WHAT DO WE KNOW ABOUT THE EFFECTS OF SPORT AND ELITE ATHLETICS ON CHILD DEVELOPMENT OUTCOMES? A REVIEW OF THE LITERATURE

Terry Bennett
Clinical Scholar
Offord Centre for Child Studies
Department of Psychiatry and Behavioural Neurosciences
McMaster University
Hamilton, Ontario

And

Ellen L. Lipman
Associate Professor
Offord Centre for Child Studies
Department and Psychiatry and Behavioural Neurosciences
McMaster University
Hamilton, Ontario

And

Lindsay Robertson
Research Assistant
Offord Centre for Child Studies
McMaster University
Hamilton, Ontario

December 2008
# EXECUTIVE SUMMARY

**PURPOSE**

**METHODS**

**BACKGROUND**

**RESULTS**

<table>
<thead>
<tr>
<th>Youth Involvement in Physical Activity</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youth Involvement in Sports</td>
<td>7</td>
</tr>
<tr>
<td>Youth Involvement in Elite Sports</td>
<td>8</td>
</tr>
<tr>
<td>Understanding the Influence of Context on Child Experience</td>
<td>9</td>
</tr>
<tr>
<td>WHAT WE DON’T KNOW</td>
<td>10</td>
</tr>
<tr>
<td>WHAT WE SUGGEST</td>
<td>10</td>
</tr>
</tbody>
</table>

## INTRODUCTION

**METHODS**

<table>
<thead>
<tr>
<th>WHAT IS RESEARCH EVIDENCE?</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHAT ARE RELEVANT OUTCOMES?</td>
<td>16</td>
</tr>
<tr>
<td>REVIEW PROCESS</td>
<td>17</td>
</tr>
<tr>
<td>REVIEW GOALS</td>
<td>19</td>
</tr>
</tbody>
</table>

**BACKGROUND**

**HEALTHY CHILD DEVELOPMENT**

## RESULTS

**YOUTH INVOLVEMENT IN PHYSICAL ACTIVITY**

<table>
<thead>
<tr>
<th>Physical Health</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Health</td>
<td>25</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-Analyses</td>
<td>25</td>
</tr>
<tr>
<td>Summary</td>
<td>26</td>
</tr>
<tr>
<td>Academics</td>
<td>26</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-Analyses</td>
<td>26</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>26</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>27</td>
</tr>
<tr>
<td>Summary</td>
<td>27</td>
</tr>
<tr>
<td>Social</td>
<td>28</td>
</tr>
<tr>
<td>Conclusions for Physical Activity and Health</td>
<td>28</td>
</tr>
</tbody>
</table>

**YOUTH INVOLVEMENT IN SPORT**

<p>| Mental Health                        | 28 |
| Depression                           | 30 |</p>
<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal Observational Studies</td>
<td>30</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>30</td>
</tr>
<tr>
<td>Summary</td>
<td>30</td>
</tr>
<tr>
<td><strong>Anxiety</strong></td>
<td>31</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-analyses</td>
<td>31</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>31</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>31</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>31</td>
</tr>
<tr>
<td>Summary</td>
<td>31</td>
</tr>
<tr>
<td><strong>Self-Esteem</strong></td>
<td>32</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-Analyses</td>
<td>32</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>32</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>32</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>32</td>
</tr>
<tr>
<td>Summary</td>
<td>32</td>
</tr>
<tr>
<td><strong>Externalizing/Behavioural Problems</strong></td>
<td>33</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-Analyses</td>
<td>33</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>33</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>33</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>33</td>
</tr>
<tr>
<td>Summary</td>
<td>33</td>
</tr>
<tr>
<td><strong>Substance Use</strong></td>
<td>34</td>
</tr>
<tr>
<td>Systematic reviews/meta-analyses</td>
<td>34</td>
</tr>
<tr>
<td>Experimental intervention studies</td>
<td>34</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>34</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>34</td>
</tr>
<tr>
<td>Summary</td>
<td>34</td>
</tr>
<tr>
<td><strong>Conclusions for Sport and Mental Health</strong></td>
<td>35</td>
</tr>
<tr>
<td>Academic</td>
<td>35</td>
</tr>
<tr>
<td>Systematic Reviews/Meta-analyses</td>
<td>35</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>35</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>35</td>
</tr>
<tr>
<td>Cross-sectional Studies</td>
<td>35</td>
</tr>
<tr>
<td>Summary</td>
<td>35</td>
</tr>
<tr>
<td>Social</td>
<td>36</td>
</tr>
<tr>
<td>Meta-Analyses/Systematic Reviews</td>
<td>36</td>
</tr>
<tr>
<td>Experimental Intervention Studies</td>
<td>36</td>
</tr>
<tr>
<td>Longitudinal Observational Studies</td>
<td>36</td>
</tr>
<tr>
<td>Cross-Sectional Studies</td>
<td>36</td>
</tr>
<tr>
<td>Summary</td>
<td>36</td>
</tr>
<tr>
<td><strong>YOUTh INVOLVEMENT IN ELITE ATHLETICS</strong></td>
<td>37</td>
</tr>
<tr>
<td>Mental Health</td>
<td>37</td>
</tr>
<tr>
<td>UNDERSTANDING CONTEXT</td>
<td>38</td>
</tr>
<tr>
<td>Who delivers program</td>
<td>38</td>
</tr>
<tr>
<td>Where program delivered</td>
<td>38</td>
</tr>
</tbody>
</table>
This paper is dedicated to the memory of Dr. Dan Offord, child psychiatrist, researcher and camp director, who devoted his career to making the race fair for all Canadian children.
EXECUTIVE SUMMARY

PURPOSE

The purpose of this report is to provide the following:

1) Information on healthy child development, particularly as it pertains to child athletic participation

2) A brief review of the effects of physical activity on child development

3) A review of the studies of competitive sports and developmental outcomes

4) A review of the studies of elite sports and highly trained young athletes and developmental outcomes

5) Discussion of the importance of context on child experience

6) Recommendations regarding how competitive athletics programs support principles of healthy child development, where improvement may be needed and where future research may be needed to answer questions that are as yet unanswered.

METHODS

An evidence-informed review of the peer-reviewed literature was done, to evaluate the quality of research studies before summarizing the findings of these studies. We used a hierarchy of research evidence commonly used in child mental health research which ranks studies from strongest to weakest: systematic reviews or meta-analyses, experimental or intervention studies (e.g., randomized controlled trials), longitudinal observational studies, cross-sectional observational studies, and case studies or expert opinion.

The outcomes of relevance from the studies were three of four major domains of healthy child development: emotional well-being (or mental health), cognitive abilities and school achievement (or academics), and social skills and experiences (or social health). There has been
Whenever possible, we have reported the effect sizes (ES) calculated from the study results, which outline the magnitude of the effects of sport on developmental outcomes. Effect sizes are quantified as small, medium and large.

The age group of interest in this review is school-aged children, aged 6-12. However, much of the literature refers to adolescent development so when relevant we will review the adolescent effects and apply these to younger children.

BACKGROUND

One helpful framework for understanding how a child’s experience affects their developmental trajectory involves understanding the determinants of healthy child development. A determinant is an indicator or marker of healthy development and tends to lead to good development. This does not ensure or make children healthy but optimizes the chances that a child may meet his or her full potential for health and well-being. Four major categories of determinants are: protection, relationships, opportunities and community. Each of these determinants plays a role in the childhood outcomes of sport participation.

RESULTS

We briefly review the literature on youth involvement in physical activity and outcomes, including mental health, social and academic outcomes, followed by the literature on youth involvement in sports and outcomes and the literature of youth involvement in elite sports.

Youth Involvement in Physical Activity
While there is strong evidence linking physical activity with positive health in adults, the evidence in children is much more limited. Early physical activity helps children to acquire a basic movement foundation, which is needed for later activity participation.

Physical activity appears to have a medium effect on self-esteem but little effect on anxiety and depression. However it is noted that exercise is an inexpensive intervention and there are no known negative effects of exercise.

Involvement in physical activity, generally measured by physical education in school, is not associated with a negative impact on academic performance.

We found no studies examining the relationship between physical activity and social relationships.

**Youth Involvement in Sports**

Children and youth who are involved in sport are less likely to be depressed and anxious, although this may reflect issues of selection (depressed/anxious children are more likely to opt out of sports) rather than causation. The research to date does not support strong statements about beneficial effects of sport on depression, anxiety or behavioural problems in youth. Participation in team sports, particularly in the high school context, may be associated with increased rates of alcohol consumption. Female involvement in non-leanness, non-elite sport may have protective effects against disordered eating and body image.

Why wouldn’t we see stronger effects of sports on depression, anxiety and conduct problems, particularly in youth aged 6-12 years old? Psychiatric disorders tend to be caused by complex interactions between genes and environment, and once diagnosed often require intensive and multi-faceted interventions. This is not to say that sports involvement may not play a protective role, but it is unlikely on its own to have a strong impact on these outcomes.
Furthermore, many of the conclusions outlined in this literature review reflect characteristics of studies that may make it difficult to find strong results, either positive or negative, for sport because of the way that participation is measured (yes/no vs. quality or context) or the type of study (little or no follow-up).

Studies do support small to moderately beneficial effects of sport on self-esteem, which is important because low self-esteem and chronically negative self-perceptions are thought to be risk factors for problems such as anxiety and depression.

Involvement in sports has an overall beneficial effect on academic outcomes such as school performance, liking school, and years of post-secondary education. This has been hypothesized to be due to increased identification with, and commitment to, school particularly for high school team athletes. Students who are more intensively committed to extracurricular activities appear to have better academic outcomes. There is little evidence for negative effects of high levels of involvement in sport.

Less research has been carried out on involvement in sports and effect on social development, particularly for 6-12 year old children. Student athletes in high school appear to be less socially isolated and report less loneliness. Furthermore, they are more likely to socialize with school-oriented peers, however also with peers who are likely to drink alcohol underage. Sports involvement appears to play an important role in the development of adolescent self-identity, which in turn impacts upon attachment to school, peer group formation and post-high school plans.

**Youth Involvement in Elite Sports**

Involvement in elite sports has an overall beneficial effect on self-esteem and self-concept, particularly for physical abilities among children and youth. Elite sport may have a
negative effect, on eating disorders apart from participation in leanness sport (gymnastics, cheerleading, weight class sports, marathon running, aesthetic sports), which increase risk of disordered eating behaviours. Very little is known about rates of depression, anxiety, substance use or behaviour problems among elite child and adolescent athletes or the effects of overtraining or heavy competition on mental health.

Involvement in elite sports does not appear to have a negative effect on academic outcomes.

No studies have examined the effects of elite sport participation on the social development or social lives of children and youth, however peer group within sport plays an important role in enjoyment of elite sports experience.

Studies of youth involvement in general extracurricular activities suggest that breadth of involvement may confer some protective effects on youth development. While no studies exist of elite athletes' involvement in other activities, it is important to consider that excessive focus on one activity may have important trade-offs in terms of skill development and identity formation from more varying participation in other positive youth development programs.

Understanding the Influence of Context on Child Experience

It is important to note that many factors beyond participation influence a child's experience in sports. Such factors include characteristics of the child (e.g., age, gender, biological risk), who delivers the program (e.g., child-coach relationship, parental involvement), where the program is delivered (e.g., site, safety) and how the program is delivered (e.g., structure, frequency).

For example, coaching behaviours that are not excessively focused on winning, that are encouraging and offer information and feedback specific to particular performance are associated
with greater enjoyment, greater prosocial behaviour and less antisocial behaviour in young athletes. Poor self-esteem among children may predict increased sports competition anxiety.

