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Narrative Review

The Psychosocial Implications of Sport Specialization in Pediatric Athletes

Joel S. Brenner, MD, MPH*†‡; Michele LaBotz, MD§‖; Dai Sugimoto, PhD, ATC¶#; Andrea Stracciolini, MD, FAAP, FACSM¶#**††**

*Sports Medicine Program, Children's Hospital of The King's Daughters, Norfolk, VA; †Department of Pediatrics, Eastern Virginia Medical School, Norfolk; ‡Division of Sports Medicine, Children's Specialty Group, PLLC, Norfolk, VA; §InterMed P.A., Portland, ME; ‖Tufts University School of Medicine, Boston, MA; ¶Division of Sports Medicine, Department of Orthopedics, Boston Children's Hospital, MA; #The Micheli Center for Sports Injury Prevention, Waltham, MA; **Harvard Medical School, Boston, MA; ††Department of Medicine, Division of Emergency Medicine, Boston Children's Hospital, MA

Data on the psychosocial implications of sport specialization in pediatric athletes are lacking. Sport specialization often requires increased training hours and may predispose young athletes to social isolation, poor academic performance, increased anxiety, greater stress, inadequate sleep, decreased family time, and burnout. Sport specialization frequently introduces multiple stressors that could be expected to adversely affect mental health and function in young athletes and may increase the risk for burnout. This may be confounded by altered sleep duration and quality, increased drive for elite status, and perfectionistic personality types. The signs and symptoms of burnout in young athletes can be difficult to detect. It is important to be aware of the possible diagnosis of burnout in young athletes who display vague symptoms and a decrease in academic performance. The purpose of this review was to survey the available literature on sport specialization in young athletes and its association with mental health, sleep, the drive for success in sport, and burnout.

Key Words: sport psychology, youth athletes, mental health, burnout

Sport specialization occurs when a young athlete chooses to focus participation on 1 sport, possibly to the exclusion of all other sports, and typically results in year-round participation and high-intensity training in a single sport. The link between physical injury and sport specialization in youth sports has gained attention in both sports medicine research and policy development and is addressed in detail in other articles in this special issue. Far less attention has been given to the psychosocial effects of sport specialization on young athletes.

The reasons for sport specialization are multifactorial and include the parents' or athlete's (or both) drive for athletic success, financial remuneration (including collegiate scholarships), and pursuit of dreams of professional or elite sport status. However, the emotional costs of specialization to athletes and their families can be quite large. Sport specialization often requires increased training hours and may predispose young athletes to social isolation, poor academic performance, increased anxiety, greater stress, inadequate sleep, decreased family time, and burnout.[1–6] The opportunity cost of reduced exposure to other activities outside the sporting realm is another potential concern. The purpose of our article was to review the available literature on sport specialization in young athletes and its association with mental health, sleep, the drive for success in sport, and burnout. The Figure illustrates the relationships of these topics.

MENTAL HEALTH

Optimal levels of physical activity and sport participation are generally associated with improved mental health outcomes in children and adolescents. However, sport specialization typically introduces multiple stressors that could be expected to adversely affect mental health and function in young athletes. Although little evidence is available pertaining specifically to young specialized athletes in North America, mental health research on students at some of Europe's elite sport schools, as well as quantitative data on training volumes, may offer information about the stressors seen in young specialized athletes. Examination of these data may help inform current practice and future study.

Prevalence

When considering mental health concerns in young sport-specialized athletes, it is important to keep in mind how common these conditions are in the general pediatric population. Among US adolescents, anxiety appears to be the most common mental health condition, with a lifetime prevalence of greater than 30%.[7] Depression and mood disorders have a lifetime prevalence of 14% in this population.[7]

Data from North American studies are limited, but several researchers have looked at mental health of students at European elite sports schools, many of whom specialize

