Physical Education, Health and Social Sciences

https://journal-of-social-education.org

E-ISSN: 2958-5996

P-ISSN: 2958-5988

Effects of an 8-week FIFA 11+ Neuromuscular Training Program on Biomechanical and Psychological Return to Sport Outcomes in Previously Injured Soccer Players: A Mixed Methods Pilot Study

Nabila Sharif[1], Junaid Riaz[2*]

[1] Department of Physical Education, The Islamia University of Bahawalpur, IUB, Pakistan.
E-Mail: nabilarana155@gmail.com, ORCID: https://orcid.org/0009-0000-2770-5631
[2] Department of Physical Education, São Paulo State University (UNESP), Bauru, SP, Brazil
E-Mail. Junaid.riaz@unesp.br, , ORCID: https://orcid.org/0009-0004-9865-3452

DOI: https://doi.org/10.63163/jpehss.v4i1.1408

Abstract

Athletes returning to sport following serious musculoskeletal injuries often demonstrate persistent biomechanical deficits and psychological barriers that may increase reinjury risk. The FIFA 11+ neuromuscular warm-up program has demonstrated injury prevention benefits in healthy soccer populations; however, its role during return-to-sport rehabilitation remains underexplored. To examine the effects of an 8-week FIFA 11+ neuromuscular training program on biomechanical and psychological return-to-sport outcomes in previously injured soccer players. This pilot mixed-methods study included 24 competitive university-level soccer players aged 18–30 years with a history of lower-extremity injury and medical clearance to return to training. Participants were randomly assigned to either a FIFA 11+ intervention group (n = 12) or a control group (n = 12). Quantitative assessments included the Drop Vertical Jump Test, Single-Leg Landing Test, Y-Balance Test, Single-Leg Hop Test, ACL-Return to Sport after Injury (ACL-RSI) scale, and Tampa Scale of Kinesiophobia (TSK-11). Semi-structured interviews were conducted before and after the intervention and analyzed using thematic analysis. Compared with the control group, the intervention group demonstrated improvements in landing biomechanics, dynamic balance, limb symmetry, psychological readiness, and reduced fear of reinjury following the 8-week intervention. Qualitative findings suggested improved movement confidence, greater perceived readiness to return to sport, and reduced fear during sport-specific activities**.** The FIFA 11+ program may support both physical and psychological aspects of return-to-sport rehabilitation in previously injured soccer players. Larger randomized longitudinal studies are required to confirm these preliminary findings.

Keywords; *Return to Sport; Kinesiophobia; Soccer Rehabilitations; Soccer Rehabilitation; Neuromuscular Training*

Introduction

Physical activity and involvement in sports programs have been promoted because of their many benefits, which include enhanced mental and physical health. Frequent exercise lowers the risk of obesity, hypertension, and other illnesses as well as premature deaths [1]. However, engaging in sports, particularly competitive sports, comes with the risk of injury, which can have repercussions for both the athlete and society. This is a worry for both coaches and athletes. Soccer remains the world's most popular sport, with global participation and professional involvement continuing to

increase. The nature of the sport, being multidirectional and high intensity, makes it susceptible to many musculoskeletal injuries such as anterior cruciate ligament (ACL) tears, ligaments sprains, muscle strains and ankle injuries. Not only do these injuries cause athletes to miss out on participation for extended periods of time, but they also put them at greater risk of reinjury when they return to sport [2-3]. The process of returning to sport (RTS) after a serious injury is complex and multi-dimensional, stretching beyond recovery. There is consistent research that shows that athletes who return to play have recurrent biomechanical deficits, such as changes in knee kinematics, neuromuscular asymmetries, and impairment in dynamic stability, that place them at a high risk for reinjury [4]. Historically ignored but equally important are the psychological aspects of recovery. There are known barriers to successful return and continued athletic performance including fear of reinjury, decreased self-confidence and emotional stress [5]. The FIFA 11+ program is a structured neuromuscular warm up program which has been developed to minimize the incidence of injuries in soccer. It has elements of core stability, balance training, plyometrics, agility and eccentric strength and focuses on the neuromuscular control impairments that are commonly associated with lower extremity injuries [6].

