

# Sports Injuries and Their Lingering Long-Term Effects: Proposing the Addition of Injury Prevention Programs within Athletics

Abigail Theobald<sup>1</sup> and Justin Dennis<sup>1#</sup>

<sup>1</sup>Lakota East High School, USA

#Advisor

## ABSTRACT

The present review article analyzed the long-term effects of sports injuries, whether adequate measures were already being taken to prevent serious injury within athletics, and what new methods could be implemented to reduce the high prevalence of such injuries. Athletes are faced with an increased pressure to perform due to the societal expectations of achieving success at an expedited rate. This pressure combined with the lack of preventative measures and education within athletics causes both acute and chronic injuries. This article examines how these injuries can not only have devastating short-term effects on the athlete, but can also cause long-term effects that impact the remainder of the athlete's life. Some athletes are forced to drop out of participation, have to live with constant pain, and/or are unable to partake in physical activity later in life. Based upon the reviewed research, this is becoming a widespread issue within and beyond the public school system, with many institutions choosing not to implement preventative measures for their athletes.

## The Issue

The increased emphasis on high-level training, elite-level performance, and the acquisition of championships and scholarships has increased the pressure on young athletes to practice at higher intensities. Young athletes push their bodies beyond a healthy limit because of this pressure to perform. The tendency for these athletes to compete while sick, skip warm-ups and cool-downs, and rush rehabilitation regimens has drastically increased with the increase in early sport specialization. Playing through pain and ignoring the body's natural response to extreme levels of stress have also become common occurrences within athletics due to the increased pressure.

## Distinction between Acute and Chronic Injuries:

Injuries occur in all levels of varying severity, however most injuries fall into one of two main categories: acute or chronic. Acute injuries are the result of a single traumatic event and are not part of a previously existing condition. They are typically easy to diagnose because they originate from one specific event. In contrast, chronic injuries tend to be more subtle which presents a challenge in achieving a proper diagnosis. By definition, chronic means "persisting for a long time or constantly recurring". Chronic injuries either result from long-term conditions or present themselves as lingering effects brought on by a past acute injury. Improperly treated acute injuries may spiral into long-term chronic issues, often with severe side-effects. Other areas of the body can become damaged through chronic conditions due to overcompensation. In such cases, persistent pain is often a major symptom which can lead to the inability to perform in physical activity. Although chronic injuries are often overlooked by those within athletics, they can hold the same detrimental effects as acute injuries, often causing more serious and long-term issues.

## Qualitative and Statistical Findings:

Although the training that these athletes receive may seem to be improving observed skills and abilities, it is also a detriment to the body. When the human body undergoes physical stress, bones and muscles grow stronger while gaining increased functionality. However, rapid or frequent stress can cause bones and muscles to deteriorate, causing an imbalance in flexibility and strength leading to injury. Tissue breakdown and injury occur when physical activity levels become too intense and/or too excessive in short periods of time. Predisposed physiological factors can also be exacerbated by the increased intensity and frequency of athletic training, such as anatomic malalignment and decreased resistance of cartilage to repetitive microtrauma. These injuries can require lengthy recovery periods, those of which some athletes rush through due to the pressure to return to playing quickly.

Sports injuries are the second leading cause of emergency room visits for adolescents. Approximately three million youth are seen in hospital ERs and another five million by primary care or sports medicine physicians for sports injuries. While these numbers provide an adequate glimpse into the frequency of reported sports injuries, those that are overlooked by athletes, played through, and not treated are missed by this statistic.

Moreover, overuse injuries account for 50% of all sports injuries. Not only are overuse injuries much more common than realized, but they can also result in long-term health consequences. Many athletes are inactive later in life due to the long-term complications of past injuries, with many having to drop out of participation during their youth years. Overuse injuries such as stress fractures, tendinitis, bursitis, post-traumatic osteoarthritis and osteochondral injuries of joint surfaces are not only independent issues but can also be effects of other injuries of both acute and chronic nature.

