

Preventing and Managing Sports Injuries in Adolescents: Strategies and Practices

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Abstract: With the proportion of adolescents participating in sports increasing year by year, the problem of sports injuries is of increasing concern, and this study aims to investigate its main causes and effective prevention strategies. The adolescent population is at an elevated risk of sports injuries at a developmental stage when their physical maturation is not yet complete. Thus, comprehensive studies are imperative to elucidate the associated factors and effective interventions. This study employed a qualitative approach to analyze the common causes of injuries, including over-training, improper technique, and lack of protection, as identified in the existing literature. The results show that the risk of injury can be greatly reduced by enhancing the pre-exercise warm-up, imparting proper technique instruction, developing individualized training programs, and reinforcing safety education in both home and academic settings. This study may serve as a reference for preventing sports injuries in adolescents, thereby providing preliminary recommendations, aiming to support healthy growth and athletic development in adolescents.

Keywords: Adolescents, Sports Injuries, Prevention Strategies, Physical Training.

1. Introduction

The rising prevalence of young people engaging in sports activities has led to a notable increase in the incidence of sports injuries, which have emerged as a significant concern affecting their health and sports performance. The statistical evidence indicates a continued increase in the number of adolescents receiving medical treatment for sports injuries on an annual basis. This not only negatively affects their physical development but may also diminish their enthusiasm for participating in sports. Research indicates that the incidence of sports injuries among young people is as high as 20%, of which injuries caused by inappropriate training techniques and plans account for a large proportion. These injuries not only affect the physical health of young people, but may also affect their long-term sports participation. Therefore, implementing scientific preventive measures can effectively protect the physical and mental health of young people and promote their physical and mental health development [1]. This study aims to deeply analyze the causes of sports injuries among young people and evaluate the effectiveness of current prevention measures. Specifically, it reviews relevant literature to identify the main causes of these injuries, assesses the efficacy of various preventive strategies, and proposes recommendations for improvement. Moreover, it provides an overview of the current prevalence of adolescent sports injuries and associated statistical data,

analyzes the key factors that contribute to these injuries, and evaluates existing preventive measures to help identify directions for future research and improvements.

2. Factors Influencing Sports Injuries in Adolescents

2.1. Physiological Factors

The elevated prevalence of sports-related injuries among adolescents is closely associated with their physiological developmental stage, during which their skeletal and muscular systems are still maturing. In particular, the growth rate of bones often exceeds the development level of surrounding tissues. This imbalance makes adolescents prone to ligament and muscle strain during exercise. Also, adolescents have higher hormone levels and relatively lower bone density, which further increases the risk of sports injuries. Unbalanced development of the skeletal and muscular systems and incorrect posture during exercise are particularly prone to fractures and other injuries. For example, an 18-year-old male school sports athlete developed lumbar pain during exercise. The pain initially developed slowly and was not formally diagnosed or treated. It usually occurred after exercise (running) and was accompanied by soreness, but no obvious pain in the lower limbs. Although the symptoms were relieved after bed rest and acupuncture treatment, the patient's symptoms gradually worsened in the past three months, and he now has bilateral anterior and lateral thigh soreness and needle-like pain [2]. Thus, adolescents are in a rapid stage of bone and muscle development, with low bone density, coupled with incorrect exercise posture, which can easily lead to lumbar pain. This further illustrates that the risk of sports injuries increases significantly during this stage of physiological development, and highlights the importance of developing appropriate training plans and preventive measures for adolescent athletes.

2.2. Psychological Factors

Adolescents exhibit distinctive psychological characteristics, including significant mood swings and elevated stress levels, which greatly influence their susceptibility to sports injuries and their coping behaviors. Due to their immature cognitive abilities, adolescents often underestimate the risk of sports injuries and lack effective prevention awareness and skills. During self-identification, adolescents may engage in risky behaviors that heighten their injury risk. Additionally, social pressure and a competitive mindset can lead them to ignore warning signs from their bodies and persist with intense training. High levels of psychological stress can also contribute to distraction and muscle tension, further increasing the likelihood of injuries. For example, some studies have pointed out that the fear of sports injuries is one of the main psychological factors that prolong treatment time [3]. Factors such as sport type, athlete experience, injury type and location can affect recovery time. Athletes who have been engaged in professional sports for a long time often have a better understanding of their bodies, leading to varied recovery durations. These findings indicate that adolescent athletes' perception and response to sports injuries are significantly affected by psychological factors. Thus, individual differences and the role of psychological factors should be thoroughly considered when designing prevention and rehabilitation.

