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ORIGINAL

THE ROLE OF STRENGTH TRAINING IN ENHANCING PERFORMANCE AND REDUCING INJURY RISKS IN ADOLESCENT FEMALE ATHLETES

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ABSTRACT

To ascertain the present epidemiology of injuries linked to the efficacy and safety of resistance training for youth, a literature review was conducted. Injuries sustained by juvenile weightlifters and powerlifters have been documented in retrospective surveys and a few case study reports, albeit the vast majority of these injuries are likely to be categorized as accidental. Some of the reported injuries can be due to improper exercise form or inadequate training loads, both of which are caused by a lack of proper guidance. For measuring the research study used SPSS software and generate result related to the strength training in enhancing performance and reducing injury risk. Resistance training has the potential to be a safe, effective, and healthful kind of exercise for kids and teenagers as long as it is supervised by trained experts who give age-appropriate information on proper lifting techniques and training regimens. Young athletes may be able to lower their risk of sports injuries by consistently participating in an extensive resistance training program that starts in preseason and incorporates movement biomechanics education. We are now debating how to ensure the safety of youth resistance training. overall result found that direct link of strength training on enhancing performance.

KEYWORDS: Strength Training (ST), Performance (PP), Reducing Injury Risk (RIR), Adolescent Female Athletes (AFA)

1. INTRODUCTION

Adolescent female athletes are believed to be four to eight times more likely than male athletes to suffer a complete noncontact anterior cruciate ligament (ACL) injury while engaging in the same sport or activity. A wholly positive pivot shift test (grade 2 or 3 on a 0–3 point scale) and an instrumented

or clinical Lachman test demonstrating 5 mm or more increased anteroposterior tibial displacement are suggestive of a complete ACL injury. Cutting, turning, accelerating, decelerating, or landing from a jump are the noncontact causes of at least two-thirds of ACL injuries. ACL injuries in young athletes can have both immediate and long-term implications, such as high medical expenditures, an increased chance of reinjury (to both knee joints), psychological discomfort, lower productivity at work or school, the likelihood of losing scholarship money, and early osteoarthritis. In an attempt to minimise the injury risk among female athletes, many ACL injury prevention programs have been devised during the previous 20 years. Regarding the parts that make up the intervention, the length and degree of training, supervision and compliance monitoring, and the scheduling of training (pre-season or within-season), there is a considerable deal of diversity across these programs. According to consensus statements from committees and research retreats, the complexity of the injury itself makes it difficult to determine the best ACL injury prevention program in terms of the exercises included, the level of supervision needed, and the timing. Plyometric and strengthening elements are crucial, according to reviews of published programs, and female soccer players under the age of 18 show the greatest benefits from training (Darragi et al., 2024). Since 1996, when a knee ligament injury prevention training program for female high school athletes was first published in the sports medicine literature, at least 50 research have focused on this population. According to a recent systematic review of all published ACL prevention training programs in female athletes aged 19 and under, only three programs—Sportsmetrics, Prevent Injury and Enhance Performance Program [PEP], and Knee Injury Prevention [KIPP]—significantly reduced the noncontact ACL injury rate as measured by athlete exposures. As far as we know, no research has shown whether the KIPP program improves athletic performance measures. An independent evaluation of the PEP program found that after eight weeks of training, a group of eleven female high school athletes improved significantly in electromyographic muscle peak torque and average power data (hip abduction, hip extension, and knee flexion). The jump height did not much increase. In another study, 31 female adolescent soccer players who took part in the PEP program showed no increase in their vertical jump height or agility tests. Sprint timings improved after the first six weeks of training, but by the conclusion of the 12-week period, they had reverted to their original levels. Several ACL management regimens have had little effect on the noncontact ACL injury rates among adolescent female athletes. Certain programs reduced the prevalence of lower limb injuries, acute knee injuries, contact knee injuries, and contact mixed with noncontact ACL injuries, which is prominent (Blagrove & Hooper, 2021). The results of previous studies were frequently attributed to problems with inadequate training compliance, low statistical power because of the small number of exposures, and noncontact ACL injuries. Some researchers came to the conclusion that coach-led teaching was not the best way to carry out training because it lacked control over the

