Adolescence and Sports

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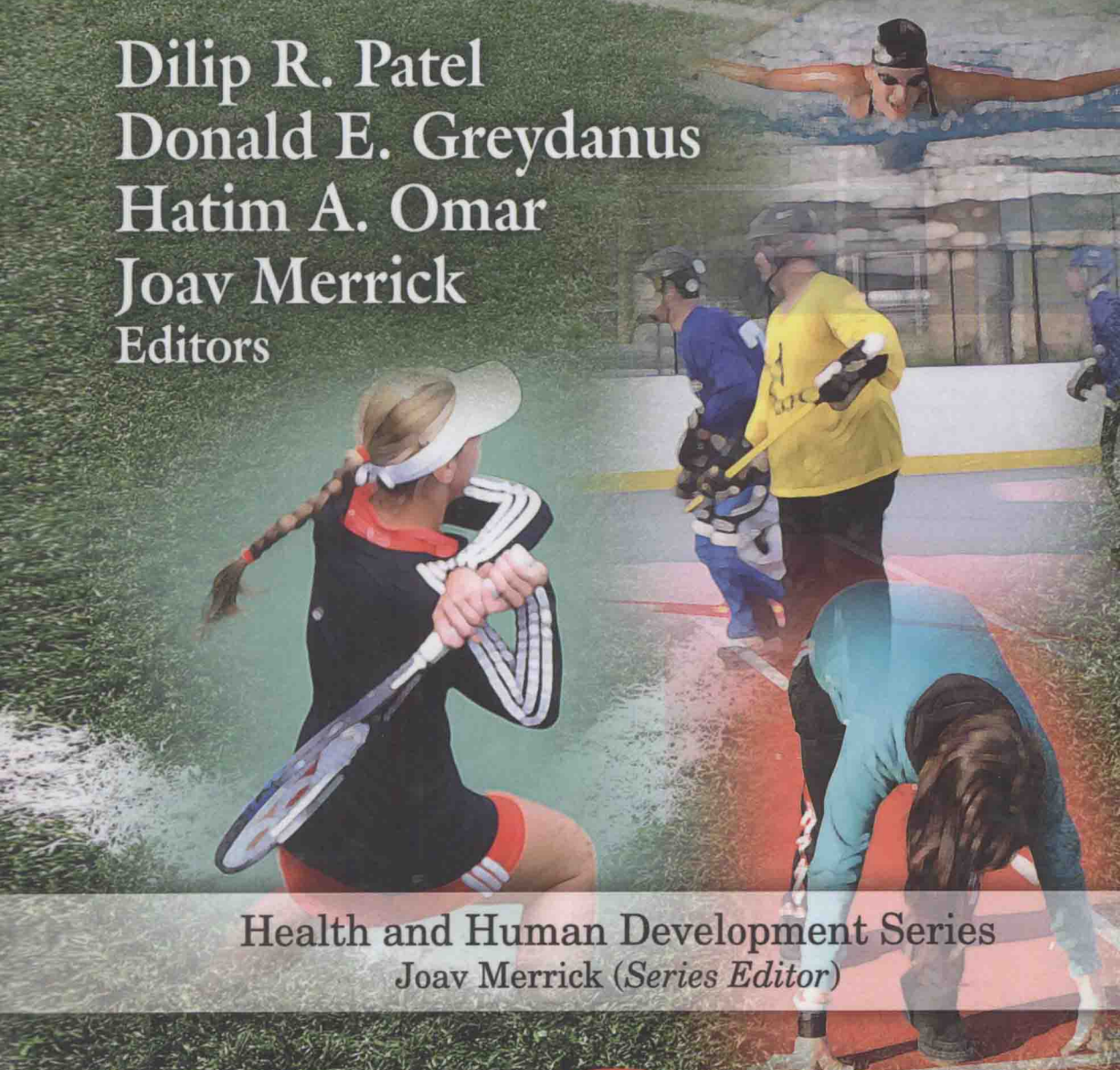

Health and Human Development Series
Joav Merrick (*Series Editor*)

NOVA

HEALTH AND HUMAN DEVELOPMENT SERIES

ADOLESCENCE AND SPORTS

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Nova Science Publishers, Inc.
New York

In: Adolescence and Sports
Editors: D. R. Patel, D. E. Greydanus et al.

