

DOES TECHNOLOGY HELP REDUCE INJURIES' RATE?

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Received 21 December 2020; Revised 04 January 2021; Accepted January 10 2021

ABSTRACT

Technology is being used in various fields, even in sport area with the purposes of maximizing the potential of athletes and to reduce or prevent injuries. However, a number of studies have shown that the incidence of sport's injury has not declined as it should be. New technology would be promoted to create new running footwear which enhances the elite athletes' performance, but the consideration should expand to those who are not an elite.

Keywords: Technology, Incidence of injury, Running.

INTRODUCTION

The speed of technological changes is likely to progress exponentially over time and to broaden the scope of its areas and impacts. In the modern world, more modern technology enables a new product to get in the hands of consumers rapidly. The field of engineering has faced this evolution including sport engineering which can be categorized into embedded and enabling technology for sport development. The behind-the-scenes embedded system allows coaches to fine-tune athletic movement techniques and performance by precision analytic tools such as radio signals to track movement, real-time data that can be fed back to coaches while the innovative equipment that the athletes use enables athletes' performance during competition. These enable coaches to tailor training programs more closely and to analyze the improvement of the athletes. The World Anti-Doping Agency (WADA) considers if the rapid technologies is being against the spirit of the sport since technological improvements in sport have accelerated to be the practice of gaining a competitive advantage using sports equipment, so called "technology doping" (Institute of Mechanical Eng, 2012).

The effect of technology on development of sport over the decades were reported (Haake, 2009). For example, clothing design improved 4% of 24% improvement in 100-m sprint, new, more flexible pole enabled athletes about 30% of improvement, innovative equipment of cycling development has seen the most impressive 221% of improvement since 1972. In marathon event which human being had not conquered under 2 hours, the current world record has been broken with the duration of 1 hour 59 minutes and 40.2 seconds in INEOS 1:59 Marathon Challenge on October 12, 2019. The training preparation had been planned and worked for years such as long tempo run and tempo intervals alternating with strength and core training. In addition, the different terrains and high altitude's conditions had been added to the workout plan to improve optimal performance. The benefit of altitude

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training is to alter the response of human body to the environment at less oxygen in the atmosphere. The athletes would produce extra red blood cells in order to carry more oxygen which can provide a performance boost of 1-2%. Under the supervision of physicians and sport scientists' team, not only building up endurance through steady-state sessions, but speed was added simultaneously (Haake, 2009).

The running pattern had been designed based on aerodynamic theory to reduced air resistance throughout the challenge. Five pacers ran in an open-V shape in front, with two behind. This configuration has been proved superior after testing about 100 options in computer simulations and wind tunnels to optimize the air flow around the athlete. The lesser air resistance he faced the less energy it took to run every step. The fluid strike pattern with smooth and quiet reduced peak vertical ground reaction force, an impact that could increase running injury. Incremental feeding strategy was used, a mouthful energy drink consumption at a time helped for steady release of energy. In addition to training plan and running pattern which mentioned above, a highlight of this event was an innovation of customized well-designed running footwear which broke the rules of traditional running footwear. For decades, the world's elite athletes have been influencing technology of customized design and engineering. So, the sport manufacturers have begun to closely collaborate with the world-class athletes to create innovation for sports. However, this customized running footwear was asked for checking if it should be used in the competitions to the world match because of the lowering energy cost by 4%, the super thick sole with 85% energy return. Therefore, the new technology running footwear provides an enhancing performance "trampoline effect" for the athletes, similar to the case for a swimwear that allowed athletes to swim faster with the new technology to reduce drag force during swimming progression. The advanced technology in sport engineering for excellency makes world athlete's associations wide awake. The concerns of the integrity of the sport might be threatened have been raised.

However, either Pro or Con occurs in the competition's world, the scientists still concern about the incidences of injuries. The questions have been raised if the technology could help reduce injuries' rate or just change the forms and locations of injury. The majority of running injuries has been located at lower extremities and back from both sudden onset evidences and repetitive loading on musculoskeletal system (Bertelsen et al., 2017). Footwear drop (heel-to-toe drop) and cushioning system are the most popular features investigated. Most running shoes have more material under the heel in order to help absorb the impact of landing. High or low heel-to-toe drop depends on foot strike pattern. Minimalist running footwear, a low heel-to-toe drop, have been believed that it could reduce running-related injuries by encouraging to midfoot or forefoot strike pattern (Lieberman et al., 2010). However, there are research revealed that running with a low heel-to-toe drop did not lead to similar lower limb biomechanics as barefoot running, increase in vertical loading rate and be associated with a higher injury risk in regular runners (Richert, Stein, Ringhof & Stetter, 2019; Malisoux, Chambon, Urhausen & Theisen, 2016). The cushioning system has been believed that it would protect the runner against consequences of repetitive high-load shock. The studies showed no evidence of the benefit of cushioning system (Theisen et al., 2014; Withnall, Eastaugh & Freemantle, 2006; Malisoux, Delattre, Urhausen & Theisen, 2020).

So, we might investigate that the new technology, which the sport manufacturers use for design a running footwear, would enhance the performance of

the elite athletes with well-training but will have any effects with recreational runners who may not ready for transitioning to the new tech-running footwear.

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