International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 08 | Aug 2022 www.irjet.net p-ISSN: 2395-0072

Data Analytical Study of Injury Reduction in Sports

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Abstract - *Despite the health benefits of participating in sports, many people are afraid of getting injured and this is a big barrier to participating in sports. Musculoskeletal injuries in athletes are a serious problem that has a major impact on the sports world. The main reasons for the high number of injuries and the long return to play are lack of proper exercise and warm-up, inadequate wearing of protective gear, variations in air temperature from place to place, and having not much understanding about how training alerts ligament structure and functions. Injuries resulting from sports and physical activity can persist and pose significant problems to the financial health and quality of life of athletes. Wearable technology combined with analytics can help reduce player risk by identifying injury risk factors and focusing on risk mitigation. Injuries to players also place liability on sponsors. A high injury rate in sport is a problem that needs to be addressed. There are many possible solutions to reducing injuries, and this paper discusses a few of them.*

Key Words: Musculoskeletal, Injury, Improper, Reduction, Sports

1.INTRODUCTION

Physical safety in sports is an important prerequisite for continued participation in sports and for maintaining a healthy physically active lifestyle. Prevention, reduction, and control of sports injuries are important goals for society as a whole. Recent advances in sports medicine have led to the need for more research on injury prevention in the real world.Some people argue that we should take a more behavioral approach when it comes to sports injury prevention, in order to reduce the number of injuries. Despite the lack of research on the role of behavior in sports injury prevention, it remains an important factor.

Various behaviors are associated with injury risk factors and injury mechanisms. There are many factors that can influence the behavior that leads to injury and risk factors for injuries[1]. This is not just something that happens to athletes. Various types of behavior by, for example, the coach, referee, physical therapist, or sports associations, can influence risk factors and injury mechanisms. In addition, multiple behaviors often work together to increase the risk of injury. Some types of behavior are clearly associated with increased injury risk, and are therefore considered risk factors. Other behaviors may only affect risk factors and injury mechanisms, and have no direct impact on injury risk.

Recent ideas about injury prevention that require studies on injury prevention in real life still rely heavily on preventive measures established through efficacy research. One serious limitation of such an approach is that one would expect that proven preventive measures would be adopted if the determinants and impacts of sporting safety behaviors were understood. Therefore, if one really wants to prevent sports injuries in real-life situations, a broader research focus is needed[3]. We need to look at the research on injury prevention in other fields to see what we can learn that can help us prevent injuries in our sport.

1.1 Injuries

For almost half of all sports-related injuries, muscle strains and tears are the most common. Their frequency and disabling potential have been documented in epidemiological studies of sports[1]. Football is often the cause of injuries that result in time off from sports and other activities, and they are also a common source of pain and poor performance following a return to competition. We don't have any information about the effects of a warmup. People who use protective equipment improperly often end up getting injured. For example, they might not use the right type of pads or boots, or they might not wear them properly. This can lead to serious injuries. It can also lead to player injury. For example, if a football player running in boots with thin spikes slips and falls while trying to stop abruptly. It might cause you some harm. For beginners, it is important to wear boots with large studs so that you don't injure yourself while running or landing after a jump. It is important to wear appropriate protective equipment when working in the field. Changes in the

normal atmosphere can also lead to a drop in performance & increasing the chances of a player getting injured.For example, Players from countries like frozen Iceland are more prone to dehydration and injuries when playing in hot countries like India.

1.2 Warm-Up

Players frequently warm up before an exercise task with the goal of enhancing performance and lowering the risk of injuries. The advantages for performance have been hotly contested. Despite the fact that this has not been fully proven, players, coaches, trainers, and doctors generally agree that this warmup lowers the chance of injury[2].

Stretching activities and a time of active muscle contraction or activity are frequently included in the warm-up phase. The range of motion in the joints and muscle-tendon units should be increased during the warm-up process, along with the muscle temperature and contraction efficiency. The increase in range of motion or the decreased stiffness brought on by the increase in muscle temperature are two reasons given by different authors for the apparent beneficial benefit of warming up.

