Manuel J. Coelho e Silva
António J. Figueiredo
Marije T. Elferink-Gemser
Robert M. Malina
Editors

Youth Sports

Participation, Trainability and Readiness

IMPRENSA DA UNIVERSIDADE DE COIMBRA
COIMBRA UNIVERSITY PRESS

COIMBRA 2009

EDIÇÃO
Imprensa da Universidade de Coimbra
Email: imprensauc@ci.uc.pt
URL: http://www.uc.pt/imprensa_uc
Vendas online: http://siglv.uc.pt/imprensa/

CONCEPÇÃO GRÁFICA
António Barros

EXECUÇÃO GRÁFICA
Sereer, Soluções Editoriais

ISBN
978-989-8074-98-0

DEPÓSITO LEGAL
297937/09

OBRA PUBLICADA COM O APOIO DE:

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR Portugal

Sub-projecto PRONTALSPORT

Manuel J. Coelho e Silva
António J. Figueiredo
Marije T. Elferink-Gemser
Robert M. Malina
Editors

Youth Sports

Participation, Trainability and Readiness

IMPRENSA DA UNIVERSIDADE DE COIMBRA
COIMBRA UNIVERSITY PRESS

• COIMBRA 2009

Part 1:

PARTICIPATION

CHAPTER 1: ORGANIZED YOUTH SPORTS – background, trends, benefits and risks

Robert M Malina

INTRODUCTION

Sport is perhaps the most visible form of physical activity and is also a primary context for activity for the majority of youth of both sexes. Youth also generally identify physical activity as sport.

Sport participation also has high social valence which is evident in the fact that participation in sport is a feature of daily living for many children and adolescents the world over. Further, the number of adolescents competing in sports at national and international levels continues to increase and significant numbers of children and adolescents of both sexes begin systematic training and specialization in a sport at relatively young ages with the goal of attaining elite status. The success of youth at elite levels of sport, which is in reality a very small proportion of participants, highlights the need to distinguish discussion of youth sport between the overwhelming majority who participate and never attain elite levels and the highly visible talented minority. Unfortunately, attention and often resources, as well as commentaries in the print and electronic media, focus on this exceptional minority!

There is a need to better understand the role of organized sport in the lives of youth - the general population of children and adolescents who fill the rosters of youth sports programs throughout the world. Organized sport is only one of many demands in the daily lives of children and adolescents. Demands associated with family, friends, school, study, play, non-sport interests, among others, are realities of childhood and adolescence. These demands are superimposed on the process of "growing up" – physical growth, biological maturation and behavioral development. Where does sport fit into the process of "growing up"? Or, where does sport fit into the daily lives of children and adolescents?

On the other hand, there is also a need to better understand the role of sport in the lives of youth aspiring for elite status. Talented young athletes are a select group which differs from the general population in many domains. Nevertheless, they are children and adolescents with the needs of children and adolescents!

"Growing Up"

The processes underlying growth, maturation and development comprise the universal business of "growing up". These terms are often treated as the same; yet, they are three distinct tasks in the daily lives of children and youth for approximately the first two decades of life (Malina et al., 2004). Details of the three processes are discussed in Chapter 15 (Volume 2). Of importance to those who work with young athletes is the need to recognize that the three processes, growth, maturation and development, occur simultaneously and interact to influence self-concept, self-esteem, body image and perceived competence and also skills and behaviors related to a sport or sport discipline. The three processes vary considerably within and among individuals, especially during the adolescent growth spurt and sexual maturation. The demands of sport are superimposed upon those associated with normal growth, maturation and development. A mismatch between demands of a sport, which are largely regulated by adults, and those of normal growth, maturation and development may be a source of stress among young athletes.

Historical Roots and Types of Programs

Sport can be informal or formal. Informal or "pick-up" sports are neighborhood competitions organized by and for children. They include the many street, lot and/or playground activities based on major sports, for example, street football (soccer), stickball (modification of baseball), street (roller) hockey, two on two basketball, and any number of ball games adapted by children to local neighborhood conditions. Informal sports have historically been a part of childhood and adolescence although the nature of the activities varied with cultural settings and changed over time.

Formal sports for youth, on the other hand, are organized which implies the presence of a coach and regular practices and competitions during the course of a season. Using the United States as an example, organized sport activities and eventually competitions for children and adolescents had their roots in two developments related to child welfare late in rapidly growing cities in the late 19th and early 20th centuries. The first was concern for the behavior of boys, specifically delinquency, and the second was the play movement and its concern with keeping children busy during free time. Sport activities were used to occupy the leisure time of boys and to keep them out of trouble. Some organized sport programs has their origins in the 1920s and 1930s. They were largely community based, including churches. Baseball and American football were the common sports. School sport also emerged at

the same time in several parts of the country to meet the interests primarily of boys. Of interest, inter- and intra-school sport programs had their origins in student organizations and were eventually co-opted by school administrators.

Organized youth sports as we know them today, especially children as young as 5 or 6 years of age, are relatively recent. Although sport competitions were organized in several cities, the founding of Little League Baseball in Williamsport, Pennsylvania, in 1939 by Carl Stotz was perhaps the most important event in the spread of community-based organized youth sports (Stotz and Baldwin, 1952). World War II slowed the development of Little League Baseball, but it rapidly expanded in association with the economic prosperity after the war and the development of suburbs around major United States cities. Inter-school sport competition within and between communities expanded with rapid population growth of the suburbs in the 1960s. From these relatively humble beginnings, organized youth sports have become, for better or worse, a major feature in the daily lives of youth in the United States.

It is reasonable to assume similar trends in the origins of youth sports programs in different areas or countries of the world. They likely have their origins in the historical roots of the more popular sports such as soccer (football) and in country-specific programs of physical education. The organizational nature of youth sport programs also varies compared to those in the United States.

Organized youth sport programs vary considerably and several types can be identified. Agency-sponsored programs youth sports programs are perhaps the most visible. They are sponsored by independent organizations which offer competitions in a variety of sports, e.g., Little League baseball, Pop Warner football (America), Police Athletic League track clubs, more recently YMCA soccer, and others. Agency-sponsored programs often involve a seasonal fee for participants. Recreational sport programs are community based and vary considerably in structure. In larger cities, for example, recreational basketball leagues are often highly structured. School sport programs are also community based. Interscholastic or inter-school competitive sport is currently the dominant program; intramural or within-school programs are very limited in most communities. Both recreational and school sport programs are publicly funded. Sport-specific clubs and in some cases academies are more recent forms of organized sport for youth. Focus is ordinarily on a single sport and participation is fee based. Most visible clubs sports are gymnastics, figure skating, swimming and tennis; more recently, youth soccer has adopted the club model. Although clubs are often aimed at the general population of youth, current emphasis is more often on the talented.

In contrast, sport programs for youth in other areas of the world vary considerably in structure and operation. Sport federations generally have national governing bodies and have a top-down approach in sport from the elite or national teams to the local level. Sport clubs offer programs from the local to the professional levels and many have academy programs for the popular sports. Other sport programs for youth are found in schools which often have sport clubs and competitions, in communities which include sport programs for the general population, and in commercial clubs, i.e., for profit, which may be largely recreational.

