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ORIGINAL

BIOMECHANICAL STRATEGIES FOR INJURY PREVENTION IN ADOLESCENT ATHLETES: A SYSTEMATIC REVIEW

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ABSTRACT

One of the aims was to evaluate the things and conclude results by observing the measures' effect on preventing injuries. Two types of studies are involved before deciding about athlete injury prevention strategies. These studies are random controlled examination, nonrandom arbitration, and studies based on cohort. Physical education and adequate sports supervision are based on adolescents aged 12 to 18. In it, the school sports range is usually involved within a country known as Ireland. The types of sports for which this survey was performed were athletics, hockey, rugby, football, swimming, tennis, squash, badminton, basketball, handball, netball, Gaelic football, camogie, hurling, and lacrosse. It involves all those sports which are played majorly. Those sports that are played by minorities are not involved in this survey. In all types of sports, there are chances of both types of injuries like acute in which fractures, soft tissue injuries, concussion, head injuries, major trauma, and death are involved. There is also a chance of chronic injuries. After the study, the outcome in the form of injury measured was of the following types: the injury rate on behalf of one participant is per 1000 exposure hours. On behalf of the severity of injury, Time is wasted due to practice for training or participation in sports because of injury. The calculation of the effects of the study individually becomes the cause of risk. After calculation, it appears to be 95%C1. All of these factors are essential in finding the solution to any injury. Overall, research found a direct and significant link of biomechanical strategies for injury prevention.

KEYWORDS: Biomechanical Strategies (BS); Injury Prevention (IP); Adolescent Athletes (AA)

1. INTRODUCTION

The word biomechanics is related to the branch of science that studies movements in living organisms, mainly human beings. Various factors must be considered accurately and deeply for better body posture and performance in athletes. In many cases, minor negligence in biomechanics may lead to injury in adolescent athletes. In this research, we will discuss the important biomechanical Strategies for Injury prevention in adolescent athletes. As we know, the lifestyle of athletes is different from that of laymen (McSweeney et al., 2021). Along with this, there is more risk of injury in athletes, so there is a need for strategies that may help prevent these injuries in athletes. The main part of training athletes is the main focus on maintaining body postures relevant to sports requirements for injury prevention and performance enhancement. Various biomechanical factors must be considered carefully during athletes' performance or exercise (Wang & Zhu, 2023). The first important factor is the lower extremity movement patterns in athletes. As we know, most of the mass of the body lies in the lower area, so there is a need for proper training that may focus on which movements are necessary for lower area control and performance enhancement related to Lower area movements. Medical studies have proved that the balance of the whole body is dependent upon the balance in the lower area of the body. If there is improper training of lower area movements in adolescent athletes, this may increase the risk of injuries to lower body parts in adolescent athletes (Zebis et al., 2016). The second most important factor that needs to be considered in adolescent athletes related to biomechanics is the aspect of single-leg hop. Single leg hop is a particular assessment method used in the training of athletes to check lower body part strength, power, and balance in young athletes. It has been seen that this factor is deficient in young athletes, which may cause injuries in athletes. The other important factor that needs to be considered for better balance and injury prevention in athletes is sleep and recovery. We cannot deny the importance of proper sleep for better health in this era of science and technology. We know that medical science has proved that there is a need for proper sleep to enhance recovery rates in athletes as well as in laymen. If there is a Disturbed sleep-wake cycle in athletes, it may increase the risk of injuries in athletes. Now, we are going to discuss the important biomechanical Strategies for Injury prevention in adolescent athletes (Holden et al., 2016). The first and foremost strategy for injury prevention in adolescent athletes is the proper training of athletes. As we know, there is a great impact of training on the performance of athletes, so such training should be provided to athletes, which may help them to learn biomechanics. This training includes a few study courses that teach athletes about the basis of biomechanics. These courses include anatomy, physiology, biomechanics, kinesiology, exercise physiology, and sports medicine. These training also include a few aspects that are related to performance enhancement and injury prevention in athletes, such as strength