The literature has examined at how various strategies can help prevent injuries in football. Additionally, there is strong evidence that proprioceptive and balance exercises can prevent ACL injuries and recurring ankle sprains. Stretching and flexibility training, however, did not lower the risk of tendons and muscle damage [7-8]. The effects of FIFA 11+ and a modified warm-up program on preventing injuries and physical performance in young male soccer players. The results showed that while reducing the risk of injury, the FIFA 11+ program significantly improved balance, agility, strength, and control of movements [9]. The importance of psychological recovery during rehabilitation was highlighted, which found that players with higher psychological readiness showed greater confidence and a reduced fear of reinjury. An athlete's cognitive assessment of the injury determines how they react to it. Emotional and behavioral reactions to injury are linked to how the person mentally assesses and interprets the injury, according to cognitive appraisal models [10-11]. Although the effectiveness of the program in injury prevention with healthy athletes has been established, there is limited research on the application of the program in a post-injury rehabilitation setting, specifically with regard to both biomechanical and psychological outcomes. This study aims to fill this gap by examining the effects of an 8-week FIFA 11+ neuromuscular training intervention on movement biomechanics and injury risk parameters, and psychological readiness and fear of reinjury in competitive soccer players recovering from serious injury. In order to capture both quantitative and qualitative aspects of the athlete's return-to-sport journey, a mixed-methods design was employed.

Methods

Study Design

This pilot mixed-methods study employed a parallel-group pretest-posttest experimental design with embedded qualitative interviews. Quantitative outcome measures were used to evaluate biomechanical, functional, and psychological changes, while qualitative interviews explored participants perceptions of recovery and return-to-sport readiness. This method was chosen to give an in-depth understanding of the Soccer athletes experiencing the intervention's individual psychological experiences as well as their quantifiable physical improvements [12-13]. The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Islamia University of Bahawalpur, under the approval code (*41/27/IUB/RYK/Admin. 2026*).

Participants

A total of 24 competitive university-level soccer players (12 males and 12 females) aged between 18 and 30 years participated in the study. Participants had a history of a significant lower-extremity injury, including ACL injury, ligament injury, ankle injury, muscle tear, or fracture, resulting in at least four months away from training or competition. Participants were eligible if they had completed primary rehabilitation, medically cleared to return to training, and provided written informed consent prior to enrolment. The exclusion criteria include current severe musculoskeletal pain, ongoing physiotherapy for acute injury, cardiovascular contraindications to exercise, or neurological disorders affecting movement. Participants were randomly allocated to either the intervention group (n = 12) or control group (n = 12) using a computer-generated randomization procedure.

Table 1: Participant Demographic Characteristics (Mean ± SD)		
Variable	Intervention Group (n=12)	Control Group (n=12)
Age (Years)	22.5 ± 2.9	23.1 ± 3.1
Height (cm)	174.7 ± 6.3	173.1 ± 5.9
Body Mass (Kg)	71.4 ± 8.5	70.9 ± 7.8
BMI (kg/m²)	23.5 ± 2.2	23.4 ± 2.4
Months Since Injury	8.3 ± 1.7	8.7 ± 1.9
Injury Type: ACL	32%	32%
Ligament tear	26%	26%
Muscle Tear	18%	24%
Ankle Injury	16%	9%
Fracture	8%	9%

Intervention Program

The intervention group completed the FIFA 11+ neuromuscular training program three times per week for eight consecutive weeks prior to regular training sessions. The FIFA 11+ program included running exercises, balance activities, core stabilization exercises, plyometric drills, and strength exercises performed according to standardized FIFA guidelines [14]. The control group continued their normal soccer training routines without the FIFA 11+ intervention. Training adherence was monitored throughout the study period. Over the course of the study, both groups' training adherence and injury rates were observed.

Quantitative outcome measures

Movement Biomechanics

Movement biomechanics were assessed using the Drop Vertical Jump (DVJ) Test and Single-Leg Landing (SLL) Test [15]. Knee valgus angle, hip flexion angle, and landing symmetry were evaluated using two-dimensional video analysis with Kinovea software at 120 frames per second [16]. Single-limb landing control and dynamic stability were evaluated with the SLL Test. Angular kinematics were quantified using 120 frames per second (fps) with video analysis software, Kinovea [17].

Functional Performance and Injury Risk Indicators

The team medical staff filled out an injury report form to gather information about the frequency of injuries. Dynamic balance was assessed using the Y-Balance Test (YBT) [18]. Dynamic balance was assessed in anterior, posteromedial, and posterolateral reach directions and composite scdores were computed as a percentage of the length of the limb.