Trends in Sport Participation

Trends in sport participation with age during childhood and adolescence vary among surveys and countries. Data are lacking globally and current interest is more focused on monitoring physical activity and inactivity. Variation in statistics reflects in part problems related to measurement and definition, and in the structure of sport programs in different countries. In the United States, sport participation statistics are driven in part by the sporting goods industry and of course the extensive interscholastic sport programs in American high schools.

The National Council of Youth Sports (2001, 2008) reported a slight increase in youth participants ~6-18 years of age from 38.3 million in 2000 to 40.0 million in 2008. The estimates approximated 73% and 76%, respectively, of kindergarten through grade 12 (high school) enrollments in the United States. More boys participated in sport (63%, 66%) than girls (37%, 34%) in 2000 and 2008, respectively.

The Sporting Goods Manufacturers' Association (2001) reported that 54% of youth 6-17 years of age participated in at least one organized team sport in 2000. This figure translated to about 26 million youth 6-17 years. Of interest, 44% of youth played only one team sport; does this represent a trend to early specialization? On the other hand, 30% played two sports and 26% played three or more sports. Statistics of the Sporting Goods Manufacturers' Association for 2005 (as reported in Farrey, 2008) indicated an almost identical estimate, 26 million youth 6-17 years of age (54%) played at least one team sport. On the other hand, an estimated 10 million youth played only in a non-organized team sport (21% of the 6-17 year population) and 12 million (25%) did not participate in any team sport. Compared to 1990, estimated numbers of participants in basketball, softball and baseball in 2005 declined while the number of participants in soccer increased (Farrey, 2008).

The National Federation of State High School Associations also keeps statistics on participation in interscholastic sport in the United States. In the 2005-2006 school year, an estimated 7.16 million high school youth in grades 9-12 participated in interscholastic sport activities, about 59% males and 41% females (National Federation of State High School Associations, 2006). The estimate includes more than 45 competitive activities, but the majority of participants is in five sports. Among boys the five sports accounting for 71% of all participants were American football (1,071,775), basketball (546,335), track and field (533,985), baseball (470,671) and soccer (358,935). The five sports accounting for 67% of all female participants were basketball (452,929), track and field (439,200), volleyball (390,034), fast pitch softball (369,094) and soccer (321,555). In all likelihood, the numbers are to some extent an overestimation. In smaller communities, many youth participate in multiple sports. For example, in a rural high school with a grade 9-12 enrollment of 310 students, 126 students (41%) accounted for "239" participants in interscholastic sport. Among 82 boys, 48% participated in two or three sports while 8% participated in four sports; among 44 girls, 52% participated in two or three sports (Malina, unpublished data).

Sport programs vary among countries, in accessibility and cost, and in degree of sport specialization and participant selectivity (Heinemann, 1999). In addition, data for other countries use a variety of estimation strategies. Sport England (2003) surveyed a sample of 3028 youth in school years 2-11 (approximately 6-16 years of age). Parents completed a questionnaire for those in years 2-6, while youth in years 7-11 completed the questionnaire. Frequent participation in sport out of school lessons was defined as at least 10 times per year. Estimated numbers of participants are based on the number of children 6-16 years in all schools in August 2002 (www.dfes.gov.uk, Statistics of Education 2003). The percentages of boys reporting frequent participation in sport and estimated numbers were as follows: team games 68% (2.3 million), swimming and diving 48% (1.6 million), athletics and gymnastics 43% (1.4 million) and racket sports 33% (1.1 million). Corresponding estimates for girls were: swimming and diving 55% (1.8 million), athletics and gymnastics 48% (1.5 million), team games 39% (1.3 million), racket games 28% (0.9 million), and dance and ice skating 26% (0.8 million). The data for England also include a category labeled outdoor adventure sports which attracted 62% of boys (2.1 million) and 57% of girls (1.8 million). Sport out of lessons was done in several settings: youth clubs or other organizations (55%), sport club outside school (43%) and extracurricular school programs (42%).

Among Australian youth, about 1.6 million children 5-14 years of age participated in school-, club- or association-sponsored sport outside of school hours in 2000 (Australian Bureau of Statistics, 2003). More males participated than females, and the most popular sports were soccer, swimming, Australian

rules football and cricket among boys and netball, swimming, tennis and basketball among girls.

Sport participation among youth varies with age. Among American youth in the late 1980s, there was a steady decline from 10 to 18 years in participation or the intention to participate in organized sport outside of school (Ewing and Seefeldt, 1989). The trend for team sports also suggested a slight decline in later adolescence compared to younger ages among American youth. The proportion of participants in team sports reported by the Sporting Goods Manufacturers Association (2001) was as follows: 6-8 years (24%), 9-11 years (27%), 12-14 years (28%), and 15-17 years (21%). The decline with age comes as no surprise as selectivity increases with age for most sports and interests of youth change.

Change in participation with age across childhood and adolescence shows variation by country; several samples will suffice. Daily participation in sport club training declined from 9 to 21 years, while participation twice per week declined from 12 to 18 years among Finnish youth (Telama and Yang, 2000). The percentage of Italian youth in 2000 who regularly practiced sport increased from 48% at 6-10 years to 53% at 11-14 years and then declines to 41% at 15-19 years (Istituto Nazionale di Statistica, 2005). Among Australian youth, participation in organized sport peaked at 11 years and then declined through 14 years of age (Australian Bureau of Statistics, 2003).

In contrast, limited data indicate no adolescent decline. A sport participation score increased from 10 to 18 years in a national sample of Portuguese boys and girls (Seabra et al., 2007), while in a small sample of Dutch adolescents followed longitudinally from 13 to 16 years and then observed at 21 years of age, there were no age differences in participation in organized sport, while participation in non-organized sport declined over this interval (Van Mechelen et al., 2000). The variation among studies probably reflects methodological differences. Sample representativeness is a concern in longitudinal studies.

What Are the Objectives of Youth Sports Programs?

Objectives of youth sport programs emphasize the enjoyment, well-being, fitness and health of participants. Stated objectives are ordinarily subsumed under several broad categories related to the development of (1) general and sport-specific movement skills; (2) physical fitness; (3) habits of regular physical activity; (4) social interactions with teammates, opponents and adults; (5) understanding of self; and (6) a sense of sportsmanship and fair play. More recently, youth sports are being heralded as a potentially important means to

combat the worldwide epidemic of childhood overweight and obesity through the provision of regular physical activity.

The identification and development of elite athletes has not been and is not an objective of most youth programs. However, some programs have as their objectives the identification and development of talented athletes. This is evident in talent identification programs in general; in sport-specific academies as in tennis and soccer; select teams as in basketball, soccer, baseball, softball, and so on; sport-specific clubs as in gymnastics, figure skating, tennis, and perhaps ballet; and special sport-specific summer camps and leagues in some countries. Although there is overlap among the examples listed, the emphasis is clear – preference for identification and development of talented young athletes.

Whether or not youth sports programs attain their objectives has not been systematically evaluated. Critical appraisal of potential benefits and risks associated with participation in youth sports provides a means of evaluating programs in general, recognizing, of course, that each program is unique.