## Deficiency of Preventative Techniques:

Despite the severity of this on-going issue within youth sports, no real widespread injury awareness exists. Athletes are required to sign participation waivers prior to their involvement in sports, but are not adequately educated upon the effects of the sports injuries that they may sustain during the season. Beyond optional sports medicine classes offered at select schools, athletes do not have accessible information from credible sources regarding the long-term effects they may suffer. Without education and awareness, athletes, coaches, and athletic administration will continue to overlook the severity of this issue. Additionally, a majority of athletic departments within schools and club athletic teams do not provide their athletes with proper preventative measures. Not many protocols for sports injury prevention are in place to protect the athletes, and the rehabilitation programs required after an injury is sustained are seldom followed or reinforced by athletes and their respective coaching staff.

## Preventative Measures as a Proposed Solution

Sports injury prevention programs can not only reduce the overall number of injuries, but also their severity and intensity. Specifically, neuromuscular injury prevention programs have shown to hold a 37% reduction in overall injury risk and a 47% reduction in overuse injury risk. Neuromuscular training uses specific exercises to target neural and muscular movement components with biomechanics as a major focus. If utilized correctly, they can help develop better control and joint stability which reduces the risk of acute injuries. Previously, neuromuscular conditioning techniques have been used post-injury in rehabilitation programs to restore neuromuscular control through the use of proprioceptive exercises. However, these techniques are also advocated for when it comes to injury prevention. Successful components of this type of training include plyometrics, agility, balance, and sport specific movements. When used frequently in the correct combination as a pre-habilitation method, these neuromuscular exercises can successfully reduce injury rates.

## Warm-Ups and Cool-Downs:

Due to the nature of neuromuscular training exercises, they can easily be built into a 10–15-minute warm-up prior to all athletic performances. The addition of longer warm-up routines prime the body for athletic participation by activating the targeting muscle groups allowing the athlete to perform at a lower risk. The addition of cool-down routines after exercise aids the body in returning to its resting state while minimizing post-activity soreness. Effective warm-ups and cool-downs will not only aid in reducing the risk of injury involved with participating in sports but will also improve overall performance.

The purpose of an effective warm-up is to increase heart rate, body temperature, and blood flow gradually and safely to muscles. This increase improves elasticity of muscles and joints by distributing lubricating fluid to reduce friction, stimulates neural pathways, and prepares muscles for performance. A warm-up should last 15-30 minutes while progressing through a variety of stages, and should produce mild sweating. However, it should not fatigue the athlete prior to more rigorous training. Phase one should include a low intensity cardiovascular exercise that lasts for 5-10 minutes, such as walking or light jogging. Phase two should involve more dynamic movements or stretches to loosen the body. Lunges and arm rotations are two adequate examples. Phase three should include agility, acceleration, deceleration, and speed drills to help prepare the body for the faster movements involved in sport. Such exercises include form running and lateral shuffles. Phase four should involve sport-specific exercises initially performed at lower intensity building up to peak performance. By the end of phase four, the athlete should be able to perform at 100% without compromising the safety of their body.

Appropriate cool-downs are essential to the body's natural recovery process and will not only assist with decreasing soreness, but also reduce the likelihood of muscle shortening and possible injury. The purpose of the cool-down is to gradually lower the heart rate and body temperature, relax the muscles, dispose of waste products and toxins generated during exercise such as lactic acid, stop blood from pooling, and prevent dizziness which can occur if activity is stopped abruptly. Stopping activity without cooling down can contribute to the build up of toxins and lactic acid within the body which can cause muscular pain and stiffness in the following days. This stiffness results in restricted movement, which if not treated properly through both dynamic and static stretching, can cause injury. Effective cool-downs should last close to 15-30 minutes depending on the type of exercise previously performed. Easy exercise should be done towards the end of practices as the beginning of the cool-down, which can include light jogging and walking or the exercise that best resembles the overall workout. Stretching should immediately follow the conclusion of the first phase of the cool-down. PNF, utilizing resistance, and static stretches are usually the best to do for cool-downs, although yoga is also beneficial. Deep breathing during stretching also helps to re-oxygenate the body's systems.