WHAT WE DON'T KNOW

More studies that focus on younger children and elite athletes are needed. More research of higher quality is also needed. This includes intervention research and longitudinal research. The effects of athletics involvement on early intermediate risk factors or mechanisms in the development of emotional and behavioural disorders need to be studied and followed over time. Studies including sports participation as part of a package of interventions for kids with more severe problems may also be helpful.

WHAT WE SUGGEST

The relationship between physical activity/participation in sports and child outcomes is complex. Factors related to the child him or herself, where the activity takes place, associated adult interactions and the method of instruction may all influence the experience and outcomes for the child. Both psychosocial risk factors (e.g., poverty), and genetic/biological risk factors (e.g., family history of depression) also have an impact on how children do. Further, special populations, such as children with specific physical or mental health problems, bring even more complexity to the relationship between physical activity/participation in sports and child outcomes.

In the absence of strong research to help understand the impact of participation in physical activity and sports on child mental health, social and cognitive outcomes, developmental principles should guide participation. Such principles include the following:

Every recreational and athletic community should ensure that the 4 broad determinants of healthy child development are addressed: i) Protection – are the environment and activities safe
Activities such as free time, play and creativity met? ii) Relationships: Is the quality of the coach-athlete relationship emphasized? Is it nurturing and supportive? Are there opportunities to develop peer relationships? iii) Opportunity: Are all children in the program receiving feedback and opportunities for practice and mastery? Are they receiving feedback contingent upon their performance in a supportive manner? iv) Community: Are all children in the community making it into the programs offered, or are there significant barriers according to income, culture, gender or transportation? Are organizations thinking about the children are not accessing their programs?

As children are continuing to grow and develop both physically and cognitively, adults working with children need to have a basic understanding of child cognitive and physical development. It is also important to realize that at a given age, there is a wide range in terms of what is considered normal with respect to growth and development.

Organized sports should match the developmental level of the participants, and include rules designed for health and safety.

Demands of a sport or physical activity should not exceed the capacity of a child at their age and stage of development. When demands of a sport or physical activity go beyond a child’s cognitive and physical development, negative feelings such as frustration and failure may result. Factors such as variety, freedom, fun, success, family participation, peer support and enthusiastic leadership are believed to encourage and maintain participation. Failure, embarrassment, competition, boredom, regimentation and injuries discourage participation.

Initiatives that are undertaken at a community, provincial or national level to increase universality of access to athletics and of standards of quality in sport across geographic and socioeconomic strata should be welcomed. Setting developmentally appropriate standards for
coaching (including technical aspects of teaching sport and standards for supportive, encouraging
relationships), hours of training and rules for competition acknowledges that the context and
delivery of sport affects whether it confers benefit, harm or no effect in the life of a child. It also
makes the point that adults in society need to ensure that all children have access to safe,
encouraging environments, positive relationships with friends and adult mentors and
opportunities to develop their potential.

Setting more universal and transparent ways of teaching various sports at recreational and
elite levels also enables and encourages research into the effects of such programs. Measurable
outcomes are being more frequently requested to justify continued funding of a range of
programs. This is likely to be true of programs of physical activity and sports that are not
exclusively funded privately. Therefore evaluation will become an increasingly important part of
the physical activity/sports field.

The High Five literature is consistent with the literature reviewed for this document. The
importance of multiple factors influencing a child’s experience of participation could be
highlighted.
In 2008, High Five National, a division of Parks and Recreation Ontario, proposed to collaborate with child psychiatrists and researchers at the Offord Centre for Child Studies to carry out an evidence-based review of the research literature regarding child and youth participation in competitive and elite athletics. High-Five is a quality standard for sports and recreation activities serving children aged 6-12 that provides accreditation and promotion of programs that benefit healthy child development. The Offord Centre is a research centre at McMaster University devoted to promoting the life quality and life opportunities of children with emotional and behavioural problems in Canada.

Thousands of children and youth participate in competitive team and solo sports within their schools and communities across Canada. A smaller number of these will devote their time and energy to train to become elite athletes with hopes of competing at provincial, national and international levels. Such participation is a major developmental influence for many children and adolescents and plays a valuable role in building traditions, pride and cohesiveness in Canadian society. While athletic development is generally regarded to bear many positive outcomes for children, research has not investigated the balance of benefits versus tradeoffs for competitive sport, particularly at a more elite level that requires a more extreme commitment of time and focus. What does academic research in fields such as education, psychology, child development and sociology say about the effects of competitive athletic training on the development of children aged 6-12?

Given the large numbers of youth and adults devoting hours to sport as well as the commitment and funding it receives from families, schools, communities and government, it is essential that we keep score on how child athletes are faring in terms of their overall well-being.
It is therefore important to critically review what we know about the effects of sports, and whether this is supported by high-quality research in order to have confidence that we are doing the best for child athletes.

This paper will provide the following:

1) Information on healthy child development, particularly as it pertains to child athletic participation

2) A brief review of the effects of physical activity on child development

3) A review of the studies of competitive sports and developmental outcomes

4) A review of the studies of elite sports and highly trained young athletes and developmental outcomes

5) Discussion of the importance of context on child experience

6) Recommendations regarding how competitive athletics programs support principles of healthy child development, where improvement may be needed and where future research may be needed to answer questions that are as yet unanswered.
The aim of this paper is to present an evidence-informed review of the effects of competitive athletics on child development outcomes. This involves using the best available research to guide our recommendations. We must therefore first evaluate the quality of the evidence in the studies relating to this topic before summarizing their conclusions. This involved searching databases containing empirical, peer-reviewed research: The term empirical refers to research that is based on measured observations or experimentation (as compared to other ways of knowing, such as opinion, individual clinical experience or traditionally held beliefs). Peer-review is an added quality-assurance component in academic research, which requires that an article that is submitted to a journal for publication must be read, critiqued and held to particular standards of the field by a group of one’s colleagues with substantial research expertise in a given domain.

In child mental health research, we describe what is called a hierarchy of research evidence from highest-quality studies to those that are increasingly more limited. This hierarchy is shown in Table 1. The best studies are systematic reviews or meta-analyses, in which the results of several high-quality studies on a topic are statistically combined, analyzed and summarized. The next best are experimental studies like randomized controlled trials, high-quality intervention studies in which participants are randomly assigned (like a coin flip) to an intervention group (e.g. a sports program) or a control and the groups are compared on meaningful outcomes that are reliably measured. Studies that are lower on this hierarchy are observational studies which are longitudinal (follow children over time). This includes prospective cohort studies, in which a group of children who received an intervention (e.g.
participation in sports) are followed over time and, ideally, compared to a control group and retrospective case-control studies in which children with certain types of outcomes (e.g. antisocial behaviour) are compared to those who are free of such outcomes and then researchers look back to see if they differ in terms of their exposure to a particular intervention (e.g. sports involvement). Cross-sectional studies are observational studies which take a "snapshot" and provide information on the association between two elements of interest (e.g., sports involvement and academic achievement). These studies do not provide information about cause and effect, since both elements are measured at the same time. Finally, considered to be lowest on the hierarchy are case studies (in which children are followed over time without a control group) and expert opinion.

The body of research on children and the time they spend in recreation, sports and competition is considerably more complex and often limited with respect to the quality of studies than public and academic discourse would lead one to believe. It is therefore important to describe "how" we have reached our conclusions about youth sport involvement i.e. on what quality of evidence, in order to be clear about what is truly helpful versus harmful in terms of child athletic involvement. Canadian youth deserve programs that have been shown to be truly effective and efficient.

WHAT ARE RELEVANT OUTCOMES?

This review will focus on the effects of general sports involvement and, more specifically, elite sport training, across the major domains of outcomes within child development. Researchers have generally agreed upon 4 broad health and developmental outcomes in children: emotional well-being (or mental health), cognitive abilities and school achievement (or academics), social skills and experiences (or social health) and physical health
Mental health outcomes refer to psychological adjustment, depression, anxiety, behaviour problems, juvenile delinquency, self-concept and self-esteem. Academics include cognitive abilities (e.g., scores on tests of intelligence, verbal ability, problem-solving ability and visual-spatial ability) and academic achievement (grade completion, learning disabilities, standardized school tests scores, school completion and ability to pay attention in class). Social skills and experiences include concepts such as choices of peer group, number and quality of friendships, social status, empathy and concern for others, loneliness and romantic relationships. Finally, physical health outcomes for school-aged and older children involve growth, fine and gross motor development, freedom from injuries, sexual development and chronic or acute illness.

REVIEW PROCESS

A review of the psychiatric, psychological, sport, educational and sociological literature was undertaken to survey peer-reviewed studies of the effect of sport and elite athletics on child development outcomes. Mental health, academic and social outcomes were considered to be the focus of this paper; search terms therefore included the following: athletics or sports or physical activity and developmental outcomes, cognitive, social, emotional, behavioural, academic, self-esteem, social skills, friendships, self-concept, quality of life, emotional health. The following databases were searched: PUBMED, PSYCHinfo, SportDiscus, Cochrane, and ERIC as well as hand-searches of bibliographies from articles obtained and a review of the researchers' own reference lists.

Once a comprehensive list was obtained, it was vetted to determine if the objectives of each paper included (a) the assessment of the effects of sports involvement (measured as yes/no participation, breadth of participation, time involvement or level of involvement such as
social developmental outcomes constituted the dependent variable (or outcome). Although the aims of this review regard sport participation by children aged 6-12, where such studies do not exist for this age group, literature involving adolescent age groups is reviewed with results generalized to younger children with the caveat that similar effects may or may not apply. The type of study and quality of the evidence was determined according to guidelines as outlined in Table 1. Studies included and outlined in the final review were systematic reviews or meta-analyses (highest level of evidence), experimental intervention trials (randomized, controlled intervention studies, nonrandomized experimental intervention studies), longitudinal observational studies in (which the effects of participation in sports were evaluated at a later time point) and cross-sectional studies in which sport involvement and the outcome of interest were studied concurrently. National or international expert guidelines regarding youth involvement in sport were included where very limited evidence existed in the literature as an example of the current state of knowledge and expert opinion on specific topics such as childhood involvement in elite athletics.

Whenever possible, we have reported the effect sizes (ES) calculated from the study results, which outline the magnitude of the effects of sport on developmental outcomes. Effect sizes are quantified as small, medium and large. Detailed information on the studies reviewed is available from the authors on request.

The age group of interest in this review is school-aged children, aged 6-12. However, much of the literature refers to adolescent development so when relevant we will review the adolescent effects and apply these to younger children.
Although most of the research concerning young athletes pertains to physical development, this review will focus primarily on the first 3 domains mentioned above: mental health, academic and social outcomes for several reasons: First, there has been a relative lack of focus on how sport influences these important outcomes, which we hope to highlight. Secondly, the physical effects of athletic involvement (particularly elite training) are often very sport-specific and less relevant to a general review of youth athletic involvement. The literature outlining these effects including benefits for weight reduction, muscle training, cardiorespiratory fitness is much larger and merits a review of its own by experts in physiology, kinesiology or physical education. Finally, although athletic involvement is often described as being of psychological or social benefit for children and youth, the research literature is much more limited and less often reviewed. We will therefore examine the research findings more broadly for these domains and omit discussion of physical outcomes from this review.