ISBN: 978-1-60876-702-1

Chapter 1

PSYCHOSOCIAL CONSIDERATIONS IN YOUTH SPORTS: AN AMERICAN PERSPECTIVE

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This chapter identifies various psychosocial factors influencing children and adolescents who are involved in sports. The emphasis is on lessons learned from being part of highly organized sports programs in the United States which have a primary emphasis on winning. We start with developmental issues and then proceed to the effects of (over) training, chronic illness or disability and intrinsic or extrinsic influences on sport participation experience by youth. This chapter also considers such concepts as psychological reactions to injury, stress and anxiety, depression and suicidal ideation, substance use and aggression. We conclude that sports participation by children and adolescents can have beneficial effects. However, these effects can be lifelong and potential adverse results of a highly competitive system must also be understood. This chapter reviews some of the psychosocial issues observed in American youth participation in highly organized sports programs. It is hoped that the lessons learned may be of help to others who develop and expand these programs for their children and adolescents.

INTRODUCTION

Physicians, parents, educators, coaches, and adolescents acknowledge and promote the health benefits of regular physical activity in shaping the lives of young people (1). In the United States, the increased focus on involving youth in sport activities through their schools and communities has shifted from being spontaneous and fun to being highly organized and competitive. Proponents having youth adopt a competitive attitude towards their sport

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participation justify their actions by saying that competition is a helpful tool for teaching these youth how to make physical activity part of a lifelong strategy to stay physically fit and also, to teach them many important things about participation in life -- how to win and even more important, how to lose but maintain a winning attitude.

Additional cited benefits include the development of the following skills: a) frustration tolerance, b) strategic planning skills that will be useful in later life, c) pro-social skills, d) friendship making and maintaining, e) emotional coping, f) good work and academic habits, g) good self-esteem, h) ability to work as part of a team, and i) the ability to integrate these skills into the school and community (2-7). Some parents state they experience personal benefits from having their children participate in sport activities by using practice sessions and events as a means of personal socialization and status.

However, experience from many decades of highly organized sports programs for children and adolescents in the United States show these competitive sports programs may also create emotional stress, and poor self-esteem for youth who can not meet performance expectations of themselves or the significant adults in their lives (4,6-10). Also, considerable stress can be noted in athletes "successfully" involved in competitive sports (11).

As the adolescent is experiencing physical, cognitive, social, and emotional changes due to the normal process of adolescence, it is imperative that parents, coaches, physicians, and others remember that they may be placing increased pressures on the adolescent to perform and practice; this is noted even though the efforts of engaging them in sport activities may be well intentioned. Problems can arise when adults place expectations that exceed the adolescent's capabilities, leading him or her to experience self-doubt, internal conflict, and stress; in addition, this can result in responses by the adolescent athlete that are frequently difficult for adults to understand - arguments, refusal to participate in sports, and angry outbursts (2,4,5).

ADOLESCENT DEVELOPMENT

Early adolescence

At this stage of development (10-14 years of age) adolescents are preoccupied with rapidly changing events of puberty, beginning of symbolic movement away from the home environment, comparison with peers, worry over perceived physical abnormalities, establishment and maintenance of same-sex friendships, and the development of initial abstract thought (1,12,13). Their thinking is concrete; they understand what is and is not expected of them (basic rules of behavior, techniques and social rules of sports) but usually cannot generalize these rules from one situation to another. They may not connect consistent daily practice with performance on game day, since behavior and consequences are processed based on the here and now. They tend to attribute success or failure to their uniqueness rather than to the team effort (12). Peer acceptance is important but the approval and support from family are guiding forces. These adolescents are also able to enjoy and take pride in increasingly complex accomplishments and begin to improve their self-image. Those adolescents who experience consistent successes often develop a positive self-image, while those who experience repeated failures may develop a poor self-image (2,3,5).