## Importance of Rest and Recovery:

Rest and recovery days are also vital to the well-being of any active individual. Within the world of fitness, experts in the field recognize that rest days are of the utmost importance. During recovery, the body is able to remove excess lactate from muscles, fibroblasts repair muscle tissue from microtears that occur during physical activity, and glycogen stores are replenished. This in turn alleviates pain and soreness, increases energy levels, and also allows the mind to rest. Despite this fact, most athletes are forced to perform while experiencing the overtraining symptoms, which can cause both short and long-term damage to their bodies. Not allowing the body to rest can cause a depletion in glycogen stores that triggers the body to use protein for energy instead. This switch in energy sources causes a decrease in available protein for muscle repair and growth, which hinders the athlete from improving their performance and increases the risk of serious injury. Without a rest day, the body does not have enough time to repair itself in between training sessions, which leads to mental exhaustion. One day a week is not always sufficient time for the body to repair itself, especially after a particularly strenuous session. Many coaches do not understand how overtraining affects the body, which leads them to the mindset that multiple days off for recovery will cause their ath-

letes to lose their skill or fitness. However, through the implementation of scheduled rest days and active recovery sessions, athletic performance can be boosted and sustained for longer periods of time.

### Education and Awareness for the Athlete:

Education is another major component of injury prevention. Athletes cannot make informed decisions about their athletic involvement without first understanding the extent of the risks and the methods to reduce said risk. Presentations upon the outlined issue would serve to raise the awareness of both the athlete and the athletic administration, while informational meetings regarding preventative techniques would decrease the risk of injury. To ensure comprehensive understanding of injuries, their long-term effects, and preventative measures, the expertise of healthcare professionals such as athletic trainers and team physicians should also be utilized. Medical professionals such as those stated above have been thoroughly educated and trained to support the health of the athlete, therefore, their recommendations should be held in the highest regard by both the athlete and the surrounding athletic administration.

## Potential Obstacles and Implementation Challenges

Added expenses could be viewed as a potential obstacle in the implementation of the aforementioned solutions, however almost all of them negate the need to purchase new equipment or rent new space. Increasing education would only require an added expense if the athletic institution does not already have the necessary resources. Neuromuscular training, warm-ups, and cool-downs can all be performed anywhere without the use of equipment, and rest days can be added to the team's schedule without any cause for monetary concern.

Loss of valuable practice time could also be seen as an issue with the addition of preventative programming, however many of the proposed solutions can be built into pre-existing routines or added with minimal disruption. Neuromuscular training can be worked into a longer warm-up or emphasized in the weight room. Rest days can be utilized for film studies or other team activities, and educational sessions can be combined with previously scheduled team meetings so as to reduce the amount of unnecessary events.

Some athletes, coaches, or administrators may feel as though these proposed solutions are unnecessary, however current systems can always be improved. With the addition of preventative training techniques and education, athletes can begin to participate in their respective sports without as great a risk of long-term consequences. Overall performance may also be boosted which would in turn generate greater outcomes for the athletes and their teams.

Although those opposed to the implementation of the previously stated preventative measures will likely see added cost, loss of time, and unnecessary need as issues, these obstacles are rare and should not hinder the success of prevention programs within athletics nor should they minimize the overall health benefits.

## Discussion

After a deep dive into existing research on sports injuries, overtraining, and prevention techniques, it became evident that this is a major issue within society. Many athletes have lost out on long term participation in sport because of career ending injuries or overtraining to the point of bodily damage. The risks of sustaining such an injury remain high without any preventative techniques to offset them.

## Conclusion

Sports injuries and their lingering effects are a detriment to the health of every athlete. However, there are ways to decrease the risk and prevent them from occurring. Through the implementation of prevention programs within athletics and the expansion of education upon this issue, the risk for sports injuries and their effects will likely decrease which would in turn increase the overall health of each individual athlete.

## Acknowledgments

I would like to thank Lakota East High School for providing academic resources. I also wish to extend a special thanks to Beacon Orthopaedics for useful discussion and partnership.