In order to carry out these goals, this paper will provide the following:

1) Information on healthy child development, particularly as it pertains to child athletic participation
2) A brief review of the effects of physical activity on child development
3) A review of the studies of competitive sports and developmental outcomes
4) A review of the studies of elite sports and highly trained young athletes and developmental outcomes
5) Discussion of the importance of context on child experience
Competitive athletics programs support principles of healthy child development, where improvement may be needed and where future research may be needed to answer questions that are as yet unanswered.
We all want the best for Canada’s children. Most adults understand that the relationships, learning opportunities, playtime and well-being that children experience early in life need to be safeguarded. They are also the stepping stones to adult quality of life, good health and positive relationships as well as productive economies and cohesive communities. Healthy child development means that children grow and change with respect to their physical, emotional, social and learning pathways in ways that progressively build upon each other in a reasonable order and time. These pathways are shaped by ongoing interplay between biology and experience. One helpful framework for understanding how a child’s experiences affects their trajectories, involves understanding the determinants of healthy child development. According to the Canadian Institute of Child Health, a determinant is an INDICATOR or MARKER of healthy development (Canadian Institute of Child Health, 2000). Determinants tend to lead to good development, but despite the name, they do not ensure or make children healthy. They open doors to healthy development, or optimize the chances that a child may meet his or her full potential for health and well-being (Guy, 1997).

While there are too many individual markers to list, four helpful categories to consider are the following: protection, relationships, opportunities and community (Guy, 1997). These determinants occur across all of the important contexts of children’s lives: their homes and families, daycares and schools, neighbourhoods and playgrounds and, of course, in their extracurricular activities and athletic worlds too.

Childhood is an incredible time of intense learning and growth. Children are very dependent upon their experiences and environments to develop. Childhood is also a long period
Protection is a key determinant of healthy child development. **Protection is the most fundamental determinant.** It is helpful to think of protection in 2 ways: First, protection involves safeguarding a child’s physical and emotional well-being across the lifespan. For example, children’s physical protection must be safeguarded with safe gyms and training equipment and coaches who do not push them past safe limits. Protection also entails safeguarding key childhood experiences, such as play, creativity, learning and safe exploration from the pressures of adult life. Children involved in practice and training must also have protected unstructured time to play and be creative.

**RELATIONSHIPS** are powerful determinants in a child’s trajectory. Research has shown that early relationships are very important in terms of their impact on even adult behaviour. While early caregiver attachment has been shown to shape a child’s long-term attachment patterns, mental health research has also found that having even one consistent, healthy and supportive relationship with an adult inside or outside of the family has important protective benefits. Peer relationships also take on increasing importance as children age into their adolescence. The realm of sports, with the potential for powerful long-term coach-athlete relationships and friendships with peers of similar interests, must also ensure that the quality of relationships is attended to in children’s lives.

The determinant of OPPORTUNITY is perhaps most obviously associated with athletics and sport. Children need to have opportunities to learn, to practice and develop their skills as an essential part of their healthy development. Sport is therefore an important component of this determinant. Within their experiences of sport, it is increasingly clear that there are important differences between *structured* or coached sport and *unstructured* or informal sport. In Canada, participation in adult-led athletic and extracurricular programs such as hockey leagues...
or swimming lessons differs widely across economic strata (Canadian Institute of Child Health, 2000). Within sport, children need to have the opportunity to practice according to their skill level, to receive supportive feedback and to have their progress evaluated in order to develop and learn.

Finally, children’s experiences of COMMUNITY strongly influence their development over time. Communities may be defined as social settings that range in size and focus from child care centres to schools to sports teams to neighbourhoods and cities. The community or neighbourhood context in which children grow up, and in which sporting opportunities are offered, have been shown to influence children’s physical activity and well-being. For example, Canadian children in low-socioeconomic status communities have significantly higher odds of becoming overweight during their childhood than do kids in well-off communities (Oliver & Hayes, 2008). This may relate to limited opportunities, though may also be influenced by other factors (e.g., diet). Furthermore, a U.S. study found that children living in unsafe neighbourhoods who participated regularly in recreation centres had worse outcomes with respect to anxiety than did those with lower participation rates, possibly due to increased exposure to violence (Fauth et al., 2007). Community context not only affects child development in general; it colours the effects of other developmental influences, such as sport, on child outcomes.
YOUTH INVOLVEMENT IN PHYSICAL ACTIVITY

While the focus of this review is the effect of sport and elite athletics on child development outcomes, we thought it important to include a brief examination of the literature on youth involvement in physical activities. We considered a range of outcomes including physical health, mental health, academic and social outcomes. More detailed descriptions of the latter three outcomes are provided later in this paper.

Physical Health

The evidence linking physical activity with positive physical health outcomes is strong for adults (e.g., Erikssen, Liestol, Bjornholt, et al., 1998). In particular, regular physical activity through the lifespan is associated with improved health and quality of life, as well as reduced risk of premature mortality in general, and of specific health problems such as heart disease, high blood pressure, colon cancer and diabetes.

The evidence linking physical activity with physical health benefits in children and adolescents is more limited. It has been suggested that this may be in part since many children and adolescents are healthy and the target health disabilities generally appear later in life (Bailey, Armour, Kirk, et al., 2008). There is evidence of improved bone strength linked with physical activity (Bass, 2000), but mixed results for improved cardiovascular risk factors (Riberio, Guerra, Oliveria, et al, 2004; Reed, Warburton, Macdonald, et al., 2008).

Early physical activity has also been noted to help children acquire a basic foundation for movement which is needed to enable individuals to participate in a range of physical activities later in life (Bailey, et al, 2008).
There is one systematic review that examined the impact of exercise on self-esteem in children and young people (Ekeland, Heian, Hagen, et al., 2004). Measurement of self-esteem captures the value that one puts on him or herself. This review included 23 trials where participants were allocated to receive an exercise intervention (either alone or as part of a more comprehensive intervention) compared with "ordinary activity" (no intervention). Interventions lasted a minimum of 4 weeks. Among trials comparing exercise only vs. no intervention, the overall effect of exercise on self-esteem was of medium magnitude. Among trials comparing exercise as part of a more comprehensive intervention vs. no intervention, the overall effect of exercise on self-esteem was of similar magnitude. There were considerable differences among the studies included in this review, including a wide age range (3 to 20 years of age), intervention duration (4 to 20 weeks) and rigor of the study (generally low quality).

There is one other systematic review that examined the impact of vigorous exercise on anxiety and depression in children and young people (Larun, Nordheim, Ekeland, et al., 2006). This review included 16 studies in which participants were allocated to receive a vigorous exercise intervention compared with various interventions (i.e., no intervention, low intensity exercise psychosocial intervention), in both general and "in treatment" populations. The general population sample refers to those having no clinical diagnoses and not being treated in a mental health setting vs. those in treatment. Interventions lasted a minimum of 4 weeks. Among trials comparing exercise only vs. various interventions in the general population, the overall effect of exercise on anxiety and depression was small and generally non-significant. The small number of studies and diversity of the studies in terms of participants, intervention and measures made the...
Comparisons difficult and limited the ability to draw firm conclusions about the effect of exercise on anxiety and depression in the general population. For the comparison of exercise only vs. various interventions in the typical treatment population there were very few trials, and no trials with anxiety as an outcome measure, allowing no firm conclusions. However the authors noted that exercise is an inexpensive intervention and there are no known negative effects of exercise.

Other types of studies (experimental intervention studies, longitudinal observational studies, cross-sectional studies) were not included in this brief review.

Summary

Clear conclusions about the effect of exercise on mental health are limited by the poor quality of available studies and diversity between the studies. It appears that exercise has a medium effect on self-esteem (vs. no intervention), though the effect of vigorous exercise on anxiety and depression is small and non-significant in the general population (vs. various interventions). No conclusions can be drawn about the effect of exercise on clinical populations. However it is noted that exercise is an inexpensive intervention and there are no known negative effects of exercise.

Academics

Systematic Reviews/Meta-Analyses

There are no systematic reviews or meta-analyses examining the relationship between physical activity and academics.

Experimental Intervention Studies

As part of a review of the relationship between physical education/school physical activity and academic performance among children in primary grades, six studies were identified that compared children allocated to a physical education program vs. a comparison group on
Interventions varied, though most consisted of additional time for physical education/physical activities. Academic outcome measures varied. Overall, allocation of extra time to physical activity (up to an additional hour) was not associated with a negative impact on academic performance despite decrease time allotted to other subjects. For example, in a B.C.-based trial of a school-based physical activity intervention for Grades 4 and 5, participants in the intervention showed small-medium effects (improvements) on standardized achievement tests (Ahamed, Macdonald, Reed, et al., 2007).

Longitudinal Observational Studies

A number of studies have examined the links between physical education and school physical activity with academic achievement. A U.S. study examined the influence of physical education (rated as low-high, based on the number of minutes/week) on math and reading from kindergarten to grade 5 among almost 5400 children enrolled in a longitudinal study of kindergarten children. Girls with high physical education (70-300 minutes/week) showed benefits in math and reading, even when adjusting for potential negative influences of sociodemographic factors (e.g., race, income, parental education) (Carlson, Fulton, Lee, et al., 2008). The same benefit was not seen for boys, though no negative effects were seen.

Other types of studies (cross-sectional studies) were not included in this brief review.

Summary

Involvement in physical activity, generally measured by physical education in school, is not associated with a negative impact on academic performance. A single study suggests there might be a differential effect by gender, with girls doing better.
It has been suggested that physical activity can have social benefits (Bailey, Armour, Kirk, et al., 2008), but we found no studies of any type (systematic reviews/meta-analyses, experimental intervention studies, longitudinal observational studies, cross-sectional studies) examining the relationship between physical activity and social relationships.

**Conclusions for Physical Activity and Health**

1. It is commonly believed that participation in physical activity and sports has a range of positive benefits for children. This overstates the available evidence.

2. What we know about the impact of physical activity:

   While there is strong evidence linking physical activity with positive health in adults, the evidence in children is much more limited. Early physical activity helps children to acquire a basic movement foundation, which is needed for later activity participation.

   Physical activity appears to have a medium effect on self-esteem but little effect on anxiety and depression. However it is noted that exercise is an inexpensive intervention and there are no known negative effects of exercise.

   Involvement in physical activity, generally measured by physical education in school, is not associated with a negative impact on academic performance.

   We found no studies examining the relationship between physical activity and social relationships.

**YOUTH INVOLVEMENT IN SPORT**

**Mental Health**
Mental health problems are important causes of suffering and decreased quality of life in Canadian children. It is estimated that 14% of Canadian children aged 4 to 17 suffer from significant emotional or behavioural symptoms and that, of these, fewer than 25% access appropriate medical or psychiatric attention (Waddell et al., 2005). It is therefore important that, as a society, we take stock of activities or interventions that may be helpful (or harmful) to children’s mental health.

As noted above, a recent, extensive and evidence-based research review found that exercise and physical fitness programs may have beneficial effects on child self-esteem, but that more research needs to be done (Ekeland et al., 2004). What about the effects of organized sport, and more specifically elite athletics for children and youth aged 6-12 years old? One can understand that there may be different or added benefits from learning how to set goals and practice skills towards these, in socializing with peers of similar interests and in forming coach-athlete relationships. It is also important to consider potential negative effects that may not be present in unstructured physical activity, such as increased anxiety due to pressures to compete or isolation from non-athletic friends due to intense training schedules. It is therefore necessary to review the research literature on sports for potential benefits or harm.

In summarizing research findings on the effect of sport on child and youth mental health, we chose to focus on important emotional and behavioural symptoms or problems that: (a) may be plausibly affected by participation in sports, and (b) that have been found to cause significant burdens of suffering and decreased quality of life, (c) that are severe enough to require attention from the health care system or (d) that may be risk factors for more serious problems to come (e.g. self-esteem). Examples include depression, anxiety, self-esteem, externalizing/behavioural...
Depression

All children and youth will experience "feeling sad" many times during their development, which tends to be felt over a short period of time and is clearly related to an event. Depression, on the other hand, is identified by chronic feelings of daily sadness or extreme irritability that interfere significantly with one’s ability to function and enjoy life; these are accompanied by chronic changes in sleep, energy, appetite and sometimes thoughts of suicide or self-harm. Clinical depression is much less common in young children than in adolescents; it is found in about 1.5% of children aged 5 to 12, increasing to approximately 7% after puberty (Jacobs et al., 2008). Experiences or vulnerabilities that increase a child’s risk for depression include: a genetic or family history of depressive disorders, early child characteristics such as difficulty regulating one’s moods, chronic low self-esteem and psychosocial factors such as poor early attachments, poor family support, or chronically harmful parenting strategies. It is more and more clear that interactions between multiple risk and protective factors are important in affecting later chances of child and adolescent depression.