calibre of instruction or the progression of activities. According to a research study, it's critical to provide feedback that highlights proper form and technique and helps athletes stay motivated while exercising. We believe that supervision is critical, especially for athletes who use potentially risky landing and cutting techniques, such as low knee and hip flexion angles and landing flatfooted, with the foot far from the centre of body mass, which are thought to increase the risk of noncontact ACL injury. During training, athletes were repeatedly encouraged to cease sprinting workouts with the least amount of impact possible, to decelerate with small, silent steps, and to land softly with high knee flexion while leaping. To avoid an extended or hyperextended posture, excessive knee flexion was also encouraged. While not measured in our current investigation, other researchers, including ourselves, have reported reduced ground reaction forces and increased lower extremity alignment during landing and cutting when these approaches are used, potentially lowering the chance of lower extremity injuries (McPherson et al., 2024).

2. Literature Review

Studies explain that resistance preparing basically improves actual wellness (for example., brawn potency, force, hasten) & ivory thickness in women footballers. The results of this study indicates that 12th Weeks of an in-spice strength preparing brought about bigger actual wellness enhancements & less wounds contrasted & a functioning restrain in world class youthful women footballers. As needs be, strength preparing ought to be methodically employed in women footballer to upgrade execution & forestall wounds(Darragi et al., 2024). Studies analyzed the impacts of a brief term beneficial potency-force preparing scheme on myoneural execution & game explicit abilities in juvenile competitors. The consequences of this research demonstrated that this beneficial potency-force scheme executed as seven to nine minutes works on myoneural & athletic-explicit execution following ten Weeks of preparing(Karagianni et al., 2020). The basic aim of this study was to inspect the connection among greatest potency, sport execution, & development ability & decide if contrasts subsist among powerful young ladies, normal young ladies, & feeble young ladies. Solid young ladies had fundamentally quicker run multiplication than normal young ladies. Also, powerful young ladies & normal young ladies executed altogether best compared to feeble young ladies in whole appraisals. The consequences of this explore show the significance of solidarity toward sport execution & development expertise in juvenile young ladies(Sommerfield et al., 2022). The purpose of this audit is to analyze 3 common patterns in modern Strength & accustoming writing meanwhile they connect with women competitors to uncover regions ailing in investigation. Outcomes exhibit the usefulness of carrying out Blood flow constraint, practical development appraisals, & different advances amid this populace to extend portrayal of women competitors in Strength & accustoming writing, work on sport abilities & execution, & abatement possibility toward wound after some

period(Santos et al., 2022). Researchers reveal that potency & accustoming arrangement toward youthful competitors provides remarkable difficulties & open doors for mentors. Times of fast & non-uniform development in gaunt designs may bring about brief decreases in sport execution & elevated wound danger. Scholars depict seven points of support that furnish experts with proof founded & basically suitable techniques that may be involved successfully to lessen wound hazard & increment execution in youthful competitors(Read et al., 2020). The primary point of this chronicle audit is to introduce & talk about the importance of brawn force for young people Physical growth. The subsequent object is to account proof on the viability of Resistance training on solid wellness (brawn potency, force, brawn perseverance), on development expertise execution & wound anticipation in young people. There's proof that Resistance training is powerful in improving proportions of brawn wellness in kids & youths, regardless of gender (Chaabene et al., 2020). Studies gives a logical reasoning to the consideration of solidarity preparing in the scheme of an aloofness sprinter & to frame down to earth proposals toward the execution of fitting potency preparing exercises. Focused energy force preparing executed habitually in brief sessions might assist with diminishing the danger of particular sorts of overexploitation wound. Plyometrics practices create neurotic-strong characteristics connecting with the extend-contraction series & proposition an elevated degree of move to racing(Blagrove & Hooper, 2021). The basic aim of this research was to examine the impacts of a wound counteraction scheme on human Knee workings in ahead of schedule, recent-, & after-pubescent women. The likelihood of elevated human Knee kidnapping instant was additionally diminished in the after-pubescent preparation bunch though it didn't modify in the after-pubescent benchmark bunch. The scheme restricted the advancement of elevated-chance development designs related with development in initial adolescence whilst further developing the human Knee workings in after-pubescent young people(Otsuki et al., 2021). The motivation behind this research was to assess Diminish-Extremity Musculo-skeletal wound frequency in women juvenile competitors with past of athletic-associated concussion pursuing a myoneural preparation mediation. Women juvenile competitors with past of athletic-associated concussion revealed a more serious gamble of diminish-Extremity Musculo-skeletal wound contrasted & competitors without really any set of experiences of athletic-associated concussion. Subsequent function is as yet expected to comprehend the hidden instruments related with prospective diminish-Extremity Musculo-skeletal wound pursuing athletic-associated concussion & intercessions that enhance raised wound danger(McPherson et al., 2024). The objective of this study is to decide the commonness & danger elements related with outer brawn wounds supported in women juvenile Volley-ball athletes. Further aggressive & skilled young adult women performers might cause wounds because of dynamically greater magnitudes of frolic as encounter & contest degree increment. Performers who focused on just performing Volley-ball took part in more