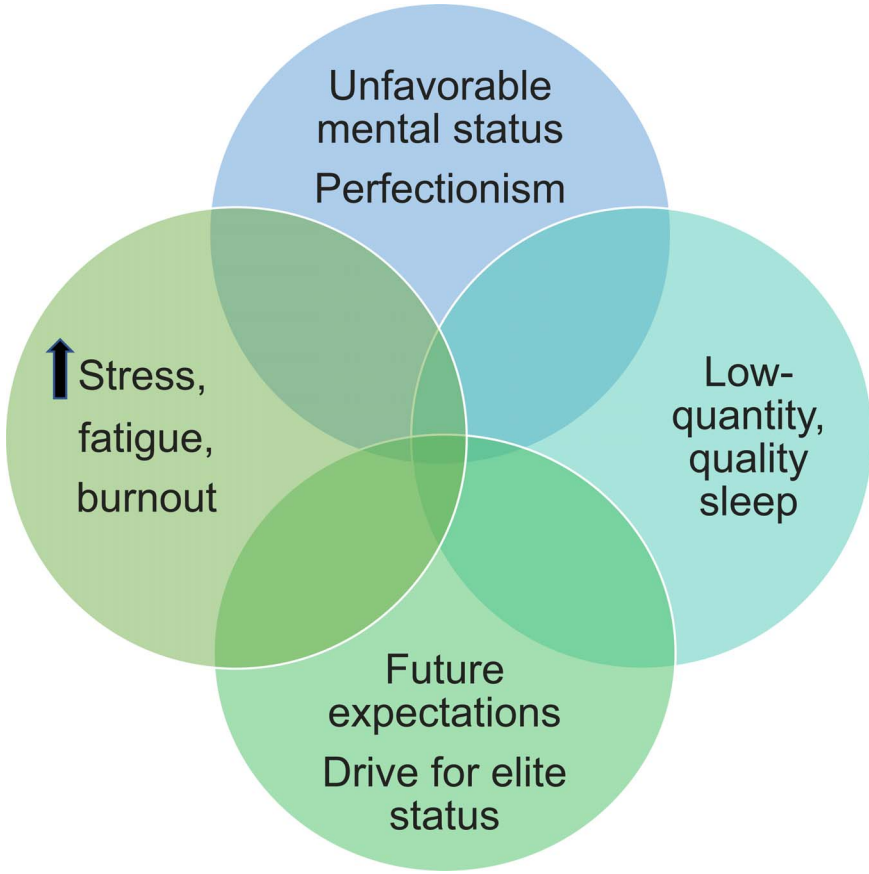

Figure. Psychosocial relationships in the sport specialization of young athletes.

in a single sport. A prospective study[8] using validated survey instruments was conducted on adolescent regional- and national-level athletes attending Swiss Olympic sports classes. Participants were single-sport athletes and represented a broad spectrum of team and individual sports. Participants were between 14 and 22 years of age (mean = 16.8 ± 1.4 years) and 63% of participants were male. The baseline analysis of 257 athletes identified 9% with reported clinically relevant depressive symptoms.[8] However, 197 of these athletes participated in a 6-month follow-up survey, and only 2% reported clinically relevant depressive symptoms. The authors did not offer an explanation for this decrease in symptom prevalence but did note that study dropouts did not differ from follow-up participants for any of the main study variables or potential confounders. In these young athletes, mental toughness correlated with improved measures of mental health, particularly during periods of high stress.[8]

The Hospital Anxiety and Depression Scale was administered to 326 elite German athletes between 12 and 18 years old (mean = 14.3 ± 1.6 years).[9] Twelve sports were represented, including both team and individual sports, and most participants attended German elite sport schools. Seven percent were classified with "possible anxiety," 3% with "probable anxiety," 10% with "possible depression," and 4% with "probable depression." These findings did not differ by sex or age and were not analyzed by sport type.

In a 2018 Norwegian study,[10] rates of psychological distress between participants in elite sport high schools (n = 611; 390 males, 221 females representing 50 sports) and a control population of general high school students (n = 355; 199 males, 156 females) were compared. All participants were 15 or 16 years old. Symptom checklists revealed higher levels of psychological distress among the control group (18.9%) than the athletes (7.1%). Sex differences were present, with higher rates of distress in female athletes (13.2%) as compared with males (3.6%), and these rates were 11% higher in both male and female control participants. Differences by sport were not analyzed. Perfectionistic traits were the best predictor of psychological distress in this population,[10] and we examine the role of perfectionism in contributing to burnout in young athletes later in this article.