Growth, physical skill and development vary widely among youth and may result in awkwardness and increase concerns about body image (4,14). Mismatches in team sports often occur when participation is based on age or grade level alone, without concern for pubertal development (4). Normal comparisons between self and peers may cause the adolescent to be either distressed or feel superior (2,4).

Middle adolescence

During middle adolescence (14-18 years) adolescents demand increased levels of independence from their parents and authority; they begin to rely on peers for their frames of reference versus parents and family members (1,12). They use peer feedback to set personal goals and rules of conduct (4). They are developing increasing levels of inductive and deductive reasoning ability, even reflecting on the thought process itself (11,12). They use their enhanced cognitive abilities to fantasize in developing theories about life and who they will grow up to be.

Adolescents at this stage of development will increasingly become altruistic and the coach becomes a very important role model at this stage. The adolescent by now has determined his or her sexual identity and will need support if that choice does not fit the expectations of family, peers or community (12). During middle adolescence feelings are very intense and risk taking behavior can cause conflict with parents and authority figures. Factors, such as chronic illness, physical or psychological trauma, that impair normal development may retard self acceptance (4).

Late adolescence

During late adolescence (19 to 21 + years) most issues of emancipation should be essentially resolved, and final pubertal changes have occurred. Abstract thinking and empathy skills are well developed and personal values clearer and well defined. The older adolescent athlete at this stage is better able to deal with pressures from parents, coaches, and society, as well as personal failures (4). The well adjusted, mentally and physically healthy adolescent has developed a secure, acceptable body image and gender role; he or she is able to maintain mutually giving and caring adult relationships, including sexual relationships (1,12,13). He or she has a more realistic view of the role of sports in the overall scheme of his or her life (12)

PUBERTY

Precocious puberty

Adolescents who are early developers may be stronger, faster and have developed better motor coordination compared to their peers, resulting in superior athletic performance; such youth are often called "superstars." These adolescents may become accustomed to considerable attention and praise from others, especially their coaches. However, we must

prepare them for the inevitable time when their peers catch up with them developmentally and they may be no longer out performing others; then, inevitable frustration and disappointment might be experienced by these youth, their families and their coaches. We must remember that only one-fourth of these "superstars" will remain in this category through middle as well as late adolescence and beyond. Be prepared to recognize and treat youth who experience depression, anxiety, or even act out during this transition period. Provide encouragement for the development of the teen's other abilities (music, art, scholarship, others) in preparation of loss of "superstar" status and as an important aspect of all human development.

Delayed puberty

Adolescents who are smaller, weaker and less coordinated may experience the frustration, anxiety, and disappointment of not being able to meet performance expectations when playing sports (14). They may even be ignored by peers as well as coaching staffs. Provide these adolescents with encouragement to continue to engage in activities that will help them build strength, endurance and skills as they continue to mature physically and mentally. Point out that they will eventually grow and be more competitive with their peers. Encourage the development of other skills as well.

OVERTRAINING

Over training can also result in overall negative mood disturbances in youth. Some youth may train harder and become more stressed because the training does not produce the desired outcomes encouraged by competitive sports; these youth may develop more negative attitudes about participation and then, performance deteriorates. Adolescents who are allowed appropriate rest may develop more positive attitudes towards participation (15). Over training can also result in more injuries to the athlete.

CHRONIC ILLNESS AND DISABILITY

Adolescents with physical disabilities or chronic illness may be denied participation in sports or may perceive themselves as being incapable of participation. However, they should be provided developmentally, physically, and age appropriate outlets for engaging in physical activities (4). Physically challenged adolescents especially should be able to participate in sport activities and allowed to be a contributing part of modified or special groups. By participation in sports the physically challenged youth can derive all the same physical and psychosocial benefits as for other adolescents (16).

INTRINSIC FACTORS THAT INFLUENCE SPORT PARTICIPATION EXPERIENCE

Whether or not an adolescent participates in sport activities is influenced by many factors, including gender, class, race, and age relations as well as political, economic, social and cultural factors (5). Historically, American females have participated at a lower rate than their male peers. The influence of coaches, parents, teachers, academic grades, access to activities, and transportation may be additional factors. The adolescent is not in total control of whether or not he or she plays. Adults, especially coaches, define who has the skills and capabilities that are noteworthy and valuable, selecting those who are then allowed to participate.

