalism* scores of 6 are considered low; scores of 7 to 12, moderate; and above 12, high. *Fighting* scores of 7 are considered low; scores of 8 to 14, moderate, and above 14, high (Cf. Table 2).

Table 2
Range of Actual Scores for the Delinquency Variables

Delinquency Variables	Lo *	Mod **	Hi ***
Substance Abuse	3	4-6	Above 6
Theft	11	12-22	Above 22
Vandalism	6	7-12	Above 12
Fighting	7	8-14	Above 14

* **Lo** denotes scores of zero with respect to a particular delinquency variable
** **Mod** denotes the range of moderate scores with respect to a particular delinquency variable
*** **Hi** denotes the range of high scores with respect to a particular delinquency variable

While in the moderate category some items could have had high scores, this could only be true of very few items. Consequently, the benefit of the doubt was given to the individual and he was considered to be in the moderate category – at least on the whole. To better be able to profit from the richness of the data, the data was presented under two format; namely, tables which present the data on the four delinquency variables for a single year of the study (Appendices C to F), and, which present the same data but for a single delinquency variable at a time over the four years of the study (Tables 3 to 6). The presentation of the two sets of tables will provide a better understanding of the change in the level of sport participation from year to year (Tables 3 to 6) as well as the relative number of individuals within the three levels for the four delinquency variables in any one year (Appendices C to F).

Table 3
Frequency and Percentage of Distributions of the Substance Abuse Scores at each Age in Relation to the Level of Sport Participation with Increasing Age **

Sport ***	Substance Abuse with Increasing Age				
	Level *	Age 11	Age 13	Age 15	Age 17
(a)					
	Zero	225 (73.8)	108 (49.8)	45 (26.6)	29 (14.5)
1	Lo/Mod	74 (24.3)	98 (45.2)	77 (45.6)	75 (37.5)
never/ 1 or 2 hrs	Hi	6 (2.0)	11 (5.1)	47 (27.8)	96 (48.0)
	Zero	279 (68.7)	231 (46.8)	120 (22.1)	53 (10.4)
2	Lo/Mod	117 (28.8)	245 (49.6)	264 (48.7)	175 (34.2)
several/ many hours	Hi	10 (2.5)	18 (3.6)	158 (29.2)	283 (55.4)
(b)					
1	n=711	305 (42.9)	217 (30.5)	169 (23.8)	200 (28.1)
2		466 (57.1)	494 (69.5)	542 (76.2)	511 (71.9)
(c)					
	Zero	504 (70.9)	339 (47.7)	165 (23.2)	82 (11.5)
n=711	Lo/Mod	191 (26.9)	343 (48.2)	341 (48.0)	250 (35.2)
	Hi	16 (2.3)	29 (4.1)	205 (28.8)	379 (53.3)

* Level for the substance abuse variable vs. ranges of the actual scores: Zero=3; Lo/Mod=4-6; Hi=Above 6

** Numbers within parentheses are percentages for the frequencies in the substance abuse columns by each level of sport

*** The numbers within this category will vary with the age in which the delinquency variable is being considered

Table 4
Frequency and Percentage of Distributions of the Theft Scores at each Age in Relation to the Level of Sport Participation with Increasing Age **

Sport ***	Theft with Increasing Age				
	Level *	Age 11	Age 13	Age 15	Age 17
(a)					
	Zero	170 (55.7)	123 (56.7)	76 (45.0)	109 (54.5)
1	Lo/Mod	133 (43.6)	91 (41.9)	85 (50.3)	84 (42.0)
never/ 1 or 2 hrs	Hi	2 (0.7)	3 (1.4)	8 (4.7)	7 (3.5)
	Zero	225 (55.4)	254 (51.4)	217 (40.0)	238 (46.6)
2	Lo/Mod	174 (42.9)	234 (47.4)	301 (55.5)	254 (49.7)
several/ many hours	Hi	7 (1.7)	6 (1.2)	24 (4.4)	19 (3.7)
(b)					
1	n=711	305 (42.9)	217 (30.5)	169 (23.8)	200 (28.1)
2		466 (57.1)	494 (69.5)	542 (76.2)	511 (71.9)
(c)					
	Zero	395 (55.6)	377 (53.0)	293 (41.2)	347 (48.8)
n=711	Lo/Mod	307 (43.2)	325 45.7	386 (54.3)	338 (47.5)
	Hi	9 (1.3)	9 (1.3)	32 (4.5)	26 (3.7)

* Level for the theft variable vs. ranges of the actual scores:
Zero=11; Lo/Mod=12-22; Hi=Above 22

** Numbers within parentheses are percentages for the frequencies in the theft columns by each level of sport

*** The numbers within this category will vary with the age in which the delinquency variable is being considered

Table 5
Frequency and Percentage of Distributions of the Vandalism Scores at each Age in Relation to the Level of Sport Participation with Increasing Age **

Sport ***	Level *	Vandalism with Increasing Age: Age 11	Age 13	Age 15	Age 17
(a)					
	Zero	209 (68.5)	153 (70.5)	107 (63.3)	140 (70.0)
1	Lo/Mod	94 (30.8)	62 (28.6)	59 (34.9)	54 (27.0)
never/ 1 or 2 hours	Hi	2 (0.7)	2 (0.9)	3 (1.8)	6 (3.0)
	Zero	278 (68.5)	343 (69.4)	339 (62.5)	379 (74.2)
2	Lo/Mod	126 (31.0)	148 (30.0)	196 (36.2)	130 (25.4)
several/ many hours	Hi	2 (0.5)	3 (0.6)	7 (1.3)	2 (0.4)
(b)					
1		305 (42.9)	217 (30.5)	169 (23.8)	200 (28.1)
----------	n=711	----------	----------	----------	----------
2		466 (57.1)	494 (69.5)	542 (76.2)	511 (71.9)
(c)					
	Zero	487 (68.5)	496 (69.8)	446 (62.7)	519 (73.0)
n=711	Lo/Mod	220 30.9	210 (29.5)	255 (35.9)	184 (25.9)
	Hi	4 (0.6)	5 (0.7)	10 (1.4)	8 (1.1)

* Level for the vandalism variable vs. ranges of the actual scores: Zero=6; Lo/Mod=7-12; Hi=Above 12

** Numbers within parentheses are percentages for the frequencies in the vandalism columns by each level of sports

*** The numbers within this category will vary with the age in which the delinquency variable is being considered

Table 6

Frequency and Percentage of Distributions of the Fighting Scores at each Age in Relation to the Level of Sport Participation with Increasing Age **

Sport ***	Fighting with Increasing Age				
	Level *	Age 11	Age 13	Age 15	Age 17
(a)					
	Zero	113 (37.0)	97 (44.7)	73 (43.2)	123 (61.5)
1	Lo/Mod	182 (59.7)	113 (52.1)	87 (51.5)	72 (36.0)
never/ 1 or 2 hrs	Hi	10 (3.3)	7 (3.2)	9 (5.3)	5 (2.5)
	Zero	131 (32.3)	196 (39.7)	215 (39.7)	279 (54.6)
2	Lo/Mod	263 (64.8)	281 (56.9)	301 (55.5)	225 (44.0)
several/ many hours	Hi	12 (3.0)	17 (3.4)	26 (4.8)	7 (1.4)
(b)					
1	n=711	305 (42.9)	217 (30.5)	169 (23.8)	200 (28.1)
2		466 (57.1)	494 (69.5)	542 (76.2)	511 (71.9)
(c)					
	Zero	244 (34.3)	293 (41.2)	288 (40.5)	402 (56.5)
n=711	Lo/Mod	445 (62.6)	394 (55.4)	388 (54.6)	297 (41.8)
	Hi	22 (3.1)	24 (3.4)	35 (4.9)	12 (1.7)

* Level for the fighting variable vs. ranges of the actual scores: Zero=7; Lo/Mod=8-14; Hi=Above 14

** Numbers within parentheses are percentages for the frequencies in the vandalism columns by each level of sports

*** The numbers within this category will vary with the age in which the delinquency variable is being considered

An examination of Table 3 supports the claim that there was considerable movement of subjects within and between the categories for *Substance Abuse* over the four years of the study. Over the years, few subjects remained completely free of any type of substance use. We find a clear pattern demonstrating definite and continuous increases in drug use over the four years, in fact, as Table 3-c shows 422 more individuals were found in the substance abuse category in the last period than in the initial year of the study (the "never" category went down to 82 at age 17 from an original number of 504 at age 11. Table 4 presents the frequency distribution of scores for *Theft* for each category over the four years of the survey. It can safely be inferred that there was minimal movement of subjects within and between categories for the *Theft* variable. For example, as Table 4-c shows, the "never" category decreased by only 48 individuals by the last period of the survey. While we cannot be sure how many subjects moved from one category to another to make up the relative number within any given level in any given year, it remains true that the overall numbers within the levels remained rather constant for theft. Similarly, as Table 5-c shows, there is little movement of individuals across categories over the years for the *Vandalism* variable. *Fighting* on the other hand, seems to have diminished as the years passed. As Table 6-c shows the number of subjects in the "never" category increasing by 158 individuals by the last year.