Systematic Reviews/Meta-analyses

Does participation in structured sport activity affect depression or depressive symptoms in pre-adolescent children? Starting from our earlier criteria of the highest quality of evidence -- systematic reviews or meta-analyses of multiple research findings -- we found that no studies to date have examined the role or organized sport (either team, individual, school or non-school) with respect to mental health symptoms or depression.

Experimental Intervention Studies
Experimental studies comparing a sport-involved group of children and a control group (youth in non-sport programs or no intervention) were also lacking overall; one study of 198 grade 4 and 6 students did randomly assign students to either an exercise or sports intervention 3 times/week compared to regular physical education curriculum (Bonhauser et al., 2005). Researchers found positive changes in the physical athletic performance of the students but not in depression; as they did not include the appropriate statistics to calculate effect sizes, this study was categorized as weak overall.

**Longitudinal Observational Studies**

The best level of evidence therefore comes from observational studies that follow children over time to compare the rates of depressive symptoms in children and teens who participate in sports compared to those who don’t. Five such studies exist, following children over a time frame of at least one year; none of these found associations between sports participation and lower levels of depression 1 or more years later. Barber, Eccles and Stone (2001) interviewed approximately 900 students in grade 10 every 2-4 years over 4 time points; they found that choice of sport involvement (as compared to no or other activity involvement) was unrelated to level or changes in depressed mood (Barber et al., 2001). Fredricks and Eccles found no significant association between community sport involvement (grades 7-8) or school athletics teams (grade 10-11) and psychological adjustment or distress 1-2 years later in 659 youth (Fredricks & Eccles, 2006a). One study of 198 grades 4-5 children found that levels of depression at age 10 predicted lower sport involvement at age 12 (small effect), indicating that children with higher levels of depressive symptoms are less likely to participate in sport in their pre-teen years, but found no association between participation at age 10 and mood symptoms at age 12 ((McHale et al., 2001). Another study (Gore et al., 2001)of 1, 036 high school students
found that although sports did not affect depressive symptoms 1 year later in high school students, after controlling for important family and peer risk and protective factors, in one specific high-risk group—girls with lower GPA scores—greater sport involvement was associated with improved mood (small effect).

Cross-sectional Studies

Eleven cross-sectional studies reporting on associations between sport and depression have generally been more positive than longitudinal findings. These studies surveyed children and teenagers to examine the relationship between sports and depression in a cross-sectional manner—a "snapshot" looking at sport involvement and mood at the same time (generally by asking youth to fill out questionnaires). Eight of these studies reported statistically significant associations between involvement in sports and decreased levels of depression; youth who participated regularly in sports were less likely to be depressed, or to have symptoms of sadness or psychological distress. In the cross-sectional results of their paper, Gore, Farrel and Gordon (2001) found that among highly depressed female teens, only 9.2% participated "some or a lot" of the time compared to 20% in the rest of the female sample; by comparison in boys categorized in the lowest 20% for depression, 46.3% participated "some/ a lot" in sports compared to 32.1% of all other teenaged boys (Gore et al., 2001). Sanders et al. (2000) studied 89 senior high school students using a well-validated depression scale (CES-D, Radloff, 1987) and found that youth in the low-sports participation group had moderately higher mean depression scores than moderately participating groups (large effect) (Sanders et al., 2000). Fredricks and Eccles found lower levels of depression and sadness in grade 11 students who participated in organized sport, controlling for grade 8 levels of depression (Fredricks & Eccles, 2006b). Steptoe and Butler (1996) analyzed data from 2,223 16 year-olds and concluded that participation in team and
individual sports in the previous year was associated with decreased sadness or "malaise" (small effect) and increased odds of describing emotional well-being (small effect) (Steptoe & Butler, 1996). Michaud and colleagues' (2006) study of 7,248 adolescents aged 16-20 years old found that adolescent girls aged 16-17 who participated in sports were more likely to rate themselves as "not depressed," whereas no association was found for older female athletes or male athletes; this study did not describe the measure used for depression, however, so is difficult to judge (Michaud et al., 2006). A study of 988 youth aged 14-18 found that participation in endurance sports was related to improved mood (small effect) (Kirkcaldy et al., 2002). Finally, Findlay and Coplan (2008) found cross-sectional associations between participation in at least one type of sport with emotional well-being (large effect), positive affect ("appearing to be happy," large effect) (Findlay & Coplan, 2008). Competence in sports, as compared to participation, may also be important; Cole (1997) found that peer-nominated competence in sport was associated with a small but statistically significant effect on reduced depressive symptoms (small association) (Cole, 2008).

A smaller number of cross-sectional studies failed to find significant associations between sports involvement and youth mood. Wild et al. (2004) looked indirectly at sport activities in a wide age-range of 939 youth and adults (12-26 years old) by examining how sport self-esteem affected suicidal ideation or attempts, and found that there was no significant association after controlling for youth depression symptoms (Wild et al., 2004b). A second study by Wild and colleagues in 116 youth aged 12-18 years old (grade 8 and 11), found that sports self-esteem was not associated either positively or negatively with suicidality (Wild et al., 2004a). Fletcher et al. (2003) assessed 147 children in grade 4 using validated scales and found
Involvement in sports with internalizing (depression and anxiety) symptoms as reported by teachers or parents (Fletcher et al., 2003).

**Summary**

Overall, conclusions about the benefits of sports are limited by the small number of generally weak studies, as well as by the predominance of cross-sectional studies that prevent discussion about causes and effects. All of the positive studies on participation involved adolescents only; furthermore, several of these did not use measures of depression that have been agreed-upon as valid research scales (Kirkcaldy et al., 2002; Wild et al., 2004a; Wild et al., 2004b; Michaud et al., 2006). Only 1 study involved younger children (grade 4), which found no effect of sports on depressive symptoms (Fletcher et al., 2003). The majority of cross-sectional studies involved adolescents and the effects of sport participation ranged from small to moderately large, indicating that participants are less likely to have significant depressive symptoms compared to those who are not involved in sports. It is also understandable that sports involvement would have limited effect on depression: (a) clinical depression is quite rare in children below the age of puberty, so it would be unusual for studies to detect effects on this outcome, (b) when depression does occur in children and young teens the biggest risk factor is genetics, which again would prevent interventions such as sports from having large effects.

**Anxiety**

Anxiety has also been studied in a small number of research papers as a potential outcome of sports participation, and it is an important problem in child mental health. It is more common than depression in children aged 6-12, with rates across all anxiety disorder of about 6.4% (Degnan & Fox, 2007; Waddell et al., 2005). Risk factors for anxiety include a family history of anxiety disorder and early temperamental characteristics in the child of shyness or
Sports participation may offer benefits with respect to improvements in shyness, as we know that anticipation of anxiety-provoking situations worsens anxiety over time; the experience of performing in front of others (in the context of supportive environments) or of socializing on a team may decrease children’s anxious thoughts, feelings and behaviours over time while building self-confidence.

Systematic Reviews/Meta-analyses

As with depression, no studies to date have performed systematic reviews or meta-analyses of the effect of organized sport on anxiety.

Experimental Intervention Studies

In the same intervention study by Bonhauser et al. (2005) of grade 6 students participating in a school-based exercise and sports program, students reported statistically significant decreases in anxiety symptoms after 7 months of training (however, evidence is considered weak due to lack of statistics outlined) (Bonhauser et al., 2005).

Longitudinal Observational Studies

Only 2 studies examined the effects of sport on later anxiety levels. In a study limited by high drop-out rates (only 56% retained at 1 year), Findley and Coplan (2008) found a nonsignificant trend of small effects on social anxiety over 1 year for 355 shy children aged 8-11 enrolled in sports programs (Findlay & Coplan, 2008). In the study cited above by Barber, Eccles and Stone (2001) of about 900 grade 10 students followed up over several years, there was no effect of grade 10 activity involvement on worry over time (Barber et al., 2001).

Cross-sectional Studies

More positive relationships were found between youth athletics and anxiety symptoms or disorders when these were assessed at the same time. McHale et al. (2001) described a
There is a moderate size (moderate effect) between organized team involvement in the past year and shyness or social withdrawal in 12-13 year-olds (McHale et al., 2001), while Kirkcaldy and colleagues found that 14-18 year-olds who never participated in sports were more likely to complain of anxiety (small effect size) (Kirkcaldy et al., 2002). Finally, a Filipino study of 12-28 year-olds found that individuals who rated themselves as high in shyness were significantly less likely to participate in team sports compared to a low-shyness group, but did not differ from those self-rated as average in shyness (Page & Zarco, 2001).

Summary

Despite the plausible mechanisms for how anxiety may be benefited by participation in sport, relatively few studies have examined such effects. Current research has found small-to-moderate cross-sectional correlations; shy or anxious children are less likely to participate in sport, but it is less clear if this is a selection effect (shy kids avoid sport involvement) or evidence of some benefit (participation decreases levels of anxiety).

Self-Esteem

Self-esteem, self-concept and self-perception are all slightly different but overlapping concepts that may play important roles in positive youth development. Self-esteem -- the value one places on oneself -- and self-concept -- how one perceives oneself -- are considered to be more global concepts, encompassing styles of thinking about oneself, personality traits, emotional reactions and associated behaviours. Often researchers will break down these concepts into specific domains, e.g. physical self-concept, social self-concept and academic self-concept because children and adults may vary widely in how they rate themselves in one domain versus another (Marsh & O'Mara, 2008; Ekeland et al., 2004). Self-perceptions are more
children and youth appraise their sense of competence in a variety of domains. All are considered to be important developmental concepts and potential risk factors for later depression and anxiety (Jacobs et al., 2008). There is increasing evidence, as well, how one perceives oneself is related to how well one performs in a two-way manner. Reciprocal relationships (in which self-esteem or self-concept and performance are both cause and effect of each other) have been found in studies of academics and sports—in children and youth who perceive themselves as being more competent in gymnastics, for example, are more likely to perform well in gymnastics, which in turn reinforces their positive self-concept (Marsh et al., 2006a; Marsh et al., 2006b; Marsh & O'Mara, 2008).

Systematic Reviews/ Meta-Analyses

While a small number of studies exist examining the role of exercise or physical activity on self-esteem in children (Ekeland et al., 2004; Ekeland et al., 2005), none have examined more specifically the role of structured, organized or coached sports on this outcome.

Experimental Intervention Studies

Two studies have examined the effect of specific running training programs on self-esteem and similar outcomes in school-aged girls, however both also include specific educational components targeting self-esteem thoughts and behaviours along with the more general coaching, training and competing elements and neither study compared their intervention to a control. DeBate and Thompson (2005) created a 12-week running program in which 377 girls aged 8-12 years old trained twice a week across multiple intervention sites in the United States (DeBate & Thompson, 2005). Self-esteem and other measures were compared at the start of the intervention and again at the end (pre-test/post-test design). They found moderate to large effects on general self-esteem (large effect) and smaller effects on the ability to resist pressure
Waldron (2007) compared the pre- and post-treatment effects of a structured after-school running program in which a certified coach worked twice a week with 40 grade 6 girls (mean age 11.6 years) to train for a 5km running event. After the intervention, girls rated themselves more highly in perceived social competence (small-moderate effect), physical competence (moderate effect), physical appearance (small-moderate effect) but no differences were found in perceived ability to make close friends and overall self-worth (Waldron, 2007).