In general as children move through adolescence, they become less physically active. If the adolescent sees him or herself physically competent or skilled in a particular sport, he or she will have a more positive attitude toward participation and will enjoy such activities (16). Adolescents are increasingly likely to develop lifelong habits of physical activity if they perceive sport participation as beneficial to their physical fitness, as a way to maintain or improve skills, and as a means to improve appearance, muscular strength, endurance and flexibility. Those adolescents who see participation as a barrier, or perceive other factors as barriers to engaging in sport activities (such as peer rejection, time, level of fitness, weight, poor health, or access) will tend not to participate nor remain committed to engaging in sport activities. Other factors that affect participation include whether or not the parents are physically active and supportive of participation, and whether or not the adolescent has access to activities (transportation, money for equipment, convenient play spaces, and sport equipment) (16).

The adolescent's beliefs about the purpose and causes of success in sport are also important. Those who believe the purpose of sport participation is for personal development, status, and lifetime health, are better at coping with psychological issues associated with sport participation. Athletes who are focused on pro-social and adaptive achievement beliefs about sport participation are more likely to facilitate adaptive cognitive and affective patterns in competitive sports during adolescence (17,18). Youth learn about competitive behavior as children; those who develop a "win at all costs" attitude may find it difficult to deal with failure. They learn to place value on a particular accomplishment and learn a means of achieving that goal. When they discover that someone else also values the same accomplishment or object and is willing to work equally as hard (or harder) to attain it, they learn about competition. The idea of being a "former winner" (i.e., a "current loser") may affect how they approach similar situations in the future. The manner in which they cognitively process the inability to accomplish that task or obtain that object, may determine how he or she will function in the future in similar situations (12,19).

Adolescents who perform poorly in sport activities may experience negative consequences of the socialization process (embarrassment, rejection, criticism, ridicule, and punitive intervention) (2). Those who engage in sports beyond his or her physical capabilities (due to late physical maturation, cognitive deficits or chronic illness) may experience physical and psychological trauma. Adolescents who are inexperienced, lack innate abilities, or have a poorly developed body sense (i.e., eye-hand coordination, gross motor skills, attention skills, socialization skills) are also vulnerable to suffering physical and psychological trauma from

sport participation (2-5,12). Additional social deficits (such as excessive restlessness, talkativeness, bossiness, and attention-getting behaviors) may also be a risk. Adolescents who perceive that they are not meeting the expectations of coaches, parents, or peers (because of their repeated failures in competition) can suffer as well (2-4,12).

EXTRINSIC FACTORS THAT INFLUENCE SPORT PARTICIPATION EXPERIENCE

Sport participation may be viewed as a social process that many see as a way to link themselves and their children to the larger social world in which it occurs (2). Socialization is tied to selection, and ignoring this fact makes it difficult to understand sport participation. In the best case scenario, sport participation enhances the socialization process by bringing the adolescent prestige that leads peers and significant others to treat him or her more seriously as a worthy human being, and wanting to establish personal peer relationships (2,20). When participation causes young people to be noticed by those who can positively influence their academic lives, positive changes are then more likely. Sport participation may not always lead to creating attributes, connections or reputations which facilitate achievement in non-sport activities (2-5).

Parents

Parents have a greater influence with children less than 10-12 years than in the older teens. By this later age the child's values about winning have been developed and fixed. At each stage of development, all adolescents are better able to develop a positive self-esteem if they are nurtured by a stable home life with caring parents, stable peer groups and academic success, along with some proficiency in their chosen sport (2,4). Parents who are involved, encouraging, and making suggestions may have a more positive effect on their child's character development. However, if parents are too enthusiastic or overbearing they can have a detrimental effect on the athlete's values about winning (14). Most parents expect their adolescent to excel and be recognized by his or her peers and the parent's peers. If parents invest time, money, and friendships in their child's sport participation, they may experience (and exert) more pressure for their child to perform and play well (2-5,12).