In summary, it can be stated that fewer individuals were involved in fighting over the four years, while participation in substance abuse activities increased rather dramatically, and the relative numbers of individuals involved in theft and vandalism remained rather constant. While we cannot be sure how many individuals moved from one category to another to make up the relative number of subjects within any given level in any given year, the general observations made above, are appropriate for the whole sample. Appendices C to F group together the four delinquency variables for any

given year against the four levels of sport participation in the same given year.

Correlation of Sport Participation and the Delinquency Variables

The question that this section attempts to answer is whether any relationship exists between sport participation and the various delinquency variables. Regression analysis was used to examine this relationship. As an initial step, it was important to create a proper correlation matrix that took the differences in kinds of scale of the different variables into consideration.

The Correlation Matrix

The delinquency variables could be considered to be on an interval scale, and, as such, product-moment correlation is appropriate. When correlating ordinal variables that have an underlying continuum – such as the sport variables used in the study – it is more appropriate to use polychoric correlation. If the variables are all ordinal or mixed (i.e., ordinal by interval) – and sport variables (ordinal) and the delinquency variables (interval) are just such a mixed combination – using ordinary product-moment correlation is not appropriate. Therefore, polyserial correlation was used. The PRELIS procedure, which is a preprocessor for LISREL, was used to produce the matrix of correlations which takes all of these exigencies into consideration.

Some General Comments about the Observed Correlations

A cursory examination of Table 7 reveals that the correlations between participation in sport (Sport 89; age 11 to Sport 95; age 17) and the delinquency variables (SubAb 89; age 11 to Fight 95; age 17) are extremely low – most being substantially zero.

Table 7

Correlation Matrix of Delinquency and Sport Participation Variables

	SubAb Age 11	Theft Age 11	Vand Age 11	Fight Age 11	SubAb Age 13	Theft Age 13	Vand Age 13	Fight Age 13	SubAb Age 15	Theft Age 15	Vand Age 15	Fight Age 15	SubAb Age 17	Theft Age 17	Vand Age 17	Fight Age 17	Sport Age 11	Sport Age 13	Sport Age 15	Sport Age 17
SubAb - 11	1.000																			
Theft - 11	0.537	1.000																		
Vand - 11	0.466	0.627	1.000																	
Fight - 11	0.477	0.635	0.559	1.000																
SubAb - 13	0.245	0.270	0.125	0.224	1.000															
Theft - 13	0.241	0.400	0.223	0.283	0.470	1.000														
Vand - 13	0.249	0.392	0.294	0.337	0.325	0.634	1.000													
Fight - 13	0.279	0.396	0.277	0.420	0.485	0.598	0.562	1.000												
SubAb - 15	0.178	0.199	0.119	0.239	0.446	0.299	0.247	0.347	1.000											
Theft - 15	0.180	0.309	0.218	0.293	0.344	0.455	0.329	0.491	0.539	1.000										
Vand - 15	0.156	0.271	0.218	0.284	0.293	0.328	0.293	0.411	0.446	0.727	1.000									
Fight - 15	0.190	0.319	0.223	0.374	0.310	0.370	0.360	0.549	0.492	0.679	0.544	1.000								
SubAb - 17	0.071	0.094	0.039	0.166	0.318	0.252	0.199	0.209	0.608	0.407	0.301	0.348	1.000							
Theft - 17	0.161	0.239	0.205	0.284	0.317	0.389	0.290	0.381	0.392	0.623	0.474	0.482	0.395	1.000						
Vand - 17	0.104	0.138	0.189	0.162	0.229	0.161	0.194	0.216	0.192	0.329	0.349	0.315	0.186	0.560	1.000					
Fight - 17	0.178	0.255	0.191	0.299	0.202	0.253	0.237	0.367	0.267	0.428	0.323	0.529	0.326	0.639	0.506	1.000				
Sport - 11	0.067	0.029	-0.025	0.026	0.067	0.058	0.065	0.068	0.097	0.102	0.059	0.143	0.115	0.044	-0.017	0.085	1.000			
Sport - 13	-0.046	0.000	-0.062	-0.025	-0.021	0.028	0.022	0.051	0.080	0.045	-0.012	0.047	0.143	0.051	0.025	0.112	0.450	1.000		
Sport - 15	-0.001	-0.049	-0.074	-0.039	-0.078	-0.006	-0.051	-0.074	-0.033	-0.055	-0.079	-0.034	0.030	-0.028	-0.063	-0.002	0.367	0.529	1.000	
Sport - 17	-0.077	-0.066	-0.122	-0.039	-0.025	-0.013	-0.057	-0.023	-0.073	-0.042	-0.031	-0.035	0.012	-0.019	-0.108	-0.022	0.370	0.391	0.546	1.000

If one examines the correlations within any one year (the correlations within the "triangles"), the correlations of the variables appear to be only of moderate degree, with vandalism and theft showing the strongest relationship. For example, the correlations among the delinquency variables average 0.55 for age 11, 0.51 for age 13, 0.57 for age 15, and 0.44 for age 17; the correlations for the sport variables averaged 0.44. The correlations of the same delinquency variables with those of the contiguous year are stronger than those farther apart. The correlations (the shaded entries) between the various years for substance abuse, for example, became weaker and weaker (going from 0.245, to 0.178, and finally to 0.071), as the distance between age 11 and the subsequent years became greater; the same substantially is true of the other variables.

Regression Analysis

The correlation matrix was described because it served as the basis for the regression analysis which was performed, and because it provides the background for assessing the importance of the results. The data were subjected to four multivariate multiple regression analyses: the four scores of each of the delinquency variables (e.g., substance abuse from age 11 to age 17) were regressed on all four sport participation scores (the four scores being considered as forming a pattern of sport behaviour). Table 8 (a) below reports the results of these analyses. In three of these analyses, significant multivariate Fs for the relationship were found: namely, for *substance abuse* ($F = 2.96$; df. = 16, 2148 $p < .001$); for *vandalism* ($F = 1.907$; df. = 16, 2148; $p = .016$); for *fighting* ($F = 2.107$; df. = 16, 2148; $p = .006$); only *theft* proved not to be significant ($F = 1.104$; df. = 16, 2148; $p = .345$).

The analysis was repeated with the inclusion of early age disruptive behaviour as an additional predictor, since it was considered a measure of a lifelong persistent behavioural trait that could influence sport participation behaviour. The results are reported in Table 8 (b). As was expected, the

Table 8

Results of Multivariate Multiple Regression for Each of the Delinquency Variables

Variable	Multivariate F	Degrees of Freedom	*p*
(a) Predictors: Sport Participation Variables Only			
Substance Abuse	2.962	16, 2148	<0.001 *
Theft	1.104	16, 2148	0.345
Vandalism	1.907	16, 2148	0.016 *
Fighting	2.107	16, 2148	0.006 *
(b) Predictors: Sport Participation Variables with the Addition of the Disruptiveness Variable			
Substance Abuse	3.423	20,2329	<0.001 *
Theft	1.883	20,2329	0.011 *
Vandalism	3.365	20,2329	<0.001 *
Fighting	2.968	20,2329	<0.001 *
(c) Predictor: The Disruptiveness Variable Alone			
Substance Abuse	5.699	4,706	<0.001 *
Theft	5.419	4,706	<0.001 *
Vandalism	10.088	4,706	<0.001 *
Fighting	6.852	4,706	<0.001 *

* Significance at p <0.05

prediction was enhanced as evidenced by the smaller probability levels – three of which were less than 0.001, and the fourth (*theft*) reached 0.011.