2.3. Environmental Factors

Environmental factors significantly impact the incidence of sports injuries in adolescents. The safety of sports venues and equipment directly influences the severity of injuries. Poorly maintained facilities, outdated equipment, or the absence of essential safety measures, such as gymnastics mats and crash pads, can increase the risk and severity of injuries. In addition, extreme weather conditions, such as heat or cold, can elevate the risk of injury. Inadequate training plans also pose a risk, as

improper guidance and plans that do not account for the physiological characteristics of adolescents can result in both acute injuries and chronic fatigue or overuse injuries. For example, in extreme heat conditions, adolescents may be at risk of heat stroke, while inclement weather conditions may lead to slip accidents. Training plans that lack scientific basis and inappropriate guidance can easily lead to excessive exercise, which in turn increases the chance of injury. To mitigate the risk of sports injuries and ensure the safety of sports venues and equipment, it is essential to design training plans that align with the physiological characteristics of adolescents and to adjust activity content based on weather conditions.

3. Prevention Strategies for Sports Injuries in Adolescents

3.1. Enhancing Awareness of Injuries and Self-Protection

Young athletes are particularly prone to injuries in high-intensity sports such as basketball. And these injuries can adversely affect their competitive performance and pose significant risks to their long-term health and development. Therefore, it is essential to enhance athletes' awareness of injuries and their self-protection strategies. First, athletes need to recognize the prevalence of sports injuries and their impact on their sports careers. For example, survey data showed that 132 out of 160 basketball players had experienced sports injuries. Finger and knee joint injuries are particularly prevalent, comprising 66.7% and 69.7% of cases, respectively. These injuries mainly occur during actions such as dribbling, layups and dunks, and the fingers and knee joints are under greater pressure during intense exercise. In addition, wrist and ankle injuries are also prevalent, with 57.6% and 49.2% of athletes reporting experiencing these problems, respectively. Despite the relatively rare occurrence of the most severe injuries, they still significantly impact athletes' performance and recovery. And muscle strains are also common in basketball training, affecting 44.7% of athletes and significantly impacting training plans [4]. The survey of U16 youth basketball players in Jiangsu, China revealed that many athletes have insufficient knowledge of sports injuries and self-protection strategies. Therefore, coaches need to strengthen the cultivation of injury awareness in theoretical and practical training. Athletes should fully understand the risks of sports injuries and effective preventive measures through detailed explanations, demonstrations and practical operations, which includes the use of appropriate protective equipment, such as knee pads, elbow pads and wrist guards, to reduce the incidence of sports injuries. Improving athletes' self-protection awareness will help reduce the occurrence of sports injuries and ensure their health and sports performance [4].

3.2. Optimizing Technique and Training Methods

Standardized technical movements play a key role in preventing sports injuries and improving sports performance. Standardized technical movements not only help reduce the occurrence of sports injuries, but also improve sports efficiency and maintain the persistence of skills in training and competition. To ensure the standardization of technical movements, a systematic teaching method must be adopted, including detailed explanations, demonstrations, continuous practice, and timely feedback. Tools such as video analysis, mirror exercises, and peer reviews are crucial for helping athletes identify and correct technical deficiencies, which enable athletes to gain a clearer understanding of their movements and make the necessary adjustments. Moreover, developing a personalized training regimen is an effective strategy for optimizing sports performance. Training intensity should be incrementally increased to avoid overtraining. The regimen should be customized based on the athlete's age, physical condition, and recovery capacity. Implementing the principle of periodic training and reasonably arranging high-intensity and low-intensity training courses can effectively avoid the monotony of training. At the same time, the fatigue and recovery of athletes need to be carefully monitored. Timely adjustment of training plans and attention to the value of rest

and recovery, which includes adequate sleep and nutritional supplements, are also important measures to prevent sports injuries. Regular physical examinations and adjustment of training intensity based on test results can further improve the training effect. Athletes should also be educated to recognize signs of overtraining syndrome and proactively communicate their physical condition to facilitate early identification and intervention. Employing these strategies to optimize technique and training methods can significantly reduce the incidence of sports injuries, enhance athletic performance, and safeguard the health and long-term well-being of young athletes [5].