noteworthy magnitudes of Volley-ball game, that builds the chances of supporting a physical issue(Wasser et al., 2021). Studies suggest that ACL wounds are an unmistakable problem in the area of athletics medication, particularly toward the women competitor. Counteraction procedures intend to address myoneural uneven characters & enhance bionic shortfalls, that are probably the main danger elements prompting such wounds. Perceiving the adequacy & possibility of using avoidance procedures & proceeding to foster powerful methods survive from most extreme significance to diminish the occurrence of this significant wound amid competitors (Bradsell & Frank, 2022). Scholars suggest that defiance preparing is turning out to be more significant as a fundamental piece of far reaching athletic preparing diets, academy actual training courses, & post-academy work out schedules. The rising lot of young people who're engaged with athletic exercises, combined along the medical issues of latency & as obese, have brought about expanded concern in defiance preparing(Stricker et al., 2020). The results of this study indicates that 4 particular knee tendon wound danger elements connected with the lateral-trimming maneuver were distinguished in a populace of juvenile women upper class soccer & group hand-ball performers with no past knee tendon wound. As knee tendon wound commonly happen over lateral-trimming, mediation projects to change such danger elements represent an auspicious system toward knee tendon wound counteraction in juvenile women upper class soccer & group hand-ball(Zebis et al., 2022). In this study, scholars mean to give proof founded suggestions to the mix of solidarity & molding toward the improvement projects of youthful competitors who partake in athletics along a cultivation of former field. However, the standards of scheduling, techniques are given comparative with checking of development, ontogeny, & preparing burden to delineate the possible intricacies of endeavoring to improve long haul sport advancement in initial practicing competitors(Moeskops et al., 2022). Studies examine explicit regions that may be custom-made to assist women competitors with forestalling wounds & upgrade their sport exhibition. Researchers as well feature in what way expanded women group practitioner portrayal in athletics might assist with upgrading concern for women competitors. Upholding for sexuality value in athletics medication to propel portrayal of ladies in the area will increment labor force variety & advance greatness in athletics medication concern(de Borja et al., 2022). The aim of this research was to explore the viability of a solitary instructional meeting utilizing a convention convenient criticism preparing framework that gives execution signs to advance alterations in influence energy & diminish furthest point spot over arriving in women competitors. The outcomes of this study show that a convenient criticism framework might be compelling in decreasing pinnacle vertical ground reaction force & advancing a greater helpful Knee to Ankle proportion over arriving & move undertaking arriving in juvenile women competitors(Kernozek et al., 2021). The outcomes of this study propose the fuse of preparing conventions to lessen inter-limb deviations in developing