Potential Benefits of Participation in Organized Sports

Skill Acquisition and Development

Improvement of motor skills in general and sport-specific skills is often a primary objective of youth sports programs ranging from those at the community level to more advanced sports schools and academies that ordinarily focus on a single sport. Improvement in sport skills is also a major motivation for children and adolescents to be involved in sport (Ewing and Seefeldt, 1989; see also Chapters 3 and 4, this volume). Given the importance placed upon skill acquisition, improvement and refinement in sport, it is somewhat surprising that the youth sport literature that deals with issues related to skill development of youngsters is not more extensive. In contrast, there is major focus on the development of expertise, often with talented and elite young athletes (Malina, 2008a; see also Chapter 9, this volume).

Improved Physical Fitness

Youth who are regularly active, including those in sport programs, tend to have higher levels of aerobic fitness compared to less active youth (Strong et al., 2005). Experimental aerobic and resistance training programs are associated with significant gains aerobic endurance and muscular strength and endurance, respectively (Strong et al., 2005; Malina, 2006a). Although these

data are not based on youth involved in specific sport programs, both aerobic and resistance training are often recommended for participants in many sports. Aerobic fitness is especially well developed in many adolescent athletes in sports with a high endurance component, e.g., distance running, swimming, cycling, soccer, ice hockey (Malina et al., 2004a). Issues related to the trainability of components of fitness are discussed in more detail in Chapters 9 and 10, this volume.

Physical Activity on a Regular Basis

Organized sport provides opportunity for physical activity on a regular basis and in a safe environment. Sports vary in intensity and continuity of activity. Team sports such as soccer, basketball, ice hockey and field hockey involve more or less reasonably continuous activity which varies in intensity during a match, while sports like baseball and American football involve intermittent activity among frequent periods of relative inactivity. Among individual sports, intermittent activity is characteristic of gymnastics, diving, racket sports and some field events in athletics, while continuous activity is a feature of swimming and running events in athletics.

The preceding are generalizations. Specific information on the activity status of youth involved and not involved in sport is somewhat limited. Among youth 12-14 years of age, evaluation of three day diary records indicated that boys and girls involved in organized youth sports expended, on average, more overall energy (total daily energy expended in absolute terms and per unit body mass) and energy in moderate-to-vigorous activities (≥ 4.8 METs) than non-participants (Katzmarzyk and Malina, 1998). Youth sports participants also indicated less television viewing time. Though limited to a single community in mid-Michigan which was surveyed in January and February (there may be variation by season of the year), the results suggest a greater level of physical activity and less time in one form of inactivity in participants compared to non-participants. In a more recent study which included accelerometry for a subsample of boys 6-12 years of age, participation in youth sport accounted for about one-fourth of 110 minutes of moderate-to-vigorous physical activity in the day (Wickel and Eisenmann, 2007). About one-half of time in youth sport was spent in sedentary and light-intensity activities (~52%), while time in moderate and vigorous activity was 27% and 22%, respectively. Time in moderate-to-vigorous physical activity on the day in which boys participated in sport was about 30 minutes greater than on the non-sport day, which highlights the potential contribution of participation in youth sport to daily physical activity.

Other data show similar trends. Although limited to questionnaire information, sport participants were also more physically active than non-

participants among rural South Carolina youth primarily 11-12 years (Trost et al., 1997), South Carolina girls about 13-18 years (Pfeiffer et al., 2006) and Finnish twins 16-18 years (Aarnio et al., 2002). Adolescent athletes 16-19 years of both sexes also had greater daily energy expenditure and energy expenditure in physical activity than non-athletes (Ribeyre et al., 2000).

Allowing for variation in the frequency, duration and intensity of physical activity associated with different sports, the important point is that youth involved in sport tend to me more physically active on a regular basis. And, regular physical activity, especially activity of moderate-to-vigorous intensity, is associated with health and fitness benefits (Strong et al., 2005). Several of the benefits – weight control, less adiposity, increased bone mineral content, improved aerobic capacity and muscular strength and endurance, and enhanced self-concept – are discussed subsequently.

Transfer to Adult Physical Activity

Although nor ordinarily indicated as an objective of youth sport programs, participation in sports during adolescence tends to track at higher levels than other indicators of physical activity (Malina, 2001). Tracking refers to the stability of a characteristic, in this case level of physical activity or participation in sport. Tracking is also related to prediction. Can adult physical activity be predicted from activity or sport participation during childhood and adolescence? Sport club membership (by inference, participation) tracks at a higher level than other indices of physical activity among Finnish adolescents and young adults (Telama et al., 1994, 1997). Further, the frequency of participation in sports at 14 years of age (Tammelin et al., 2003), membership in sport clubs at 16 years of age (Barnekow-Bergkvist et al., 2001) and sport club training and competition during adolescence (Telama et al., 2006) significantly predict physical activity in young adults of both sexes (late 20s-early 30s). The preceding observations are derived from Scandinavian countries. In the Michigan Study of Adolescent Life Transitions which sampled subjects at 12, 17 and 25 years of age, sport participation in childhood (time spent on sports) and adolescence (time in sports, kinds of after school activities) was a significant predictor of sport and physical fitness activities in young adulthood (Perkins et al., 2004).

Given the strong association between adolescent participation in sport and adult physical activity, more attention should be given to this context of physical activity among adolescents. An association between sport participation during adolescence and "psychological readiness" for physical activity in adulthood has been proposed (Engstrom, 1986, 1991) and highlights the need for study of the process through which participation in sport during adolescence translates into an active lifestyle in young adulthood. This issue is

especially relevant as many surveys indicate a decline in sports participation during adolescence (see above) and sport programs tend to become more selective. The results indicate a need to modify sport programs to accommodate youth with a wide range of skills. Many European countries have adopted such a focus as evident in a "sport for all" theme that contrasts interscholastic sport programs in the United States which become quite exclusive during adolescence. Sport offerings for youth with lesser skill or with less interest in elite competition are often limited in many communities in the United States.

Regulation of Body Weight and Composition

Regular physical activity associated with sport has the potential to favorably influence body weight and composition. Much of the focus, however, is on adiposity and there are more data for relatively elite young athletes in contrast to youth sport participants. Youth who are relatively high in physical activity tend to have less adiposity measured as skinfolds, percentage body fat and the BMI (Strong et al., 2005), whereas young athletes in a variety of sports, however, tend to have less adiposity (Malina et al., 2004). The contrast between athletes and non-athletes in percentage body fat is more apparent among females than males. There is variation among sports and some positions or disciplines within a sport, e.g., throwing events in track and field, linemen in American football (Malina, 2006b, 2007).

Youth Sports and the Prevention of Obesity

Organized sport is increasingly indicated as a potentially important context of physical activity to combat the epidemic of obesity among youth. In announcing the Youth Olympic Games: "The International Olympic Committee, *in an effort to fight childhood obesity and other problems associated with inactivity among children*, on Thursday voted to stage Youth Olympic Games modeled after the Olympics" (Michaelis, 2007, italics mine). It is not clear how an event modeled after the Olympics, i.e., for talented adolescent athletes, will combat obesity in the general population of youth throughout the world!