Finally, in the aforementioned study by Bonhauser and colleagues, the school exercise and sport intervention involving grades 4 and 6 classrooms also found statistically significant differences between the intervention and control groups on self-esteem (Bonhauser et al., 2005).

**Longitudinal Observational Studies**

Two out of 4 longitudinal studies found small-moderate and positive effects of sports on self-esteem. In a large study of 4,250 high school students (Marsh & Kleitman, 2003), total athletic participation in grade 10 was predictive of self-esteem in grade 12, controlling for grades 8 and 10 self-esteem (small-moderate effects). Barber, Eccles and Stone (2001) found that grade 10 youth who participated in sports had higher self-esteem than non-athletes and that self-esteem improved significantly in a linear fashion over high school (Barber et al., 2001). Findlay and Coplan’s smaller study failed to find longitudinal effects 1 year after assessing the sports participation of 355 8-11 year-olds (Findlay & Coplan, 2008). Fredricks and Eccles failed to find associations between grade 11 participation in sports and self-esteem measured 2 years later, after controlling for earlier self-esteem in 1,060 high school students (Fredricks & Eccles, 2006b).

**Cross-sectional studies**
Among 5 cross-sectional studies identified in this review, 4 found positive, statistically significant concurrent associations between sport involvement and self-esteem or positive self-concept. Fredricks and Eccles found that grade 11 students who participated in sport had significantly higher self-esteem than those with lower or less participation (small effect) (Fredricks & Eccles, 2006b). Findlay and Coplan failed to find longitudinal relationships between sports and later self-esteem but did find that students who were involved in sports had higher scores on the Self-Description Questionnaire (SDQ) for perceived physical ability (moderate effect), perceived physical appearance (small-moderate effect) and peer self-esteem (large effect) (Findlay & Coplan, 2008). Kirkcaldy et al. (2002) found small effects of participation in endurance sports on the self-image ratings of 988 youth aged 14-18 (small effect) (Kirkcaldy et al., 2002). Effects of similar size (small effect) were found in McHale et al.’s 2005 study of 423 children aged 12-13, investigating the effects of involvement specifically in organized team sport on outcomes including self-esteem (McHale et al., 2005). In Fletcher’s study of 147 grade 4 students, one of the few surveying pre-pubertal youth, no effects were found on extracurricular involvement in sports on self-esteem (Fletcher et al., 2003).

**Summary**

Relatively greater support exists for the beneficial effects of sport on self-esteem. This is one of the few outcomes for which intervention studies exist, all of which indicate benefits for their programs. Several caveats exist about these studies: The running studies failed to include a control group, therefore the girls may have improved with respect to self-esteem due to other reasons than intervention or because of a phenomenon called regression to the mean (where the issue of interest moves from a more extreme rating to a more average rating as a result of the passage of time). Furthermore, these studies do not apply directly to general participation in
community or school sports as they included added teaching components specifically targeting self-esteem in their programs. They are also specific to girls and were developed specifically with female pre-adolescent issues in mind. The Bonhauser et al. study included a control group, randomized classes to treatment or control, and controlled for other effects on self-esteem such as gender, age, socioeconomic status, academics and body mass index; however it did not include sufficient detail about the outcome scores to statistically calculate effect sizes, which weakened our ability to comment somewhat (Bonhauser et al., 2005). None of the interventions studies followed the participants past the termination of the intervention, which limits the ability to comment on long-term effects of sport on self-esteem.

Marsh and Kleitman’s longitudinal study of participation in school athletics was particularly strong as it followed youth over several time points and used well-validated measures to assess self-esteem, finding moderate effects of athletics (Marsh & Kleitman, 2003). It was significantly larger than the Findlay and Coplan study, which may have been too small in sample size, or lost too many children to follow-up, to more accurately detect significant effects (Findlay & Coplan, 2008). Furthermore, cross-sectional studies overwhelmingly described student athletes as having higher self-esteem globally as well as more specifically with respect to more specific areas of self-appraisal (e.g. physical ability, physical appearance), which may indicate beneficial effects of sport on concurrent positive self-esteem or that youth with higher self-esteem are more likely to seek out athletic involvement.

Externalizing/Behavioural Problems.

*Externalizing problems* is an umbrella term for disorders or behaviours that include problems with poor attention, hyperactivity and impulsivity (as occurs with attention-deficit-hyperactivity disorder), as well as physical aggression, rule-breaking and other conduct problems
which, at certain thresholds may be termed conduct disorder, or, when there is involvement with
the law, delinquency). There are multiple risk factors for these problems, including family
history, as well as family-level psychosocial issues such as harsh, inconsistent parenting, low
socioeconomic status, mothers who were adolescents and demonstrated antisocial behaviour at
time of the child’s birth and later involvement with deviant peer groups (Waddell et al., 1999;
Offord & Bennett, 1994). Some of these risk factors for externalizing behaviours, such as
family poverty, are also known to affect participation in sport.

Systematic Reviews/Meta-Analyses

There are no studies to date that review and statistically combine the results of sports
interventions on externalizing behaviours.

Experimental Intervention Studies

No studies were found that examined differences between youth who participated in
experimental intervention studies compared to a control group for externalizing behaviours.

Longitudinal Observational Studies

Three of the longitudinal studies cited in previous sections also examined the effects of
involvement in sports on externalizing behaviours (among other measures), with none finding
beneficial effects of sport (Findlay & Coplan, 2008; McHale et al., 2001; Marsh & Kleitman,
externalizing behaviours 1 year later in children aged 8-11, and McHale, Crouter and Tucker
(2001) failed to find links between children spending their free-time on sports activities at age 10
(n=198) and conduct problems 2 years later. Examining an adolescent age group, Marsh and
Kleitman (2003) examined found that involvement in athletics (as a whole or, more specifically,
In a sample of 4,250 American high school students, involvement in extracurricular activities (intramural, varsity, individual and team) had no effect on reports of staying out of trouble 2 or more years later (no effect).

Cross-sectional Studies

Two out of seven cross-sectional studies found that children with higher involvement in sports had lower scores on conduct or other externalizing problems overall compared to non- or low-participants (Findlay & Coplan, 2008; Fredricks & Eccles, 2006b). Although they failed to find longitudinal associations, Findlay and Coplan found that when they surveyed 8-9 year-olds at the first time point of their study, those who participated in sports had significantly lower scores on externalizing symptoms checklists (moderate effect size). Fredricks and Eccles (2006b) also found cross-sectional associations and concluded that boys involved in sport were less likely to be high in externalizing symptoms (unable to calculate effect sizes). Furthermore, a study examining potential protective effects of sport on delinquency in 169 youth aged 14-15 years old, Burton and Marshall (2005) found that rule-breaking and aggressive behaviour were higher on average in sport-involved youth (small effect for rule-breaking; small effect for aggression) (Burton & Marshall, 2005). Fletcher et al., (2003) failed to find any association in grade 4 students, nor did Duncan et al (2002) in their study of students age 10-14 and McHale et al. (2005) in youth aged 12-13 (Fletcher et al., 2003; Duncan et al., 2002; McHale et al., 2005).

Summary

In general, the literature regarding externalizing behaviors (attention-deficit-hyperactivity, oppositional behaviour patterns and conduct problems) is much less extensive than that of depression and self-esteem. There have been no studies on ADHD symptoms, and other behaviour problems have rarely been studied as the main outcome of studies with appropriate measures. Furthermore, despite the importance of psychosocial interventions for these kinds of
have been developed. Conduct disorder—a more chronic and pervasive syndrome of antisocial behaviours in youth—is a complex problem requiring intervention at multiple levels over long periods of time; therefore one would expect that sports involvement would play a relatively small, but potentially important, role as part of a complex, multi-dimensional intervention involving families, schools and communities.

**Substance Use**

Use or misuse of substances, including alcohol, prescription or illegal drugs or cigarettes is an important outcome to monitor in children and adolescents: early abuse or dependence is a significant risk factor for poor mental health as well as educational and social problems in adolescence and young adulthood. Substance abuse is defined as the use of substances such as alcohol or illicit drugs in a manner that interferes significantly with one’s life, with consequences such as educational impairment, social, interpersonal or legal problems or failure to fulfill major obligations, while dependence is characterized by patterns of use that involve tolerance and withdrawal, needs for greater amounts of substance and unsuccessful attempts to cut down (American Psychiatric Association, 1994). Approximately 0.8% of Canadian youth aged 9 to 17 suffer from substance abuse (Waddell et al., 2005). Risk factors include genetic predisposition, early significant behaviour problems and, to a lesser extent, anxiety or mood problems, low prosocial family characteristics (monitoring, rules and parent-child attachment), deviant peer involvement and peer drug use, single parent families and child social skill deficits (Zucker et al., 2008). Athletic involvement may plausibly confer protection against substance abuse or dependence by structuring youth time, exposing them to coach mentors and peers with focused interests and promoting an interest in physical health and well-being.

*Systematic reviews/meta-analyses*
No such reviews were identified on the topic of sports involvement and substance use.

**Experimental Intervention Studies**

No intervention studies were available for appraisal.

**Longitudinal Observational Studies**

Five longitudinal studies included alcohol and/or marijuana use as outcome variables of interest in determining associations between participation in structured athletics and health outcomes over time. Three of these found that participation in sports predicted increased alcohol use at least one year later while two studies found no association for either increased or decreased use. Eccles and Barber's 1999 study of 1259 grade 12 youth followed up 2 years later found that students who participated in sport were more likely to endorse drinking (small-moderate effect) and getting drunk (small effect) 2 years later, controlling for maternal education. Student athletes were also more likely to describe socializing with peers who drank regularly 2 years later (small effect). Another high school study by Barber, Eccles and Stone (2001) following youth over 6 years from grade 10 found that female athletes increased their frequency of drinking at a faster rate than nonathlete females between age 16-21, while male athletes increased their drinking at a lower rate (Barber et al., 2001). Fredricks and Eccles then asked if duration of sport involvement over a 3-year time span in grades 7 through 10 was predictive of alcohol use over time; they found that longer duration of involvement significantly predicted alcohol use among grade 10 students, but not grade 7 or 8 students (small effect) (Fredricks & Eccles, 2006a). However in a more representative sample of grade 11 youth followed 2 years later, Fredricks and Eccles found no association between participation in grade 11 high school sport and either alcohol or marijuana use 2 years later (Fredricks & Eccles,
(2003) found no association between participation in high school athletics and substance use from grades 10 to 12 (Marsh & Kleitman, 2003).

Cross-sectional Studies

Four cross-sectional studies offer mixed conclusions about concurrent associations between involvement in sport and drinking or drug use. McHale et al. (2005) found no effect of athletic involvement on alcohol use in 423 youth aged 12-14 who were asked if they had been involved in organized team sports ever or in the last year, however rates of marijuana use were significantly lower among boys in sport (McHale et al., 2005). Duncan and colleague surveyed 356 youth aged 10-14 and, similarly, found no effect of organized sports activity on decreased substance use (Duncan et al., 2002). However, Michaud et al. (2006), surveying an older group of 7,248 16-20 year-olds found that 16-17 year-old female athletes were less likely to endorse being drunk at least once (small-moderate effect) whereas acknowledging having used cannabis at least once was higher for older female athletes aged 18-20 (moderate effect). In this same study, 16-17 year-old male athletes were less likely to endorse smoking daily but older male athletes were more likely to admit to cannabis use than non-athletes (large effect) (Michaud et al., 2006). Finally, in an indirect study of sport involvement, Wild et al. (2004) found that grade 8 and grade 11 students who reported high sports self-esteem were more likely to drink (small effect) and smoke (small effect) than lower self-esteem peers but sport involvement had no effect in either direction on illicit drug use (Wild et al., 2004a).