Although these data suggested that elite sport participation was consistent with improvements in mental health versus the general population, such concerns were still fairly common in high-level athletes. However, myriad cultural differences between European and American adolescents raise questions about the applicability of these data to young US athletes. In addition, it is unclear if the students who were selected to participate in specialized, athletically oriented school settings reflected the majority of specialized child and adolescent US athletes in mainstream social and academic environments. Even though specific prevalence data regarding mental health concerns in young specialized athletes are not yet available, athletic trainers (ATs) should be aware that these children and adolescents are not immune to the same mental health struggles as the general population and that strategies to develop mental

toughness may mitigate this risk, particularly when stress levels are high.[8]

Training Volume

Specialized athletes tend to have high training volumes, and several investigators have explored the dose-response curve between sport training volume and mental health. In a cross-sectional study[11] of 481 adolescents, those who reported more than 60 minutes of physical activity per day, 5 to 7 days per week, had 56% reduced odds of depression and 47% reduced odds of trait anxiety compared with adolescents who performed physical activity 0 to 2 days per week. Correlations between mental well-being and the volume of weekly sports practice were examined in a Web-based survey[12] of 1245 Swiss 16- to 20-year-olds. Peak mental wellbeing was evident at a mean of about 14 hours of sports practice per week; the odds of poor wellbeing increased for athletes with higher or lower volumes of training. In athletes training more than 17.5 hours per week, the odds ratio for poor wellbeing was 2.29, and for those athletes training less than 3.5 hours per week, the odds ratio was 2.33.

Although these results seem to indicate that 2 hours per day of training supported good mental health, survey studies lack the rigor of longitudinal data.

The specific role that sports training plays in mental health cannot be inferred from cross-sectional data, and a great deal of interindividual variability is undoubtedly present in the physiological and psychological responses to different training volumes. Time spent in practice, competition, and conditioning sessions may push specialized athletes toward the higher range of the weekly hours mentioned here. Athletic trainers and others who care for young athletes should keep these parameters in mind while monitoring the individual's response to different levels of training.

Self-Esteem

The World Health Organization described mental health as "more than the absence of mental disorders"[13] but also a state of wellbeing that allows individuals to realize their abilities, cope with normal stressors, and make meaningful contributions to their community. Therefore, it is important to keep in mind the effects of sport participation and specialization, not only on mental illness but also on the development of optimal mental health. Authors of a meta-analysis[14] explored the potential mechanisms linking physical activity with mental health outcomes in children and adolescents. The strongest current data demonstrated that physical activity enhanced self-efficacy and physical self-concept. This appears to generalize to increased self-esteem, which is a critical component of good mental health.

Although physical activity is an important part of sport, a 2014 Canadian study[15] illuminated the direct relationship between self-esteem and sport. The researchers followed 1492 adolescents over 4 years and found that sports enjoyment, rather than sports participation per se, appeared to predict increased self-esteem. This may indicate that the key principle in the relationship between sport specialization and mental health is not necessarily what or how much young athletes do but whether they are still enjoying their sport experience. This is a point worth emphasizing to those who care for these athletes.

Significant concerns have been raised that specialization causes young athletes (and the adults who work with them) to focus excessively on performance and achievement, with a subsequent decrease in perceived enjoyment and fun. This topic was addressed by the "What Sport Means in America" study[16] commissioned by the United States Anti-Doping Agency. The multifaceted study included a survey of 8- to 17-year-olds ($n = 2263$) who participated in sport at school or in their local community; 646 athletes competed for their national governing bodies (NGBs). Young people participating in school or local sports were selected to demographically represent the US general population, and NGB sports were selected to provide a representative cross-section of sports played in the United States. Although NGB athletes typically train and compete at a higher level than non-NGB athletes, the rate of specialization in this sample was not determined. Participants were asked to identify what was "really important" to them when playing sports. The top answers among students participating in school or local sports were focused on social and developmental aspects of participation and included "having fun," "doing my best," and "being with my friends." The top answers among NGB athletes were more performance oriented and included "performing well," "doing my best," and "improving my skills." Responses were not sorted by sex or sport. It is impossible to tease out whether the NGB athletes became more performance oriented as they progressed through their athletic careers or if they pursued more competitive opportunities due to these baseline personality characteristics. In either case, 82% of NGB athletes reported that "having fun" was "really important" to them in their sport and, therefore, they still perceived their sport participation as a positive experience. This is important, because the accumulation of positive experiences is crucial for building self-esteem and mental health in children and adolescents. Those who care for specialized athletes should recognize the benefit of providing an environment that fosters fun, even as attention is often increasingly directed toward performance and skill development.