## References

Cooling Down after Sport - Sports Injury Prevention | Sports Medicine Information. (n.d.). Nsmi.Org.Uk. Retrieved March 29, 2021, from <http://www.nsmi.org.uk/articles/injury-prevention/cooling-down.html>

Emery CA, Roy TO, Whittaker JL, Nettel-Aguirre A, Mechelen W. Neuromuscular training injury prevention strategies in youth sport: a systematic review and meta-analysis. *Br J Sports Med* 2015; 49:865-70.

Emery, C. A., & Pasanen, K. (2019). Current trends in sport injury prevention. *Best Practice & Research Clinical Rheumatology*, 33(1), 3–15. <https://doi.org/10.1016/j.berh.2019.02.009>

Etty Griffin, L. Y. (2003). Neuromuscular Training and Injury Prevention in Sports. *Clinical Orthopaedics and Related Research*, 409, 53–60. <https://doi.org/10.1097/01.blo.0000057788.10364.aa>

Fletcher, J. (2021, January 28). When and how to spend a rest day. *Medical News Today*. <https://www.medicalnewstoday.com/articles/rest-day#risks-of-no-rest>

Harrop, B. (2017, August 16). Warm Up and Cool. . . *PhysioAdvisor*. <https://www.physioadvisor.com.au/health/injury-prevention/warm-up-cool-down/>

Injury Prevention in Sport. (n.d.). Physiopedia. Retrieved March 28, 2021, from [https://www.physio-pedia.com/Injury\\_Prevention\\_in\\_Sport](https://www.physio-pedia.com/Injury_Prevention_in_Sport)

Kid's Sports Injuries: The Numbers are Impressive. (n.d.). Nationwide Children's. <https://www.nationwidechildrens.org/specialties/sports-medicine/sports-medicine-articles/kids-sports-injuries-the-numbers-are-impressive>

Kliethermes, S. A., Marshall, S. W., LaBella, C. R., Watson, A. M., Brenner, J. S., Nagle, K. B., Jayanthi, N., Brooks, M. A., Tenforde, A. S., Herman, D. C., DiFiori, J. P., & Beutler, A. I. (2021). Defining a research agenda for youth sport specialisation in the USA: the AMSSM Youth Early Sport Specialization Summit. *British Journal of Sports Medicine*, 55(3), 135–143. <https://doi.org/10.1136/bjsports-2020-102699>

Medina, M. (2019, December 17). Do You Know How To Prevent a Chronic Sports Injury? | Keck Medicine of USC. Keck Medicine of USC |. <https://www.keckmedicine.org/do-you-know-how-to-prevent-a-chronic-sports-injury/>

Owoeye OBA, Palacios-Derflinger LM, Emery CA. Prevention of ankle sprain injuries in youth soccer and basketball: effectiveness of a neuromuscular training program and examining risk factors. *Clin J Sport Med* 2018;28:325-31.

Roantree, G. (n.d.). Neuromuscular training and injury prevention. *SportsCare and Physiotherapy*. Retrieved March 29, 2021, from <https://www.sportscarephysio.com.au/neuromuscular-training/>

Sheu, Y., Chen, L.-H., & Hedegaard, H. (2016). Sport And Recreation Related Injury Episodes In The U.S. Population. *Medicine & Science in Sports & Exercise*, 48, 868.  
<https://doi.org/10.1249/01.mss.0000487603.12911.c4>

Simon, J. E., & Docherty, C. L. (2013). Current Health-Related Quality of Life Is Lower in Former Division I Collegiate Athletes Than in Non-Collegiate Athletes. *The American Journal of Sports Medicine*, 42(2), 423–429.  
<https://doi.org/10.1177/0363546513510393>

Steakley, L., Armitage, H., & Benzkofer, S. (2014, March 6). Lingering effects of injuries sideline many former college athletes later in life. *Scope*. <https://scopeblog.stanford.edu/2014/03/06/lingering-effects-of-injuries-sideline-many-former-college-athletes-later-in-life/>

Walden, M. (2019, July 30). Warm Up & Cool Down – Why? *Sportsinjuryclinic.Net*.  
<https://www.sportsinjuryclinic.net/sport-injuries/sports-injury-prevention/warm-up-cool-down>