Functional performance and limb symmetry were evaluated using the Single-Leg Hop Test (SLHT) [19]. Agility performance was assessed using a standardized 5-10-5 shuttle agility test [20].

Psychological Measures

Two validated instruments were used to quantify psychological readiness. Psychological readiness was evaluated using the ACL-Return to Sport after Injury (ACL-RSI) scale [21]. Fear of movement and reinjury was assessed using the Tampa Scale of Kinesiophobia (TSK-11) [22]. All outcome measures were collected at baseline and after completion of the 8-week intervention.

Table 2. Biomechanical and Injury Risk Variables: Pre/Post Measures

Variable	Assessment/Test
Knee Valgus Angle (°)	Drop Vertical Jump
Hip Flexion Angle (°)	Drop Vertical Jump
Landing Asymmetry Index (%)	Single-Leg Landing
YBT Composite Score (% of Limb Length)	Y-Balance Test
Limb Symmetry Index (%)	Single-Leg Hop Test
Change-of-Direction Time (s)	5–10–5 Agility Test
ACL-RSI (0–100 score)	ACL-RSI Scale
Kinesiophobia Score (11–44 score)	TSK-11

Qualitative Data Collection

Semi-structured interviews were conducted before and after the intervention period. Interviews explored participants' perceptions of confidence, fear of reinjury, emotional readiness, motivation, and overall rehabilitation experience. All interviews were audio-recorded and transcribed verbatim. The interview guide was designed based on the sports psychology framework that focuses on the constructs of self-determination theory relevant to the RTS process: competence, relatedness and autonomy [23]. Interviews were about 30-45 minutes long and recorded with consent of the participants.

Qualitative Data Analysis

Qualitative data were analyzed using Braun and Clarke's six-step thematic analysis approach [24]. Two independent researchers coded the transcripts and developed themes through repeated review and discussion. To improve trustworthiness, member checking and independent coding procedures were implemented [25].

Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics Version 27.0. Descriptive statistics are presented as mean ± standard deviation. Data normality was assessed using the Shapiro Wilk test. Independent-samples t-tests were used for baseline comparisons. A two-way repeated-measures ANOVA was used to examine the effects of time, group, and group × time interactions for all quantitative outcome measures. Effect sizes were calculated using Cohen's d and interpreted as small (0.2) moderate (0.5) and large (0.8). Statistical significance $p < 0.05$.

Results

Quantitative Results

Effect of the FIFA 11+ intervention on Movement Biomechanics

A significant group × time interaction was found for knee valgus angle ($F(1,22) = 18.74$, $p < .001$, $\eta p^2 = 0.46$). The mean knee valgus angle of the intervention group significantly decreased from 18.4° ± 3.2° at pre intervention to 11.8° ± 2.5° post intervention ($p < .001$, $d = 1.84$), which is a large clinically meaningful improvement in frontal plane knee control. The control group showed no significant change (17.9° ± 2.9° to 17.3° ± 3.1°, $p = .38$). Hip flexion angle during landing was significantly higher in the intervention group (pre: 34.2° ± 4.6°; post: 42.9° ± 5.2°; $p < .001$, $d = 1.42$), reflecting better energy absorbing strategies when landing. There was a significant difference in pre-post landing asymmetry index between the intervention group, with decreased index (pre: 23.4% ± 4.2%; post: 11.8% ± 3.1%; $d = 2.13$, $p < .001$), suggesting significantly improved bilateral movement symmetry.