Sport Environment

As athletes become more specialized, a greater proportion of their life experience is sport related, and the sport environment has increasing influence on specialized young athletes and their development. The United States Anti-Doping Agency's "What Sport Means in America" study[16] asked young athletes to identify the type of influence coaches and other potential role models exerted on their behavior. The Table lists those who were frequently identified as having a "mostly good" influence on young athletes in sport, and both NGB and community-level and school-level athletes rated coaches as having greater influence than parents and teachers. Athletes training and competing at higher levels, which typically includes those who choose to specialize in a single sport, tend to have a highly favorable view of their experiences with coaching staff.

Coaches, ATs, and other youth sport stakeholders should recognize that positive mental health outcomes are enhanced

Table. Respondents Who Reported Various Role Models[a] as Having a "Mostly Good" Influence on Their Behavior in Sport[16]

Role Model	Percentage
National governing body athletes (n = 2219)	
Coaches	90
Parents	76
Olympic athletes	64
Other players	56
Local or community athletes (n = 643)	
Coaches	78
Parents	75
Other players	56
Teachers	53

[a] Participants were asked to indicate whether the following people had *mostly good influence*, *mostly bad influence*, or *no influence* on their behavior in sport: other players, coaches, officials, parents, spectators, teachers, professional athletes, Olympic athletes, collegiate athletes, other.

in specialized athletes when training and competition environments are fun, include the intentional teaching of life skills, and offer a motivational climate that supports the needs of the athlete.[17] This improves athlete resilience and mental toughness, which has been shown to protect mental health during periods of high stress in elite young athletes.[8]

Abusive environments compromise mental health and, unfortunately, specialized athletes are often in situations that place them at higher risk for abuse.[18] These include travel (especially with nonparent adults), close athlete-coach relationships, and perceptions of dependence on the coaching staff for future success.[18] Athletic trainers, parents, and health care providers should be aware of the warning signs for abuse and should ensure that sports programs adhere to best practices regarding abuse prevention and reporting.[18]

SLEEP

Sleep duration and quality is an important component of the health maintenance of all youth athletes. The interplay among increased training hours, goal-oriented sports participation, and sleep duration and quality has not been extensively investigated in the youth sports arena. The increase in training volume that is inherent to sport specialization may directly affect physical and psychological health by altering sleep duration and quality. Training volume has also been associated with an increased risk for injury in high school athletes and youth baseball players.[19,20] It then follows that attention to sleep duration and quality by health care providers, including ATs, is a critical component of caring for the specialized young athlete and may improve mental health and prevent injury.

Epidemiology

The American Academy of Pediatrics (AAP)[21] recommended that children 6 to 12 years of age sleep 9 to 12 hours per night and adolescents 13 to 18 years of age sleep 8 to 10 hours per night. Athletes sleep an average of 6.8 hours per night. Elite athletes participating in individual sports slept 6.5 hours per night, and team-sport athletes, 7 hours per night.[21] The psychophysiological effect of increased training volume on sleep quality and quantity in specialized athletes may be related to increased muscle tension and pain after excessive participation or training, increased stress of competition, and changes in core body temperature.[22–24] The multitude of demands placed on athletes, including academic pressure, social pressure, and physical stress, may affect sleep in various ways.

