

Ergonomic Approaches for the Improvement of Sport Injury Analysis and Prevention

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Introduction

Sport is an influential part of our contemporary daily life and takes the large part of lives of many people around worlds [1-3]. Involvements in sports or exercises provide many advantages, ranging from simple fun to health development [1-4]. Regular physical activities reduce the chance of a person developing chronic diseases, and also play a beneficial role in relation to mental health disorders [1-3,5]. They are important not only for the younger generation to fit well, but also for the elderly one in supporting life quality and self-sufficiency [1-3,6]. Joining in sports or exercises may also offer chances for social contact which can be beneficial to build solid individual and/or public relationships [1-4,7].

Increasing evidences show that physical activities for all age groups are imperative in the prevention and care of some of the most substantial conditions including cancer, cardiovascular disease, depression, diabetes, hypertension, obesity, and osteoporosis [1,5-7]. Physical activities from overall population groups are a usual apprehension, but increasing levels of recreational physical activities and sports involvements have been informed in some population groups [2,5-7]. However, the promotion of physically active lifestyles to reduce the risk of chronic diseases should consider the possible problem of accompanying injuries [3,8,9]. Injuries are practically the unique disadvantage of exercise or sport, but may be a usual outcome from physical activities and have been disclosed as a sizable problem [5-7,10].

Sports injuries are one of the most common injuries in modern societies. Sports injuries are burdens on both individuals and societies with respect to the duration and nature of treatment, amount of sporting and working time lost, permanent damage and disability, reduced quality of life, and monetary costs [11]. Because handling sport and sport-related injuries are often difficult, pricey and taking up or wasting a great deal of time, preventions are strongly vindicated by medical as well as economic views [12]. Hence, avoidances of sport and sport-related injuries must be recognised as a major public health and safety goal.

Ergonomic Approaches for Sport Injury Prevention

Sport injuries

Sport and sport-related injuries are generally sourced by overuse, direct collision, or force application that our body cannot be physically tolerated [8,13]. Two types of injuries such as acute and chronic are commonly found in sports [8]. An acute sport injury is a sudden injury that is usually associated with a traumatic event such as a sprained ankle caused by an awkward landing [8]. On the other hand, a chronic

sport injury is caused by overuse of particular body parts such as muscles or joints either through sports or exercises [8]. They develop slowly and last a long time. Their symptoms are mild compared to acute injuries and the pain they cause are also little. Poor techniques and structural deformities can also cause to the occurrence of chronic injuries [8,13]. However, different kinds of interventions and strategies for the prevention of sports injuries, such as strength training, stretching activities, proprioception exercises, and combinations of these are needed to be accessible to everyone effectively and are required to limited medical staff assistance [5-7,12,14].

Due to the magnitude and frequency of sport injuries, a great deal of research is found in the literature. However, most studies on sport injuries have focused on an individual intervention, a specific injury type and situation, or studied rather closely defined research issues [5-7,12]. Main ideas on sports injury prevention have explored mainly to find answers on intrinsic (ability, age, fitness, gender, physical characteristics, and psychology) and extrinsic (environment, equipment, and exposures) risk factors [5-7,14]. For example, Aaltonen et al. [15] reported an outline of all sports injury prevention measures [5-7]. Recently, Schiff et al. [16] stated the similar issue with additional studies [5,6]. However, the two studies were incapable to provide detailed calculations for individual training exposures and intervention effects [5,6]. This means that examinations and differentiations between acute and chronic injury estimates are still lacking. Hence, it is suggested that aggregation of effective measures and analyses with novel technical inputs and interventions such as an Ergonomic approach may provide practical evidences to the future research focuses for the prevention of sport and sport-related injuries [5,6].

Ergonomic approaches

Musculoskeletal injuries constitute the largest class of athletic injuries sustained in sports. For example, shoulder injuries are frequent in relation to sport activities [4,17]. The typical shoulder injuries are a rotator cuff impairment injury and an impingement syndrome [4]. The shoulder injury and syndrome may occur after unusually high intensity of repetitive movements such as swimming [4,14,18].

The damage risk of musculoskeletal systems during sports is associated with physical and psychological attributes of the performed physical activities [4,14]. The recognized external risk factors in physical attributes involve a fixed raised-posture, recurring arm movement, heavy load, deficient rest, temperature, and static posture [4,19]. Moreover, internal individual risk factors for the physical attribute such as anthropometry, gender, physical ability, and personality also play a significant role in sport injuries [4,18].

Whilst the psychological attribute including stress and pain behaviour is also acknowledged as important in relation to physical activities [4]. Some sport-related overwork injuries are comparatively easy to identify whilst a significant part of work-related musculoskeletal disorders (WMSDs) often remains unexplained [4,20,21]. Musculoskeletal disorders (MSDs) are frequently appeared by sensory symptoms such as muscle fatigues and pains placed in cartilages, ligaments, muscles, and tendons [4,19].

Ergonomic analyses have significantly contributed to enhance our knowledge on the triggering causes of human movements [22]. This fact is maintained that the exclusive use of examination techniques correlate uncertainly with quantitative ergonomic measures [4]. Ergonomic approaches have definitely supported accurate calculations of movement tactics to improve, sustain or progress high level human performance whilst preventing MSDs in sports [4,22]. This is demonstrated by general concurrences regarding the significant function of shoulder girdle muscles in the progress of a rotator cuff impairment injury and an impingement syndrome [4,23]. Thus, ergonomic evaluations of human performance impact significantly to describe harmful effects on load patterns to the musculoskeletal system concerning physical activities [4,18,19].

The advance of new technologies such as sensor and recording systems has also promoted to accessible ergonomic assessments for a larger part of the population [4,18]. This can be established by the development of objective measurements of sport performance such as running shoes attached with an accelerometer and a global positioning system for the uncovering of running distance, path and speed [4,18]. The recent technical advancement is also remarkably beneficial in ergonomic interventions with a number of newly emerged gadgets such as wearable devices and smart phones, enabling constant monitoring and long lasting recording of physical conditions. Data from obtained variables with ergonomic measurements and analyses during sport activities may also provide valuable evidences for each player such as temporal, load, and position information [4]. These results can then be assessed in relation to muscle fatigue development as it is suggested to be a sign of sport injuries [4,19].

Conclusion

Whilst there has been an increased awareness on sports injuries and extensive countermeasures have been reported in the literature, actions for sports injury prevention still remain to further improvements. This article presents to emphasize the importance of ergonomic roles for the prevention of sport injuries. The blend of physical measurements with ergonomic interventions may provide a better picture for the understanding of musculoskeletal loads with respect to sport activities [4]. Ergonomic approaches would be particularly indispensable to measure and recuperate sport performance with decreasing the injury risks [4]. Therefore, it is projected that advanced ergonomic involvements may considerably contribute to allocate a harmful effect on load patterns to the musculoskeletal system in relation to sport events [4].

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