Graph 1. Biomechanical Outcomes: Pre and Post Intervention Comparison

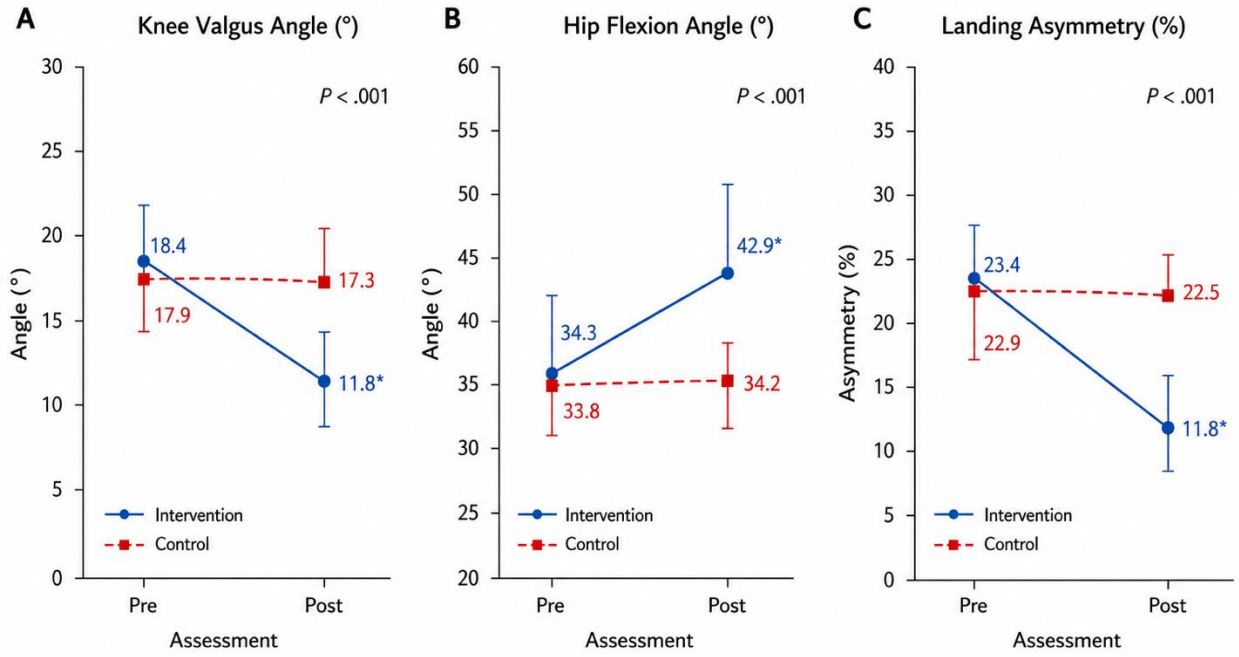

Figure 1. Biomechanical outcomes before and after intervention. (A) Knee valgus angle (°), (B) hip flexion angle (°), and (C) landing asymmetry (%). Data are mean ± SD. *Significant within-group change from pre to post ($P < .001$).
Between-group differences at post-intervention were significant for all variables ($P < .001$).

Effect of the FIFA 11+ intervention on Injury Risk Assessment

The composite scores of the Y-Balance Test showed a significant group × time interaction ($F(1,22) = 22.31$, $p < .001$, $\eta p^2 = 0.50$). The intervention group had a mean composite score rise from 74.2% ± 5.8% to 85.6% ± 4.9% ($p < .001$, $d = 1.61$) which was above the clinically important score of 80%, with reduced ACL reinjury risk. There was no significant change in the control group ($p = .51$). There was significant improvement in the introduction group on the Single-Leg Hop Test (pre: 76.4% ± 7.2%, post: 91.3% ± 5.4%, $p < .001$, $d = 1.89$) with values approaching the clinical criterion of ≥90% for RTS clearance. Agility performance also improved significantly (pre: 6.84 ± 0.42 s; post: 6.11 ± 0.38 s; $p < .001$, $d = 1.47$). There were no significant differences in any injury risk measures in the control group.

