



## TECHNOLOGY IN SPORTS AND EXERCISE: ADVANTAGE FOR PERFORMANCE AND ATHLETE'S PROTECTION OR INCREASED RISK FOR INJURY?

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This presentation describes the enormous development of technology and methodology in biomechanics of sports related to performance and sporting goods, apparatus and equipment. It will critically discuss the relevance and importance of technology for performance and its enhancement on one hand and the impact of human resources and training on the other hand. Technology of sporting goods and sport equipment is not only developed to enhance performance but also to decrease the risk of injury during sport activity and exercise. The effects of advanced technology will critically be reviewed regarding to their efficiency and sustainability to the athlete in elite and recreational sports and exercise.

**INTRODUCTION:** In the past decades technology in sport and exercise have dramatically changed and developed. Equipment in cycling, alpine skiing, pole vaulting and many other competitive but also recreational sports changed not only in regard to design and colour but also in relation to the mechanical functionality. Energy loss in using such equipment was reduced, the capacity to use e.g. the biomechanical potential of the muscle-tendon-system was increased. Changes in equipment like in skis facilitated performance but obviously the risk of injury has not been cut down. Many of technological advantages in sporting goods and sporting technology do not meet the aim to reduce the risk of injury or even decrease the danger of failure.

**RESEARCH METHODOLOGY:** The technology of movement analysis in sports and sports biomechanics developed intensively in the past. Research equipment is now easier to receive, cheaper and more or less available for every interested sport scientist. Software packages often used as black boxes allow or promise calculations and results, which are often not strictly controlled and proved. We see a critical risk of receiving misleading results and mal-interpreting "sophisticated" or challenging findings.

**SPORTING GOODS:** Footwear and other sporting goods were mainly designed to decrease the risk of injuries. Whereas some cases showed a positive effect of e.g. running shoes on performance, an experimental prove of the efficacy of reducing the risk and the frequency of running related injuries is still missing. One can ask the question if researchers asked the right questions or forgot to research the major important biomechanical causes of overuse and injury.

**SPORT EQUIPMENT AND PROTECTORS:** Poles for vaulting or alpine skis were extremely developed and functionally optimized. This development clearly facilitated better performance, to learn faster and to jump higher or ski faster. That clearly increased the risk of accidents and related injuries. At the same time protectors as helmets were more frequently applied and used not only in elite sports. Remarkably, the number of injuries and especially the severity of injuries was not significantly reduced simultaneously.

**DISCUSSION & CONCLUSIONS:** Despite the decades of effort invested in the study of sport equipment, apparatus and sporting goods, we continue to discover that many developments with the aim to reduce the frequency of injury failed. We have to discuss if the type of the (recreational) athletes using the sport equipment has changed and offer today decreased biological resources or if the equipment is generally sometimes overconstructed.

Performance enhancement is strongly related to equipment, technology and sporting goods. With performance enhancement the risk of overuse may increase and biomechanical research may help in the future to determine how far a technological enhancement makes sense especially for the recreational athlete.