and coordination coaching, the training related to speed and agility, power development, the training related to mobility and flexibility, and others (Pappas et al., 2015). All of these aspects of training are necessary for enhancing the performance of athletes and preventing injuries by increasing their strength and power related to sports. The other important biomechanical Strategy that is mandatory for injury prevention in adolescent athletes is the aspect of protective and monitoring equipment. Nowadays this era is the era of science and technology where science and technology are playing a role in athletes training as well. A variety of wearable technologies these days are used to monitor athletes' health and performance (Sañudo et al., 2019). For example, there is the use of Smart watches that can monitor heart rate, breathing rate, blood pressure, body temperature, and other factors that may be used to monitor the health of athletes. At the same time, some protective equipment can be used for injury prevention in athletes, such as helmets, face masks, shoulder pads, chest protectors, protective eyewear, and others. These protective equipments protect and protect athletes for injury prevention. This strategy is gaining much importance these days and aims to use technologies that may prevent injuries more effectively in athletes. The other important biomechanical strategy related to injury prevention in athletes is psychological intervention. We can never deny the importance of mental health for better performance in athletes (Stephenson et al., 2021). If athletes have a mental willingness to participate in sports, this aspect will automatically increase their performance level. However, if an athlete is not interested in sports, he may also have poor performance and risk of injury. It has been seen that mental health issues are also increasing in athletes, such as depression, anxiety, stress, fear of failure, and others (Lopes et al., 2018). It is a common observation that an athlete may not find success in each performance, he may also have to confront failures sometimes. So, it is part of training for athletes to process the fear of failure. Otherwise, this aspect will lower their confidence level. That's why it is suggested that there should be no pressure on athletes to get only success, and they should not be discouraged in case of failure (Hanlon et al., 2020). If there are no mental health issues in athletes, they may perform well in sports, but if there are mental health issues such as stress, anxiety, depression, and others, this aspect may increase the risk of injuries in athletes (McBain et al., 2012). In this way, we can say that psychological intervention is also important for injury prevention in athletes. All of these biomechanical Strategies will help prevent injury in athletes (Abernethy & Bleakley, 2007).

1.1 Research Objective

This particular research aims to discuss the important aspects related to biomechanical Strategies for Injury prevention in adolescent athletes. This study has vividly explained different strategies that help enhance performance and prevent injuries in teenage athletes. The research study determines that Biomechanical Strategies for Injury Prevention in Adolescent Athletes. The

research paper is divided into five specific sections. The first describes the introduction and the objective of the research. The second section represents the literature review, and the third portion describes methods of research and the implications related to biomechanical strategies and injury prevention. The fourth portion describes the results, and its descriptions also. That last section summarized the overall research study and presents recommendations about injury prevention in adolescent athletes related to biomechanical strategies.

2. Literature Review

This efficient audit demonstrates that wound anticipation projects further develop a few adjustable natural danger variables of diminished limit execution amid young competitors, especially coerce age. In any case, a few natural danger elements were not fundamentally impacted or explicitly tended to by current projects (Hanlon et al., 2020). Studies determined that top articulation genus kidnapping instantly diminished, which demonstrates that injury prevention schemes impact an ideal development procedure to assist competitors with beating hazardous tendon strength piles emerging from the absence of front-facing horizontal management over energetic undertakings. The absence of discoveries toward a few bionic factors proposes that prospective injury prevention schemes might be improved by focusing on members' gauge silhouette deficiencies, featuring the requirement to convey personalized & work-explicit injury prevention schemes (Lopes et al., 2018). The basic aim of this study is to give a subjective rundown of distributed efficient surveys & postmodern examinations that inspected the viability of athletics wound counteraction schemes on decreasing outer muscle wounds. Results indicate that this far-reaching survey furnishes athletics medication suppliers with a solitary wellspring of the best forward-thinking distributions in the writing on athletics wound counteraction (Stephenson et al., 2021). This efficient audit aimed to assess the ongoing proof by evaluating the viability of combinative contractile organ preparation projects in wound avoidance & athletics execution in youthful competitors. This audit gives proof that combinative contractile organ preparation projects may upgrade execution & wound avoidance in youthful competitors, considering that adhesion toward the preparation scheme is satisfactory. Altogether, all-around planned, riffled investigations are important to team up with current discoveries (Sañudo et al., 2019). Studies give analysis & well-qualified assessment encompassing the condition of information & prospective bearings for survey in juvenile racing movement science, wound anticipation & ancillary preparation. Relationship between racing movement science & overexploitation wounds came to be generally concentrated on in grown-ups, although the somewhat diminutive examination has similarly designated racing movement science in teenagers (McSweeney et al., 2021). Studies objective is to assess the normal & viable parts remembered for anterior cruciate ligament neuromuscular training projects & foster a proficient,