1.3 Need of Injury Reduction

Sports and physical activity-related injuries can be chronic and significantly impact a player's economic well-being and quality of life[4]. Numerous teams and sponsors must invest a lot of money in players who will later retire from competition due to injury, costing the sponsors money. This situation necessitates a decrease in injuries. By focusing on risk reduction and detecting injury risk factors, wearable technologies in combination with analytics can assist in reducing the danger to players[5]. Wearables can be used to facilitate the quantification of relevant functional capacities prior to participating in physically demanding athletic activities, thus advancing the field of sports injury management[6].

2. LITERATURE SURVEY

The paper “Risk factors for sport injuries- a methodological approach” by Markus Endler R Bahr and I holme effectively discusses the methodology for studies designed to investigate potential risk factors muscle-tendon units. According to some earlier studies, muscle-tendon units that are repeatedly passively stretched display a reduction in tension. They were primarily looking to see if a preconditioning or warming up phase without applied stretch has any protective effects. The topic of sports injuries is discussed using the example of hamstring strains. The intricate interaction of numerous risk factors and events leads to injuries. A multivariate statistical method should be utilized as a result. Additionally, it's important to give serious thought to the study's sample size. Sample size is mostly determined by the risk factor's anticipated impact on injury risk and the need to identify moderate to strong relationships. Small to moderate associations would require roughly 200 injured instances from 300 subjects, whereas 20 to 50 injury cases are required. Studies on the risk factors for hamstring strains that have been published so far include methodological flaws and are too weak to identify small to moderate relationships and medium correlations. By integrating as many pertinent risk factors as feasible and employing a multivariate statistical methodology, studies on the etiology of sports injuries need to take into consideration the multifaceted character of sports injuries. It is important to carefully assess the study's sample size, which mostly depends on the estimated impact of the risk factor on the likelihood of suffering an accident. 20 to 50 injury cases are required to detect moderate to strong relationships, whereas 200 wounded patients are required to discover small to moderate associations. The studies that have been published are yet to suffer from methodological flaws and are unable to detect modest to moderate relationships, hence more research on the risk factors for hamstring strains is required.

The study "Role of Warming-up in Promoting Athletes Health and Skills" by Dr.Homoud M. Alanazi discusses about Warming-up is considered to be as the main sport component for any sport training period, it is the basis for any athletes before performing any sport activity or competitions. It has been observed that the majority of sport coaches do not pay the necessary attention to and follow up on the players' warm-up phase, instead letting fitness trainers handle it unattended. Exercises performed as a warm-up should pay close attention to their nature, duration, and correct timing before actual training or competition. For the advantage of the athlete generally and for the score outcomes of his participation in competitions specifically, the health goal average level of heart pulses should be obtained through warming up exercises. Exercises for warming up should be performed correctly; otherwise, it will have a negative impact on an individual's performance and health. Sports warming up is very important, especially before an athlete performs an exercise that calls for maximal effort to be put forth in a short amount of time. The goal of this study is to shed more light

on the value of warming up from all angles in order to achieve peak performance and health. This study will pay particular attention to the effect that warm-up activities have in increasing the physical prowess of football players in certain matches. In every element of life, warm-ups are crucial. In our field of study, scientists have demonstrated its importance to athletes in terms of many body organs and components, and it is anticipated that additional information about its importance to the athlete body will be discovered in the future. Overall, it's critical to our survival as humans because it ensures a happy and healthy life for us.

In the paper "The Harstad injury prevention study: the epidemiology of sports injuries. An 8 year study" by Borge Ytterstad describes the epidemiology of sports injuries occurring in a community during 8 years and to evaluate the outcome of an intervention implemented against injuries occurring in downhill skiing. The report addresses regional sports injury epidemiologies. Our study shares some epidemiological traits with other Scandinavian studies documenting prospective injury recording, such as the proportion of sports injuries compared to all injuries, the mean age, the female to male ratio, and soccer's predominance in the injury landscape. However, there are some variations in the proportion of certain sports injuries, which are primarily attributed to location and regional cultural variations. Fractures and concussions were the most common types of downhill skiing injuries. This is consistent with a sport's AIS score being much higher. However, whereas downhill skiing-related injuries were a significant issue in our study, they are far less prevalent in studies from the flat sections of Sweden. However, ice hockey, which in these Swedish studies accounted for a significant portion of sports injuries, is infrequent in Harstad.