Given the importance of early age disruptive behaviour as a strong predictor of later delinquency (Farrington, 1995; Loeber, 1988; Pulkinnen, 1983; Dobkin, Tremblay, Mâsse, & Vitaro, 1995; Farrington et al., 1990; Haapasalo & Tremblay, 1994; Loeber & Dishon, 1983; Stanton & Magnusson, 1989; Tremblay et al., 1992; Tremblay, Pihl, Vitaro, & Dobkins, 1994), a further regression analysis was conducted using only disruptiveness as a predictor variable. The results are found in Table 8 (c). As is evident from the probability levels, disruptiveness measured at the early age of 6, was a powerful predictor of later delinquent behaviour. In fact all the significance levels were less than 0.001.

While these additional analyses were conducted for clarification and completeness, it is important to note that the separate impact of sport participation is found in the first analysis where these variables were the only predictors. It bears repeating that all but one of the relationships between the delinquency variables and sport participation reached significance.

Analyses of Covariance

The objective of the analyses of covariance was to assess whether a higher degree of participation in sport was conducive to less delinquent behaviour. To elucidate the solution to the question, two different sets of tables are provided: Table 9 which provides cross-tabulations of levels of sport participation of one year with those of another year, and Tables 10 to 15 which present the results of the analyses of covariance.

Cross-tabulations of Levels of Sport Participation Across Years

Table 9 makes clear the movement of individuals from one category of sport to another. It will be sufficient to report on a representative set of the tables to show how and to what extent the subjects moved among the levels

Table 9

Cross-tabulations of Levels of Sport Participation Across Ages of Subjects

Sport	Sport – Age 13				
Age 11	1	2	3	4	Totals
1	14	30	5	11	60
2	[illegible]	83	81	63	245
3	[illegible]	[illegible]	79	45	161
4	[illegible]	[illegible]	[illegible]	135	245
	39	178	240	254	711

Sport	Sport – Age 15				
Age 13	1	2	3	4	Totals
1	13	12	8	6	39
2	[illegible]	56	59	38	178
3	[illegible]	[illegible]	91	109	240
4	[illegible]	[illegible]	[illegible]	174	254
	53	116	215	327	711

Sport	Sport – Age 15				
Age 11	1	2	3	4	Totals
1	18	19	13	10	60
2	[illegible]	54	78	95	245
3	[illegible]	[illegible]	61	76	161
4	[illegible]	[illegible]	[illegible]	146	245
	53	116	215	327	711

Sport	Sport – Age 17				
Age 13	1	2	3	4	Totals
1	15	13	5	6	39
2	[illegible]	54	57	39	178
3	[illegible]	[illegible]	94	98	240
4	[illegible]	[illegible]	[illegible]	127	254
	67	133	241	270	711

Sport	Sport – Age 17				
Age 11	1	2	3	4	Totals
1	23	14	15	8	60
2	[illegible]	63	94	67	245
3	[illegible]	[illegible]	62	66	161
4	[illegible]	[illegible]	[illegible]	129	245
	67	133	241	270	711

Sport	Sport – Age 17				
Age 15	1	2	3	4	Totals
1	24	14	9	6	53
2	[illegible]	42	37	16	116
3	[illegible]	[illegible]	104	62	215
4	[illegible]	[illegible]	[illegible]	186	327
	67	133	241	270	711

of sport activity. The conclusions reached for this representative set were found to apply to the tables as a whole. For instance, at age 11 the 711 subjects in the study were distributed across the four levels of sport participation as follows: level 1 (never), 60 individuals; level 2 (1 or 2 hours/week), 245; level 3 (several hours/week), 161; and level 4 (many hours/week), 245. The cross-tabulation of the levels of participation in sport of these individuals with their levels of participation at age 13 shows that 311 (14+83+79+135) had remained stable, that 235 (30+5+11+81+63 +45) had increased their participation, and that 165 (18+3+34+4+31+75) had decreased their participation. Of the 60 at age 11 who never participated in sport, 30 spent 1 or 2 hours per week in sport activity, 5 increased their participation to several hours per week, and 11 to many hours at age 13. On the other hand, the behaviour of the 161 who at age 11 participated in several hours of sport could move in either direction: 45 of them increased their participation, and 37 (3+34) decreased their participation. In addition to examining the movement of subjects across levels of participation from one year to the immediately following year, it was also thought useful to examine these movements across the whole research period. A thorough examination of the six-part table leads to the following conclusions: (i) that there was constant movement of individuals from one level of participation to another; and (ii) that the question of whether participation in sport had any impact on the level of delinquency could be most appropriately answered by comparing the behaviour of those who increased their activity in any one year to the behaviour of those who decreased their participation.

Results of the Analyses of Covariance

For these analyses, groups were formed from those individuals who either increased their participation or decreased it. Thus, an attempt was made to answer the question as to whether transition from one level of participation to another has any impact on the amount of delinquency.

Table 10

The Effect of Change in Amount of Sport Participation from Age 11 to Age 13 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for each Delinquency Variable

		Delinquency Variables – Age 13				Delinquency Variables -- Age 15				Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight	SubAbus	Theft	Vand	Fight	SubAbus	Theft	Vand	Fight
Decrease	165	3.99	12.63	6.66	8.70	6.68	14.04	7.06	9.55	6.98	13.42	6.55	8.25
Increase	235	3.76	12.33	6.53	8.52	5.45	13.34	6.75	8.77	7.05	13.18	6.00	8.19
Mean	400	3.86	12.45	6.58	8.60	5.53	13.63	6.88	9.09	7.02	13.28	6.58	8.22
Covariate	F	1.87	3.42	8.52	6.13	0.54	3.84	2.57	8.92	0.81	3.99	2.60	2.66
	p	0.173	0.065	0.004	0.014	0.462	0.051	0.109	0.003	0.368	0.047	0.108	0.104
Group	F	3.82	1.36	0.98	0.49	0.62	2.71	3.90	6.64	0.04	0.33	0.23	0.05
	p	0.051	0.244	0.323	0.484	0.432	0.101	0.049	0.010	0.840	0.564	0.635	0.820

Table 11

The Effect of Change in Amount of Sport Participation from Age 11 to Age 15 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for each Delinquency Variable

		Delinquency Variables – Age 15				Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight	SubAbus	Theft	Vand	Fight
Decrease	141	6.13	14.54	7.24	9.60	7.34	13.78	7.67	8.44
Increase	291	5.33	13.19	6.74	8.61	6.80	12.90	6.45	8.00
Mean	432	5.59	13.63	6.90	8.93	6.98	13.19	6.52	8.14
Covariate	F	0.14	4.46	2.62	6.72	1.200	0.89	0.70	1.90
	p	0.704	0.035	0.106	0.010	0.274	0.346	0.402	0.169
Group	F	9.15	8.51	8.69	11.81	4.17	5.08	2.13	4.38
	p	0.003	0.004	0.003	0.001	0.042	0.025	0.146	0.037

Table 12

The Effect of Change in Amount of Sport Participation from Age 11 to Age 17 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for each Delinquency Variable

		Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight
Decrease	170	7.29	13.58	6.80	8.58
Increase	264	6.81	12.11	6.60	8.09
Mean	434	7.00	13.30	6.77	8.28
Covariate	F	0.31	2.46	2.35	4.27
	p	0.577	0.117	0.126	0.039
Group	F	3.34	1.43	1.62	5.13
	p	0.068	0.232	0.204	0.024

Table 13

The Effect of Change in Amount of Sport Participation from Age 13 to Age 15 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for each Delinquency Variable