Two questions, perhaps among others, surface in this context. First, is the physical activity associated with youth sports of sufficient duration and intensity to prevent unhealthy weight gain (adiposity) in those of normal weight and thus prevent overweight and/or obesity, and to bring about a reduction in adiposity in those who are overweight and obese? Active youth and adolescent athletes have, on average, less relative fatness than the general population of youth. Experimental activity programs in normal weight youth appear to have a minimal effect on adiposity, while physical activity

interventions with overweight and obese youth result in reductions in overall adiposity and abdominal adiposity (Malina, in press). The beneficial effects of activity programs on fatness in obese youth are lost when the interventions are stopped. In other words, continued regular activity is essential although the amount of activity needed to maintain the benefits of interventions with obese youth is not known.

Second, are sports as presently constituted and practiced suitable for the obese? In other words, will obese youth have equal opportunities in sport compared to normal weight youth? Most youth sports as presently offered are not user friendly for the overweight and obese. American football, wrestling and weight events in track and field athletics are exceptions. These sports have a place for boys (and girls in track and field), who may be overweight and/or obese. However, given the value placed upon large size and mass per se, it is possible that these sports may place some participants at risk for persistent overweight or obesity.

A major issue is getting overweight and obese youth involved in sport programs. Limited movement capacity and proficiency may be major constraints. Excess body mass or fatness associated with obesity has a negative influence upon performances in motor and fitness tests which require movement or projection of the body. On the other hand, isometric and isokinetic strength are greater in obese compared to non-obese youth, reflecting the absolute size advantage of the obese. Limited proficiency in motor skills may limit access to or the experience of success in youth sports. Obese youth are often less proficient in motor skills and components of physical fitness which may reduce the likelihood of experiencing success in a sport (Malina et al., 2004a). If the objective of the Youth Olympics is to be attained, modification of sports programs to accommodate the special needs of overweight and obese youth is essential.

Improved Skeletal Health

Bone is a feature of body composition that is currently a focus of attention specifically in the context of preventing osteoporosis later in life. In general, the more mineral accumulated in the skeleton during growth and maturation, the better off the individual three or four decades later when mineral context of the skeleton begins to decline. And, regular physical activity has a beneficial effect on bone mineral content and bone mineral density. This is apparent in many studies of youth, including comparisons of athletes and non-athletes and retrospective studies of childhood and adolescent sport activity, relative to adult bone mineral content (Strong et al., 2005). Moreover, retrospective studies of athletes in racket sports highlight the beneficial effect of early onset of training on bone mineral content (Kannus et al., 1995).

Psychosocial Outcomes.

Social interactions with teammates, opponents and adults in and through sport experiences are generally assumed to benefit the psychosocial development of participants. Although there is considerable discussion of psychosocial outcomes associated with participation in youth sports, a good deal of the literature does not deal with outcomes per se. Much of the emphasis is on social influences – parents, coaches, peers – in contrast to the influence of sport on aspects of psychosocial development such as self-concept and self-esteem, perceived competence in sport and social interactions, peer interactions, parent-child and coach-child relationships, values of fair play, and so on. Sport-related issues dealing with parents and coaches are discussed in more detail in Chapters 6 and 7 (this volume).

Self-concept and its different domains is a behavioral outcome that has received most attention. Self-concept refers to the perception of self, whereas self-esteem refers to the value placed on one's self-concept. Self-concept comprises several domains—academic, social, emotional, physical, sport competence and appearance. The structure of self-concept changes with age and becomes more clearly differentiated in the transition into puberty and during adolescence. In cross-sectional studies, physical activity is positively correlated with global and physical self-concept, but weakly correlated social, emotional and academic self-concepts. Quasi-experimental studies indicate strong positive effects of physical activity on global self-concept and specific domains of physical self-concept, appearance and sport competence; on the other hand, effects on the social and academic domains of self-concept are rather weak (Strong et al., 2005). Although sport activities are positively associated with global self-concept and perceived sport competence, they also have the potential for negative influences. Two key factors in this context are outcome (i.e., winning or losing) and quality of adult involvement, specifically coaches per se and coaching styles (Smoll and Smith, 2003).

Identifying other psychosocial outcomes associated with participation in youth, sports, and of course measuring them, is more challenging. A good deal of the research has focused on potential influences of adults – coaches and parents – in contrast to the potential influence of sport per se on behavioral development. Less research has focused on peers as important agents in psychosocial outcomes associated with sport. This may be expected given the degree of adult involvement in youth sports and the quality of adult-youth interactions in the context of sport. Research on parents has focused on expectations and pressures, perceptions of competence, goal orientation, responses to performances of their child, degree of involvement, role

modelling, and son on (Brustad, 2003; Weiss, 2003). Research on coaches has focused on the coach as a source of information about sport competence, the frequency and types of feedback to young athletes and the effects of coach education on the quality of youth sport experiences (Weiss, 2003; Smoll and Smith, 2003). An additional concern, specifically in North America, is the dual role of the parent-coach. The earliest sport experiences of many youth occur under the guidance of parent-coaches.

Coaches who are supportive and who emphasize learning and improvement (a mastery-oriented climate) facilitate beneficial psychosocial outcomes, e.g., perceptions of competence, sport enjoyment, positive friendships, and so on. Similar outcomes are associated with coaches who undergo a coach effectiveness training program (Smoll and Smith, 2003). Issues related to coaches are discussed in more detail in Chapter 5 (this volume) and Chapter 27 (Volume 2).

Much remains to be done to better understand and specific psychosocial outcomes associated with sport participation among children and adolescents. The complex interactions among young athletes, parents, coaches and peers in the context of a sport highlight the need for creative methodology to better understand the processes, interactions and potential outcomes.

Moral/Ethical Behaviors.

Participation in sport can be a vehicle for moral or ethical development. This is generally subsumed in the generic terms sportsmanship, fair play, being a "good sport" and character development, among others. Progress toward the development of morally competent behaviors includes the ability to recognize right from wrong, abiding by the rules of the game during practices and competitions, and respect for teammates and opponents. However, the potential influence of sport participation on the development of moral reasoning needs to be established (Bredemeier, 2003; Bredemeier and Shields, 2006).

Much remains to be done in understanding the contributions of participation in youth sports to moral or ethical development. A recent survey of 5th to 8th grade sport participants (~10-14 years) noted that 9% acknowledged cheating, 13% reported attempts to injure an opponent, 27% noted behaviors associated with being a "bad sport", and 31% reported arguing with game officials. Of interest, 7% of youth reported encouragement from their coaches to cheat, while 8% reported encouragement to injure an opponent (Shields et al., 2005). The use of prohibited performance enhancing substances by young athletes is a related issue. Though apparently not

widespread, a small but significant percentage of youth, athletes and non-athletes, have tried or have been enticed into using these substances (Faigenbaum et al., 1998; Laure and Binsinger, 2005). Of interest, parents, friends and even family physicians are indicated by the adolescents as the source of the performance enhancers (Laure and Binsinger, 2005).