Summary

Study conclusions were mixed overall with respect to drug use. Certain longitudinal studies consistently found associations between sport (particularly high school team) involvement and youth endorsement of drinking. This does not address issues of alcohol abuse.
to a culture of alcohol consumption on high school or other teams to which young people may be introduced by alcohol-using peers. These studies also applied mainly to high school students; the few cross-sectional studies of younger youth (e.g. age range 10-14) did not follow youth long enough to determine whether early sport involvement predicted high school drinking. Results on cannabis use were mixed. The highest-quality studies of cigarette use indicated decreased use of cigarettes among athletes, and possible interaction effects whereby young people who are genetically at risk of smoking are also most likely to benefit from sport involvement. This speaks to the importance of identifying possible higher-risk groups for which sports may be particularly protective with respect to substance use, as well as situations in which sport participation may increase that risk (e.g. varsity team sport, boys versus girls). It is very important that future studies employ experimental designs, validated measures of substance use but also of abuse and dependence and follow-up studies of the substance use habits of younger sport-involved versus uninvolved youth, controlling for important variables such as family history, socioeconomic status and mental health problems.

Conclusions for Sport and Mental Health

Findings from cross-sectional studies indicate that children who participate in organized sport are more likely to report fewer depression and anxiety symptoms, and higher self-esteem. Such associations were not found, however for externalizing symptoms (ADHD and conduct symptoms) and results were mixed for substance use. These studies indicate correlation only, however it is not causation. It is also very plausible that issues of self-selection i.e. depressed children will not join sporting teams or activities because of the nature of their symptoms (withdrawal, low energy, poor motivation).
Studies of lower quality generally reported a greater number of positive associations between sport and well-being, with larger effect sizes, than did higher quality studies that followed children over time. The conclusions one can draw about the potential benefit (or harmful effects) of sport on mental health are therefore very limited by the overall quality of the research studies to date. Longitudinal studies generally found no associations between participation in sport and mental health or well-being measured at least 1 year later. There may be a longitudinal association between participation in high school sport and increased chances of high school drinking, but links to substance or alcohol abuse or dependence are unknown.

**Academic**

The effects of athletic participation on academic outcomes in youth, particularly in high school, have been a topic of debate in educational research for many years (Marsh & Kleitman, 2003). Some argue that time spent in sports, particularly at a varsity or elite level detract from hours spent learning, doing homework or attending class whereas others highlight potential cognitive benefits of improved physical fitness and the translation of improved goal-setting and work ethic in sport to the academic setting. While there is some preliminary research indicating that physical fitness may benefit memory and learning in the elderly, or brain plasticity (the ability to form new connections), this basic science research is still preliminary and will not be reviewed here. Instead, we will focus on the effects of sport participation on academic outcomes, as performance in school has been associated with positive adult outcomes, making it an important developmental effect and predictor. As was outlined for mental health above, we will review studies in order of quality.

**Systematic Reviews/Meta-analyses**

No reviews of previously published studies exist currently in the literature.
No experimental intervention studies in which a sporting intervention is offered to a group as compared to a control group have been conducted to date.

**Longitudinal Observational Studies**

Six major studies have examined how participation in organized sports affects academic outcomes in youth; of these, 5 studies found statistically significant positive associations between sport involvement and benefits in terms of grades, highest level of schooling achieved and vocational outcomes. In the largest and most representative study of high school students, Marsh and Kleitman studied the effects of athletic participation in school extramural, intramural, team and individual sport over 8 years in 4,250 grade 8 students. They found beneficial effects of athletic participation on grade 12 grades (small effect), educational aspirations (moderate-large effect) and applications to university (moderate-large effects) as well as university enrolment after high school (moderate-large effect), months in university (moderate-large effect) and post-secondary educational aspirations (moderate effect) (Marsh & Kleitman, 2003). Furthermore, they found that team sports conferred slightly more benefit than individual sport in that they affected a greater number of positive outcomes; they did not find any evidence that higher levels of participation brought diminishing academic returns but that there was a linear relationship between sports participation and academic benefits.

Eccles and Barber (1999) found that grade 10 involvement in team sports at high school was positively associated with "liking school" in grade 12 (small effect) but did not have an effect on GPA (no effect); further positive effects were found 1 year after high school such as an increased likelihood of attending college (small effect). Student athletes were also more likely to describe having friends with intentions to attend college in grade 12 (small-moderate effect)
In a later study, Barber, Eccles, Stone (2001) followed approximately 900 high school students over 4 timepoints between grades 10 to 2 years post-high school; they reported significantly greater years of schooling post-high school in students who had been involved in grade 10 sports (unable to calculate effect size), higher college graduation rates (39% for those involved in team sports compared to 30% among nonparticipants and greater job autonomy at age 24 (unable to calculate effect size) (Barber et al., 2001). Fredricks and Eccles (2006a) found that duration of involvement in organized school team sports over 3 years predicted greater school belonging in grade 11 students (small effect) but not among grade 8 students, and there were again no effects on GPA; in a separate study they found that participation (yes/no) in team sports was also associated with higher mean educational status 1 year after high school (small effect) (Fredricks & Eccles, 2006b). Finally, in the only study of pre-adolescent youth, McHale, Crouter and Tucker followed up 198 grade 4/5 children two years later but found no correlation between the amount of participation in sport activities in free time and self-reported grades 2 years later (McHale et al., 2001).

Cross-sectional Studies

Three studies were identified that examined cross-sectional associations. Fredricks and Eccles found that student athletes in grade 11 had higher grades (small effect) and higher educational expectations (small effect) (Fredricks & Eccles, 2006b). However, Sanders et al. (2000) found no association between low, moderate or high sport involvement and grade point average in 89 high school seniors (Sanders et al., 2000), and McHale and colleagues (2001) similarly found no effect on concurrently measured grades in younger students aged 10-12 (McHale et al., 2001).
Based on the longitudinal studies above, one can conclude that there is fairly strong evidence that involvement in sports benefits academic performance in students. It is important to note however, that the majority of these studies examined high school sport participation among American students. It may be that affiliation with school team sports in particular increases one’s sense of identification with school and the intention to pursue higher education, as has been hypothesized by researchers (Marsh & Kleitman, 2003). The benefits of non-school sport participation on academic outcomes may therefore be less certain, as would be the effects on school performance in younger children. Therefore more research is needed in the realm of experimental intervention as well as in non-high school sports and younger age groups.

Social

Social skills are those that are used by children to get along with others, to understand what they are thinking and feeling, to play and work cooperatively, and to form relationships with friends, family and important adults such as teachers, neighbors and coaches. Children who are considered highly “sociable” have been found to have lower levels of behaviour problems and better cognitive and emotional outcomes under stressful circumstances than children who are lower in sociability—that is, more sociable children seem to be more resilient to negative life situations (Wachs, 2006). Youth’s participation in sport may affect their social development through many mechanisms, such as: forming coach-athlete relationships, problem-solving with peers in team sport, socializing with friends who have common goals, learning to regulate one’s emotions, working co-operatively with others, forming social identities as “athletes” or “jocks,” anticipating the responses of teammates in a game, or foregoing the company of peers who prefer unstructured “hanging out” or other activities. In reviewing studies with the aim of better understanding the impact of sport on social development, we
therefore attempted to include a broad range of outcomes, including loneliness, friendships, self-perceived social competence, youth social identity and social skills among others.

Meta-Analyses/Systematic Reviews

No reviews were available examining sport and child or youth social development.

Experimental Intervention Studies

Waldron’s 2007 study, outlined above, of 40 grade 6 girls who participated in a running program with a special curriculum focus on building competence found a small effect on perceived social competence (i.e. how competent girls perceived themselves to be in terms of social status, being liked, being able to get along with others etc. (small-moderate effect) but no effect on perceived competence as a close friend (no significant effect) (Waldron, 2007).

Longitudinal Observational Studies

Three studies investigated the role of sport in shaping social development in different ways. In a creative study by Barber, Eccles and Stone, the characteristics of approximately 600 Michigan grade 6 students, including sports self-competence, were documented. These students were then followed up in grade 10 and asked to categorize themselves according to “identities” outlined in the then-popular movie “The Breakfast Club”: brains, jocks, princesses, basket cases or criminals. In a series of statistical tests undertaken to determine which activities discriminated most highly between groups, the researchers found that sports self-competence played a significant role in discriminating between groups in both boys and girls (Barber et al., 2001). In a second study of the same cohort of youth now followed into high school, they found that grade 10 sports participation predicted lower levels of social isolation; athletes were less likely to feel lonely or to have trouble fitting in with others (Mean difference on social isolation score: athletes (3.2) versus non-athletes (3.0); unable to calculate effect size). Findlay and Coplan (2008),
however, did not find an effect of sport participation on loneliness 1 year later in their study of 355 8-11 year-olds (Findlay & Coplan, 2008).

Cross-Sectional Studies

Six studies examined cross-sectional relationships between youth sport participation and social outcomes. McHale et al. (2005) surveyed 423 12-13 year-olds cross-sectionally and found that boys and girls who had been involved in an organized team sport ever or in the last year had significantly higher scores on social competence (moderate effect) and lower levels of social withdrawal or shyness (moderate effect) (McHale et al., 2005). Another study of 356 younger children aged 10-14 found that children who participate in organized sports were also more likely to participate in other prosocial activities, such as organized nonsport activities, music or volunteer work (Duncan et al., 2002). Furthermore, in a study of grade 4 students, Fletcher et al. found that sports involvement in children’s spare time was a significant unique predictor of psychosocial maturity as measured by teachers (small effect) (Fletcher et al., 2003). Kirkcaldy and colleagues’ 2002 study of 988 youth aged 14-18 found that participation in endurance sports was associated with somewhat fewer self-reported social problems (small effect) as measured using the Child Behaviour Checklist (CBCL) (Kirkcaldy et al., 2002). Only two studies failed to find even small cross-sectional associations between sport involvement and social outcomes: Sanders et al. found no association between sport involvement (low/moderate/high) and scores on an relationship questionnaire regarding parents and friends in a small study of high school seniors (Sanders et al., 2000). Findlay and Coplan (2008) failed to find concurrent relationships between youth involvement in sport and ratings of loneliness in children aged 8-11 (Findlay & Coplan, 2008).

Summary
children’s social skills and well-being can be monitored over time according to their developmental stage, there are relatively few studies examining the impact of sport on this developmental domain. Those that do address the effects of athletics in shaping children’s social abilities and worlds measure a very diverse range of outcomes. According to the longitudinal studies above, there is preliminary evidence that youth participation in sport plays a significant role in decreasing their levels of loneliness and helping them to feel more included among peers. Children’s sense of sport competence may already affect how they broadly perceive themselves in terms of their high school identity.

Furthermore, as shown in the sports and academics literature, high school youth who participate in sport are more likely to identify other school-oriented and university-bound adolescents as their primary peer group. Further research is needed to investigate how athletic involvement affects children’s cooperation with others, their moral reasoning, their relationships with adults and their ability to form and keep friendships.

YOUTH INVOLVEMENT IN ELITE ATHLETICS

Elite athletes are often defined as those who participate at national or international levels successfully over a period of time or who train and compete professionally in leagues. Among youth and adolescents, these may involve novice, junior or senior levels of experience. There are many reasons why the effects of participation in sport may differ for elite versus nonelite athletes: greater physical and cognitive demands, greater number of training hours, higher-intensity competition, a more highly skilled pool of individuals against whom to compare oneself, fewer hours with family and friends and less time to engage in a wider range of extracurricular activities may affect young athletes’ development for better or for worse. It is
research findings on general sport participation apply directly to this group of young athletes.