In paper "Performance aspects of an injury prevention program: a ten-week intervention in adolescent female football players'' by K. Steffen and colleagues state that the injury rate in football is high, and effective injury prevention methods are needed. An exercise program, the ‘‘11,’’ has been designed to prevent the most common injury types in football. The impact of such a programme on performance is unknown, though. This randomized-controlled trial's goal was to find out how the "11" affected performance following a 10-week training period. A random assignment process was used to place 34 teenage female football players in an intervention or control group. Ten exercises for core stability, lower extremity strength, balance, and agility make up the 15-minute "11" programme. Performance evaluations included vertical jump tests, sprint running, soccer skill tests, isometric hip adduction and abduction strength protocols, and isokinetic and isokinetic strength protocols for the quadriceps and hamstrings. For all of the tests used, there was no difference in the pre-to-post test performance between the intervention and control groups. Finally, it can be said that employing the "11" as a systematic warm-up programme had no impact on a group of teenage female football players' performance on a number of tests. The new comprehensive preventative programme, called "The 11+," is a favor warm-up routine that can be employed in matches and training. It includes significant workouts and running drills. Implementing this warm-up programme "11+" at the beginning of training sessions should happen at least twice a week for around 20 minutes. Only the running exercises should be done. A randomized controlled trial that examined the impact of an 11+ on the risk of injuries in female youth football found a significantly lower risk of injuries overall, overuse injuries, and severe impairment. This prevention programme is useful to perform prior to games as well. They asserted that the 11+ programme can help young female football players avoid injuries and lower their likelihood of suffering them. This "11+" warm-up programme should be used at least twice a week for about 20 minutes at the start of training sessions. You should just perform the running exercises. An 11+ considerably reduced the incidence of serious injuries, overuse injuries, and total injuries, according to a randomized controlled trial that looked at how an 11+ affected the risk of injuries in female youth football. It is beneficial to carry out this preventative approach before games as well. They claimed that the 11+ programme can aid young female football players in preventing injuries and reducing their risk of doing so.Even if the research stated above are significant and examined the role played in minimizing injuries among young football players, additional prospective studies should be carried out to determine whether the same outcomes exists. Research needs to be updated to meet the requirements of other sports disciplines while also looking into the significance of the 11+ programme for adult football players. Every training regimen should aim to reduce the number of sports-related injuries while also enhancing athletes' abilities.

The paper “Statistical modeling for recurrent events: an application to sports injuries” by Shahid. U compares five different survival models (Cox proportional hazards (CoxPH) model and the following generalizations to recurrent event data: Andersen-Gill (A-G), frailty, Wei Lin Weissfeld total time (WLW-TT) marginal, Prentice-Williams-Peterson gap time (PWP GT) conditional models) for the analysis of recurrent injury data. Model selection criteria and goodness-of-fit statistics were used to empirically evaluate and compare various models. Studies using simulations evaluated the strength and size of each model fit. Results The modeling approach is put into practise by using recurring injury data from the Australian National Rugby League's 2008 playing season. 14 (40%) of the 35 players analyzed suffered more than one

injury, and 49 contact injuries were sustained during 29 games. The recurrent sports injury data had the worst match with the CoxPH model. In comparison to the WLW TT and PWP-GT models, the fit was better with the A-G and frailty models. Conclusions Although there isn't much of a difference in how well the A-G and frailty models fit the data, it is advised that, when appropriate, future studies modeling recurrent sports injury data utilize the frailty model instead than the CoxPH model or its other generalizations. The study offers justification for potential statistical modeling techniques for recurrent sports injuries.