In this light, research devoted to sleep patterns of elite-level athletes may improve our understanding of the effects of intense training on sleep patterns in young specialized athletes. Leeder et al[25] reported that elite Olympic-level athletes showed poorer markers of sleep quality than age-matched and sex-matched nonathletes. Among a cohort of elite rhythmic gymnasts, 78% described poor sleep quality, and gymnasts training more than 30 hours per week had roughly twice the odds of short sleep duration.[26] Training schedules may directly affect sleep duration: early-morning starts reduced sleep duration and increased pretraining fatigue levels.[27,28]

The adverse effects of short sleep duration on performance and injury are just now beginning to be realized in the sports literature. A recent study[29] demonstrated a relationship between training load and sleep in young athletes: the negative effects of training load on wellbeing were exacerbated by reduced sleep and minimized by increased sleep. Among elite-level gymnasts, decreased sleep duration, augmented training load, and inferior performance were associated.[30]

Sleep and Mental Health

The interaction between sleep duration and mental health in adolescents is significant, with insufficient sleep and daytime sleepiness having the greatest relationship with mood disorder.[31,32] The relationships among sleep duration, training volume, and mental health were examined in athletes 6 to 18 years old. Female athletes, athletes who self-reported a history of clinically diagnosed depression or anxiety, and athletes who reported a prior sport-related injury were less likely to meet sleep recommendations. Athletes who were goal oriented in their sport pursuits were also less likely to meet sleep recommendations than young athletes who pursued sport for fun or pleasure.[33] Analyzing the same data, Milewski et al[34] found that athletes who practiced soccer more than 10 hours per week slept less than their peers who practiced 3 or fewer hours per week, and middle school–aged boys (11–14 years old) who practiced more than 10 hours per week slept at least 0.5 hours less per night than their peers who practiced fewer hours. More than 40% of 137 elite, young French athletes with high training volumes reported poor or just sufficient sleep quality, and poor sleep quality was associated with poor academic performance.[35]

Sleep Education

Improving education surrounding sleep hygiene and sports participation, regardless of specialization patterns, is important. O'Donnell and Driller[22] indicated that sleep-hygiene education in elite female netball athletes may have a positive effect on sleep duration and quality. Improving anticipatory guidance efforts surrounding sleep hygiene for young specialized and single-sport athletes may maintain both mental and physical health in all athletes, especially

young athletes on the path toward increased training and specialization.

ELITE STATUS AND PERFORMANCE

Questions surrounding not only the costs but also the benefits of year-round intensive training in children focusing on a single sport persist for athletes, parents, and coaches. For example, a widely held belief is that year-round, intensive training, specialized in a single sport at an early age, leads to future athletic success. Developing superior athletic skill sets relative to peers in a certain sport may encourage young athletes to participate in more advanced levels during early childhood, which may be reinforced by subsequent attention from social media, college scouts, and professional sports organizations. Media platforms often spotlight the high-priced contracts awarded to athletically talented young athletes. Although this news is impressive to read, the statistics tell a different story.

Probability of Success

According to a National Collegiate Athletic Association (NCAA) report,[36] the percentages of high school basketball players who advance to play NCAA varsity men's and women's basketball are 3.4% (1.0% in Division I, 1.0% in Division II, and 1.4% in Division III) and 3.8% (1.2% in Division I, 1.1% in Division II, and 1.5% in Division III), respectively. In summary, only 3 or 4 of 100 high school basketball players participate in varsity basketball at the NCAA level. Additionally, the likelihood of playing at a NCAA Division I institution and potentially receiving a men's or women's basketball scholarship was estimated to be approximately 1 in 100 high school basketball players.[4,36]

Only 1.2% and 0.9% of eligible men's and women's NCAA basketball players were drafted by the National Basketball Association (NBA) and Women's National Basketball Association.[36] The probability of high school basketball players ultimately playing for the NBA or Women's National Basketball Association was exceedingly low: 0.011% (60/550 305, odds of 1 in 9172 players) for males and 0.008% (36/430 368, odds of 1 in 11 955 players) for females. The numbers and percentages of high school athletes who progressed to participate at the collegiate and professional levels are available at the NCAA Web site (http://www.ncaa.org/about/resources/research/probability-competing-beyond-high-school).