So what does the peer-reviewed academic literature say about the benefits or drawbacks of participation in elite sport on children’s emotional, academic and social development? Unfortunately, significantly fewer studies have examined the impact of elite sport, particularly among children before puberty, on the developmental trajectories of young people. For example, we know little about the effects of elite sport involvement on academic or social outcomes. This review will therefore outline the small number of studies that have addressed how young people in elite athletics fare with respect to certain aspects of emotional development, namely eating behaviours and attitudes, and self-esteem.

Mental Health

Considerable controversy has existed in the popular media and research literature regarding the effects of participation in elite sport and disordered eating or weight restriction, particularly for “leanness” sports requiring smaller, thinner builds for optimal performance. Eating disorders are particularly important outcomes because they confer the highest mortality rates of all psychiatric disorders. In a 1999 meta-analysis of studies that investigated the relationship between female athletics and disordered eating, Smolak et al. (1999) found no effect overall of athletics on eating behaviours in high school students (ES = -0.06, no effect) and found a protective effect for nonelite athletics – students who participated in sports, but not at a national or international level, had lower rates of disordered eating than nonathletes (small effect). However, athletes involved in dance or performance sports (ballet, aerobics instructors, cheerleaders) were significantly more likely to have such problems (moderate effect). Furthermore, “leanness athletes” (gymnasts, figure skaters, divers, marathon runners, “weight

54
athletes) were also significantly more likely to be diagnosed as having eating disorders or to score more highly on measures of disordered eating (small effect), particularly if competing at an elite level (moderate effect). However, the authors of this study warned that the overall quality of the research reviewed was variable and often fairly poor (Smolak et al., 2000). These findings were later supported by a higher quality study of 186 Norwegian elite female athletes aged 13-39 compared to nonelite athletes and nonathletes, which found that 46.7% of leanness sport athletes scored highly on disordered eating scales compared to 19.8% of non-leanness sport athletes and 21.4% of controls (Torstveit et al., 2008). Studies therefore support possible protective effect of sport involvement on body image and disordered eating among general and elite athletes, with the exception of those involved in aesthetic or leanness sports, who appear to be at significantly higher risk.

While elite athletes are without a doubt particularly gifted with respect to physical fitness and athleticism, some researchers have become interested in whether this in turn translates into improved self-esteem. While such individuals, from an early age, are identified as being particularly talented, they are also exposed to increased scrutiny, competition and highly talented peers. Marsh et al. compared elite athletes, the majority of whom were aged 16-25 on a multi-dimensional scale of self-concept. Compared to nonathletes, elite athletes had much higher physical self-concept (ES = 0.76, large, for males and 1.8, very large, for female athletes). The global self-esteem of female elite athletes was moderately larger than that of female nonathletes (moderate effect) with smaller effects for male athletes (Marsh et al., 1995). Elite athletes also rated themselves as having higher self-concept with respect to same sex relations, opposite sex relations and parental relationships. Although few studies exist to date, and no studies were
of pre-pubertal elite athletes, competing at a high level may have beneficial effects for self-esteem.
In summarizing the literature regarding physical activity, participation in organized sport and involvement in elite athletics, one can conclude that the literature is mixed and where effects consistently occur for positive developmental outcomes, they are often fairly small. While many reasons exist for these findings (including substantial variation in the quality of studies) it is particularly important to note that it is not just whether young people access sports programs but also how these programs are run, where they are offered and who is leading them. The context or mechanisms of sport delivery likely play key roles in how children are affected. The "who" also involves who is participating: children and youth bring their own experiences, temperaments, emotional and behavioural strengths and vulnerabilities with them to practices and games. The effects of sport on child development are therefore bi-directional in many ways: children’s individual traits affect how they interact with coaches and peers and how they experience sport while multiple other factors such as coaching style, parental pressure, peer groups and the neighbourhoods in which sport is offered shape a child’s individual development over time. Figure 1 illustrates these relationships. In this diagram arrows are shown as unidirectional but are likely bidirectional for most children.

**Who delivers program**

A very small number of studies have investigated key aspects of how sports programs are delivered and whether this affects child and youth outcomes. Most obviously, the coach-athlete relationship has been examined in some studies investigating the experience of young athletes. In the first, 677 Norwegian male and female soccer players aged 10-14 were surveyed cross-sectionally; athletes with coaches who emphasized social comparison and winning were more likely to report poorer self-perceptions of soccer competency and increased perfectionistic
American study of 312 competitive elite U.S. team swimmers aged 10-18 investigated different ways in which coaches responded to swimmers’ desirable and undesirable performances. They found that athlete reports of performance-contingent encouragement and information from coaches were associated with greater success, self-competence, motivation and effort, whereas criticism was negatively associated with such outcomes and praise unrelated to specific performance had no effect (Black & Weiss, 2008). Rutten et al. (2008) surveyed 331 boys aged 9-19 years old in 11 soccer clubs in a study looking at team- and individual levels of influence on antisocial and prosocial behaviour on and off the field. While individual differences between players contributed the greatest amount to variation in on-field behaviour, contextual variables such as teams and coaches played a small but significant role (8% of variance in on-field antisocial behaviour, 14% of on-field prosocial behaviour). Increased coach emphasis on fair play was associated with less on-field antisocial behaviour (small effect) and increased relational support by the coach was significantly related to increased child prosocial behaviour on the field (small effect). Even more striking was the influence of coaching and team contextual elements on off-field antisocial behaviour (e.g. in locker room), which accounted for 21% of the variance in antisocial behaviour; relational support by the coach and sociomoral reasoning about sports dilemmas were both associated with decreased negative off-field behaviours by athletes (small effects) (Rutten et al., 2008). In a 1988 study, Brustad found that the motivational climate (emphasis on winning/losing) developed by coaches and organizations, along with parental pressure, accounted for the greatest unique variance in children’s enjoyment of playing in an organized basketball league, whereas winning or losing, perceived competence, self-esteem or actual ability had no effects (Brustad, 1988). Although few in number, studies indicate that the
and the competitive philosophy of the coach and team significantly influence children and youth’s experience of sport in terms of enjoyment and friendships, perceived competency, sport anxiety and individual behaviours. More studies are needed comparing athletes versus nonathletes in order to determine if coaching helps to explain potential differences between these youth.

**Where program delivered**

In discussing aspects of program delivery, some broader parallels may be drawn between sport research and youth extracurricular activity involvement that may impact in important ways on child and adolescent outcomes. For example, in examining links between after-school activities (sports, arts, community clubs, religious groups) and developmental outcomes such as anxiety/depression, delinquency and substance use in 1,315 Chicago youth aged 9- and 12- years old over 6 years, Fauth, Roth and Brooks-Gunn (2007) found that participation in community-based clubs was associated with increased anxiety and depression in violent neighbourhoods; the safety and location of particular programs therefore affected whether or not a child was helped or harmed (Fauth et al., 2007). The effects of sports involvement may also be partly explained by peer group interactions. High school athletes are more likely to identify strongly with peer groups who are more school-oriented but who are also more likely to engage in high school drinking (Eccles & Barber, 1999). In a study of after-school activities, Mahoney and Stattin found that youth who participated in unstructured recreation activities (e.g. drop-in centers) were more likely to socialize with antisocial peers and were therefore more likely to participate in antisocial behaviours than those who participated in structured, organized activities (Mahoney & Stattin, 2000). The physical context, organizational structure, level of supervision and
Characteristics of peer group involvement are therefore essential elements of sports programs that may significantly impact upon child development over time.

**Child characteristics**

A child’s individual temperament and personality traits also affect his/her experience of sport: For example, a study of 207 children aged 9-13 in a youth basketball league found that self-esteem was the biggest predictor of sport competition anxiety, as compared to coaching or parenting behaviours, team wins or losses or actual ability (Brustad, 1988). Another longitudinal study found that young athletes’ self-concept was both a predictor and effect of actual performance: those with lower physical self-concept were more likely to perform poorly, which in turn reinforced their negative self-perception (Marsh et al., 2006b). Therefore, the individual characteristics that children bring to athletics programs may influence whether the experience confers benefit or harm and are therefore important to keep in mind when monitoring children’s enjoyment, progress and skill development over time.

**How program delivered**

Characteristics of sport that also affect outcomes include the intensity and duration of a child’s involvement. How much involvement becomes too much? Is there a point after which too many hours of sports training per week lead to harmful effects? Do children need to remain involved in sports consistently for a certain period of time in order to obtain the benefits of skill development, consistent coach and peer relationships and reinforcement of self-esteem? Researchers have only begun to examine these questions in a preliminary manner. With respect to intensity of involvement, Marsh and Kleitman found that higher levels of high school sports involvement were generally associated with more positive benefits academically with little evidence of deleterious effects on grades, enjoyment of school or likelihood of attending college.
of hours (Marsh & Kleitman, 2003). In a study of multiple types of adolescent after-school activities in 19,394 grade 10 students (including, but not limited to, sports), more intensive participation was also associated with greater educational, civic (volunteering, voting) and occupational success in early adulthood (Gardner et al., 2008). Furthermore, they found that youth who participated in organized activities for 2 years demonstrated more positive educational and civic outcomes than those who participated for 1 year, and few differences depending upon whether activities were high school-based or community-based. Although exceptions may exist for extremely high levels of participation (e.g. greater than 20 hours/week), in general the benefits of sport and other extracurricular participation appear to increase with more intensive involvement over a greater period of time.

Finally, for many youth, participation in sport is one of many activities in which they are involved; it is therefore important to consider the effects of athletics participation in relation to other activities in which children (and their parents) choose to spend their spare time. Is it best to focus more intensively on a smaller number of activities in order to maximize skill development and talent formation, or do children who train more intensively in sport miss out on the developmental benefits offered by, for example, music, leadership and volunteer activities? This debate highlights the importance of measuring *breadth*, or variety, of involvement in activities. Breadth may confer particular benefits by exposing youth to a variety of peer groups, coaches and different content domains that build upon different talents or skill sets. Fredricks and Eccles found that participation in a greater variety of activities was significantly associated with improved psychological outcomes over time in high school students (Fredricks & Eccles, 2006a). Simpkins et al. found also that breadth of activities was associated with fewer depressive symptoms and problem behaviours and greater self-worth, an association that was
largely explained by friends’ characteristics (Simpkins et al., 2008). These studies do not directly compare youth who participate more intensely in one activity, such as elite sport, compared to those involved in a wider number of different activities with respect to mental health, academic and social outcomes; such studies are required in order to comment more specifically on potential trade-offs. However, when considering the benefits of youth athleticism on child development, it is also important to weigh the potential opportunity costs of non-participation in a variety of other extracurricular activities and their unique contributions to child well-being and mental health outcomes over time.

HIGH FIVE

The High Five literature is consistent with the literature reviewed for this document. The importance of multiple factors influencing a child’s experience of participation could be highlighted.
1. It is commonly believed that participation in physical activity and sports has a range of positive benefits for children. This overstates the available evidence.

2. What we know about the impact of physical activity:

   While there is strong evidence linking physical activity with positive health in adults, the evidence in children is much more limited. Early physical activity helps children to acquire a basic movement foundation, which is needed for later activity participation.

   Physical activity appears to have a medium effect on self-esteem but little effect on anxiety and depression. However it is noted that exercise is an inexpensive intervention and there are no known negative effects of exercise.

   Involvement in physical activity, generally measured by physical education in school, is not associated with a negative impact on academic performance.

   We found no studies examining the relationship between physical activity and social relationships.