The paper titled "Predicting Sports Injuries with Wearable Technology and Data Analysis" portrays an idea about Wearable technologies in conjunction with analytics that can help mitigate the risk to players by identifying injury risk factors and focusing on risk reduction. Wearables can be used to facilitate the quantification of relevant functional capacities prior to participating in physically demanding athletic activities, thus advancing the field of sports injury management. The authors of this research highlight how tracking participants across a wide range of characteristics can help athletes' health and athletic performance. In this study, a cohort of 54 army ROTC cadets took part. They acquired quantifiable data using Zephyr BioHarness Wearable technology to produce insights that help them predict and avoid injuries connected to the wearer's physical activity during sporting events. This study suggests that a high BMI in conjunction with severe mechanical loads may result in injury. Therefore, it is essential to ensure that mechanical load is gradually raised as athletes get more conditioned while creating an exercise programme during the practise season. While a high degree of repetitive mechanical load with untrained athletes may quickly result in injuries, it is crucial to include enough mechanical loads in the training regimen to guarantee proper musculoskeletal growth. Even though their analysis found a number of variables linked to injury data during ROTC exercises, additional wearable variables might be important in different types of contexts. In conclusion, this study's findings show that wearable technology makes it possible to identify and target players who are more likely to sustain injuries. This essay examined how tracking participants across a wide range of characteristics might improve athletes' physical well-being and sports performance. Athletic trainers can utilize these instruments to collect quantitative data to get insight into the training approach that is yielding the greatest results and to forecast and prevent injuries resulting from wearer-related behaviors. This research shows that wearable technology has the ability to forecast sports injuries. Their study proved that wearable technology could function as a medical informatics system to categorize sporting activities and look into variables that affect athletes' risk of injury. With the use of these systems, athletic trainers and coaches can collect measurable data to get insight into the training approach that is yielding the best results and utilize the same data to forecast and avoid injuries resulting from the wearer's actions. By giving measurable data for our behaviors, wearable devices like Zephyr BioHarness build a bridge between the physical world we perceive and the analytical world we are constructing.

3. CONCLUSIONS

The requirement of the hour is to keep up a physically active lifestyle and lessen sports-related ailments. Numerous injuries among the athletes put a financial strain on their sponsors. Basic steps for reducing injuries include following suitable warm-up and cool-down routines, drinking enough water to preserve health and prevent cramping, and appropriately donning a protective gear. Added to that There are many things that data analytics and machine learning can do to reduce injuries. It is possible to anticipate the likelihood that a player would sustain an injury by analyzing differences in the tendons during each stretch using embedded devices and measuring the pulses with the aid of wearable technologies, such as digital wrist bands.

These kinds of technologies could function as a medical informatics system to categorize sporting activities and investigate variables that affect players' risk of injuries. Coaches and trainers can determine which training method is generating the best results by analyzing the data that wearables have acquired from athletes. They can also utilize this data to predict and prevent injuries associated with wearer action.

REFERENCES

[1] R Bahr., I Holme., Risk factors for sport injuries- a methodological approach, Br J Sports Med, Vol. [1]37, pp. 384–392, 2003.

[2] Dr. M.A Homoud ., Role of Warming-up in Promoting Athletes Health and Skills, International Journal of Scientific and Research Publications, Volume 6, Issue 1, pp. 2250-3153, January 2016

[3] B Ytterstad ., The Harstad injury prevention study: the epidemiology of sports injuries. An 8 year study, Institute of Community Medicine,University of Tromso,Breivika,N-9037 Tromso, Norway, Br J Sports Med,1995.

[4] K. Steffen., H. M. Bakka., G. Myklebust.,and R. Bahr., Performance aspects of an injury prevention program: a ten-week intervention in adolescent female football players, Scand J Med Sci Sports .Printed in Singapore . DOI: 10.1111/j.1600-0838.2007.00708.x , 2008.

[5] Shahid ., J G Tim ., & F F Caroline ., Statistical modeling for recurrent events: an application to sports injuries, Br J Sports Med: first published as Vol. 10, pp. 1136, bjsports-2011-090803 on 7 August 2012, Downloaded from http://bjsm.bmj.com/ at India:BMJ-PG Sponsored.Protected by copyright, 20 June 2021.

[6] Amir Zadeh., David Taylor., Margaret Bertsos., Timothy Tillman.,Nasim Nosoudi., Scott Bruce. Information Systems Frontiers, Volume 23 Issue 4, Aug 2021 pp 1023-1037 https://doi.org/10.1007/s10796-020-10018-3