easy-to-use device to survey the nature of anterior cruciate ligament neuromuscular schemes. Expanded alighting adjustment & inferior corpse force practices over every meeting worked on preventive advantages. Contemplating the totaled proof, researchers suggest that anterior cruciate ligament neuromuscular schemes focus more on youthful competitors & utilize prepared expeditors whoever integrate inferior corpse force works out alongside a particular spotlight on alighting adjustment (bounce/leap & grasp) all through their game spells (Petushek et al., 2019). In this study, researchers center around compassionate bionic medications for knee tendon wounds & in what way this information may illuminate the two viewings & preparing mediation exploration & exercise in athletics. By encouraging the experimental proof of adaptable bionic medications for knee tendon wound danger, scholars may more readily view better exercises for creating mediations on a massive measure to forestall knee tendon wounds in the donning local area(Weir, 2022). Studies aim to distinguish the danger of knee tendon wounds in juvenile competitors by game, intercourse, & context beyond various normal United States & worldwide games. A combined athletic woman competitor was assessed to have an almost ten percent danger of knee tendon wounds beyond their whole higher education profession. In particular, men & women youths performing football, b-ball, hockey, & grid games showed up at specific danger of wounds, a determination that may be utilized to focus on a physical issue mediation(Bram et al., 2021). This methodical audit blends bionic danger variables connected with improving running-related wounds in non-harmed sprinters. Contemporary planned proof connecting bionic components to running-related wound danger is inadequate & conflicting, with discoveries generally subject to the populace & wounds being contemplated. The prospective examination is expected to affirm such bionic danger elements & decide if alteration of such factors might help with racing wound counteraction & the board (Ceyssens et al., 2019). The motivation behind this survey was to investigate the arrangement among bionic suggestions for knee tendon wound counteraction & execution with respect to shifts in course moves. A few examinations connecting shift in course movement science to the twoknee tendon wound hazard & execution were analyzed. The discoveries of this survey underline the requirement to contemplate the two knee tendon wound hazard & execution while analyzing the movement science of course adjustment moves (Fox, 2018). The findings of this study indicate that woman footballers, macho ruggers, & woman handballers display unobtrusive breadthways contrasts while acting caustic moves. Although, the appendage showing greater-danger machinists is conflicting inside & among reviews & populaces. In this way, it stays uncertain for change of direction that appendage predominance is a knee tendon wound-danger variable & whichever a specific appendage is of elevated wound-danger (Dos'Santos et al., 2019). Researchers reveal that there're some above tossing wounds in young adult competitors. This original copy will instruct specialists by examining a multi-

media way to deal with wound counteraction over the conversation of hazard components, acknowledgment of the significance of the dynamic string, utilization of forbearing-focused result devices to recognize danger for wound, suitable size & responsibility tossing proposals, a survey of proper hurling movement science, & planning epoch-explicit power & moulding schemes (Zaremski et al., 2019). The purpose of this research is to deliberately survey & sum up the information, perspectives, convictions, & relevant impressions of young athletic mentors into wound-avoidance preparing schemes by utilizing the Hypothetical Spaces Structure to direct the association of outcomes. Scholars' discoveries encourage the requirement for projects, conventions, & strategies to upgrade information on & sustain for young athletic mentors who desire to carry out wound-anticipation preparing projects (Hawkinson et al., 2022). Studies suggest that despite not being familiar with the prevalence of athletics-explicit wound avoidance projects, mentors and competitors favor specific summed practices up practice scsummed-upconese liberate survey meant to introduce accessible proof of what comprehensive & athletics-explicit avoidance projects mean for wound estimates in competitors. The comprehensive & blended projects decidedly influence wound estimates. Athletics-explicit projects are unexplored & in spite of broad conversation with respect to the description, no agreement was accomplished (Mugele et al., 2018). A structured survey was led to recognize natural parts that're possibly material in physical education teacher education schemes. A different prophylactic intercession ought to incorporate a mindfulness program, practical force preparing, extending, workout, center security & vigorous steadiness activities of the down appendages. This various prophylactic mediation ideally has a slow development, utilizes no or just straightforward supplies & is carried out nearby threefold weekly (Goossens et al., 2019). Studies assesses observational proof for intercession surveys focusing on conveyance & betterment of development ability inside young competitors. Diagramming the route of movement ability advancement over numerous time focuses, alongside revealing person development work stacks, may help specialists in devoting proper chance to movement ability improvement in a competitor's early stages (Rogers et al., 2020). Studies subsequently tries to give a reasoning to the improvement of an activity founded wound prevention projects explicit for juvenile speed hats. It additionally frames plan standards & gives a model activity program that maybe carried out toward the local area degree. Playing out an activity founded wound prevention projects prior Cricket preparing might decrease wound estimates in juvenile speed hats (Forrest et al., 2018). Studies gives an extensive assessment of the most recent headways in movement science & their suggestions for athletics execution improvement & wound counteraction. Also, the survey features the flow difficulties & restrictions inside the area & intends prospective headings for examination & employment. This study combines discoveries on the basis of such derivations to frame basic improvements in the area of athletics movement science (Vancini et al., 2023).