Graph 2. Psychological Readiness Score: Pre and Post Intervention Comparison

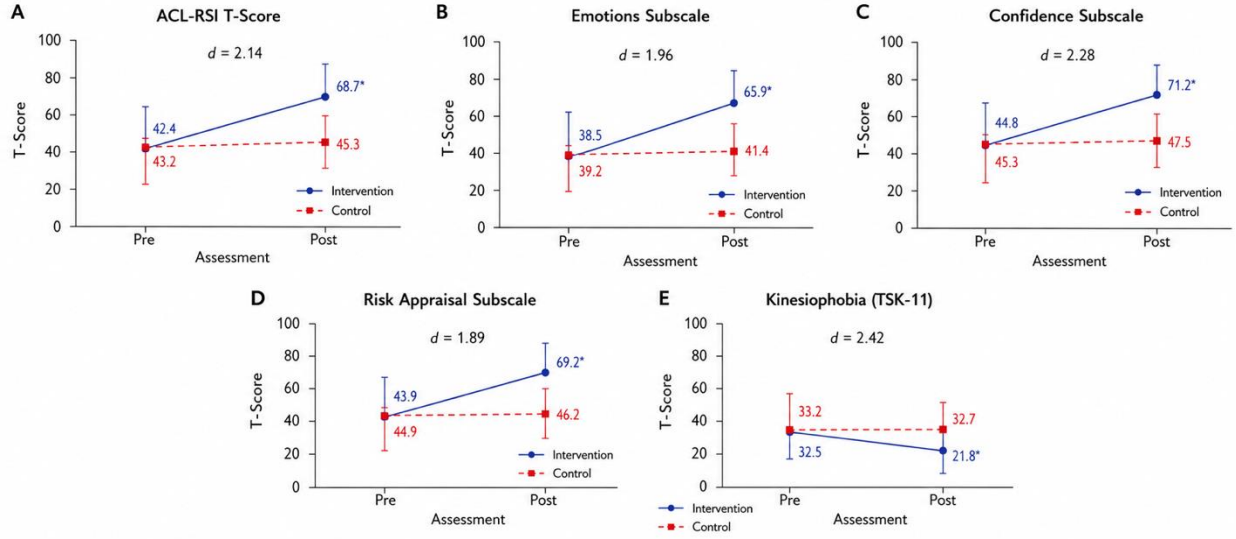

Figure 1. Psychological readiness outcomes before and after intervention.
(A) ACL-RSI T-Score, (B) Emotions Subscale, (C) Confidence Subscale, (D) Risk Appraisal Subscale, and (E) Kinesiophobia (TSK-11).
Data are mean ± SD.
* Significant within-group change from pre to post ($P < .001$).
Between-group differences at post-intervention were significant for all measures ($P < .001$). Effect sizes (Cohen's d) reflect between-group differences at post-intervention.

Psychological Readiness Outcomes

The intervention group had significant improvements in ACL-RSI total scores, from 42.3 ± 9.1 (moderate) to 68.7 ± 8.4 (high) ($p < .001$, $d = 2.14$). The intervention resulted in statistically and clinically significant improvements on all three subscales of the ACL-RSI: emotions, confidence in performing, and risk appraisal. The mean Kinesiophobia score, on the TSK-11, was significantly lower following the intervention (21.8 ± 3.7; $p < .001$; $d = 2.42$), and below the clinical threshold of 25, indicative of clinically relevant fear of movement. The psychological measures did not significantly change in the control group.

Qualitative Results

Semi-structured interview transcripts were analyzed using thematic analysis, which resulted in five emergent themes that were implicated in the athlete's psychological experiences before and after the intervention. The themes are meant to convey a path from doubt and worry to readiness and confidence. Qualitative analysis in the pre-intervention identified that there were pervasive themes of fear, uncertainty, and lack of confidence. A gap between perceived physical ability and being prepared for competition was repeatedly mentioned by the participants, in line with the self-determination theory framework. Athletes voiced concerns about their body's ability to handle the intense exercise of competition and reported avoiding high-intensity exercise.

Table 3. Qualitative Themes and Representative Quotes of Participants

Theme	Subtheme	Representative Quotes (Post Intervention)
Improved movement confidence	Confidence in the body	I no longer second guessed every move; they just moved.
Less fear of reinjury	Emotional desensitization	At first, I was scared of landing, now I hardly think about it, I just play!
Psychological readiness to compete	Return to sport self-belief	But I'm ready, not just physically, I'm mentally ready.
Motivational re-engagement	Motivational re-engagement	Training with the program was giving me structure, it was reminding me of the reasons why I love this sport.
Positive intervention experience	Acceptability and perceived benefit	The exercises were realistic but complicated. I was not feeling like I was merely going through the motions; I felt like I was being prepared.

After the intervention, a clear thematic shift became evident. Participants indicated increased confidence in their movement ability, decreased catastrophic thoughts about injury, and increased motivation to return to competition. Importantly, athletes commented on the systematic nature of the FIFA 11+ protocol in creating a sense of 'graduated exposure' to challenging movements that seemed to function as a psychological desensitization to feared movement patterns.