Coaches

The roles of coaches and other adults and sports heroes can become very important to help set personal limits and develop a stable life image (4,5,14). As athletes mature, the coach becomes the most significant source of influence. The coach's techniques are crucial factors in the way an individual player views himself or herself in the sport and ultimately in society. An adept coach will use positive techniques while carefully and rarely using punitive measures to motivate and teach athletes. He or she will help shape competence and increased

performance though feedback and training, and also help what is ultimately of great importance---the athlete's self-concept and self-esteem (5).

Parents and coaches have a significant influence on the means and responses selected by the adolescent, depending on the stage of development the adolescent has attained. Coaches are involved in the development of winning or losing attitudes; as the level of competition increases, the significance of winning also increases (5). Development of character and morals are most strongly influenced by parents and family. However, the influence coaches do have is more related to the coach's and individual adolescent's interactions than as an inherent value of sports (2).

Peers

Peer acceptance may wax and wane with the performance of an athlete. Some athletes may experience rejection and criticism from peers for lack of skill, competence or performance during a specific time; however winning and elite athletes may also experience rejection, jealously and criticism from peers (2,21). Teammates tend to be more accepting and complimentary to each other when they win and more rejecting and critical when they lose. The athlete must decide what level of personal recognition and social acceptance are necessary to his or her survival. It is important that the individual athlete understand this dynamic (5).

Media

The American media has much to do with the positive image given to sports heroes in the United States. Professional sports heroes earn tremendous salaries, and command enormous respect from all levels of our society (22). Many youth dream of becoming superstars in their favorite sport and this dream is common in American youth. If a youth is considered a good athlete by peers, parents and others, much goodwill is automatically afforded to this fortunate individual. It is normal for youth to seek to excel and for parents to expect this performance. All forms of the media regularly participate in considerable coverage of sports events and can transform a player of any age into a superstar. The media coverage of winners may reinforce the message that winning at all costs is success while losing is always a failure (2,3). The media projects the idea that success in sports means success in life, and that not being number one means limited achievements or overt failure in life. Adolescents can develop an unhealthy attitude that winning is more important than fairness and fun (1).

PSYCHOLOGICAL EFFECTS OF INJURY

The risk of injury increases with longer practice time and the degree of difficulty of routines. Repetitive stress on the developing musculoskeletal system can result in injuries. The pressure to practice and compete while injured compounds the risk of further musculoskeletal injuries. Athletes who have low coping skills and poor social support are

more likely to be vulnerable to poor outcomes when dealing with the stresses of sports injury (23-26). Although the adolescent may initially minimize or deny the extent of his or her injury, the realization that they can not play or perform at previous levels may result in feelings of anger, isolation, and loneliness. The periods of absence from practice and competition may be overwhelming to athletes who are accustomed to the intensity and demands of their normal routine (though a few athletes may even welcome this post-injury phase).

The challenges faced during recovery may often combine pain with failure to perform to certain personal expectations. The athlete may find that he or she cannot complete exercises to stay fit. Following recovery, the athlete may not being able to perform to a level achieved prior to the injury. Some may find a new emotion, that of fear of re-injury. As the adolescent recovers from the injury and regains strength and stamina, the depression should lift and acceptance and hope follow. The physician can be a key "player" in motivating the adolescent to work toward recovery by explaining that depression and anger are normal outcomes of injury, the healing process, and the therapeutic process. Cognitive-behavioral techniques combined with appropriate physical therapy and medical interventions can help the athlete move toward recovery (6,10,24-27).

COMPETITIVE STRESS AND ANXIETY

Stress and anxiety can have both a positive or negative impact on children and adolescents (4,6,7,10,28-30). Sports activity can teach the athlete that, stress is a natural part of sports participation. Sports participation may teach the athlete how to handle competition, performance anxiety and even defeat. It may also teach the youth about physical fitness, how to develop social skills and friendships, and the importance of team play in sports and in life. Anxiety appears to act differently than other emotions on sport performance. Higher levels of anxiety are associated with an individual's best performance and interventions to reduce pre-competition anxiety may actually worsen the performance (29). Although a certain amount of arousal or stress is necessary to performing, stress can also impede performance and cause health problems in children (3,28). Events such as pre-game situations, losing games, and fear of failure have been identified as increasing the emotional stress levels of young athletes (3,6,7).