Studies planned to quantifiably research & account the bionic qualities of concussions & Sub-concussions effects in young athletics. 26 investigations encountered the consideration models for measurable union & examination. In spite of this, the information uncovers prominent effect information that young competitors are presented to, proposing adjustments might be expected to lessen extended haul neural dangers (Sundaram et al., 2023). This research purpose was to combine the proof over impacts of multimodule wound prevention schemes on bionic results & contractile organ execution estimated on kids & youths whilst executing essential movement aptitudes. Multimodule wound prevention schemes may decidedly influence essential movement aptitudes in youngsters & youths in athletics-associated contexts. Remembering multimodule wound prevention schemes for actual proficiency mediations, actual schooling categories, & coordinated active work might prompt utilitarian transformations that assist with advancing secure actual work (Jimenez-Garcia et al., 2023). Scholars suggest that knee tendon wounds are predominant & development designs connected to an expanded danger of knee tendon harm should be visible in adolescents younger than ten. However, the cycles basic such projects are for the most part indistinct, counteraction frameworks came to be shown to bring down paces of wound. Studies recommends paths of further developing wound anticipation schemes, particularly for particular Leg & eliminating positions, to decrease diverse knee tendon danger variables (Chang & Wang, 2024). The point of this orderly audit was to sum up the current writing researching outward danger elements that came to be connected with essential contactless knee tendon wound danger. It's been feeble proof of contrasts in bionic danger components inclining toward knee tendon wound by ecological requirement in the two macho & woman youths performing football & spice ease in macho young people performing b-ball (Crotti et al., 2024). Studies elaborate that wound counteraction projects might be compelling in expanding human Knee joint points over energetic touchdown & caustic errands yet might affect another diminish appendage bionic factors.

Thusly, the advantages of wound counteraction projects might be interceded by components apart from modified movement science & additionally might occur over another bionic estimates excluded from this survey (Lima et al., 2024). This research demonstrates that person investigation at part degree uncovered that the down corpse (two-sided & one-sided, coaxial, & whimsical) part was the just one related alongside a huge decrease on generally wounds. Backhanded proof proposes that mediations consolidating down corpse coaxial & erratic, center, mechanism, & down corpse solidness activities maybe the best for lessening generally speaking, down furthest point, & down leg wounds in young group activities (Ayala et al., 2024). The basic purpose of this precise audit was to sum up preparing mediations intended to lessen bionic danger components related with expanded hazard of down limit wharf wounds & to assess their reasonable ramifications in beginner

athletic. The results of this efficient survey features that beginner mentors may diminish important bionic danger elements through negligible preparation arrangement, for instance, educating to concentrate in on a delicate wharf, same inside just a single instructional course of basic method preparing (Bathe et al., 2023).

3. Research Methods

The research study determines that biomechanical strategies for injury prevention in the adolescent athletes. The research study based on primary data analysis for determine the data used SPSS software and generate result included paired sample statistic, the ANOVA test also that explain the chi square analysis between them. Biomechanical strategies involve the science in which the movement of human beings is studied and analyzed deeply so that their activity can be predicted. For example, this thing can be elaborated by considering the locomotion of the swimmer's hand and its position's effect on the propulsion phenomenon.