competitors to work on their presentation. This useful utilization is significant to mentors & actual coaches who intend to work on the actual execution of juvenile racketers. More noteworthy lopsidedness brings about a diminished capacity to deliver one-sided level power(Villanueva-Guerrero et al., 2024). Researchers deduce that a Ten-Week myoneural preparation scheme might be an adequate upgrade to further develop soccer-explicit execution factors in undeniable degree women soccer performers. In this way, women performers & mentors ought to know that week by week consideration of solidarity, force & vigorous equilibrium practices pursuing a myoneural worldview is useful for soccer-explicit execution advancement(Roso-Moliner et al., 2023). Studies elaborate that athletic support & workout convention are viewed as gainful for psychological condition, pliant a superior state of mind & best personal satisfaction. Then again, great psychological wellness is remembered to prompt best actual condition & game execution. Moreover, there's a predictable job of burdensome & uneasiness side effects in impacting the danger of athletic wound in whether sporting or upper class competitors(Fossati et al., 2021). The reason for this research was to examine the impacts of defiance preparing regardless of exercise session on danger elements toward wound & defiance preparing ability in around top-level speed young men. This review proposes that a School-founded combined defiance training scheme might give huge upgrades in bounce wharf pneumatics, while the consideration of exercise session developments might give more prominent enhancements in obstruction preparing expertise(Pichardo et al., 2021). Studies claim that majority accessible information on sport improvement preparing patterns center around grown-up or proficient competitors, whereas expanding responsibility limit & execution is an essential objective. In this survey, scholars provide personalized preparing patterns to particular young competitors that focus on execution for solid, tough young competitors & versatile over weak ontogenic intervals & wound(Jayanthi et al., 2022). Scholars explain that for young adult b-ball performers, limb caution wound counteraction schemes concentrating on significant outer brawn disabilities are viable at lessening wound frequency estimates. Cross-modal wound counteraction schemes that further develop numerous outer brawn impedances are greater complete & might bring about preferred wound decrease over schemes concentrating on a particular disability(Matsel et al., 2021). Studies show that the blend of greater successive utilization of the survival method, definite reevaluating, & elevated degrees of actual execution limit might forestall a harrowing wound in juvenile women soccer players (Feng, 2024). Mentors are urged to embrace the two physiologic & mental variables while forestalling wounds in youthful women soccer players(Tranaeus et al., 2021). Scholar studies reveal that the knee tendon is oftentimes harmed in first class competitors, along women up-to multiple times bound to experience a knee tendon dart than guys. The two inherent & outward components ought to be perceived & discussed to enhance the preparation schemes that are intended to forestall wound, & work on how they might

interpret such wounds(Mancino et al., 2023). This deliberate survey & postmodern-examination showed that, whenever contrasted with benchmark bunch (for example., specialized & strategic preparation), the other force preparing procedures displayed little to direct upgrades in run execution in women group activity competitors. The consequences of a mediator examination exhibited that young competitors less than eighteen years conceded a more prominent enhancement in run execution contrasted & grown-ups greater than or equal to eighteen years (Hughes et al., 2023).

Table 1: Result of Coefficients

COEFFICIENTS						
MODEL		**UNSTANDARDIZED COEFFICIENTS**		**STANDARDIZED COEFFICIENTS**	**T**	**SIG.**
		B	**STD. ERROR**	**BETA**		
1	(Constant)	1.726	.403		4.287	.000
	Strength Training 1	-.020	.127	-.022	-.156	.876
	Strength Training 2	-.086	.143	-.080	-.601	.550
	Performance	.053	.167	.045	.316	.753
	Injury Risks	-.011	.136	-.011	-.080	.936
a. Dependent Variable: Adolescent Female Athletes						

The preceding results shown in table 1 show that linear regression analysis results reflect beta values, standard error values, t statistic values, and the significance level of each independent variable. The major independent variable, strength training 1, has a beta value of -0.022 and a t statistic of -0.156. There is an 87% degree of significance between them. Strength training 2 is another independent variable, and the t statistic value is -0.601. There is a 55% degree of significance between them. The performance is 75% significant among teenage female athletes. The danger of harm is determined by the negative relationship between them.

Table 2: Result of Test Statistics

TEST STATISTICS					
	STRENGTH TRAINING 1	**STRENGTH TRAINING 2**	**PERFORMANCE**	**INJURY RISKS**	**ADOLESCENT FEMALE ATHLETES**
CHI-SQUARE	41.892[a]	21.815[b]	33.446[b]	17.569[b]	17.200[b]
DF	3	2	2	2	2
ASYMP. SIG.	.000	.000	.000	.000	.000
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 16.3.					
b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 21.7.					

The preceding results shown in table 2 show that the chi square analysis

result represents the chi square values associated with strength training 1 and 2, as well as their performance and injury risk. Overall chi square values are 41.892, 21.815, 33.446, and 17.569, with 17.200 positive chi square rates for each variable. The total significant rate is 0.000, indicating that there are 100% significant levels between them.