Presently available evidence highlights the central role of coach behaviors, specifically deliberate attempts to teach ethical/moral values (Bredemeier and Shields, 2006). The role of the media and the high level sports culture also needs careful consideration in this context as what happens at higher levels often trickles down to lower levels. One wonders what message is sent to youth by "professional fouls" in soccer or the fact that virtually every foul towards the end of a basketball game is deliberate and at times flagrant. A college basketball broadcaster offered the following observation: "Intelligent fouling is a good strategy" (University of Illinois vs Michigan State University, 1 March 2009). This comment essentially translates as follows: deliberate violation of game rules is a good strategy! The line that separates strategy and cheating to gain an advantage in sport is indeed fine and becoming finer!

Other Social Outcomes

Other benefits have been attributed to sport participation, especially interscholastic sport, though the evidence is variable in quality. These include greater likelihood of staying in school and fewer absences from school (Marsh, 1993), reduced likelihood of being involved in delinquent behavior (Segrave and Hastad, 1982), and fewer risk-taking sexual behaviors and pregnancies (Sabo et al., 1998; Savage and Holcomb, 1999). Sport participation among youth is associated with a reduction in suicide ideation and suicide attempts (Oler et al., 1994; Women's Sports Foundation, 2000; Sabo et al., 2005; Brown et al., 2007). These associations, though interesting, need to be more critically evaluated in the context of the many factors known to influence adolescent behaviors.

Potential Risks of Participation in Organized Sports

Risk of Injury.

Children and adolescents incur injury in organized and unorganized sport, in addition to many other activities. Injuries can be classified as acute – fractures, sprains, strains, general trauma, and overuse – microtrauma associated with excessive repetition of specific sport activities. The latter are receiving considerably more attention given their increasing prevalence among youth

and organized youth sports are often indicated as the primary cause of overuse injuries. Issues related to definition, surveillance, epidemiology and risk factors for injury in youth sports are discussed in more detail in Chapters 13 and 14 (this volume).

Competitive Stress.

Discussions of potential psychological or behavioral risks associated with sport for children and adolescents are often set in the context of competitive stress. In fact, there has been concern for stress in organized youth sports since their inception. Stress is a physiological state and as such is beset with problems of measurement – physiological measures per se (heart rate, galvanic skin response, hormonal levels) and lack of correlation between paper and pencil scales commonly used in surveys of youth sport participants. A major factor is individual differences in the perception or lack of perception of stress.

Sport-related stress is generally transient depending on the flow of games or competitions. Stress is more accentuated in individual sports in which athletes compete or perform as individuals, e.g., gymnastics, figures skating, diving, swimming and distance running. Performance evaluations per se tend to be stressful, especially in the aesthetic sports; seemingly subjective judgments of adults evaluating the performances undoubtedly contribute to the stress. On the other hand, the greater number of athletes involved and the highly interactive nature of activities in team sports tend to diffuse responsibility so that the performance of any individual athlete is generally less conspicuous and performance evaluation is less of a threat. The buffer of team members may alleviate stress associated with mistakes and losing. There are, of course, situational exceptions such as the penalty shot in soccer and free throws in basketball. In contrast to actual competitions, it is more difficult to gauge stress in the training or practice environments of specific sports which are ordinarily under the control of coaches, each with their own style of teaching and training.

Potential consequences of competitive stress include lowered self-esteem, elevated anxiety, more aggressive behavior, injury, "burnout" (see below) and perhaps others. Factors associated with stress include failure; negative performance evaluations by coaches, parents and peers; and unrealistic expectations by self, parents and coaches.

The influence of interactions between biological and behavioral characteristics of young athletes in contributing to stress and potentially negative outcomes associated with sport has not received attention in the context of youth sport. The transition into puberty as well as sexual maturation per se and the adolescent growth spurt include major physical,

physiological and behavioral alterations. Puberty is often described as a period of physiological learning as youth adapt to the changes taking place in their bodies. Of relevance to sport, these changes often occur at a time when there is considerable emphasis on sport selection and specialization. Evidence of biobehavioral interactions associated with sport is apparent in social physique anxiety and disordered eating, especially among girls.

Attrition

Attrition or dropping-out is often indicated as a potential negative outcome of youth sports. It is often discussed in the context of the age-associated decline in sport participation and physical activity in general which is evident in many, though not all, studies (Malina, 2008b).

The concept of drop-out as a risk of participation in organized sport has a problem with definition. Does it refer to complete cessation of participation in a sport or physical activity? Does it include youth who leave one sport only to begin participation in another sport or in non-sport activities? Behavioral change associated with puberty and adolescence is a potential confounder. Changing interests (sport and non-sport) and changing and often conflicting demands of home, school, sport and social activities commonly occur. This is normal development!

Factors associated with cessation of participation include reasons not related to and related to sport. The former include loss of interest and lack of enjoyment in the sport, interest in non-sport activities, time requirements, time for study, and costs. Sport-related factors include lack of playing time, lack of success, limited progress in development of sport skills, lack of enjoyment, coach behaviors (favoritism, teaching style), poor training environment, unrealistic expectations, emphasis on competition and winning, and injury, among others. These are included among motives for discontinuing participation in sport among American (Ewing and Seefeldt, 1988) and Mexican (Chapter 3, this volume) youth. A relevant question that needs consideration is the following: How can sport be modified to meet the interests of youth and permit broader participation, especially during adolescence?

As youth pass from childhood into adolescence, many sports become more selective. Issues related to selection versus exclusion also need to be considered. Does "cutting" by a coach or sport program represent premature drop-out?

In many sports for boys, there appears to be discrimination by maturity level. For example, among youth soccer and ice hockey players, a

broad range of skeletal maturity is represented among younger participants 10-12 years of age, i.e., boys with both late and advanced skeletal ages are almost equally represented. However, among players 13-16 years of age, late maturing boys (skeletal age behind chronological age by more than one year) are less often represented (Malina, 2003; see also Chapters 16 and 18, Volume 2). Thus, with advancing chronological age and presumably experience, boys advanced in biological maturity are more common among adolescent players in soccer and ice hockey. This may reflect selection or exclusion (self, coach, sport system, or some combination), differential success of boys advanced in maturity, the changing nature of the games (more physical contact may be permitted in older age groups with an advantage for larger, stronger, more mature boys), or some combination of these factors. On the other hand, later maturing boys are often successful in some sports in later adolescence (16-18 years), e.g., track, basketball. This is associated with the catch-up in biological maturity and late adolescent growth, i.e., all youth eventually reach maturity, and with the reduced significance of maturity-associated differences in body size and performance of boys in late adolescence.

Later maturation, on the other hand, tends to me more common among successful young female athletes. Examination of the distributions of adolescent athletes by age at menarche shows a predominance of average (on time) and later maturing girls and a limited number of early maturing girls. The distributions may reflect selection practices in specific sports, e.g., small body size in gymnastics and figure skating, linear physique among distance runners, and so on; and differential sport success of girls late in maturation. Additional factors may relate to changes in proportions (relatively broad hips and shorter legs) and body composition (increased absolute and relative fatness) associated with sexual maturation in girls (Malina et al., 2004). The potential role of behavioral factors associated with variation in maturity timing and sport participation among girls needs study.