3. What we know about the impact of participation in sports:

   Children and youth who are involved in sport are less likely to be depressed and anxious, although this may reflect issues of selection (depressed/anxious children are more likely to opt out of sports) rather than causation. The research to date does not support strong statements about beneficial effects of sport on depression, anxiety or behavioural problems in youth.

   Participation in team sports, particularly in the high school context, may be associated with increased rates of alcohol consumption. Female involvement in non-leanness, non-elite sport may have protective effects against disordered eating and body image.
Why don’t we see stronger effects of sports on depression, anxiety and conduct problems, particularly in youth aged 6-12 years old? Psychiatric disorders tend to be caused by complex interactions between genes and environment that, once diagnosed in children, often require intensive and multi-faceted clinical interventions. For example, depression is much less common in children below aged 12 than in older teenagers; it is thought that genetics play a much larger role in child mood disorder. This is not to say that sports involvement may not play a protective role, but this would likely be as part of a multi-faceted solution. On the other hand, antisocial behaviour at high levels such as in conduct disorder, is thought to result from multiple risk factors and has been shown to require intensive, long-term and expensive interventions involving home, school and community; positive, consistent and longer-term sport involvement with positive peers and adult role models may play an important role of such an intervention, but it is unlikely on its own to change severe or chronic antisocial trajectories in large groups of children. Furthermore, many of the conclusions outlined in this literature review reflect characteristics of studies that may make it difficult to find strong results (positive or negative) for sport: Many of the studies measure participation in sport as yes/no; we know that the quality and context of sport experience affects outcomes. Furthermore, the majority of the studies are cross-sectional or 1-year follow-up studies: more time may be needed to detect the effect, say, of consistent childhood participation in sport on mental health in adolescence, which is a higher-risk time for many mood, anxiety, substance, eating and behaviour problems.

Studies do support small to moderately beneficial effects of sport on self-esteem; this is particularly important because low self-esteem and chronically negative self-perceptions are thought to be risk factors for problems such as anxiety and depression. Once mental health problems present in children at clinical levels (requiring medical or psychological intervention,
Involvement in sports has an overall beneficial effect on academic outcomes such as school performance, liking school, and years of post-secondary education. This has been hypothesized to be due to increased identification with, and commitment to, school particularly for high school team athletes. Students who are more intensively committed to extracurricular activities appear to have better academic outcomes. There is little evidence for negative effects of high levels of involvement in sport or other activities, except possibly for very high levels, and even at these levels the benefits appear to outweigh harm.

Involvement in sports has a varied effect on social development. Considerably less research has been carried out in this domain. Student athletes (particularly in high school) appear to be less socially isolated and report less loneliness. Furthermore, they are more likely to socialize with school-oriented peers, however also with peers who are likely to drink alcohol underage. Sports involvement appears to play an important role in the development of adolescent self-identity, which in turn impacts upon attachment to school, peer group formation and post-high school plans.

4. What we know about the impact of participation in elite sports:
Involvement in elite sports has an overall beneficial effect on self-esteem and self-concept, particularly for physical abilities among children and youth. Elite sport may have a slightly protective effect, or at least no negative effect, on eating disorders apart from participation in leanness sport (gymnastics, cheerleading, weight class sports, marathon running, aesthetic sports), which increase risk of disordered eating behaviours. Very little is known about rates of depression, anxiety, substance use or behaviour problems among elite child and adolescent athletes or the effects of overtraining or heavy competition on mental health.

Involvement in elite sports does not appear to have a negative effect on academic outcomes.

No studies have examined the effects of elite sport participation on the social development or social lives of children and youth, however peer group within sport plays an important role in enjoyment of elite sports experience.

Studies of youth involvement in general extracurricular activities (sports, arts, clubs, volunteers work) suggest that *breadth of involvement* may confer some protective effects on youth development. While no studies exist of elite athletes' involvement in other activities, it is important to consider that excessive focus on one activity may have important *trade-offs* in terms of skill development and identity formation from more varying participation in other positive youth development programs.

5. The context:

Coaching behaviours that are not excessively focused on winning, that are encouraging and offer information and feedback specific to particular performance are associated with greater enjoyment, greater prosocial behaviour and less antisocial behaviour in young athletes.
Multiple levels of contextual factors such as child self-esteem and self-concept, peer group characteristics, parental input and neighbourhood safety significantly affect child and youth experience of sport and must be monitored in any program. Coaches may need to pay greater attention to children with lower self-esteem, who may be less likely to appraise themselves positively with respect to their performance in sport and more likely to experience high rates of competition-related anxiety.

6. High Five Literature:

The High Five literature is consistent with the literature reviewed for this document. The importance of multiple factors influencing a child’s experience of participation could be highlighted.

7. What we don’t know:

We are lacking studies that use the best methodologies to generate research evidence. The hierarchy of study methodologies for sport interventions runs from systematic reviews (best), through randomized controlled studies, prospective controlled studies, retrospective case-controlled studies, and case studies (worst). More studies with stronger research methods are needed to move our understanding forward.

A range of other available studies have examined the association between participation in sports and specific outcomes. These studies provide a snapshot in time of the co-occurrence of sports participation and the specific outcome. From this type of study it is impossible to understand cause and effect (i.e., that participation in sports causes better health or vice versa).

Available studies also vary considerably in a range of other features. Studies vary by type of sport intervention. Differences in measurement also influence findings for example, variations in the intensity and frequency of sport involvement across studies (e.g., hours per day
or week), the setting of the intervention, the level of outcome that is being measured (e.g., mastery vs. participation, structured vs. unstructured), and the level of structure in the sport all contribute to difficulties comparing between studies.

Many of the studies we reviewed focus on older children (high school age). More studies are needed examining younger children (primary school age). More studies are needed for elite athletes.

8. What we suggest:

The relationship between physical activity/participation in sports and child outcomes is complex. Factors related to the child him or herself, the site of the activity, associated adult interactions and the method of instruction may all influence the experience and outcomes for the child. Both psychosocial risk factors (e.g., poverty), and genetic/biological risk factors (e.g., family history of depression) also have an impact on how children do. Further, special populations, such as children with specific physical or mental health problems, bring even more complexity to the relationship between physical activity/participation in sports and child outcomes.

In the absence of strong research to help understand the impact of participation in physical activity and sports on child mental health, social and cognitive outcomes, developmental principles should guide participation. Such principles include the following:

Every recreational and athletic community should ensure that the 4 broad determinants of healthy child development (Guy, 1997) are addressed: i) Protection — are the environment and activities safe for children? Are their needs for “child” activities such as free time, play and creativity met? ii) Relationships: Is the quality of the coach-athlete relationship emphasized? Is it nurturing and supportive? Are there opportunities to develop peer relationships? iii)
iv) Community: Are all children in the community making it into the programs offered, or are there significant barriers according to income, culture, gender or transportation? Are organizations thinking about the children who are not accessing their programs?

As children are continuing to grow and develop both physically and cognitively, adults working with children need to have a basic understanding of child cognitive and physical development. It is also important to realize that at a given age, there is a wide range in terms of what is considered normal with respect to growth and development.

Organized sports should match the developmental level of the participants, and include rules designed for health and safety.

Demands of a sport or physical activity should not exceed the capacity of a child at their age and stage of development. When demands of a sport or physical activity go beyond a child’s cognitive and physical development, negative feelings such as frustration and failure may result. Factors such as variety, freedom, fun, success, family participation, peer support and enthusiastic leadership are believed to encourage and maintain participation. Failure, embarrassment, competition, boredom, regimentation and injuries discourage participation.

In general, more research of higher quality is needed in this area. This includes intervention research comparing specific programs to normal activity (i.e., no addition of specific program) where participants are allocated to intervention or not in a non-biased method (e.g., like flipping a coin). Longitudinal research is also needed to determine whether effects seen in the short term are sustained and what factors influence participation in physical activity and sports over time. The effects of athletics involvement on early intermediate risk factors or
problem behaviours, social skills) need to be studied and followed over time. Studies including sports participation as part of a ‘package’ of interventions for kids with more severe problems may also be helpful.

There are specific areas where research is particularly sparse. These include young children and elite athletes. Studies of young children allow us to determine if benefits and potential harm of varying degrees of athletic involvement differ for younger versus older children. Furthermore, community interventions may be more effective at preventing problems or effecting change before emotional or behaviour problems become more chronic or entrenched; we know that the roots of many adult and adolescent problems occur in the early years, and that earlier sport participation increases the likelihood of later involvement. The study of elite athletes is important because the intensity of training, competition and lifestyle changes may lead to significantly different outcomes.

Initiatives that are undertaken at a community, provincial or national level to increase universality of access to athletics and of standards of quality in sport across geographic and socioeconomic strata should be welcomed. Setting developmentally appropriate standards for coaching (including technical aspects of teaching sport and standards for supportive, encouraging relationships), hours of training and rules for competition acknowledges that, as argued above, the context and delivery of sport affects whether it confers benefit, harm or no effect in the life of a child. It also makes the point that adults in society need to ensure that all children have access to safe, encouraging environments, positive relationships with friends and adult mentors and opportunities to develop their potential.
Setting more universal and transparent ways of teaching various sports at recreational and elite levels also enables and encourages research into the effects of such programs. Measurable outcomes are being more frequently requested to justify continued funding of a range of programs. This is likely to be true of programs of physical activity and sports that are not exclusively funded privately. Therefore, evaluation will become an increasingly important part of the physical activity/sports field.

One method of increasing research in this important area is to include an evaluation component with new programs that are undertaken. If change occurs gradually -- e.g. certain clubs in a community receive training before others then, one can compare the effects of putting in place new models and standards to the previous "community standards." If new programs or universal standards are expected to effect certain changes in the way sport is delivered AND hoped-for outcomes, then it is important to measure both processes. Are programs indeed changing the way they deliver coaching and competition? How faithful are clubs, teams or organizations to the model? Does this affect enrolment and retention of children and youth? Who is not joining up and who is dropping out? Are these program delivery factors related to the final outcomes, such as the development of elite athletes, improved health and well-being for participants, and healthier communities?


Bass, S. (2000). The Pubertal years: A unique opportune stage of growth when the skeleton is most responsive to exercise? Sports Medicine, 30, 73-78.


Guy KA. Our Promise to Children. Ottawa: Canadian Institute of Child Health; 1997.


Schwartz C; Waddell C; Harrison E; Garland O; Nightingale L; Dixon J. Prevention for Mental Disorders Children's Health Policy Centre, Faculty of Health Sciences, Simon Fraser University. Winter Issue 2007;176:471-472.


### TABLE 1

**Hierarchy of Study Designs**

<table>
<thead>
<tr>
<th>Level</th>
<th>Study Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Systematic reviews (summarizing multiple well-designed studies), or meta-analyses (combining studies with related research questions).</td>
</tr>
<tr>
<td>Level 2</td>
<td>Experimental or intervention studies — randomized controlled trial, on-randomized controlled trial</td>
</tr>
<tr>
<td>Level 3</td>
<td>Observational studies — Longitudinal (prospective cohort studies, retrospective case-control studies)</td>
</tr>
<tr>
<td>Level 4</td>
<td>Observational studies — Cross-sectional</td>
</tr>
<tr>
<td>Level 5</td>
<td>Case studies or expert opinion</td>
</tr>
</tbody>
</table>

Adapted from Schwartz, Waddell, Harrison, Garland, Nightingale, ÚDixon, 2007
FIGURE 1

Factors influencing child experience of physical activity / sports program

CHILD
(e.g., age, gender, biological risk)

WHO DELIVERS PROGRAM
(e.g., child-coach relationship)

EXPERIENCE

WHERE PROGRAM DELIVERED
(e.g., site, safety)

HOW PROGRAM DELIVERED
(e.g., frequency, structure)