Lessons From Elite Athletes

A German research team[37] classified 1558 elite athletes as either *world class* (ie, individuals who ranked in the top 10 places at Olympic competitions or the Senior World Championships) or *national level* (ie, individuals who finished in the top 10 at National Senior Championships but not internationally). Compared with national-level athletes, a greater proportion of world-class athletes participated in multiple sports during childhood and adolescence. This was true for both training (66% versus 51%) and competition (53% versus 39%). Longitudinal analysis confirmed that the world-class athletes spent more time practicing sports other than their dominant sport from early childhood to adulthood. Interestingly, among this population of world-class athletes, a dose-response association appeared to be present between world-class success and the number of additional sports pursued by the athlete. Furthermore, early athletic success (<14 years old) resulting from single-sport specialization was generally not sustained into adulthood and the onset of single-sport specialization was later (14.4 years) in the world-class athletes than in the national-level athletes (12.1 years). Similarly, elite Danish athletes specialized in a single sport at a later age than near-elite Danish athletes.[38] The German research team concluded that performing multiple sports, especially during the early to middle teen years, indicated a greater likelihood of athletic success.[37] Although admittedly, other contributing factors differentiate world-class from national-level athletes, this report is worth highlighting. Gullich et al[39] compared sport-activity histories between medalists and nonmedalists in international competitions with similar findings. In the United States, the AAP[2] observed that NCAA Division I athletes had a propensity to play multiple sports during high school. Additionally, the same AAP report documented that at the 2015 National Football League Scouting Combine, 87% of the 322 participants played multiple sports, compared with only 13% who pursued football alone while they were growing up.[2] More evidence has been documented in Australia. Baker et al[40] found that top triathlon athletes spent more training hours in non–triathlon-related activities than middle-ranked and low-ranked triathlon athletes.

The underlying mechanism may be that playing multiple sports during childhood and throughout their athletic careers exposes athletes to various neuromuscular-activation, -control, and -movement patterns.[41] General motor skill sets can be classified into *skill-related physical fitness* (agility time, reaction time, coordination, power, speed, and balance) and *health-related physical fitness* (muscular strength, muscular endurance, cardiovascular endurance, body composition, flexibility, and stress recovery).[42] Those who specialize in a single sport may develop skill-related physical fitness relative to their sport at an early age. However, those who engage in multiple sports likely enhance their overall physical fitness. Training various muscle groups by participating in different sports during childhood may facilitate greater overall athletic development.

Injury Risk

Several groups[43,44] have looked at injury risk in young specialized athletes. Rugg et al[43] identified current NBA players who were drafted in the first round from 2008 to 2015 and investigated whether they participated in additional sports (multiple-sport athletes) or played only basketball (single-sport athletes) during high school. Of 237 NBA players, 15% were multiple-sport athletes and 85% were single-sport athletes in high school. The NBA players who were multiple-sport athletes in high school were less likely to sustain a major musculoskeletal injury than those who focused on basketball alone (multiple-sport NBA players = 25%, single-sport NBA players = 43%). Also, NBA athletes with a history of multiple-sport participation during high school demonstrated greater longevity and higher percentages of total games played than NBA athletes

who pursued only basketball (multiple-sport NBA athletes = 94%, single-sport NBA athletes = 81%).[43]

Other authors[44] investigated sport-specialization status among 102 professional baseball players in an independent league in the United States. The players were asked whether or not they specialized in baseball before high school and about their history of major injuries. A *major injury* was defined as a musculoskeletal injury or condition that kept the player out of baseball for an entire year.[44] Specialization in baseball before high school occurred in 49%, whereas 51% played other sports. Professional baseball players who participated only in baseball (single-sport athletes) before high school were more likely to suffer major injuries during their professional careers than players who participated in additional sports (multiple-sport athletes).[44] These studies seem to indicate the prophylactic benefits of performing multiple sports in childhood and adolescence rather than focusing on a single sport.

Hall et al[45] reported 1.5- to 4-fold increased relative risks of patellofemoral pain, Sinding-Larsen-Johansson disease or patellar tendon-related conditions, and Osgood-Schlatter disease in young female athletes who pursued a single sport compared with multiple sports. According to Sugimoto et al,[46] training volume tended to be greater in single-sport female athletes than in those who participated in multiple sports and was independently associated with lower extremity overuse injuries. Jayanthi et al[47] explored risk factors for overuse injuries and early sport specialization in young athletes and found that total time spent in training per week and sport specialization were independently associated with serious overuse injuries, such as spondylolysis, osteochondritis dissecans, and stress fractures. The links among training volume, injury, and sport specialization have been consistent. Post et al[48,49] demonstrated that high competition and training or practice volumes were independently associated with lower extremity injuries in young female athletes.