Discussion

Impact of the FIFA 11+ intervention on Biomechanical adaptation

This study showed that the FIFA 11+ neuromuscular training program had significant and clinically relevant improvements in movement biomechanics of soccer players after a serious injury for an 8-week intervention. Similar to the other studies, the intervention considerably decreased the incidence of ankle and lower extremities injuries [26]. The findings of these knee valgus angle reductions and hip flexion angle increases during the landing tasks fit well into known pathways of neuromuscular adaptations. Reducing knee valgus at the time of landing is one of the main biomechanical targets to reduce the risk of ACL injury and is thought to be a key goal in ACL rehabilitation. The magnitude of improvement found in the intervention group ($d = 1.84$) is similar to and corroborates as reported in previous studies [27]. who reported significant changes in frontal plane knee kinematics after an 8-week neuromuscular program for collegiate soccer players.

The progression of the FIFA 11+ protocol inherently involves task specific loading that is thought to be the mechanism underlying these biomechanical adaptations. Balance and single/half leg exercises build proprioceptive sensitivity which allows the athlete to better regulate the output of the neuromuscular system in response to perturbation. In plyometric exercises, especially drop landing activities, athletes are required to use strategies that absorb energy (greater knee and hip flexion) which shift mechanical loading away from passive stabilizers. Improvements in landing mechanics indicate true neuromuscular re-education and not task specific practice effects as demonstrated by transfer to different functional tests including the Y-Balance Test and Single-Leg Hop Test [28-29].

Impact of the FIFA 11+ intervention on Injury Risk Reduction

When compared to a control group that used their regular preparation, this study demonstrated that the implementation of the FIFA 11+ program with adherence to standards in training and competition reduced the incidence of injuries. The results from the Y-Balance Test composite scores and Limb Symmetry Index values that surpassed the 80% threshold and approached the

clinical criterion of ≥90%, respectively, indicate a clinically relevant decrease in the risk of functional injury for the intervention group. The results are similar to previous studies, that a full competitive soccer season of implementing the FIFA 11+ program led to a significant decrease in the incidence of injuries [30]. The current study extends this literature by showing that these functional performance markers can improve similarly in an 8-week period among athletes who have not trained for at least 6 months. Interestingly, the magnitude of improvement in limb symmetry (LSI 76.4% to 91.3%) corresponds to a clinically significant progression as LSI values below 90% have been shown to be significantly associated with a higher risk of ACL reinjury when returning to sport [31]. The improvements in agility further indicated that the FIFA 11+ protocol improves the efficiency of the neuromuscular system when conducting multidirectional movements, which is an important factor that contributes to an increased risk of injury in soccer-specific scenarios.

The psychological readiness and fear of reinjury.

The most salient result of this study is the amount of psychological change found in the intervention group. These changes go from moderate to high psychological readiness for ACL-RSI scores of 42.3 to 68.7, and from high to below the clinical fear threshold for TSK-11 scores. The changes from moderate to high psychological readiness (42.3 to 68.7) for the ACL-RSI and from high to below the clinical fear threshold (TSK-11 scores) are of consequential practical significance. These results corroborate that the ACL-RSI was a reliable way to gauge psychological readiness and that it was a good predictor of RTS outcomes. The results of this study indicate that confidence was a crucial element of psychological preparedness and that confidence was multifaceted, a conclusion supported by earlier studies [32-33].

The qualitative results add valuable context to the quantitative results. The shift in themes from a pre to post intervention, from narratives of catastrophizing, movement avoidance and fear, to post intervention narratives of movement confidence, decreased fear and competitive readiness, is consistent with the theoretical framework described by Podlog et al. [23]. In particular, the "progressive" structure of the FIFA 11+ protocol seems to meet athletes' psychological requirement for competence and offers a set of progressively more challenging physical challenges. Each session was a chance for mastery experiences little successes gained that gradually increased self-efficacy and decreased threat related to high intensity movement.

This interpretation aligns with the cognitive-behavioral models of sports injury rehab, which focus on the fear reduction mechanism being repeated exposure to activities that are feared and successful. The present study offers novel evidence that the FIFA 11+ program can serve as a neuromuscular training stimulus, but also as a structured exposure protocol, where the psychological benefits of the program are not only present, but expected to be a fundamental part of its design.

Clinical Implications

The FIFA 11+ program may represent a practical and low-cost adjunct within return-to-sport rehabilitation programs for soccer players recovering from lower-extremity. To enhance physical performance and neuromuscular control, the results of this study indicate that the FIFA 11+ program may also facilitate psychological recovery during rehabilitation. emerging viewpoint that an effective return to sport should be undertaken within a biopsychosocial framework instead of depending exclusively on physical recovery metrics [23,34]. Clinicians should consider incorporating both physical and psychological outcome measures when evaluating readiness to return to sport.