Stress can be a hazard on the playing field, having an adverse affect on performance and increasing injury (7,10). Cognitive-behavioral techniques (relaxation response, stress inoculation training, biofeedback, mediation, counseling by psychologists, yoga, deep muscle relaxation, self- hypnosis, visualization, breath control, time management and multi-dimensional relaxation training) have been shown to be effective in enhancing sport performance, improving recovery from injury, and preventing sport injury (26-33).

The stress of trying for a team and not making it can be a positive experience (if handled well) or a very negative one. Negative consequences to overwhelming stress are many, including chronic fatigue ("athletic burnout syndrome")--with rapid loss of previous skills. Such "burnout" can also result from over training by over-zealous teens (as well as their parents or coaches). Children and teens should enjoy their sports participation and not be forced into specializing in one sport or another too soon --- in the hopes of producing another

famous, wealthy superstar. Teens who do excel at one sport may feel sad or anxious when "off-season." Encouraging other (perhaps non-competitive) sports, interests (i.e., music or art) and social activities may help such youth.

Parents can be counseled to avoid joining the current milieu of victory at any cost, which is characteristic of highly organized sports programs in the United States. School personnel and parents can seek to have sports participation by children and adolescents which develop positive goals. These goals can include learning the joy of physical activity and a sense of competence. Our teens should not be placed under overwhelming pressure to win, despite the "price of victory." Parents should not push their children beyond abilities or teach their children that self-esteem comes only from winning. Some youth feel that they are loved and valued only if they do well in sports. Counseling against such attitudes should start early by the trusted clinician. It is educational for clinicians to go to a sports event at an elementary or junior/ high school event in the United States and observe the yelling parents who are rude to their children, coaches, umpires and fellow parents-in a vain attempt to teach love only through victory and victory at any cost.

DEPRESSION AND SUICIDAL IDEATION

Athletes who limit their socialization to social groups who are only related to a particular sport may experience periods of depression, sadness, anxiety, restlessness, and irritability when they are off season; therefore it is important for coaches, parents, teachers and physicians to encourage adolescents to develop social and athletic activities during these off seasons." These athletes should engage in additional sport activities simply for fun and exercise and be encouraged to develop friendships and relationships with individuals and groups that are involved in other physical and social activities (34).

SUBSTANCE ABUSE

There are increasing reports of recreational and performance enhancing drug and alcohol use by many American athletes (35-38). There is a negative relationship between sport participation and smoking in adolescents (35). Decreased substance use is associated with adolescents who increased their aerobic fitness following an aerobic training program. A study of former college athletes revealed they are more likely to use tobacco and alcohol than non-athletes in later life; runners were least likely to smoke; although female runners consumed alcohol at the same rates as male runners and non-runners, they were more likely to have chronic alcohol use than non-runners (35).

A three year prospective study of 1,245 American adolescents aged 12-16 years found that 33% of these athletes had never smoked cigarettes, consumed alcohol nor used marijuana; 25% of students reported smoking in the past 30 days, 52% reported alcohol use in the past year and 13% reported marijuana use in the past year (35). White students reported more cigarette smoking and alcohol consumption compared to non-whites (35). Increasing age is associated with increases in the prevalence of all reported substance use (36). Lower socioeconomic status was associated with higher reported use of marijuana while higher

socioeconomic status was associated with lower reported use of cigarettes. Males who participated in competitive athletics were significantly more likely than non-athletes to initiate alcohol use while the most active or most fit females were likely to initiate cigarette smoking (35). In contrast the most active males (those who participated in competitive athletics) appeared more at-risk for initiating alcohol consumption than their less active counterparts.

AGGRESSION AND VIOLENCE

Current research has not empirically established a relationship between media coverage of sports and violent behavior and little is known about how people integrate their exposure to media coverage of sports into the rest of their lives (2,22). A survey of 2,436 high school students found no significant differences for violent or delinquent behavior between athletes and non-athletes (45). However it did show that non-contact sport athletes (male and female) were less likely to engage in various violent and delinquent behaviors than were contact sport athletes and non athletes (45).