		Delinquency Variables – Age 15				Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight	SubAbus	Theft	Vand	Fight
Decrease	145	5.87	14.40	7.06	9.36	7.36	13.39	6.69	8.32
Increase	232	5.28	13.47	6.82	8.85	6.77	12.88	6.45	7.94
Mean		5.50	13.83	6.91	9.05	8.00	13.07	6.54	8.09
Covariate	F	0.13	0.82	0.01	1.63	2.64	0.05	1.60	2.11
	p	0.722	0.365	0.942	0.203	0.105	0.817	0.206	0.147
Group	F	5.17	3.89	1.97	2.39	4.52	1.71	2.51	3.31
	p	0.024	0.049	0.161	0.123	0.034	0.192	0.114	0.070

Table 14

The Effect of Change in Amount of Sport Participation from Age 13 to Age 17 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for the Differences on Each Delinquency Variable

		Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight
Decrease	203	7.26	13.29	6.78	7.40
Increase	218	6.79	13.06	6.50	7.04
Mean	421	7.02	13.17	6.64	7.12
Covariate	F	0.18	0.86	1.44	3.18
	p	0.669	0.355	0.230	0.075
Group	F	3.01	0.35	3.50	3.16
	p	0.084	0.554	0.062	0.076

Table 15

The Effect of Change in Amount of Sport Participation from Age 15 to Age 17 on Delinquent Behaviour with Increasing Age: Means for the Groups and Significance Levels for each Delinquency Variable

		Delinquency Variables – Age 17			
Change	N	SubAbus	Theft	Vand	Fight
Decrease	211	7.10	13.16	6.69	8.28
Increase	144	6.92	13.27	6.57	8.24
Mean		4.02	13.21	6.64	8.26
Covariate	F	0.43	0.90	2.22	2.72
	p	0.514	0.345	0.137	0.100
Group	F	0.31	0.05	0.59	0.07
	p	0.581	0.817	0.442	0.793

Increases and decreases were calculated for transitions between age 11 and ages 13, 15, and 17, between age 13 and ages 15 and 17, and between age 15 and age 17. The results were used to constitute the various "increase" and "decrease" in sport participation groups. The dependent variables were the delinquency scores of ages 13, 15, and 17, with the scores of early age disruptive behaviour used as the covariate.

Tables 10 to 15 present the results of the ANCOVAs, and answer the question as to whether transition in the amount of sport activity from one year to another has any impact on delinquent behaviour after taking the relationship of the delinquency variables with disruptiveness into consideration. This is done, first of all, for the year in which the transition is being measured. And then, in order to measure whether this transition had a more lasting impact, delinquent behaviour in years that were more distant

were also studied. Thus, increase-decrease in sport participation for the transition from age 11 to age 13 (see Table 10) was used to measure the impact of the transition in levels of sport participation on the amount of delinquent behaviour exhibited by individuals at age 13 (1991) and, then, on the amount of delinquent behaviour for the subsequent ages of 15 and 17 (1993, 1995). The same procedure was then done for the transition from age 11 to age 15 for delinquent behaviour at ages 15 and 17 (see Table 11) and for the transition from age 11 to age 17 for delinquent behaviour at age 17 (see Table 12). The above process was again repeated for the transition from age 13 to age 15 with respect to delinquent behaviour at ages 15 and 17 (see Table 13), and for the more remote transition from age 13 to age 17 for delinquent behaviour at age 17 (see Table 14). And finally the transition from age 15 to age 17 was used as the basis for designating the categories for examining the impact of sport activity on the delinquent behaviour of subjects at age 17 (1995) (see Table 15).

Increase/Decrease in Sport Participation from Age 11 to Age 13. Table 10 reports the result of subject transition in the amount of sport activity from age 11 to age 13. One-hundred-sixty-five subjects decreased their activity, and 235 increased it. For the delinquency scores for age 13, the analyses of covariance do not reach significance. Only *substance abuse* shows marginal significance ($F = 3.82$, df. = 1, 397, $p = .051$). The impact of the age 11 to age 13 transition on the subsequent years of 1993 (age 15) and 1995 (age 17) also appears in Table 9. Two of the delinquency variables for the age 15 period resulted in significance; namely, *vandalism* ($F = 3.90$, df. = 1, 397, $p = .049$) and *fighting* ($F = 6.64$, df. = 1, 397, $p = .010$). None of the analyses of covariance were significant at age 17 for the age 11 to age 13 transition categories. However, it is worth noting that comparisons of the means for the "increase" in sport participation group with those of the "decrease" group always show the "increase" group to have lower levels of delinquent behaviour with respect to the transition in the amount of sport participation. Undeniably the

differences are small, but they all favour the the group that increased its participation in sport.

Increase/Decrease in Sport Participation from Age 13 to Age 15 and from Age 15 to Age 17. The examination was extended to see if the "increase" group, based on other transitions, also manifested the same characteristics with respect to the impact of sport participation on delinquency. When the various variables were examined for the transition from age 13 to age 15, substantially the same conclusions were found. The groups differed significantly on two of the variables for delinquent behaviour at age 15 (see Table 13). Both *substance abuse* and *theft* reached significance with probabilities of 0.024 and 0.049 respectively; only one of the variables for the transition categories from age 13 to age 17 were significant; namely, *substance abuse* ($F = 4.52$, df. = 1, 397, $p = .034$). It is interesting to again note that the trend of lower delinquency scores for the "increase" in sport participation category persists.

Finally, the subject transition categories across age 15 to age 17 (1993 to 1995) were examined, and again the same trend was evident: none showed significant results, but three of the means for the "increase" group were lower (see Table 15). Only for *theft* was the mean higher for the group who decreased their participation in sport.

Persistence of Increase/Decrease in Sport Participation Across the Years. Would this pattern of results also hold for sport transition scores that were farther apart? Groups were formed on the basis of the sport transition scores between ages 11 and 15, between ages 11 and 17, and between ages 13 and 17. Indeed, the pattern generally held true. See Table 11 for the results for ages 11 to 15 transition categories with respect to the age 15 and age 17 delinquency scores; see Table 12 for the results for ages 11 to 17 transition with respect to

the age 17 data; and see Table 14 for age 13 to age 17 transition respect to the age 17 data.

Summary. While not too many differences proved statistically significant, it is worth noting that a definite trend towards lower delinquent behaviour in *practically all cases* favoured the group that increased its participation in sport. To reach a more solid conclusion, it would be necessary to find a similar pattern of results in other longitudinal studies.

CHAPTER 5
DISCUSSION AND CONCLUSIONS

Summary of Conclusions and Observations

The objective of the study was to examine whether sport participation was significantly related to lower delinquent behaviour. There is some literature on the effects of physical exercise on maladaptive behaviour, but it is limited to very specific populations. However, they are all of cross-sectional nature. The present study, instead, relied on longitudinal data from The *Montreal Longitudinal-Experimental Study* – a research project that was initiated with the express purpose of prospectively investigating the possible links between early disruptive behaviour and the later onset of delinquency in adolescence. The present study sought to answer a particular question about these possible links – specifically concerning the association between sport participation and deviant behaviour. The activity being investigated in the study is participation in sport in which the individual participated spontaneously, either informal or formal sport activity which was self directed.

Several approaches were taken to analyze the data which, despite some shortcomings with respect to the particular question of this study, turned out to be very rich in detail. This became very evident from the descriptive analysis of the data. Very interesting relationships were brought to light in the cross-tabulations of data across adolescent development, as well as through the examination of the correlation matrix. The data were also investigated from a point of view of inferential statistics. Multiple multivariate regression analyses were used with the four scores of each of the delinquency measures as the dependent variables and the four levels of sport participation scores as the independent variables or predictors in the first instance. Significant multivariate Fs were found for three of the four analyses; only *theft* proved not to be significantly related to the sport

participation variables. This indicates that a relationship between the delinquency variables and sport participation indeed exists. These results support the earlier findings of Schafer (1969a, 1969b) and Segrave and Chu (1978) who found similar results in their studies examining the relationship between sport participation and delinquent behaviour. The results must be accepted with caution given that the correlations between the delinquency variables and sport participation seemed to be so tenuous.