Another example that can explain this phenomenon is the position of a tennis player, which strongly influences the strength of his shot. In biomechanics, important principles involve motion, force, and torque. The strength of pulling the body is directly tied to a good outcome in the force category. When a force acts on a body, the locomotion comes under the motion category. The force needed to move an object around its axis is elaborated under the torque category. Let's move towards the implications that describe the Biomechanical Strategies for Injury Prevention in Adolescent Athletes.

3.1 Hospitalization, Parental Care, and Physical activity

In adolescence, injuries mostly happen due to participation in sports. These mainly occur in young people because they are active partners in sports, and their exposure to sports typically occurs when physical changes peak. Various factors demand that injury should be avoided. If it happens, this happens, it should be protected keenly, especially among athletes who play a significant role in the field of sports for their country. Injuries strongly impact health, and their outcomes mostly appear for a long time if not properly cured. For example, we can take the early developmental stages in patients suffering from osteoarthritis.

3.2 Examine prevention strategies and focus on the level of sports

Specific surveys are performed to have complete information about preventing injuries that usually occur during sports. Still, there was a concern for the athletes who belong to an adolescent group of age and face-face outstanding injuries during sports. The main purpose of this survey is to analyze all those techniques that can prove helpful for injury prevention among highly

active young people.

A big focus was also given to the school sports participants as that is the initial stage when players try to choose their fields. Care and treatment of that level so that any injury does not profoundly affect the parts of the body of athletes should be considered keenly. The primary purposes of this survey involve the following aims. Identify all those trials taken by players randomly, along with studies and observations now and then that are completely based on the level of effectiveness of prevention techniques and how much these practices can prove helpful for athletes.

Table 1: Results of ANOVA

ANOVA		SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
BIOMECHANICAL STRATEGIES 1	Between Groups	1.382	2	.691	1.717	.191
	Within Groups	19.324	48	.403		
	Total	20.706	50			
BIOMECHANICAL STRATEGIES 2	Between Groups	2.081	2	1.041	2.710	.077
	Within Groups	18.429	48	.384		
	Total	20.510	50			
INJURY PREVENTION 1	Between Groups	3.002	2	1.501	4.328	.019
	Within Groups	16.645	48	.347		
	Total	19.647	50			

The results of table 1 demonstrate that ANOVA test analysis result describe the sum of square values, the mean square values, the F statistic rates also that it explains the significant values of each variables included dependent and independent. The biomechanical strategies 1 is the main independent variable result describing that its sum of square rate is 1.382, the mean square value is 69%, the F statistic rate is 1.717, also that its significant value is 0.191 shows that 19% significant level between them. the biomechanical strategies 2 is another independent variable result describe that sum of square value between groups and within group is 2.081 and 18.429 the mean square value is 1.041 and 0.384 shows positive average square rates.

The significant value is 0.077 its shows that 7% significantly level with them. similarly, the injury prevention 1 is dependent variable result describe that its sum of square value is 16.645 and 19.647 the mean square rate is 34% and 1.501 positive square levels. The significant value is 19% significantly between them.

Table 2: Results of Coefficients^a

COEFFICIENTS^A					
MODEL	Unstandardized		Standardized	T	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
1 (CONSTANT)	1.379	.299		4.615	.000
BIOMECHANICAL STRATEGIES 1					
BIOMECHANICAL	-.211	.127	-.222	-1.664	.103
BIOMECHANICAL STRATEGIES 2					
BIOMECHANICAL	.289	.128	.302	2.267	.028

A. Dependent Variable: Injury Prevention 2

The above results of table 2 demonstrate that linear coefficient analysis result demonstrates that unstandardized coefficient values, the standardized coefficient values related to the beta and standard error. The result also demonstrates that T statistic rate and significant value of each independent variables. the injury prevention is dependent variable also that the biomechanical strategies 1,2 both are independent variables. the beta value related to the unstandardized coefficient is -0.211 its standard error value is 0.127 shows 12% error rates. The t statistic value is -1.664 also that its significant rate is 0.103 shows negative but its 10% significant relation with injury preventions. Similarly, the biomechanical strategies 2 shows that t statistic value is 2.267 and significant rate is 0.028 shows that positive and 2% significant level between them.