Rates of deviant behavior among male/female athletes are similar or lower than rates among non-athletes. No differences in violence between racial groups and social class backgrounds across sports have been observed. Short-term differences in delinquency rates for all athletes and non athletes were proven non-significant over time. A three year follow-up showed that racial, social, and athlete versus non athlete differences in deviant behavior were not present (22). Sports related violence has become a critical social problem in many countries. Documented events of violent disturbances have occurred in European countries, Australia, Central and South America, Asia, and North America (22). Media coverage may exploit participant violence in sport by promoting a view that this is a natural and unchangeable ordering of a world in which men compete violently together. Media shows may contribute to a social climate that is conducive to violent behavior. Sport is a cultural practice that embodies a climate of toughness, aggression, and physical dominance especially in angry males (22).

CONCLUSION

Adolescents' unique experiences in sports and physical fitness require special approaches (5). Participation in normal spontaneous sports activity can facilitate growth in a variety of ways for athletes: character development, social adjustment, positive personality traits and attitudes, emotional control, sports-man like behavior, leadership skills, empathy, cooperation, a more outgoing and socially well adjusted personality, self-discipline, self-confidence, initiative, courage, loyalty, and self expression (19,34,46). Youth who (including those with physical disabilities and those who have a chronic illness) participate in spontaneous sports activities display both physiologic and psychological benefits. Most experts believe that teaching a healthy life style has its greatest chance of being adopted if the skills are learned and practiced in childhood and through adolescence. However, the increased pressure to engage youth in competitive sport activities increases the likelihood that

adolescents will experience psychosocial stressors related to sports participation (47-50). Lessons learned about psychosocial issues related to the highly organized American sports programs with a relentless drive for victory at all costs is reviewed.

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In: Adolescence and Sports
Editors: D. R. Patel, D. E. Greydanus et al.

ISBN: 978-1-60876-702-1

Chapter 2

SPORTS DOPING: USE OF DRUGS AND SUPPLEMENTS TO ENHANCE PERFORMANCE

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Use of different drugs and supplements is a world-wide phenomenon in athletics. Drugs and nutritional supplements are used for many reasons, in hopes of feeling good, promoting good health, preventing illness, improving overt illness, reducing fatigue or enhancing muscle development, strength and appearance. Though unproven to be effective, various substances are popular with adolescent athletes of all types--cyclists, distance runners, soccer players, weight lifters, figure skaters, judo athletes, tennis players, football players and many others. A society which emphasizes winning over positive benefits of sports activity sets up its youth to try various chemicals to enhance sports performance as well as to relieve the stress that such pressure for winning inevitably brings. Much is not really known about how these substances affect the health of our youth, since research is often limited and typically only adult males in competitive sports are studied. Relating a known effect of drugs can also be difficult because there are multiple confounding variables found in the research studies and minimal information is available regarding long term effects of these drugs, especially in adolescents. This article reviews selected drugs and supplements used for doping by young athletes. It is important to note that the popularity and use of different substances change over time, sometimes rapidly, as new ones come to the market and old ones fade out of fashion. Also popular agents may vary in different countries and sports setting in which the athlete participates.

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INTRODUCTION

The use of various substances to improve sports performance has been attempted for thousands of years--at least since the Greek and Roman Olympics, when athletes tried mushrooms and opioids. The availability of numerous nutritional chemicals has complicated this phenomenon to a considerable extent in current times. Manufacturers often provide attractive claims about their products, emphasizing that their chemicals improve lean body mass and strength while reducing fat, increase energy, improve aerobic capacity, enhance motor skills, provide antioxidant effects and other impressive results; use of performance enhancing agents by athletes raises complex medical and ethical questions (1-7).

Doping in sports is defined "as the use by an athlete of a substance or method banned by the International Olympic Committee (IOC) or prohibited by an International Sports governing body" (8). According to the World Anti-Doping Agency (WADA), doping is defined as "the occurrence of one or more of the anti-doping rule violations" as set forth in its code (9). The aims of prohibiting doping are to protect an athlete's rights to compete on a level playing field without the use of performance enhancing drugs, prevent harmful side effects, and to ensure the safety of the athletes (8). Doping is also believed to "undermine the fundamental spirit and the collective pursuit of human and sporting excellence" (8).

