



Managing Alpine Skiing Injuries: Focus on Anterior Cruciate Ligament (ACL) Tear Prevention in Adolescent Athletes

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Dear Editor-in-Chief

Alpine skiing includes the speed disciplines of downhill and super-giant slalom, and the technical disciplines of giant slalom and slalom (1). Alpine skiing became an Olympic sport in 1936, and the first International Ski Federation (Fédération internationale de ski, FIS) World Cup was held in 1967 (2). As such, alpine skiing is a sport that requires effective turning technique and supporting muscle function, as it involves continuous turns and descents with explosive force throughout the duration of a competition (1).

On the other hand, participation in competitive skiing carries an inherent risk of athletic injury, as with any sport (3). The prevalence of reported injuries in alpine skiing is very high (4), and at the highest level of competition, the World Cup, the prevalence of injuries is reported to be 23.5 to 36.7 per 100 athletes per season (5). Fatal injuries, including head and neck injuries and spine injuries, are more common in this sport than in other sports due to the nature of the activities involved (6). However, the knee is by far the most commonly injured joint in this sport (7).

Anterior cruciate ligament (ACL) injuries, including tears and sprains, are the most common musculoskeletal injuries in the lower extremity in this sport (8). The incidence of ACL injuries is re-

ported as 0.23 per 1000 athletes per day (6). This rate is higher than in female athletes (0.20 per 1000 athletes) and male athletes (0.09 per 1000 athletes) participating in soccer (9). Despite the high incidence rate, this type of musculoskeletal injury has been found to occur more frequently in adolescent athletes compared to adults, likely due to their exposure to cold weather (10). The force of knee flexor muscles, which generates counter extension and anterior shear force, could be decreased in cold weather. Therefore, implementing ACL prevention programs could be crucially important for young and adolescent athletes participating in alpine skiing (10). However, most of the previous studies have focused on the mechanism of injury and other factors in young adults (10).

Understanding the causes and mechanisms of injury is not only essential for performance improvement but also for proper treatment, athlete protection, and safe participation in the adolescent population. From this perspective, analyzing the injury mechanisms, types of injuries, implementing therapeutic exercise programs, applying preventive rehabilitation exercise programs, and treatment modalities related to injuries in alpine skiing, and suggesting preventive programs for



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them, will be helpful in managing injuries and enhancing the athletic performance of alpine skiing athletes.

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Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Kim JH, Lee KH (2014). Analysis of Specific Angle of Joint And Isokinetic Muscular Function on Performance Level Elite Alpine Skier's. *The Korean Journal of Sport Science*, 26(3): 1573-1588.
2. Georgiev NN (1995). Analyse du programme des Jeux olympiques d'hiver, 1924-1998. Lausanne, Switzerland: Centre d'études et de recherches olympiques du CIO.
3. de Roulet A, Inaba K, Strumwasser A, et al (2017). Severe injuries associated with skiing and snowboarding: a national trauma data bank study. *J Trauma Acute Care Surg*, 82(4): 781-786.
4. Baer W. Injuries in competitive skiing (1998). In: Hauser W, Karlsson J, Magi M, eds. *Ski Trauma and Skiing Safety IV*. Munich, Germany: TÜV Edition, 227-229.
5. Haaland B, Steenstrup SE, Bere T, Bahr R, Nordsletten L (2016). Injury rate and injury patterns in FIS World Cup Alpine skiing (2006-2015): have the new ski regulations made an impact? *Br J Sports Med*, 50: 32-36.
6. Meyers MC, Laurent CM Jr, Higgins RW, Skelly WA (2007). Downhill ski injuries in children and adolescents. *Sports Med*, 37(6): 485-499.
7. Davey A, Endress NK, Johnson RJ, Shealy JE (2019). Alpine skiing injuries. *Sports Health*, 11(1): 18-26.
8. Pecina M (2002). Injuries in downhill (alpine) skiing. *Croatian Med J*, 43(3): 257-60.
9. Montalvo AM, Schneider DK, Silva PL, et al (2019). What's my risk of sustaining an ACL injury while playing football (soccer)? A systematic review with meta-analysis. *Br J Sports Med*, 53(21): 1333-1340.
10. Csapo R, Folie R, Hosp S, Hasler M, Nachbauer W (2017). Why do we suffer more ACL injuries in the cold? A pilot study into potential risk factors. *Phys Ther Sport*, 23: 14-21.