BURNOUT

Definition

One possible adverse effect of early sport specialization is burnout. However, other factors contribute to burnout as well, including training overload and societal and parental pressures.[3,4,50,51] Burnout is part of a spectrum of conditions that includes overreaching and overtraining.[3] *Burnout* was defined by R. E. Smith[52] as a "response to 'chronic stress' in which a young athlete ceases to participate in a previously enjoyable activity." Raedeke[53] defined the term as a "chronic psychological syndrome consisting of emotional and physical exhaustion, reduced sense of accomplishments, and sport devaluation." Four stages of burnout were described by Smith: (1) the young athlete is placed in a situation that involves varying demands, (2) the demands are perceived as excessive, (3) the young athlete experiences varying physiological responses, and (4) varying burnout consequences develop (ie, withdrawal).[52] Young athletes may withdraw from a sport because they perceive that it is impossible to meet the physical and psychological demands of the sport.[50] Still, most young athletes do not discontinue a sport due to burnout but because they may be interested in other activities or different sports.[50]

Epidemiology

Data regarding burnout in young athletes are lacking compared with information available on adults. Due to an absence of standard definitions, it is difficult to determine the extent of burnout in young athletes.[3] *Overreaching* is defined as decreased performance due to intense training that is accompanied by psychological and neuroendocrinologic symptoms.[54] Several researchers[55,56] reported overreaching in 30% to 35% of adolescent athletes.

Barynina and Vaitsekhovskii[57] and Wall and Cote[58] observed that athletes who specialized early tended to withdraw from their sports due to burnout. Swimmers who specialized early spent less time on the national team and retired from swimming earlier than athletes who specialized later.[57]

Chyi et al[59] noted "interweaving relationships between life stressors, perceived stress and burnout in college athletes." Li et al[60] showed that focusing on long-term development and communication was protective against burnout. Optimistic elite-level male and female wrestlers were less likely to develop burnout and had lower levels of emotional exhaustion than their less optimistic peers.[61]

Perfectionism

Perfectionism in sports predicts longitudinal changes in athlete burnout.[62] Gustafsson et al[63] studied Swedish junior athletes aged 16 to 19 years in a variety of sports. Athletes who scored high in perfectionism were at greater risk for burnout. This was especially true when they perceived a parental emphasis on winning or failing rather than trying one's best. After investigating junior athletes in the United Kingdom over 3 months, Madigan et al[64] suggested that perfectionistic concerns were a risk factor for developing burnout but that perfectionistic strivings were protective against burnout.

Risk Factors

In young athletes, various factors contribute to burnout that may be related directly or indirectly to sport specialization. Environmental factors may include extremely high training volume, excessive time commitment, demanding performance expectations (imposed by self or significant others), frequent and intense competitions, inconsistent coaching practices, little personal control in sport decision making, and negative performance evaluations.[3,4,56] Personal characteristics contributing to burnout include perfectionism, a need to please others, nonassertiveness, unidimensional self-conceptualization (focusing only on one's athletic involvement), low self-esteem, and a high level of perceived stress (high anxiety).[3,4,56]

Diagnosis

The diagnosis of burnout in young athletes is often difficult and requires a comprehensive history, focused physical examination, and limited testing.[3,54,65] Athletes

with ambiguous muscle or joint complaints, fatigue, or poor academic performance without a specific diagnosis should be evaluated for burnout.[1] As part of the workup, it is important for health care providers to question further the athlete's motivation to participate in the sport.[1]

Symptoms of Overtraining Syndrome or Burnout. The symptoms of burnout may vary in young athletes and include fatigue; depression; bradycardia or tachycardia; loss of motivation or interest; hypertension; sleep disturbances or insomnia; irritability; agitation; decreased self-confidence; anxiety; nausea; loss of appetite; weight loss; lack of mental concentration; heavy, sore, or stiff muscles; restlessness; and frequent illness.[3,4,51,54]