Table 3: Result of Correlations

CORRELATIONS						
		STRENGTH TRAINING 1	STRENGTH TRAINING 2	PERFORMANCE	INJURY RISKS	ADOLESCENT FEMALE ATHLETES
STRENGTH TRAINING 1	Pearson Correlation	1	.023	.311*	-.195	-.008
	Sig. (2-tailed)		.853	.012	.119	.952
	N	65	65	65	65	65
STRENGTH TRAINING 2	Pearson Correlation	.023	1	.259*	-.002	-.069
	Sig. (2-tailed)	.853		.037	.988	.584
	N	65	65	65	65	65
PERFORMANCE	Pearson Correlation	.311*	.259*	1	.076	.017
	Sig. (2-tailed)	.012	.037		.549	.896
	N	65	65	65	65	65
INJURY RISKS	Pearson Correlation	-.195	-.002	.076	1	-.003
	Sig. (2-tailed)	.119	.988	.549		.982
	N	65	65	65	65	65
ADOLESCENT FEMALE ATHLETES	Pearson Correlation	-.008	-.069	.017	-.003	1
	Sig. (2-tailed)	.952	.584	.896	.982	
	N	65	65	65	65	65

*. Correlation is significant at the 0.05 level (2-tailed).

The subsequent outcomes shown in table 3 show that correlation coefficient analysis results include Pearson correlation values, significant values, and the number of observations for each variable. The total finding indicates some positive and negative relationships between them.

Table 4: Result of Paired Samples Statistics

PAIRED SAMPLES STATISTICS					
		MEAN	N	STD. DEVIATION	STD. ERROR MEAN
PAIR 1	Strength Training 1	1.6308	65	.71958	.08925
	Performance	1.4154	65	.55600	.06896
PAIR 2	Strength Training 2	1.5692	65	.61159	.07586
	Injury Risks	1.6769	65	.64001	.07938
PAIR 3	Performance	1.4154	65	.55600	.06896
	Injury Risks	1.6769	65	.64001	.07938
PAIR 4	Strength Training 2	1.5692	65	.61159	.07586
	Adolescent Female Athletes	1.6154	65	.65413	.08113

The above results shown in table 4 show that pair sample statistical analysis results provide mean values, standard deviation values, and standard error of mean values for each pair. The first pair is strength training 1, and the performance results reveal that its mean value is 1.6308 and 1.4154. The standard deviation rate is 71%, and 55% deviates from the mean. The estimated value's standard error is 8%, with a difference of 6%. The pair 2 demonstrates that strength training and injury risks. The mean value is 1.56, and the standard deviation value is 61% and 64% of the mean value, respectively. Pair 3 demonstrates that the performance and injury risk results differ from the mean by 55% and 64%, respectively. The pair 4 between strength training 2 and teenage athletes' results reveals that its mean value is 1.5692 and 1.6154, indicating that the mean is positive. The standard deviation indicates that 61% and 65% vary from the mean.

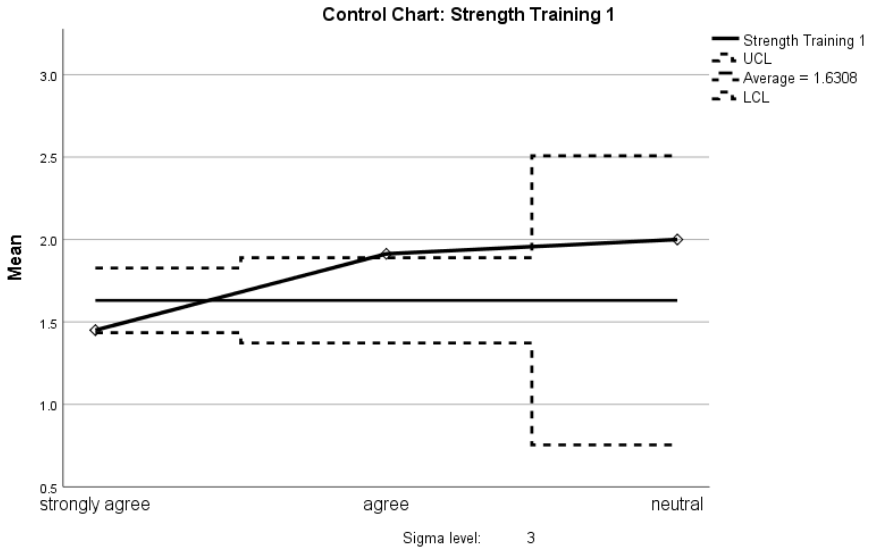

Figure 1: Control chart

The above graph of figure 1 shows that control chart in between strength

training and reducing injury risks in adolescent female athletes. The vertical side shows that mean values its start from 0.5 and end at 3.0 the horizontal side shows that range of levels included strongly agree, agree and neutral level related to the sigma. The overall average value is 1.6308 its shows that positive average rate between them.