Table 3: Result of ANOVA^a

ANOVA^A						
MODEL	Sum of Squares	df	Mean Square	F	Sig.	
1 REGRESSION	2.804	2	1.402	4.221	.020 ^b	
RESIDUAL	15.942	48	.332			
TOTAL	18.745	50				

A. DEPENDENT VARIABLE: INJURY PREVENTION 2

B. Predictors: (Constant), Biomechanical Strategies 2, Biomechanical Strategies 1

The above results of table 3 describe that ANOVA test analysis result demonstrate that sum of square values, the mean square values also that F rate and significant value of each model included regression and residual. The regression model shows that its sum of square rate is 2.804 the mean square rate is 1.402 the F statistic value is 4.221 also that its significant rate is 0.020 shows positive and 20% significant levels. Similarly, result demonstrate that residual model shows sum of square rate is 15.942 the mean square rate is 0.332 shows that 33% average square rates. The total value related to the sum of square is 18.745 respectively.

Table 4: Result of Test Statistics

TEST STATISTICS				
	Biomechanical Strategies 1	Biomechanical Strategies 2	Injury Prevention 1	Injury Prevention 2
CHI-SQUARE	17.294 ^a	15.647 ^a	15.176 ^a	19.176 ^a
DF	2	2	2	2
ASYMP. SIG.	.000	.000	.001	.000

A. 0 Cells (0.0%) Have Expected Frequencies Less than 5. The Minimum Expected Cell Frequency is 17.0.

The results of table 4 describes that test statistical analysis included chi square values the result shows that chi square rate related to the biomechanical strategies 1,2 is 17.294 and 15.645. the chi square rate of injury prevention 1 and 2 is 15.176 and 19.176 respectively shows positive chi square values according to the above result overall significant rate is 0.000 shows 100% significant levels between them.

Table 5: Result of Total Variance Explained

TOTAL VARIANCE EXPLAINED							
COMPONENT	Initial Eigenvalues			Extraction Sums of Squared Loadings			
	Total	% of Variance	of Cumulative %	Total	% of Variance	of Cumulative %	Cumulative %
1	1.642	41.062	41.062	1.642	41.062	41.062	41.062
2	.986	24.659	65.722				
3	.776	19.400	85.122				
4	.595	14.878	100.000				

Extraction Method: Principal Component Analysis.

The above results of table 5 demonstrate that total variance analysis result describes the initial eigenvalues included variance and cumulative. The result also describe that extraction sums of squared values related to the cumulative and variance percentage. The total values of initial eigenvalues are 1.642, 0.986, 0.776 and 0.595 the % of variance rate is 41.062, 24.659, 19.400 and 14.878 respectively. Similarly, the % of variance present that positive value related to the sums of squared.

4. Conclusion

The main aim of this study is to analyze the effect of biomechanical Strategies on Injury Prevention in Adolescent Athletes. These strategies are reviewed systematically. These studies provide useful information to overcome the issue of injuries in athletes. No doubt, there are some instances in which injuries are not so deep that there is any need for hospitalization. As they occur immediately and extremely costly medicines are required for treatment, such

injuries strongly influence economic conditions. If correctly performed, treatments can sort out the issue of injuries that last for a long Time. Proper injuries bring rehabilitation quickly to victims. The time given by parents to their offspring's android treatment is also a significant factor that plays an essential role in preventing and promptly treating injuries among sports participants. Due to injury, most athletes cannot participate in further physical activities. A recent report concluded that 8 % of players are kicked out of recreational activities due to their injuries because these injuries appear to be a hindering element in players' playing activities. On the one hand, sports are essential to avoid various health issues among individuals. Still, if sports are avoided to prevent any injury, then various other diseases come into being within individuals, like cardiovascular diseases, obesity, etc. However, the influences of injury can also be seen in the benefits associated with potentials like considerable self-esteem, relaxation, acculturation, working in the form of a team, and fitness, as most people are involved in sports during this age. The overall research concluded that there is a direct and significant link between biomechanical strategies for injury prevention in adolescent athletes. The main reason for preventing injury is to consider all those factors based on risk; we can take the example of appliances, the surface of which the playing is done, modification in the rules, and the period fixed to play. All these factors are extrinsic. Here, other elements are also discussed, including intrinsic factors like fitness, elasticity, and management. This information is usually calculated after the research by adult people considered wise. Still, a lot of knowledge is now accumulated on the phenomenon of sports injury prevention. This has created awareness among students, other children, and young people.