History. Athletes with burnout may have a history of decreased performance persisting despite weeks to months of recovery, disturbances in mood, lack of signs or symptoms reflective of other possible causes of underperformance, lack of enjoyment from sport participation, and inadequate nutritional and hydration intake.[3–5] Athletes should be screened for the presence of potential triggers, such as (a) increased training load without adequate recovery, (b) monotony of training, (c) excessive number of competitions, (d) sleep disturbance, (e) stressors in family life (eg, parental pressure), (f) stressors in sporting life (eg, coaching pressure and travel demands), and (g) previous illness.[3,54]

Diagnostic Testing. If indicated by the young athlete's history, the following laboratory tests could be considered to rule out metabolic causes of burnout: complete blood count, comprehensive metabolic panel, erythrocyte sedimentation rate, C-reactive protein, iron studies, creatine kinase, thyroid studies, cytomegalovirus, and Epstein-Barr virus titers.[3–5] Clinicians trained in psychological assessments could consider administering the Profile of Mood States, which is a psychometric tool for a global measure of mood, tension, depression, anger, vigor, fatigue, and confusion.[3,54,65] The Athlete Burnout Questionnaire could also be administered.[66]

Implications

Burnout in young athletes can lead to serious physical and psychosocial implications, both short term and long term. A young athlete who drops out of sports or all physical activities due to burnout is at risk for multiple comorbidities. Examples include obesity, depression, hypertension, diabetes, and poor academic performance. Overall, burnout has been reported[67,68] to have significant effects on motivation, performance, and wellbeing.

The Stroop Color and Word Test is a common neuropsychological test for brain dysfunction and cognition. Ryu et al[69] studied 460 Korean high school student-athletes using the Stroop Test and electroencephalograms. Athletes with burnout were less accurate on the Stroop Test and displayed lower amplitudes in the frontal areas of the brain. These results suggest intrinsic cognitive dysfunction in athletes with burnout.

Prevention

The AAP and American Medical Society for Sports Medicine have published 3 reports to help prevent burnout in young athletes.[1–3] Their recommendations include the following:

(1) Keep workouts interesting, with age-appropriate games and training, to preserve fun during practices.
(2) Take 1 to 2 days per week off from organized or structured sport participation to allow the body to rest or to participate in other activities.
(3) Take 2- to 3-month breaks from structured training and competition in 1 sport while focusing on other activities and cross-training to prevent a loss of skill or conditioning. These breaks may be divided into 1-month increments.
(4) Focus on wellness and teaching athletes to be in tune with their bodies so they become alert to cues that they need to slow down or alter their training methods.
(5) Emphasize skill development more than competition and winning.[1–3]

The AAP also recommended that young athletes participate in multiple sports, at least until puberty, to decrease the chances of injuries, stress, and burnout and emphasized that "the primary focus of sports for young athletes should be to have fun and learn lifelong physical activity skills."[2] Chyi et al[59] endorsed life-management programs to reduce collegiate athletes' stress; these could also be helpful for young athletes.

CONCLUSIONS

Sport participation appears to help protect mental health in young athletes. This protection is optimized when the sport experience is enjoyable and developmentally appropriate. It is important that these features remain priorities for those athletes who choose to specialize in a single sport. Athletic trainers should be aware of current sleep recommendations for pediatric and adolescent athletes. Emerging data from ongoing research on mental health and sleep hygiene in young specialized athletes should provide further guidance on best practices for this population. Athletic trainers and the entire health care team should monitor not only the physical but also the psychological responses of individual athletes to changes in training volume and intensity. Although early sport specialization is believed to be a successful pathway for young athletes' athletic careers, current evidence suggests that performing multiple sports at early ages may actually result in greater adult success in sport. The signs and symptoms of burnout in young athletes can be vague and difficult to detect. Clinicians must be attentive to the possible diagnosis of burnout in young athletes with vague symptoms and decreased academic performance.

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Address correspondence to Andrea Stracciolini, MD, FAAP, FACSM, Boston Children's Hospital, Division of Sports Medicine, Department of Orthopaedic Surgery, 300 Longwood Avenue, Boston, MA 02115. Address e-mail to Andrea.stracciolini@childrens.harvard.edu.