Taking into consideration that the *Disruptiveness* scale of the SBQ administered at Kindergarten controlled for early onset of deviant behaviour, the scores of disruptiveness were included as a further predictor in a second regression analysis. As was to be expected, the relationship between predictor variables and dependent variables was enhanced given the strong relationship of early disruptiveness to the other variables. This can be clearly seen from the correlation table as well as from the analysis of regression with disruptiveness scores as the sole predictor. In this last analysis the relationship between disruptiveness and the delinquency variables were all significant at less than 0.001. Clearly, early age disruptive behaviour is a strong predictor of future delinquent behaviour. This is in keeping with the literature that demonstrates early childhood behaviour to be an accurate and strong predictor of later adolescent behaviour (Farrington, 1995; Loeber, 1988; Pulkinnen, 1983; Dobkin, Tremblay, Mâsse, & Vitaro, 1995; Farrington et al., 1990; Haapasalo & Tremblay, 1994; Loeber & Dishon, 1983; Stanton & Magnusson, 1989; Tremblay et al., 1992; Tremblay, Pihl, Vitaro, & Dobkins, 1994). In the analysis which utilized the disruptiveness scores and the sport participation scores jointly as predictors, all the significance levels were more pronounced than those obtained for the sport participation scores alone – all of them reaching probabilities of less than 0.001 with the exception of *theft* which was significant at the 0.011 level.

To test for the impact of the transitions in sport participation (that is, the degree to which an individual increases or decreases participation in

sport activity from one year to another) on the reduction of delinquent behaviour, analyses of covariance procedures were used, but few results were found to be statistically significant. The results of this study do not allow us to conclude emphatically that sport participation does indeed impact on delinquency or that increased sport activity can lead to retrenchment of delinquent behaviour. Notwithstanding this, however, it is noteworthy to consider the finding that the delinquency scores for the group that increased its participation in sport was, in *practically all cases*, lower than those for the group that decreased its participation; only twice out of 40 times did it fail to show this pattern of results (cf. Tables 9-14). This pattern was consistent and endured throughout the study for transition scores of all combinations of years. It is the consistency with which the trend persists throughout the years under investigation that is most striking and worthy of consideration. Unfortunately, no other studies in this field have examined the effects of an increase or decrease in sport participation on the degree of juvenile delinquency. Nevertheless, there is enough information both in the analyses of regression and covariance and in the descriptive parts of the study to suggest that there is indeed a relationship that warrants further attention.

An example might help illustrate how a persistent pattern could support the claim of a real, albeit small, difference in a behavioural outcome. For instance, a world-class sprinter where the difference in performance of the athlete is measured in hundredths of seconds. Do the differences (say in the top three positions) truly represent abilities which are significantly better one from another, or are they simply representative of a quantitative measure used to define between victory and defeat? The latter interpretation would be considered true when a different athlete is victorious every time there is an event. On the other hand, if a particular athlete demonstrates a consistency in winning, – winning every race – then it can safely be said that, indeed, that particular athlete is superior even though the differences in performance are minimal. Similar reasoning could be applied to the results

observed in this investigation. Though the lower delinquency scores favour the "increase" category, the differences between the two groups are rather small and, in most cases not statistically significant. Although it is important to interpret these results with caution, the pattern shows a consistency that is not wise to disregard.

Limitations of the Study and Suggestions for Future Research

This investigation was field-based research focusing on the effect of the amount of sport activity individuals participated in spontaneously as part of their day to day living on the extent of delinquent behaviour in their lives. Recall that subjects were grouped into four categories based on the choice of one of four very general responses to a question on sport participation. The responses that could be chosen ranged from "never" to "very much". Insofar as such responses lent themselves to subjective interpretations, they could result in a valuation that was not totally unbiased by the particular judgment of each individual as to the meaning of the terms. Only the "never" category was truly a representation of a definite level of participation, and not subject to an individual or subjective viewpoint; "never" clearly meant that no participation of any kind had occurred. While useful as a general measure for most studies, it did not seem powerful enough to capture, at least through inferential procedures, the existence of a possible salutary influence of sport participation on the reduction of delinquent behaviour. As such, future studies replicating this design would benefit by making the measurement of participation in sport more precise. This would allow researchers to be more confident in the relationships that would be found between the sport participation variables and the delinquency measures.

Future investigations on this topic perhaps should use a more experimental-type design. A suggestion would be to prepare a question that would distinguish those who never participated from those who participated in some type of sport. The individuals in the latter group could be further classified into two groups as those participating in sports on their own and as

those individuals participating in organized sport (though not prescribed specifically as a treatment). A fourth group could be exposed to some kind of organized physical activity specifically designed as a treatment. In keeping with the longitudinal nature of the data, the treatment should also be long-term. This kind of a design would provide better control and follow-up and would permit more solid conclusions with respect to the possible beneficial effect of sport participation as a protective factor in reducing delinquent behaviour.

REFERENCES

Achenbach, T. M., Conners, C. K., Quay, H. C., Verhulst, F. C., & Howell, C. T. (1989). Replication of empirically derived syndromes as a basis for taxonomy of child/adolescent psycho-pathology. *Journal of Abnormal Child Psychology, 57,* 299-320.

Achenbach, T. M., Edelbrock, C. S., & Howell, C. T. (1987). Empirically based assessment of the behavioral/emotional problems of 2- and 3-year-old children. *Journal of Abnormal Child Psychology, 17,* 629-650.

Allen, J. I. (1980). Judging can modify disruptive behaviors. *Teaching Exceptional Children, 12,* 66-70.

Allison, D. B., Faith, M. S., & Franklin, R. D. (1995). Antecedent exercise in the treatment of disruptive behavior: A meta-analytic review. *Clinical Psychology: Science and Practice, 2,* 279-303.

American College of Sports Medicine. (1990). The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Medicine and Science in Sports and Exercise, 22,* 265-274.

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders,* (3rd ed., rev.). Washington, DC: Author.

Basile, V. C. (1993). *Effects of physical exercise and a mastery task on disruptive behaviors and self-concept.* Unpublished doctoral dissertation. Hofstra University.

Bass, C. K. (1985). Running can modify classroom behavior. *Journal of Learning Disabilities, 18,* 160-161.

Bordens, K. S., & Abbott, B. B. (1991). *Research Design and Methods: A Process Approach* (2nd ed.). Mountain View, CA: Mayfield Publishing Company.

Bredemeier, B. J., Weiss, M. R., Shields, D. L., & Cooper, B. A. B. (1986). The relationship of sport involvement with children's moral reasoning and aggression tendencies. *Journal of Sport Psychology,8,* 304-318.

Burks, R., & Keeley, S. (1989). Exercise and diet therapy: Psychotherapists' beliefs and practices. *Professional Psychology: Research and Practice, 20,* 62-64.

Coie, J. D., & Jacobs, M. R. (1993). The role of social context in the prevention of conduct disorder. *Development and Psychopathology,5,* 263-275.

Collingwood, T. R. (1972). The effects of physical training upon behavior and self attitudes. *Journal of Clinical Psychology, 28,* 583-585.

Collingwood, T. R., & Willett, L. (1971). The effects of physical training upon self-concept and body attitude. *Journal of Clinical Psychology, 27,* 411-412.

Cozby, P. C. , Warden, P. E., & Kee, D. W. (1989). *Research Methods in Human Development.* Mountain View, CA: Mayfield Publishing Company.

Dobkin, P. L., Tremblay, R. E., Mâsse, L. C., & Vitaro, F. (1995). Individual and peer characteristics in predicting boys' early onset of substance abuse: A seven-year longitudinal study. *Child Development, 66,* 1198-1214.

Donnelly, P. (1981). Athletes and juvenile delinquents: A comparative analysis based on a review of literature. *Adolescence, 16,* 415-432.

Dubbert, P. M. (1992). Exercise in behavioral medicine. *Journal of Consulting and Clinical Psychology, 60,* 613-618.