Reference

- Abernethy, L., & Bleakley, C. (2007). Strategies to prevent injury in adolescent sport: a systematic review. *British journal of sports medicine*, 41(10), 627-638.
- Ayala, F., Robles-Palazón, F. J., Blázquez-Rincón, D., López-Valenciano, A., López-López, J. A., & De Ste Croix, M. (2024). A systematic review and network meta-analysis on the effectiveness of exercise-based interventions for reducing the injury incidence in youth team-sport players. Part 2: an analysis by movement patterns. *Annals of medicine*, 56(1), 2337724.
- Bathe, C., Fennen, L., Heering, T., Greif, A., & Dubbeldam, R. (2023). Training interventions to reduce the risk of injury to the lower extremity joints during landing movements in adult athletes: a systematic review and meta-analysis. *BMJ open sport & exercise medicine*, 9(2), e001508.
- Bram, J. T., Magee, L. C., Mehta, N. N., Patel, N. M., & Ganley, T. J. (2021). Anterior cruciate ligament injury incidence in adolescent athletes: a systematic review and meta-analysis. *The American journal of sports medicine*, 49(7), 1962-1972.

- Ceyskens, L., Vanelderen, R., Barton, C., Malliaras, P., & Dingenen, B. (2019). Biomechanical risk factors associated with running-related injuries: a systematic review. *Sports medicine*, 49, 1095-1115.
- Chang, W., & Wang, Z. (2024). Biomechanics of athlete movement: kinematic analysis and injury prevention. *Journal of Electrical Systems*, 20(3), 1075-1084.
- Crotti, M., Heering, T., Lander, N., Fox, A., Barnett, L. M., & Duncan, M. J. (2024). Extrinsic risk factors for primary noncontact anterior cruciate ligament injury in adolescents aged between 14 and 18 years: A systematic review. *Sports Medicine*, 54(4), 875-894.
- Dos'Santos, T., Bishop, C., Thomas, C., Comfort, P., & Jones, P. A. (2019). The effect of limb dominance on change of direction biomechanics: A systematic review of its importance for injury risk. *Physical therapy in sport*, 37, 179-189.
- Forrest, M. R., Scott, B. R., Hebert, J. J., & Dempsey, A. R. (2018). Injury prevention strategies for adolescent cricket pace bowlers. *Sports medicine*, 48(11), 2449-2461.
- Fox, A. S. (2018). Change-of-direction biomechanics: is what's best for anterior cruciate ligament injury prevention also best for performance? *Sports medicine*, 48(8), 1799-1807.
- Goossens, L., De Ridder, R., Cardon, G., Witvrouw, E., Verrelst, R., & De Clercq, D. (2019). Injury prevention in physical education teacher education students: lessons from sports. A systematic review. *European Physical Education Review*, 25(1), 156-173.
- Hanlon, C., Krzak, J. J., Prodoehl, J., & Hall, K. D. (2020). Effect of injury prevention programs on lower extremity performance in youth athletes: a systematic review. *Sports health*, 12(1), 12-22.
- Hawkinson, L. E., Yates, L., Minnig, M. C., Register-Mihalik, J. K., Golightly, Y. M., & Padua, D. A. (2022). Understanding youth sport coaches' perceptions of evidence-based injury-prevention training programs: a systematic literature review. *Journal of athletic training*, 57(9-10), 877-893.
- Holden, S., Boreham, C., & Delahunt, E. (2016). Sex differences in landing biomechanics and postural stability during adolescence: a systematic review with meta-analyses. *Sports Medicine*, 46, 241-253.
- Jimenez-Garcia, J. A., Miller, M. B., & DeMont, R. G. (2023). Effects of multicomponent injury prevention programs on children and adolescents' fundamental movement skills: A systematic review with meta-analyses. *American journal of health promotion*, 37(5), 705-719.
- Lima, Y. L., Collings, T. J., Hall, M., Bourne, M. N., & Diamond, L. E. (2024). Injury prevention programmes fail to change most lower limb kinematics and kinetics in female team field and court sports: a systematic review and meta-analysis of randomised controlled trials. *Sports Medicine*, 54(4), 933-952.