The first cohesive step in this direction was with the creation of a medical commission by the IOC in 1967, which introduced a list of prohibited substances and anti-doping regulations (10). Screening for prohibited agents was implemented in the 1972 Munich Olympic Games. WADA was created in 1999 and since then is the main agency, which establishes the Anti-doping code to facilitate worldwide harmonization of implementation of anti-doping regulations (10). The World Anti-Doping Code has published The 2009 Prohibited List that lists the different categories of prohibited substances or methods used for doping (11) (see table 1). There is a separate list of substances prohibited in competition and also in specific sports.

Table 1. Prohibited substances and methods

Main categories of prohibited substances	Anabolic agents Hormones and related substances (growth hormone, IGF1, insulin, erythropoietin) Beta-2-agonists Hormone agonists and modulators Diuretics and other masking agents
Main categories of prohibited methods	Enhancement of oxygen transfer Chemical and physical manipulation Gene doping

ANABOLIC ANDROGENIC STEROIDS (AAS)

In 1935 testosterone was isolated and developed as a chemical to improve metabolism. Since then, a variety of synthetic testosterone derivatives or anabolic steroids have been developed, that include oxymetholone, stanozolol, and nandrolone decanoate, and others.

The belief that AAS will improve muscle development, strength and personal appearance has resulted in a high level of use by adolescent and adult athletes around the world. In the United States, 5-11% of high school males and up to 2.5% of high school females uses these drugs; 50% start under age 16 years and about 33% of teens who use AAS are not athletes (12,13-16). These drugs are often used with various other chemicals as well.

Athletes who consume AAS in high amounts may develop a gain in lean muscle mass, strength, and body weight (with some water retention), if they also engage in marked resistance exercise-training at the same time (3,4,6). Anabolic steroid use without appropriate training and adequate protein intake may not result in such changes. Sports with athletes at high risk for using these chemicals include body building, wrestling, football, sprinting, discus throwing, shot putting and others. High doses are used and vary with the specific drug used and some athletes are involved with steroid stacking, using many drugs simultaneously. The female athlete seeks a dose which allows increase in muscle mass and strength, but below masculinization effects, which are however difficult to avoid. Side effects of anabolic steroids are many, as listed in table 2 (3,17,18).

Table 2. Side effects of anabolic steroids

Masculinization of females ■ Hirsutism ■ Clitoromegaly ■ Alopecia (males also) Fluid retention Growing athletes ■ Acceleration of maturation ■ Early epiphyseal closure ■ Shortened ultimate adult height Psychologic changes with rise in: ■ Aggressiveness ■ Irritability ■ Depression Gastric ulcers	Hyperglycemia Acne vulgaris (can be severe) Decrease in glycoproteins (FSH and LH) with: ■ Decreased sperm ■ Decreased testosterone levels ■ Reduction in testicular size Increase in tendon injuries Increase in liver function tests Hepatic neoplasms (including a hepatocellular carcinoma) ■ Peliosis hepatitis Prostatic enlargement Reduction in high density lipoprotein (HDL) ■ Potential rise in cardiovascular disorders Wilms tumor (at least one case reported)

Human Chorionic Gonadotropin (HCG) hormone may be taken intramuscularly, in attempts to counteract the steroid-induced effect of testicular size reduction; though this reduction is reversible, germinal element defects may persist for many weeks (19). HCG or Human Growth Hormone (hGH) may also be used to increase the effect of steroids on muscle tissue, and are especially abused by power and speed athletes (20).

The source of these substances may not be the best, and impurities can cause unknown and unexpected adverse effects, for example Creutzfeld-Jacobs disease with hGH (21). Other peptide hormones (HCG, ACTH, EPO [erythropoietin]) may be used as anabolic agents with or without anabolic steroids (19,20,22). ACTH (corticotrophin) increases blood levels of endogenous corticosteroids and has a euphoric effect.