Limitations

Several limitations should be acknowledged. First, the sample size was relatively small, limiting statistical power and generalizability. Second, the inclusion of multiple injury types introduced clinical heterogeneity. Third, the intervention duration was limited to eight weeks and did not allow long-term follow-up. Finally, biomechanical assessment relied on two-dimensional video analysis rather than three-dimensional motion capture.

Conclusion and recommendations

This pilot mixed-methods study suggests that the FIFA 11+ neuromuscular training program may positively influence biomechanical and psychological return-to-sport outcomes in previously injured soccer players. Participants in the intervention group demonstrated improvements in landing mechanics, dynamic balance, limb symmetry, psychological readiness, and fear of reinjury following the intervention period. However, the findings should be interpreted cautiously due to the relatively small sample size and heterogeneous injury population. Larger randomized controlled studies with longer follow-up periods are required to confirm these findings.

Conflict of Interest

There is no conflict of interest.

References

[1] World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. World Health Organization.

[2] Bahr Roald & Krosshaug Tron (2005). Understanding injury mechanisms: a key component of preventing injuries in sport. *British Journal of Sports Medicine*, 39(6), 324–329.

[3] FIFA, T. (2024). Global Transfer Report 2023. *Zurich: FIFA. Available online: https://digitalhub. fifa. com/m/114622e4e17cf6a8/original/FIFA-Global-Transfer-Report-2023. pdf (accessed on 25 July 2024)*.

[4] Tayfur, B., Charuphongsa, C., Morrissey, D., & Miller, S. C. (2021). Neuromuscular function of the knee joint following knee injuries: does it ever get back to normal? A systematic review with meta-analyses. *Sports medicine*, *51*(2), 321-338.

[5] Truong, L. K., Mosewich, A. D., Holt, C. J., Le, C. Y., Miciak, M., & Whittaker, J. L. (2020). Psychological, social and contextual factors across recovery stages following a sport-related knee injury: a scoping review. *British journal of sports medicine*, *54*(19), 1149-1156.

[6] Al Attar, W. S. A., Soomro, N., Sinclair, P. J., Pappas, E., & Sanders, R. H. (2017). Effect of injury prevention programs that include the Nordic hamstring exercise on hamstring injury rates in soccer players: a systematic review and meta-analysis. *Sports Medicine*, *47*(5), 907-916.

[7] Hübscher, M., Zech, A., Pfeifer, K., Hänsel, F., Vogt, L., & Banzer, W. (2010). Neuromuscular training for sports injury prevention: a systematic review. *Medicine & Science in Sports & Exercise*, *42*(3), 413-421.

[8] Thacker, S. B., Gilchrist, J., Stroup, D. F., & Kimsey, C. D. (2004). The impact of stretching on sports injury risk: a systematic review of the literature. *Medicine & Science in Sports & Exercise*, *36*(3), 371-378.

[9] Asgari, M., Alizadeh, M. H., Shahrbanian, S., Nolte, K., & Jaitner, T. (2022). Effects of the FIFA 11+ and a modified warm-up programme on injury prevention and performance improvement among youth male football players. *PloS one*, *17*(10), e0275545.

[10] Ardern, C. L., Taylor, N. F., Feller, J. A., & Webster, K. E. (2013). A systematic review of the psychological factors associated with returning to sport following injury. *British journal of sports medicine*, *47*(17), 1120-1126.