Duncan, B., Boyce, W. T., Itami, R., & Puffenbarger, N. (1983). A controlled trial of a physical fitness program for fifth grade students. *Journal of School Health, 53* , 467-471.

Ensminger, M. E., Kellam, S. G., & Rubin, B. R. (1983). School and family origins of delinquency: Comparisons by sex. In K. T. Van Dusen & S. A. Mednick (Eds.). *Prospective Studies of Crime and Delinquency* (pp. 73-97). Boston: Kluwer-Nifhoff.

Evans, W. H., Evans, S. S., Schmid, R. E., & Pennypacker, H. S. (1985). The effects of exercise on selected classroom behaviors of behaviorally disordered adolescents. *Behavioral Disorders, 11,* 42-51.

Farrington, D. P. (1991). Childhood aggression and adult violence: Early precursors and life outcomes. In D. J. Pepler & K. H. Rubin (Eds.). *Development and treatment of childhood aggression* (pp. 5-29). Hillsdale, NJ: Erlbaum.

Farrington, D. P. (1995). Later life outcomes of truants in the Cambridge Study. In I. Berg & J. Nursten (Eds.). *Unwillingly to school* (4th ed). London: Gaskell. In press.

Farrington, D. P. (1995). The development of offending and antisocial behavior from childhood: Key findings from the Cambridge study in delinquent development. *Journal of Child Psychology and Psychiatry, 360,* 929-964.

Farrington, D. P., Loeber, R., Elliott, D. S., Hawkins, J. D., Kan, D. B., Klein, M. W., McCord, J., Rowe, D. C., & Tremblay, R. (1990). Advancing knowledge about the onset of delinquency crime. In B. B. Lahey & A. E. Kazdin (Eds.). *Advances in clinical child psychology* (Vol. 13, pp. 283-342). New York: Plenum Press.

Folkins, C. H., & Sime, W. E. (1981). Physical fitness training and mental health. *American Psychologist, 36,* 373-389.

Frick, P. J., Lahey, B. B., Loeber, R., Stouthamer-Loeber, M., Green, S., Hart, E. L., & Christ, M. A.G. (1990). Oppositional defiant disorder and conduct disorder in boys: Patterns of behavioral covariation. *Journal of Clinical Child Psychology, 20,* 202-208.

Frick, P. J., Lahey, B. B., Loeber, R., Tannenbaum, L., Van Horn, Y., Christ, M. A.G. , Hart, E., & Hanson, K. (1993). Oppositional defiant disorder and conduct disorder: A meta-analytic review of factor analyses and cross-validation in a clinic sample. *Clinical Psychology Review, 13,* 319-340.

Goldberg, A. D., & Chandler, T. J. L. (1989). The role of athletics: The social world of high school adolescents. *Youth and Society,21,* 238-250.

Haapasalo, J. & Tremblay, R. E. (1994). Physically aggressively boys from age 6 to 12: Family background, parenting behavior, and prediction of delinquency. *Journal of Consulting Clinical Psychology, 62,* 1044-1052.

Huesmann, L. R., Eron, L. D., Lefkowitz, M. M., & Walder, L. O. (1984). Stability of aggression over time and generations. *Developmental Psychology, 20,* 1120-1134.

Jörëskog, K. G., & Sörbom, D. (1993). *Lisrel VIII.* Chicago: Scientific Software International.

Jörëskog, K. G., & Sörbom, D. (1988; 2nd ed.) *PRELIS: A Preprocessor for LISREL.* Mooresville, IN: Scientific Software International.

Karper, W. B. (1981). The use of exercise in alleviating emotional disturbance: A review of the literature. *Journal for Special Educators, 18,* 61-72.

Lahey , B. B. & Loeber, R. (1994). Framework for a developmental model of oppositional defiant disorder and conduct disorder. In D. K. Routh (Ed.). *Disruptive behavior disorders in childhood* (pp. 139-180). New York: Plenum Press.

Loeber, R. (1988). Natural histories of conduct problems, delinquency, and associated substance use: Evidence for developmental progressions. In B. B. Lahey & A. E. Kazdin (Eds.). *Advances in clinical child psychology* (Vol. 11, pp. 73-124). New York: Plenum Press.

Loeber, R. (1990). Development and risk factors of juvenile antisocial behaviour and delinquency. *Clinical Psychology Review, 10,* 1-41.

Loeber R., & Dishion, T. (1983). Early predictors of male delinquency: A review. *Psychological Bulletin, 93,* 68-99.

Loeber R., & Stouthamer-Loeber, M. (1987). Prediction. In H. C. Quay (Ed.). *Handbook of juvenile delinquency* (pp. 325-382). Toronto: Wiley.

Luce, S. C., Desquadri, J., & Hall, R. V. (1980). Contingent exercise: A mild but powerful procedure for suppressing inappropriate verbal and aggressive behavior. *Journal of Applied Behavior Analysis, 13,* 583-594.

McCord, J. (1983). A longitudinal study of aggression and antisocial behavior. In K. T. VanDusin & S. A. Mednick (Eds.). *Prospective studies of crime and delinquency* (pp. 269-275). Boston: Kluwer-Nijhoff.

McDonald, D. G., & Hodgdon, J. A., (1991). *Psychological effects of aerobic fitness training.* New York: Springer-Verlag.

McMahon, J. R. (1990). The psychological benefits of exercise and the treatment of delinquent adolescents. *Sports Medicine, 9,* 344-351.

Martens, R. (Ed.). (1978). *Joy ad sadness in children's sports.* Champagne, IL: Human Kinetics Publishers

Muthén, B. O (1991). Analysis of longitudinal data using latent variable models with varying parameters. In L. M. Collins & L. H. Hom (Eds). *Best methods for the analysis of change: Recent advances, unanswered questions, future directions* (pp. 1-25). Washington, D.C.: American Psychological Association.

O'Donnell, J., Hawkins, J. D., & Abbott, R. D. (1995). Predicting serious delinquency and substance use among aggressive boys. *Journal of Consulting and Clinical Psychology,63,* 529-537.

Pulkinnen, L. (1983). Finland: The search for alternatives to aggression. In A. P. Goldstein & M. H. Segal (Eds.). *Aggression in global perspective* (pp. 104-144). New York: Pergamon Press.

Purdy, D. A., & Richard, S. F. (1983). Sport and juvenile delinquency: An examination and assessment of four major theories. *Journal of Sport Behavior, 6,* 179-193.

Reid, J. B. (1993). Prevention of conduct disorder before and after school entry: Relating intervention to developmental findings. *Development and Psychopathology,5,* 243-262.

Reppucci, N. D. (1987). Prevention and Ecology: Teen-age pregnancy, child sexual abuse, and organized youth sports. *American Journal of Community Psychology,15,* 1-22.

Rowland T. W. (1990). *Exercise and children's health.* Champaign, IL: Human Kinetics Books

Ruhl, K. L. (1985). Handling aggression: Fourteen methods teachers use. *The Pointer, 29,* 344-351.

Schafer, W. E. (1969a). Participation in interscholastic athletics and delinquency: A preliminary study. *Social Problems, 17,* 40-47.

Schafer, W. E. (1969b). Some social sources and consequences of interscholastic athletics: The case of participation and delinquency. *International Review of Sport Sociology, 4,* 63-79.

Segrave, J. O. (1972). *Athletics and delinquency.* Unpublished term paper, University of Massachusetts.

Segrave, J. O. (November, 1981). *Juvenile delinquency and athletics: The deterrent hypothesis.* Paper presented at the Symposium on Athletics and Delinquency at the Second Annual Convention of the North American Society for the Sociology of Sport, Fort Worth, Texas.

Segrave, J. O., & Chu, D. B. (1978). Athletics and juvenile delinquency. *Review of Sport and Leisure, 3,* 1-24.

Shipman, W. M. (1984). Emotional and behavioral effects of long-distance running on children. In M. L. Sachs & G. W. Buffone (Eds.). *Running as therapy: An integrated approach* (pp. 125-137). Lincoln: University of Nebraska Press.