Burnout

Burnout is a concept that is commonly used in the context of high performance sports in both youth and adults. It refers to withdrawal from sport due to chronic stress. It is emphasized that burnout is not equivalent with drop out as discussed above. Burnout is sometimes described as "burning desire". It is not sudden in onset; rather, it develops over time and is frequently associated with perceptions by the young athlete that he/she cannot meet the physical and/or psychological demands placed upon him/her. Reduction in accomplishment in sport and associated rewards (i.e., no longer receiving them) are additional factors. Signs of chronic stress include behavioral alterations such as agitation, sleep disturbances, and loss of interest

in practice. Other manifestations include depression, lack of energy, skin rashes and nausea, and frequent illness (Weinberg and Gould, 1995; Gould and Dieffenbach, 2003).

Many factors are involved in the development of burnout. Three especially important factors are negative performance evaluations, which are usually critical rather than supportive; inconsistent feedback from coaches and officials, which often translates into mixed messages for the young athlete; and overtraining. A contributing factor is overprotection by coaches, trainers, parents and sport officials, which limits exposure of young athletes to new situations and thus opportunities to develop coping mechanisms and social relationships. Overprotection may foster feelings of lack of control, dependency and a sense of being powerless. Self- perceptions of not being able to meet expectations imposed by self and/or others are additional factors (Gould and Dieffenbach, 2003). Injury is often a contributing factor to burnout as the individual may not be able to perform in the sport that is important to him/her. It should be noted that sport-related conditions conducive to the development of burnout in youth are superimposed on and interact with the normal biological and behavioral demands of adolescence.

Compromised Growth and Maturation

Discussions of the merits of youth sport often include a caveat regarding potentially negative influences of training for sport on growth (size attained) and maturation (timing and tempo of progress to the mature state). Historically, sport training has been viewed as having a stimulatory or accelerating influence on the processes of growth and maturation. Given the expansion of youth sports specifically in the context of year-round training, increased training demands and national and international competitions, it is periodically suggested that systematic training for some sports may have potentially negative influences on growth and maturation. Concern is expressed more often for elite young athletes, especially girls. Although compromised growth and maturation as a result of intensive sport training during childhood and adolescence is often suggested in the clinical and popular literature, presently available data are do not support the assertions (Malina et al., 2004; see also Chapter 8, this volume).

Are Programs for the Talented a Risk?

The media often highlight the accomplishments of adolescent athletes in many sports. We have just come off an Olympic year (Beijing 2008) and young athletes for better or worse were the darlings of the media. What the media and Olympic Games highlight, however, are the extremely small number who make it through rigorous identification and development programs. Those

who do not make it through these rigors are rarely, if ever, mentioned. It is legitimate, therefore, to inquire if being labeled as "talented" in a sport at a relatively young age is a risk?

Being labeled as talented encourages early specialization and year-round training and participation in a single sport. A consequence is limited experiences with other sports and activities, which some involved in talent development would call "multilateral training". In many cases, year-round training in a single sport at a relatively young age often involves major compromises by and stresses on families. It is legitimate to inquire whether the youngster has a voice in the decision making. Likewise, what is the implication of being labeled talented on parental expectations? Some parents make take this as a cue to "market" their child!

Elite young athletes face potential risks in the social, nutritional, chemical and commercial domains. Social manipulation is perhaps most evident in preferential treatment of talented athletes by the respective sport systems, the media and perhaps schools. It is also evident in differential access to resources that favor the elite as in travel, tutors for school work, access to scholarships and others. On the other hand, the preferential treatment may lead to over-dependence on and/or control by coaches and sport organizations, and altered social relationships with peers, parents and family. A potential byproduct of excessive dependence of young athletes upon coaches and sport officials (and often blind faith and trust of parents) is potential for emotional abuse – verbal or non-verbal, physical abuse and sexual abuse and molestation. There is a need for vigilance and systematic monitoring and study of coaching/training environments in select/elite youth sport programs. Stresses associated with year round training and competitions are byproducts of these environments. A study of young female athletes noted that 3 of 27 highly trained gymnasts and 4 of 16 moderately trained swimmers were considered at risk for "a manifest mental disorder over time" (Theintz et al., 1994). Although the majority of athletes did not present problems, the need monitor the coaching/training environment is obvious.

Another form of social manipulation is age modification. Competition by age group is a feature of virtually all youth sports. The integrity of age-group competitions is based upon the assumption that reported ages are accurate and records of age (birth certificates, passports) are valid. Nevertheless, problems with accurate age reporting appear on a regular basis in youth sports (Malina, 2005) and with elite young athletes (Macur, 2008; Hogg, 2009). What is the source of inaccurate reporting or age falsification? It probably lies in the culture of sport with its emphasis on winning at all costs. And, who regulates sport, specifically youth in sport? Clearly, administrators,

trainers, coaches and others associated with sport including parents need scrutiny.

Dietary manipulation, both direct and indirect, is a concern in some sports. Some adolescents may institute self-imposed dietary restriction, especially in aesthetic sports such as artistic gymnastics, figure skating and ballet. Pressures, at times subtle, to maintain or lose weight by young athletes, especially in aesthetic sports and wrestling, when the natural course of growth is to gain weight, can lead to disordered eating and clinical eating disorders. At times, direct and indirect comments on body weight from trainers and coaches may serve as a trigger to disordered eating. On the other hand, dietary restrictions on elite young athletes come directly from sport governing bodies. In the former German Democratic Republic (DDR), for example, gymnasts were on a dietary regime "…intended to maintain the optimal body weight, i.e., a slightly negative energy balance, and thus a limited energy depot over a long period" (Jahreis et al., 1991, p. 98). Such intentional energy deficit is an abuse.

Chemical manipulation is seemingly rampant in sport. It can take several forms including dietary supplements (e.g, creatine, "fat burners" with caffeine as a major ingredient), diuretics to lose weight, stimulants, and of course performance enhancing drugs). The use of prohibited performance enhancing substances by young athletes is an issue. Though apparently not widespread, a small but significant percentage of youth, athletes and non-athletes, have tried or have been enticed into using these substances (Faigenbaum et al., 1998; Laure and Binsinger, 2005). Of interest, parents, friends and even family physicians are indicated by the adolescents as the source of the performance enhancers (Laure and Binsinger, 2005). Another form of chemical manipulation that may be on the horizon is "gene doping," an extension of gene therapy, in which genes with potential to improve performance are implanted into the cells of an athlete (Haisma and de Hon, 2006).

Sport merchandising is commonplace today. What is overlooked is the fact that young athletes are often the merchandise! This is commercial manipulation. Talented young athletes in many sports, in many cases under-age, are being regularly sought and are often exploited. Corporate money permeates developmental programs for young tennis players, e.g., the International Management Group tennis academy. Soccer, baseball, basketball and American football players are widely scouted and actively pursued at young ages. Many athletes are from lower socioeconomic backgrounds so that there is potential for exploitation of both the youngster and family. Sport, on one hand, is often placed ahead of education and on the other hand is the lure for promise of education (scholarships). Many clubs develop young

players for the international market (soccer in Africa and South America, baseball in the Caribbean) and jobs may be offered to families of talented youth to bypass official regulations. There is even discussion of international legislation to regulate sport agents and clubs, especially those pursuing under-age players (BBC News, 2007). Youth basketball coaches for select adolescent teams are often labeled as brokers as they often control access to college coaches. American high schools are, to some extent, a publicly subsidized (i.e., local school taxes) farm system for collegiate and professional basketball and American football and to a lesser extent baseball. Select soccer programs have a similar role in developmental tracks for professional soccer in the U.S. and national teams. Moreover, some high schools require minimal academic study, "diploma mills" (Thamel and Wilson, 2005) or focus only on basketball, fostering a "…culture of free agency" among youth players (Thamel, 2006).