2.1 The Youth Resistance Training

While there is an inherent risk of musculoskeletal injury connected with adolescent resistance training, it does not appear to be greater than that of other sports and leisure activities that children and teens frequently participate in. Zaricznyj and colleagues used accident records to analyse the occurrence of sports-related injuries in school-aged children during a one-year period. They observed that American football caused 19% of all injuries, while strength training caused only 0.7% of 1576 injuries. When the injury-to-participation ratio was calculated, the most popular school team sports were American football (28%), wrestling (16%), and gymnastics (13%). More recent data confirms these findings, revealing that American football had the highest injury incidence of the nine sports studied (4.36 injuries per 1000 athlete exposures). A similar issue concerns how children and teens perform plyometric workouts, often known as stretch-shortening cycle activities. While some observers have argued that lower body plyometric training need a certain baseline level of strength (e.g., 1 RM squat should be 1.5 times body weight), current research and clinical findings contradict this assertion.

If correctly prescribed and rationally increased over time, plyometric exercise may be a relatively safe and effective conditioning approach for children and adolescents. However, because resistance training can increase chronic repeated stress on developing musculoskeletal systems, it should be carefully addressed when including any type of resistance training into a young athlete's overall exercise plan. If the volume, intensity, or frequency of training exceeds the participants' ability to perform technically sound motions or recover from prior training sessions, injury or illness may result. For example, in a physical education class, a 12-year-old child was instructed to perform excessive (>250) repetitive squat jumps, resulting in the development of exertional rhabdomyolysis.

2.2 The Science Behind Strength Training and Injury Prevention

It is essential to first understand the fundamentals of strength training in order to comprehend its function in injury prevention. Strength training, often known as resistance or weight training, is a type of exercise that targets certain muscles against outside opposition in order to increase physical fitness. We can encourage muscular strength by progressively increasing the weight or resistance. Your muscles can withstand tension better when they are stronger,

which lowers your chance of injury. Let's now examine the science behind this idea and its real-world applicability in reducing sports-related injuries.

2.3 Muscle Balance and Joint Stability

Every athlete understands the value of having a balanced physique. By ensuring that every muscle group is similarly strong, weight training helps to avoid imbalances that may result in sports injuries. Strains and sprains are less likely to occur when muscles are balanced because they better support the joints. Long and short muscle fibres are able to preserve flexibility and balance in a well-rounded strength training program. In turn, this protects the body's joints against abrupt or repeated movements that might cause sprains or rips.

2.4 Bone Density and Resilience

Building muscle isn't the only goal of weight training. It is also essential for boosting bone density. Athletes who have better bone density are less likely to shatter or fracture. Furthermore, robust bones are more resilient in high-intensity sports like rugby and football because they can absorb more force. By giving more protection to weak spots like the knee, elbow, and shoulder joints, the enhanced muscular power also lowers the chance of impact-related injuries.

2.5 Practical Benefits of Strength Training for Athletes

For athletes, strength training offers several useful advantages. An athlete's muscular endurance may be increased by appropriate weight-bearing activities, allowing them to perform longer and at greater levels. These workouts also assist athletes become more coordinated, agile, and balanced, which reduces their risk of injury from falls or slips. Lastly, strength training could also shorten the time needed to heal from an injury. Athletes can recuperate more rapidly and securely by strengthening the muscles that surround a broken joint or ligament.

2.6 Getting Started with Strength Training

Beginners may find starting a strength training program intimidating, but it doesn't have to be. You may begin to safely and efficiently profit from strength training with the correct technique and direction. When beginning your strength training adventure, keep the following advice in mind:

• Start Small: Avoid pushing yourself to lift big weights immediately away. As your strength increases, progressively increase the resistance from the lesser weights at first.

• Preserve Correct Form: When lifting weights, proper form is essential. It lowers the chance of damage and guarantees that you're using the

appropriate muscles. Think about collaborating with a coach or trainer who can help you with form.