Smoll, F. L. & Smith, R. E. (Eds). (1978) *Psychological perspectives in youth sports.* Washington, DC: Hemisphere.

Sonstrom, R. J. (1984). Exercise and self-esteem. In R. L Terjung (Ed.). *Exercise and sports sciences reviews* (Vol. 12 pp. 123-155). New York: Macmillan.

Spady, W. G. (1970). Lament for the letterman: Effects of peer status and extracurricular activities on goals and achievement. *Sociology of Education, 46,* 313-325.

Spitzer, R. L., Davies, M., & Barkley, R. (1991). The DSM-III-R field trials for the disruptive behavior disorders. *Journal of the American Academy of Child Adolescent Psychiatry, 29,* 690-697.

Stattin, H., & Magnusson, D. (1989). The role of early aggressive behavior in the frequency, seriousness, and types of later crime. *Journal of Consulting and Clinical Psychology, 57,* 710-718.

Tremblay, R. E., Loeber, R., Gagnon, C., Charlebois, P., Larivée, F., & LeBlanc, M. (1991). Disruptive boys with stable and unstable high fighting behavior patterns during junior elementary school. *Journal of Abnormal Child Psychology, 19,* 285-300.

Tremblay, R. E., Mâsse, B., Perron, D., LeBlanc, M., Schwartzman, A. E., & Ledingham, J. E. (1992). Early disruptive behavior, poor school achievement, delinquent behavior, and delinquent personality: Longitudinal analyses. *Journal of Consulting and Clinical Psychology, 60,* 64-72.

Tremblay, R. E., Pagani-Kurtz, L., Mâsse, B., Vitaro, F., & Pihl, R. O. (1995). A bimodal preventive intervention for disruptive kindergarten boys: Its impact through mid-adolescence. *Journal of Consulting and Clinical Psychology, 63,* 000-000.

Tremblay, R. E., Pihl, R. O., Vitaro, F., & Dobkin, P. L. (1994). Predicting early onset of male antisocial behavior from preschool behavior. *Archives of General Psychiatry, 51,* 732-738.

Tuckman, B. W., & Hinkle, J. S. (1986). An experimental study of the physical and psychological effects of aerobic exercise on schoolchildren. *Health Psychology, 5,* 197-207.

Werner, E. E. (1986). The concept of risk from a developmental perspective. In B. K. Keogh (Ed.), *Advances in special education* (Vol. 5). Greenwich, CT: JAI Press.

Wilmore, J. H., & Costill, D. L. (1988). *Training for Sport and Activity: The Physiological Basis of the Conditioning Process* (3rd ed.). Dubuque, IA: Wm. C. Brown Publishers.

Yiannakis, A. (1976). Delinquent tendencies and participation in an organized sports program. *Research Quarterly, 47,* 845-849.

Yiannakis, A. (1980). Sport and delinquency: A review and appraisal. *Motor Skills,4,* 59-64.

APPENDIXES

Appendix A
Distribution of Raw Scores on Disruptiveness Scale *

0	158
1	65
2	69
3	43
4	40
5	34
6	37
7	27
8	38
9	39
10	21
11	22
12	25
13	9
14	11
15	8
16	10
17	10
18	5
19	10
20	7
21	7
22	6
23	5
24	1
25	2
26	2

* Cutoff for subjects at greater risk of future delinquent behaviour is a score of 9

Appendix B

Distribution of Raw Scores for Delinquency Variables by Age

Score	11	13	15	17
	Substance Abuse			
3	504	339	165	82
4	136	240	161	84
5	44	71	107	85
6	11	32	73	81
7	7	17	53	78
8	6	6	55	76
9	2	3	37	64
10	1	1	20	75
11		1	19	38
12		1	21	48
	Theft			
11	395	377	293	347
12	124	121	108	105
13	80	70	90	75
14	34	34	42	43
15	25	35	34	20
16	17	23	29	26
17	13	14	28	16
18	4	8	16	20
19	2	7	9	12
20	3	7	8	6
21	3	3	15	8
22	2	3	7	7
23	3	1	5	6
24	1	5	5	5
25	2	1	4	2
26			3	2
27	1	2	4	2
28			3	1
29	2		1	2
30			1	4
31				1
32			1	
33			1	
34			1	
35			1	
37				1
38			1	
42			1	

Score	11	13	15	17
	Vandalism			
6	487	496	446	519
7	126	106	124	98
8	52	60	62	45
9	24	29	28	22
10	11	8	26	11
11	6	4	9	5
12	4	3	6	3
13	1	3	4	3
14	2	1	2	2
15			2	1
16	1	1	1	
17			1	
18				1
19				1
	Fighting			
7	244	293	288	402
8	186	167	138	126
9	98	95	73	67
10	72	49	73	30
11	33	32	38	28
12	30	20	20	19
13	17	17	27	16
14	9	14	19	11
15	7	11	8	4
16	8	7	9	3
17	1	4	4	
18	3		3	3
19	1	1	2	1
20			2	1
21	2	1	2	
22			1	
23			3	
28			1	

Appendix C

Frequency and Percenatge of Distributions of Delinquency Variables for Age 11 in Relation with Sport Participation at Age 11 **

Sport Age 11	Level *	Delinquency Variables – Age 11 SubAb	Theft	Vand	Fight
(a)					
1 n = 305	Zero	225 (73.8)	170 (55.7)	209 (68.5)	113 (37.0)
	Lo/Mod	74 (24.3)	133 (43.6)	94 (30.8)	182 (59.7)
	Hi	6 (2.0)	2 (0.7)	2 (0.7)	10 (3.3)
2 n = 406	Zero	279 (68.7)	225 (55.4)	278 (68.5)	131 (32.3)
	Lo/Mod	117 (28.8)	174 (42.9)	126 (31.0)	263 (64.8)
	Hi	10 (2.5)	7 (1.7)	2 (0.5)	12 (3.0)
(b)					
n=711	Zero	504 (70.9)	395 (55.6)	487 (68.5)	244 (34.3)
	Lo/Mod	191 (26.9)	307 (43.2)	220 (30.9)	445 62.6
	Hi	16 (2.3)	9 (1.3)	5 (0.7)	22 (3.1)

* Level refers to different combinations of scores for each subscale:

SubAb: Zero=3; Lo/Mod=4-6; Hi=Above 6

Theft: Zero=11; Lo/Mod=12-22; Hi=Above 22

Vand: Zero=6; Lo/Mod=7-12; Hi=Above 12

Fight: Zero=7; Lo/Mod=8-14; Hi=Above 14

** Numbers within parentheses are percentages for the frequencies in the delinquency variables columns by each level of sport

Appendix D

Frequency and Percenatge of Distributions of Delinquency Variables for Age 13 in Relation with Sport Participation at Age 13 **

Sport Age 13	Level *	Delinquency Variables – Age 13 SubAb	Theft	Vand	Fight
(a)					
1 n = 217	Zero	108 (49.8)	123 (56.7)	153 (70.5)	97 (44.7)
	Lo/Mod	98 (45.2)	91 (41.9)	62 (28.6)	113 (52.1)
	Hi	11 (5.1)	3 (1.4)	2 (0.9)	7 (3.2)
2 n = 494	Zero	231 (46.8)	254 (51.4)	343 69.4)	196 (39.7)
	Lo/Mod	245 (49.6)	234 (47.4)	148 (30.0)	281 (56.9)
	Hi	18 (3.6)	6 (1.2)	3 (0.6)	17 (3.4)
(b)					
n=711	Zero	339 (70.9)	377 (55.6)	496 (68.5)	293 (34.3)
	Lo/Mod	343 (26.9)	325 (43.2)	210 (30.9)	394 (62.6)
	Hi	29 (2.3)	9 (1.3)	5 (0.7)	24 (3.1)

* Level refers to different combinations of scores for each subscale:
SubAb: Zero=3; Lo/Mod=4-6; Hi=Above 6
Theft: Zero=11; Lo/Mod=12-22; Hi=Above 22
Vand: Zero=6; Lo/Mod=7-12; Hi=Above 12
Fight: Zero=7; Lo/Mod=8-14; Hi=Above 14