- Lopes, T. J. A., Simic, M., Myer, G. D., Ford, K. R., Hewett, T. E., & Pappas, E. (2018). The effects of injury prevention programs on the biomechanics of landing tasks: a systematic review with meta-analysis. *The American journal of sports medicine*, 46(6), 1492-1499.
- McBain, K., Shrier, I., Shultz, R., Meeuwisse, W. H., Klügl, M., Garza, D., & Matheson, G. O. (2012). Prevention of sports injury I: a systematic review of applied biomechanics and physiology outcomes research. *British journal of sports medicine*, 46(3), 169-173.
- McSweeney, S. C., Grävare Silbernagel, K., Gruber, A. H., Heiderscheit, B. C., Krabak, B. J., Rauh, M. J., Tenforde, A. S., Wearing, S. C., Zech, A., & Hollander, K. (2021). Adolescent running biomechanics-implications for injury prevention and rehabilitation. *Frontiers in sports and active living*, 3, 689846.
- Mugele, H., Plummer, A., Steffen, K., Stoll, J., Mayer, F., & Mueller, J. (2018). General versus sports-specific injury prevention programs in athletes: A systematic review on the effect on injury rates. *Plos one*, 13(10), e0205635.
- Pappas, E., Nightingale, E. J., Simic, M., Ford, K. R., Hewett, T. E., & Myer, G. D. (2015). Do exercises used in injury prevention programmes modify cutting task biomechanics? A systematic review with meta-analysis. *British journal of sports medicine*, 49(10), 673-680.
- Petushek, E. J., Sugimoto, D., Stoolmiller, M., Smith, G., & Myer, G. D. (2019). Evidence-based best-practice guidelines for preventing anterior cruciate ligament injuries in young female athletes: a systematic review and meta-analysis. *The American journal of sports medicine*, 47(7), 1744-1753.
- Rogers, S. A., Hassmen, P., Alcock, A., Gilleard, W. L., & Warmenhoven, J. S. (2020). Intervention strategies for enhancing movement competencies in youth athletes: A narrative systematic review. *International Journal of Sports Science & Coaching*, 15(2), 256-272.
- Sañudo, B., Sánchez-Hernández, J., Bernardo-Filho, M., Abdi, E., Taiar, R., & Núñez, J. (2019). Integrative neuromuscular training in young athletes, injury prevention, and performance optimization: a systematic review. *Applied Sciences*, 9(18), 3839.
- Stephenson, S. D., Kocan, J. W., Vinod, A. V., Kluczynski, M. A., & Bisson, L. J. (2021). A comprehensive summary of systematic reviews on sports injury prevention strategies. *Orthopaedic journal of sports medicine*, 9(10), 23259671211035776.
- Sundaram, V., Sundar, V., & Pearce, A. J. (2023). Biomechanical characteristics of concussive and sub-concussive impacts in youth sports athletes: A systematic review and meta-analysis. *Journal of Sports Sciences*, 41(7), 631-645.
- Vancini, R. L., Andrade, M. S., De Lira, C. A. B., & Russomano, T. (2023). Recent Advances in Biomechanics Research: Implications for Sports

- Performance and Injury Prevention. *Health Nexus*, 1(3), 7-20.
- Wang, S.-X., & Zhu, M.-y. (2023). Impact of wechat-based" hospital-home" integrated health education on exercise minded patients with chronic heart failure. *rimcafd*, 23(89).
- Weir, G. (2022). Anterior cruciate ligament injury prevention in sport: biomechanically informed approaches. *Sports biomechanics*, 1-21.
- Zaremski, J. L., Zeppieri, G., & Tripp, B. L. (2019). Injury prevention considerations in adolescent overhead-throwing athletes. *Current Physical Medicine and Rehabilitation Reports*, 7, 216-226.
- Zebis, M. K., Andersen, L. L., Brandt, M., Myklebust, G., Bencke, J., Lauridsen, H. B., Bandholm, T., Thorborg, K., Hölmich, P., & Aagaard, P. (2016). Effects of evidence-based prevention training on neuromuscular and biomechanical risk factors for ACL injury in adolescent female athletes: a randomised controlled trial. *British journal of sports medicine*, 50(9), 552-557.