Overview

Involvement in organized sport is a feature of the daily lives of children and adolescents the world over. Participation in sport has the potential for positive and negative experiences and outcomes in youth. The line between potential benefits and risks may be quite fine. In many instances, increased risks are associated with adult behaviors and expectations and the systems for specific sports. Nevertheless, benefits outweigh the risks and participation in sports is a satisfying experience for most children and adolescents. Experience in sport, of course, is not a single point in time; rather, it is a continuum running from enjoyment to burnout that spans many years and that has many shades or degrees between the extremes.

The charge of those who work with youth sports – coaches, trainers, teachers, administrators, parents and also the media – is to provide an environment that is conducive to maximizing potential benefits and minimizing potential risks for the youth involved. Sport is only one part, albeit an important one, of the experience of "growing up" which places many demands on youth. Like all youth, young athletes also have the need to be a child or adolescent. They are neither miniature adults nor commodities!

References

Aarnio M, Winter T, Peltonen J, Kujala UM, Kaprio J (2002) Stability of leisure-time physical activity during adolescence-a longitudinal study among 16-, 17- and 18-year-old Finnish youth. *Scandinavian Journal of Medicine and Science in Sports* 12:179-185.

Australian Bureau of Statistics (2003) Yearbook of Australia, Culture and Recreation: Children's Participation in Sports and Leisure Activities, www.abs.gov.au, accessed 2 May 2003.

Barnekow-Bergkvist M, Hedberg G, Janlert U, Jansson E (2001) Adolescent determinants of cardiovascular risk factors in adult men and women. *Scandinavian Journal of Public Health* 29:208-217.

BBC News (2007) EU signals bigger role in sport. (www.bbcnews.com, accessed 11 July).

Bredemeier BL (2003) Moral community and youth sport in the new millennium. In RM Malina, MA Clark (Eds), *Youth Sports: Perspectives for a New Century*. Monterey, CA; Coaches Choice, pp 171-182.

Bredemeier BL, Shields DL (2006) Sports and character development. *President's Council on Physical Fitness and Sports*, series 7, no 1.

Brown DR, Galuska DA, Zhang J, Eaton DK, Fulton JE, et al. (2007) Physical activity, sport participation, and suicidal behavior:U.S. high school students. *Medicine and Science in Sports and Exercise* 39:2248-2257.

Brustad RJ (2003) Parental roles and involvement in youth sport: Psychosocial outcomes for children. In RM Malina, MA Clark (Eds), *Youth Sports: Perspectives for a New Century*. Monterey, CA; Coaches Choice, pp 127-138.

Engstrom LM (1986) The process of socialization into keep fit activities. *Journal of Sports Science* 8:89-97.

Engstrom LM (1991) Exercise adherence in sport for all from youth to adulthood. In P Oja, R Telama (eds): *Sport for All*. Amsterdam: Elsevier Press, pp 473-483.

Ewing ME, Seefeldt V (1989) American youth and sports participation. North Palm Beach, FL: American Footwear Association.

Faigenbaum AD, Zaichkowsky LD, Gardner DE, Micheli LJ (1998) Anabolic steroid use by male and female middle school students. *Pediatrics* 101 (5):e1-e6.

Farrey T (2008) *Game On: The All-American Race to Make Champions of Our Children*. New York: ESPN Books.

Gould D, Dieffenbach K (2003) Psychological issues in youth sports: competitive anxiety, overtraining, and burnout. In RM Malina, MA Clark (Eds), *Youth Sports: Perspectives for a New Century*. Monterey, CA; Coaches Choice, pp 149-170.

Haisma HJ, de Hon O (2006) Gene doping. *International Journal of Sports Medicine* 27:257-266.

Heinemann K (1999) Sport clubs in Europe. In K Heinemann (Ed), *Sport Clubs in Various European Countries*. Schorndorf, Germany: Karl Hofmann, pp 13-32.

Hogg C (2009) China athletes 'faked their age." BBC News 16 March 2009 (www.news.bbc.co.uk accessed 16 March 2009).

Istituto Nazionale di Statistica (2005) Lo sport che cambia: I comportamenti emergenti e le nuove tendenze della pratica sportiva in Italia. Roma: Istituto Nazionale di Statistica.

Jahreis G, Kauf E, Frohner G, Schmidt HE (1991) Influence of intensive exercise on insulin-like growth factor I, thyroid and steroid hormones in female gymnasts. *Growth Regulation* 1:95-99.

Kannus P, Haapasalo H, Sankelo M, Sievanen H, Pasanen M, Heinonen A, Oja P, Vuori I (1995) Effect of starting age of physical activity on bone mass in the dominant arm of tennis and squash players. *Annals of Internal Medicine* 123:27-31.

Katzmarzyk PT, Malina RM (1998) Contributions of organized sports participation to estimated daily energy expenditure in youth. *Pediatric Exercise Science* 10:378-386.

Laure P, Binsinger C (2005) Adolescent athletes and the demand and supply of drugs to improve their performance. *Journal of Sports Science and Medicine* 4:272-277.

Macur J (2008) A visit to the athletes' village to see the (perhaps underage) Chinese gymnasts. New York Times 3 August (www.nytimes.com accessed 12 August 2008).

Malina RM (2001) Tracking of physical activity across the lifespan. *Research Digest: President's council on Physical Fitness and Sports*, series 3, no 14.

Malina RM (2003) Growth and maturity status of young soccer (football) players. In T Reilly, M Williams (Eds), *Science and Soccer*, 2nd edition. London: Routledge, pp 287-306.

Malina RM (2005) Estimating passport age from bone age: Fallacy. *Insight, The FA Coaches Association Journal*, autumn/winter, pp 23-27.

Malina RM (2006a) Weight training in youth-growth, maturation, and safety: an evidence-based review. *Clinical Journal of Sports Medicine* 16:478-487.

Malina RM (2006b) *Growth and Maturation of Child and Adolescent Track and Field Athletes / Crescita e Maturazione di Bambini ed Adolescenti Praticanti Atletica Leggera*. Rome, Italy: Centro Studi e Ricerche, Federazione Italiana di Atletica Leggera.

Malina RM (2007) Body composition in athletes: Assessment and estimated fatness. *Clinics in Sports Medicine* 26:37-68.

Malina RM (2008a) Skill: Acquisition and Trainability. In O Bar-Or and H Hebestreit (Eds), *The Young Athlete*. Oxford, UK: Blackwell Publications, pp 96-111.

Malina RM (2008b) Biocultural factors in developing physical activity levels. In AL Smith, SJH Biddle (Eds), *Youth Physical Activity and Inactivity: Challenges and Solutions*. Champaign, IL: Human Kinetics, pp 141-166.