** Numbers within parentheses are percentages for the frequencies in the delinquency variables columns by each level of sport

Appendix E

Frequency and Percenatge of Distributions of Delinquency Variables for Age 15 in Relation with Sport Participation at Age 15 **

Sport Age 15	Level *	Delinquency Variables – Age 15 SubAb	Theft	Vand	Fight
(a)					
1 n = 169	Zero	45 (26.6)	76 (45.0)	107 (63.3)	73 43.2)
	Lo/Mod	77 (45.6)	85 (50.3)	59 (34.9)	87 (51.5)
	Hi	47 (27.8)	8 (4.7)	3 (1.8)	9 (5.3)
2 n = 542	Zero	120 (22.1)	217 (40.0)	339 (62.5)	215 (39.7)
	Lo/Mod	264 (48.7)	301 (55.5)	196 (36.2)	301 55.5)
	Hi	158 (29.2)	24 (4.4)	7 (1.3)	26 (4.8)
(b)					
n=711	Zero	165 (23.2)	293 (41.2)	446 (62.7)	288 40.5)
	Lo/Mod	341 (48.0)	386 (54.3)	255 (35.9)	388 54.6)
	Hi	205 (28.8)	32 (4.5)	10 (1.4)	35 (4.9)

* Level refers to different combinations of scores for each subscale:
SubAb: Zero=3; Lo/Mod=4-6; Hi=Above 6
Theft: Zero=11; Lo/Mod=12-22; Hi=Above 22
Vand: Zero=6; Lo/Mod=7-12; Hi=Above 12
Fight: Zero=7; Lo/Mod=8-14; Hi=Above14

** Numbers within parentheses are percentages for the frequencies in the delinquency variables columns by each level of sport

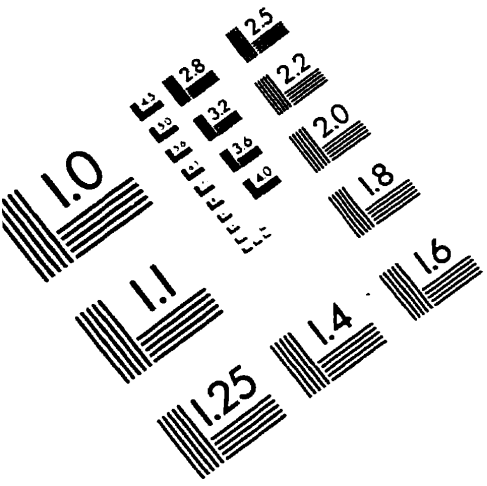
Appendix F
Frequency and Percenatge of Distributions of Delinquency Variables for Age 17 in Relation with Sport Participation at Age 17 **

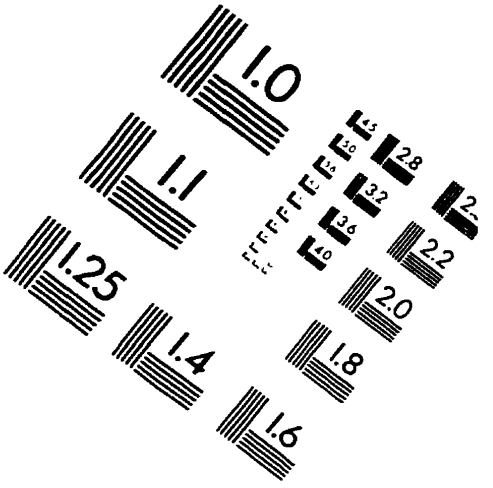
Sport Age 17	Level *	Delinquency Variables – Age 17 SubAb	Theft	Vand	Fight
(a)					
1 n = 200	Zero	29 (14.5)	109 (54.5)	140 (70.0)	123 (61.5)
	Lo/Mod	75 (37.5)	84 (42.0)	84 (27.0)	72 (36.0)
	Hi	96 (48.0)	7 (3.5)	6 (3.0)	5 (2.5)
2 n = 511	Zero	53 (10.4)	238 (46.6)	379 (74.2)	279 (54.6)
	Lo/Mod	175 (34.2)	254 (49.7)	130 (25.4)	225 (44.0)
	Hi	283 (55.4)	19 (3.7)	2 (0.4)	7 (1.4)
(b)					
n=711	Zero	82 (11.5)	347 (48.8)	519 (73.0)	402 (56.5)
	Lo/Mod	250 (35.2)	338 (47.5)	184 (25.9)	297 (41.8)
	Hi	379 (53.3)	26 (3.7)	8 (1.1)	12 (1.7)

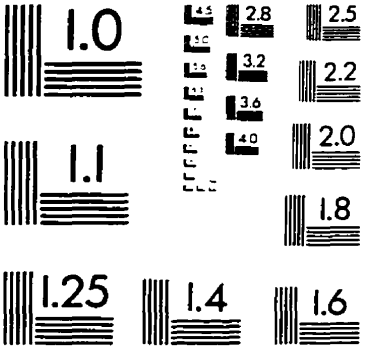
* Level refers to different combinations of scores for each subscale:
SubAb: Zero=3; Lo/Mod=4-6; Hi=Above 6
Theft: Zero=11; Lo/Mod=12-22; Hi=Above 22
Vand: Zero=6; Lo/Mod=7-12; Hi=Above 12
Fight: Zero=7; Lo/Mod=8-14; Hi=Above14

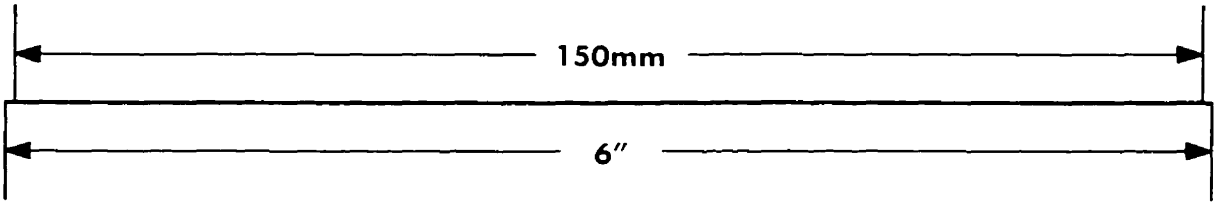
** Numbers within parentheses are percentages for the frequencies in the delinquency variables columns by each level of sport

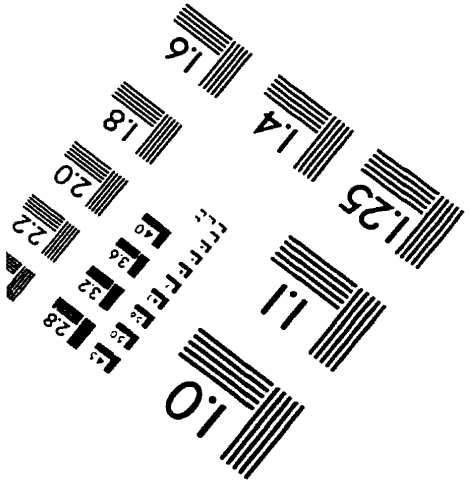
IMAGE EVALUATION TEST TARGET (QA-3)

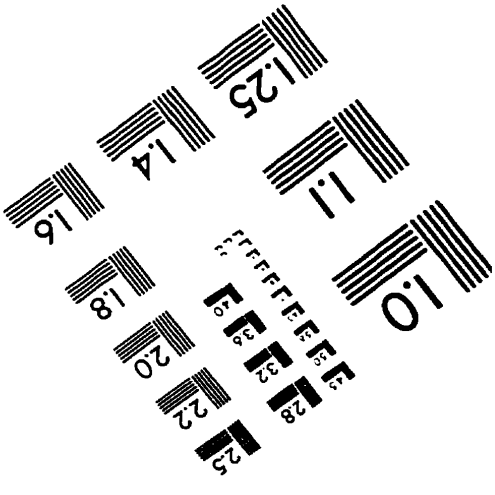












APPLIED IMAGE, Inc
1653 East Main Street
Rochester, NY 14609 USA
Phone: 716/482-0300
Fax: 716/288-5989