3.3. Implementing Effective Protective Measures

In order to prevent sports-related injuries, adolescents participating in sports should be equipped with appropriate protective gear and adhere to safety precautions, including providing suitable protective equipment during training and competition, such as helmets, knee pads, and elbow pads. Each piece of equipment should be selected based on the specific requirements of the sport, so as to ensure optimal protection. Coaches and parents need to ensure that athletes understand how to select and use the equipment and perform regular inspections and adjustments before each game. Besides, proper warm-up and stretching exercises should be included, and cool-down exercises should be performed after the activity. At the same time, continuous safety inspections of the competition venue and equipment are required, including venue consistency, equipment fixation, and the presence of harmful objects. It is also critical to ensure that all facilities meet safety standards and repair or replace faulty equipment in a timely manner. And establishing safety rules and response plans, which include prohibiting hazardous activities, ensuring adequate rest periods, and providing first aid services, are essential components of a comprehensive safety strategy. These extensive preventive measures can significantly lower the risk of injury for young athletes and encourage them to participate in sports activities in a safer way, thereby enhancing the sports experience and promoting long-term exercise habits [6].

3.4. Considering Nutrition and Recovery

A balanced diet is essential to maintaining health and optimizing athletic performance. Adolescents should consume sufficient carbohydrates to serve as their primary energy source, high-quality proteins to support muscle growth and repair, and healthy fats to maintain hormonal balance. It is recommended that adequate energy intake be consumed two to three hours before training or competition to maximize results. Therefore, the diet should include a variety of food sources such as brown rice, lean meats, fish, eggs, beans, and a variety of fruits and vegetables. In addition, timely hydration before, during, and after exercise is also key to ensure the body's water balance. Proper training and rest patterns are also essential to an athlete's recovery process. It is recommended that athletes get eight to ten hours of restorative sleep each night so that the body has enough time to recover and produce growth hormones. Appropriate rest days should be included in the training plan, especially after high-intensity training, and a recovery period of 1-2 days is recommended. It is important to avoid overtraining, so the intensity and frequency of training should be adjusted according to individual needs. Active recovery measures, such as light aerobic exercise, stretching, or yoga, can also help ease the recovery process. By eating a balanced diet and getting enough rest, young athletes can not only stay healthy but also optimize their performance and minimize their risk of injury [7].

4. Management of Sports Injuries in Adolescents

4.1. On-Site Management of Acute Injuries

The initial treatment of acute sports injuries in adolescents should strictly follow the PRICE principle to ensure effective injury reduction and recovery. First, protection requires immediate cessation of all sports activities to prevent further deterioration of the injury. Next, rest is crucial, and the injured part must rest completely to avoid additional injury and promote healing. Then, ice treatment should be performed within 24 to 48 hours after injury, for 15 to 20 minutes each time, repeated every one to two hours to reduce swelling and pain. Compression is also key, and moderate pressure applied by using an elastic bandage can help further control swelling. Finally, elevating the injured part above the level of the heart can promote venous return and reduce local edema. In the process of dealing with acute injuries, it is also necessary to continuously monitor the patient's overall health and immediately seek professional medical intervention in the event of serious injuries (such as fractures or dislocations), rather than rushing to transfer the injured to other locations. In addition, specific treatment plans should be provided according to different types of injuries (such as abrasions, sprains, etc.), and ensure that the injured part is cleaned and bandaged to prevent infection and promote healing [8].