Malina RM (in press) Childhood and adolescent physical activity and risk of adult obesity. In C Bouchard, PT Katzmarzyk (Eds), *Advances in Physical Activity and Obesity*. Champaign, IL: Human Kinetics.

Malina RM, Bouchard C, Bar-Or O (2004) *Growth, Maturation, and Physical Activity*, 2nd edition. Champaign, IL: Human Kinetics.

Marsh HW (1993) The effects of participation in sport during the last two years of high school. *Sociology of Sport Journal* 10:18-43.

Michaelis V (2007) IOC votes to start Youth Olympics in 2010. USA Today 5 July, http://www.usatoday.com/sports/olympics/2007-07-05-youth-notes_N.htm, accessed 7 January 2008).

National Council of Youth Sports (2001) Report on Trends and Participation in Organized Youth Sports. Stuart, FL: National Council of Youth Sports, www.ncys.org.

National Council of Youth Sports (2008) Report on Trends and Participation in Organized Youth Sports. Stuart, FL: National Council of Youth Sports, www.ncys.org.

National Federation of State High School Associations (2006) 2005-2006 high school athletics participation survey (www.nfhs.org accessed 23 September 2006)

Oler MJ, Mainous AG, Martin CA, Richardson E, Haney A, Wilson D, Adams T (1994) Depression, suicidal ideation, and substance abuse among adolescents. Are athletes at less risk? *Archives of Family Medicine* 3:781-785.

Pennington B (2005) Doctors see a big rise in injuries for young athletes. New York Times 22 February (www.nytimes.com accessed 22 February 2005).

Perkins DF, Jacobs JE, Barber BL, Eccles JS (2004) Childhood and adolescent sports participation as predictors of participation in sports and physical fitness activities during young adulthood. *Youth and Society* 35:495-520.

Pfeiffer KA, Dowda M, Dishman RK, McIver KL, Sirard JR, Ward DS, Pate RR (2006) Sport participation and physical activity in adolescent females across a four year period. *Journal of Adolescent Health* 39:523-529.

Ribeyre J, Fellmann N, Montaurier C, Delaitre M, Vernet J, Coudert J, Vermorel M (2000) Daily energy expenditure and its main components as measured by whole-body indirect calorimetry in athletic and non-athletic adolescents. *British Journal of Nutrition* 83:355-362,

Sabo D, Miler K, Farrell M, Barnes G, Melnick M (1998) *The Women's Sports Foundation Report: Sport and Teen Pregnancy*. East Meadows, NY: Women's Sports Foundation.

Sabo D, Miller KE, Melnick MJ, Farrell MP, Barnes GM (2005) High school athletic participation and adolescent suicide. *International Review for the Sociology of Sport* 40:5-23.

Savage MP, Holcomb DR (1999) Adolescent female athlete's sexual risk-taking behaviors. *Journal of Youth and Adolescence* 28:595-602.

Seabra A, Mendonca D, Thomis M, Malina RM, Maia J (2007) Levels of sports participation among Portuguese youth 10-18 years. *Journal of Physical Activity and Health* 4:370-380.

Segrave JO, Hastad DN (1982) Delinquent behavior and interscholastic athletic participation. *Journal of Sport Behavior* 5:96-111.

Shields D, Bredemeir BL, LaVoi N, Power FC (2005) The sport behavior of youth, parents, and coaches: The good, the bad, and the ugly. *Journal of Research in Character Education* 3:43-59.

Smoll FL, Smith RE (2003) Enhancing coaching effectiveness in youth sports: theory, research, and intervention. In RM Malina, MA Clark (Eds), *Youth Sports: Perspectives for a New Century*. Monterey, CA; Coaches Choice, pp 227-239.

Sport England (2003) Young People and Sport. National Survey 2002, www.sportengland.org/young-people-and-sport-2002 (accessed 3 June 2004).

Sporting Goods Manufacturers Association (2001) U.S. Trends in Team Sports, 2001 edition. North Palm Beach, FL: Sporting Goods Manufacturers Association.

Stotz CE, Baldwin MW (1952) *At Bat with the Little League*. Philadelphia: Macrae Smith Company.

Strong WB, Malina RM, Blimkie CJR, Daniels SR, Dishman RK, Gutin B, Hergenroeder AC, Must A, Nixon PA, Pivarnik JM, Rowland T, Trost S, Trudeau F (2005) Evidence based physical activity for school youth. *Journal of Pediatrics* 146:732-737.

Tammelin T, Nayha S, Hills AP, Jarvelin M-R (2003) Adolescent participation in sports and adult physical activity. *American Journal of Preventive Medicine* 24:22-28.

Telama R, Laakso L, Yang X (1994) Physical activity and participation in sports of young people in Finland. *Scandinavian Journal of Medicine and Science in Sports* 4:65-74.

Telama R, Laakso L, Yang X, Vikari J (1997) Physical activity in childhood and adolescents as predictor of physical activity in young adulthood. *American Journal of Preventive Medicine* 13: 317-323.

Telama R, Yang X (2000) Decline of physical activity from youth to young adulthood in Finland. *Medicine and Science in Sports and Exercise* 32:1617-1622.

Telama R, Yang X, Hirvensalo M, Raitakari O (2006) Participation in organized youth sport as a predictor of adult physical activity: A 21-year longitudinal study. *Pediatric Exercise Science* 17:76-88.

Thamel P (2006) Schools where the only real test is basketball. New York Times 25 February (www.nytimes.com, accessed 25 February).

Thamel P, Wilson D (2005) Poor grades aside, athletes get into college on a $399 diploma. New York Times 27 November (www.nytimes.com, accessed 3 December).

Theintz G, Ladame F, Kehre E, Plichta C, Howald H, Sizonenko PC (1994) Prospective study of psychological development of adolescent female athletes: initial assessment. *Journal of Adolescent Health* 15:258-262.

Trost SG, Pate RR, Saunders RP, Ward DS, Dowda M, Felton G (1997) A prospective study of the determinants of physical activity in rural fifth-grade children. *Preventive Medicine* 26:257-263.

Van Mechelen W, Twisk JWR, Post GB, Kemper HCG (2000) Physical activity of young people: The Amsterdam Longitudinal Growth and Health Study. *Medicine and Science in Sports and Exercise* 32:1610-1616.

Weinberg RS, Gould D (1995) *Foundations of Sport and Exercise Psychology*. Champaign, IL: Human Kinetics.

Weiss MR (2003) Social influences on children's psychosocial development in youth sports. In RM Malina, MA Clark (Eds), *Youth Sports: Perspectives for a New Century*. Monterey, CA; Coaches Choice, pp 109-126.

Wickel EE, Eisenmann JC (2007) Contribution of youth sport to total daily physical activity among 6- to 12-yr-old boys. *Medicine and Science in Sports and Exercise* 39:1493-1500.

Women's Sports Foundation (2000) *Health Risks and the Teen Athlete. East Meadow*, NY: Women's Sports Foundation.

Série

Investigação

•

Imprensa da Universidade de Coimbra

Coimbra University Press

2009