• Warm-up and cool-down: These are essential for getting your body ready for exercise and for helping it recover from it.

• Rest: It takes time for your muscles to strengthen and heal. Remember to take days off between intense workouts.

• Remain Hydrated: To keep your body hydrated and performing at its best, drink a lot of fluids prior to, during, and after your workout.

• Pay Attention to Your Body: You may be pushing yourself too hard or doing the exercise wrong if a certain movement or weight gives you pain or discomfort. Pay attention to your body and make the necessary adjustments.

3. Conclusion

ACL injury prevention programs should be assessed to ascertain their impact on athletic performance indices and noncontact ACL injuries, according to researchers at the sixth ACL Research Retreat. It has been predicted that training compliance will be higher for programs that improve performance and lower injury rates. This is because it is believed that if there is proof that injury prevention training can improve sports performance, it may be easier to persuade players, parents, coaches, and others of its importance. ACL injury incidence data has been published by a number of programs, but few have been rigorously evaluated for their capacity to raise athletic performance metrics. In 1996, a 6-week, 18-session supervised program for preventing ACL injuries was created and initially reported. It has since been demonstrated that this approach considerably lowers the frequency of noncontact ACL injuries in young female athletes. There were 17,222 athlete-exposures (AE) and 0 noncontact ACL injuries among the 366 athletes who finished training. There were 23,138 AE and five noncontact ACL injuries in a control group of 463 athletes who did not get training (incidence rate, 0.022, $p < 0.05$).

Sports indices including estimated VO2max, agility and sprint tests, a sit-up test, and vertical leap tests showed outstanding gains in the very small number of athletes who finished this training program (34 volleyball players, 57 basketball players, and 62 soccer players). Furthermore, when these athletes landed from a video drop-jump, their overall lower limb alignment improved. We wanted to see if the same goals—a significant reduction in ACL injury rates and an improvement in athletic performance indices—could be accomplished in a larger group of athletes as our familiarity with this training program increased. The purpose of this study was to determine whether training significantly improved neuromuscular and athletic indices in a group of 1000 female

adolescent athletes, such as lower limb alignment on a drop-jump, distance and limb symmetry on single-leg hop tests, agility, speed, lower limb muscle strength, and estimated VO2 max. The second goal was to evaluate the incidence of noncontact ACL injuries in 700 trained athletes to 1120 control individuals who were matched by body mass index, sport, and age. We hypothesised that this technique would significantly minimise the likelihood of noncontact ACL injuries in female high school athletes while simultaneously enhancing neuromuscular and athletic performance indicators.

4. Further Research

To gain a better knowledge of the long-term effects of consistent resistance training on young individuals, well-designed longitudinal epidemiological studies are essential. This study should collect exposure data (time exposed) so that injury incidence may be calculated and compared to other sports and leisure activities. The assessment of possible injury risk factors may benefit from proper documentation of data such as program design variables (e.g., exercises, sets, repetitions, load, and frequency), training experience, supervision level, and equipment design and layout. Research is also needed to determine how injury prevention strategies, like as coaching and resistance training before competition, impact acute and overuse injuries in young athletes. Despite the fact that children as young as 6 to 8 years old participate in organised sports, no preventative studies have been conducted to evaluate the influence of fitness conditioning, specifically resistance training, on juvenile sports-related injuries.

Descriptive data on the most common injury types and locations, as well as the time loss linked to injuries and the place and time of injury occurrence, will also be provided by epidemiological research. Descriptive information about young athletes' resistance training regimens may shed more light on potential risk factors and injury processes as well as how program design elements may affect the frequency and seriousness of injuries. Together, this data will support the creation and use of evidence-based preventative strategies in kid- and teen-focused educational institutions, fitness centres, and sports training facilities. Injuries are a regular worry in the realm of athletics and sports.

Athletes frequently miss time because of these regrettable ailments, which can range from sprained ankles to ruptured ligaments. However, adding strength training to your fitness regimen is one of the greatest strategies to avoid these injuries in the first place. A healthy and injury-free lifestyle depends on strengthening the muscles surrounding your joints, whether you're a runner, football fan, or someone who just wants to be more active. Strength training is crucial for preventing injuries, and we at the Performance Sports Medicine Institute recognize.

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