4.2. Rehabilitation Training and Recovery Strategies

Rehabilitation training should be based on the principle of gradual progress, starting with low-intensity exercises and gradually increasing the intensity and difficulty to adapt to the recovery process of the injured part. The development of an individualized rehabilitation plan must take into account the specific nature, severity and stage of recovery of the injury [9]. Rehabilitation training should include joint range of motion recovery exercises and enhanced proprioception training. The former aims to restore the normal range of motion of the joint, while the latter strengthens the muscles around the injured part by gradually increasing the load, improving overall stability and function. Improving proprioception ability can help enhance the athlete's balance and coordination. In addition, flexibility training should be combined with aerobic training during the rehabilitation process to fully promote recovery. It is essential to closely monitor the athlete's pain responses and prevent overtraining, particularly during this stage. Psychological rehabilitation is also a critical aspect of the recovery process. Incorporating team activities or competitive elements into the rehabilitation process is recommended to sustain the athlete's motivation and self-confidence. These comprehensive strategies can facilitate a faster recovery, enhance sports performance, and promote the long-term health and well-being of young athletes [10].

5. Conclusion

The results show that the prevention and management of sports injuries in adolescents is a complex and multidimensional task. Effective prevention strategies involve increasing athletes' awareness of self-protection, standardizing technical movements, implementing appropriate protective measures, and ensuring balanced nutrition and adequate rest. In terms of injury management, on-site treatment of acute injuries should follow the PRICE principle (protection, rest, ice, compression, elevation), while rehabilitation training needs to follow the principles of gradual and personalized. These strategies can not only reduce the incidence of sports injuries, but also improve sports performance and long-term health. Future research should focus on refinement and personalization, particularly in analyzing injury patterns across different age groups and sports, so as to develop more targeted and effective prevention strategies. At the same time, attention should be paid to the impact of psychological factors on sports injuries and a comprehensive physical and mental health management

program should be developed. In terms of technology, the use of wearable devices and artificial intelligence in real-time monitoring and early warning should be explored. In terms of education, safety awareness training for coaches, parents and athletes should be strengthened to establish an effective injury prevention and management system. Interdisciplinary collaboration will be a key trend in the future, combining insights from fields such as sports medicine, nutrition and psychology to form a comprehensive care for young athletes.

References

- [1] Yang, L. and Cheng, R.R. (2024) *Sports Injuries and Prevention Strategies in Adolescent Physical Development. Science & Technology of Stationery & Sporting Goods*, 15: 117-119.
- [2] Zhao, X.Q., , Zhang, X.R. and Luo, S.F. (2023) *A case of intervertebral discogenic low back pain due to sports injury in adolescents [J/OL] . China Clinical Case Outcome Database*, 05(1) : E00101-E00101. .
- [3] Lee , Y.S., et al. (2020) *Sports injury type and psychological factors affect treatment period and willingness-to-pay: Cross-sectional study. Medicine (Baltimore)*, 99(50):e23647.
- [4] Hu, J.L. (2023) *Research on the Investigation of Injury Damage and Prevention Methods of U16 Youth Basketball Players in Jiangsu Province. Sports Vision*, 2023(23):103-105.
- [5] Guangdong Provincial Center for Disease Control and Prevention. (2023) *Preventing Sports Injuries in Children: Risks and Strategies for Running, Jump Rope, and Ball Games. http://cdcp.gd.gov.cn/jkyy/jkzt/hjyxxws/content/post_4250699.html*
- [6] Nyland, J., Kaya, D. and Wessel, R.P. (2015). *Injury Prevention in Different Sports. In: Doral, M.N., Karlsson, J. (eds) Sports Injuries. Springer, Berlin, Heidelberg.*
- [7] Kaufman, M., et al. (2023) *Popular Dietary Trends' Impact on Athletic Performance: A Critical Analysis Review. Nutrients.*, 15(16): 3511.
- [8] Trebinjac, S. and Nair, M.K. (2020). *Current Practices in Sports Injury Rehabilitation. In: Regenerative Injections in Sports Medicine. Springer, Singapore.*
- [9] Shrier, I. (2015) *Strategic assessment of risk and risk tolerance (StARRT) framework for return-to-play decision-making. Br J Sports Med.*;49: 1311–1315.
- [10] Dhillon, H., Dhillon, S. and Dhillon, M.S. (2017) *Current Concepts in Sports Injury Rehabilitation. Indian J Orthop.*, 51(5):529-536.