[11] Wiese-Bjornstal, D. M., Smith, A. M., Shaffer, S. M., & Morrey, M. A. (1998). An integrated model of response to sport injury: Psychological and sociological dynamics. *Journal of applied sport psychology*, *10*(1), 46-69.
[12] Creswell, J. W., & Clark, V. P. (2007). Mixed methods research. *Thousand Oaks, CA*.
[13] Tashakkori, A., & Teddlie, C. (2021). *Sage handbook of mixed methods in social & behavioral research*. SAGE publications.
[14] Fernandes, A. D. A., Silva, C. D. D., Costa, I. T. D., & Marins, J. C. B. (2015). The "FIFA 11+" warm-up programme for preventing injuries in soccer players: a systematic review. *Fisioterapia em Movimento*, *28*, 397-405.
[15] Hewett, T. E., Myer, G. D., Ford, K. R., Heidt Jr, R. S., Colosimo, A. J., McLean, S. G., ... & Succop, P. (2005). Biomechanical measures of neuromuscular control and valgus loading of the knee predict anterior cruciate ligament injury risk in female athletes: a prospective study. *The American journal of sports medicine*, *33*(4), 492-501.
[16] Munro, A., Herrington, L., & Carolan, M. (2012). Reliability of 2-dimensional video assessment of frontal-plane dynamic knee valgus during common athletic screening tasks. *Journal of sport rehabilitation*, *21*(1), 7-11.
[17] Puig-Diví, A., Escalona-Marfil, C., Padullés-Riu, J. M., Busquets, A., Padullés-Chando, X., & Marcos-Ruiz, D. (2019). Validity and reliability of the Kinovea program in obtaining angles and distances using coordinates in 4 perspectives. *PloS one*, *14*(6), e0216448.
[18] Plisky, P. J., Gorman, P. P., Butler, R. J., Kiesel, K. B., Underwood, F. B., & Elkins, B. (2009). The reliability of an instrumented device for measuring components of the star excursion balance test. *North American journal of sports physical therapy: NAJSPT*, *4*(2), 92.
[19] Noyes, F. R., Barber, S. D., & Mangine, R. E. (1991). Abnormal lower limb symmetry determined by function hop tests after anterior cruciate ligament rupture. *The American journal of sports medicine*, *19*(5), 513-518.
[20] Ja, D. (1985). The 505 test: A test for agility in horizontal plane. *Aust J Sci Med Sport*, *17*(1), 15-18.
[21] Webster, K. E., Feller, J. A., & Lambros, C. (2008). Development and preliminary validation of a scale to measure the psychological impact of returning to sport following anterior cruciate ligament reconstruction surgery. *Physical therapy in sport*, *9*(1), 9-15.
[22] Woby, S. R., Roach, N. K., Urmston, M., & Watson, P. J. (2005). Psychometric properties of the TSK-11: a shortened version of the Tampa Scale for Kinesiophobia. *Pain*, *117*(1-2), 137-144.
[23] Podlog, L., & Eklund, R. C. (2007). The psychosocial aspects of a return to sport following serious injury: a review of the literature from a self-determination perspective. *Psychology of Sport and Exercise*, *8*(4), 535-566.
[24] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.
[25] Lincoln, Y. S., & Guba, E. G. (1988). Criteria for Assessing Naturalistic Inquiries as Reports.
[26] Soligard T, Myklebust G, Steffen K, et al. *Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomised controlled trial.* BMJ. 2008;337:a2469.
[27] Myer, G. D., Ford, K. R., McLean, S. G., & Hewett, T. E. (2006). The effects of plyometric versus dynamic stabilization and balance training on lower extremity biomechanics. *The American journal of sports medicine*, *34*(3), 445-455.
[28] Plisky, P. J., Gorman, P. P., Butler, R. J., Kiesel, K. B., Underwood, F. B., & Elkins, B. (2009). The reliability of an instrumented device for measuring components of the star excursion balance test. *North American journal of sports physical therapy: NAJSPT*, *4*(2), 92.

[29] Noyes, F. R., Barber, S. D., & Mangine, R. E. (1991). Abnormal lower limb symmetry determined by function hop tests after anterior cruciate ligament rupture. *The American journal of sports medicine*, *19*(5), 513-518.

[30] Plisky, P. J., Rauh, M. J., Kaminski, T. W., & Underwood, F. B. (2006). Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players. *Journal of orthopaedic & sports physical therapy*, *36*(12), 911-919.

[31] Grindem, H., Snyder-Mackler, L., Moksnes, H., Engebretsen, L., & Risberg, M. A. (2016). Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL cohort study. *British journal of sports medicine*, *50*(13), 804-808.

[32] Webster KE, Feller JA, Lambros C. *Development and preliminary validation of a scale to measure the psychological impact of returning to sport following anterior cruciate ligament reconstruction surgery.* Phys Ther Sport. 2008;9(1):9–15.

[33] Ardern CL, Taylor NF, Feller JA, Webster KE. *A systematic review of the psychological factors associated with returning to sport following injury.* Br J Sports Med. 2013;47(17):1120–1126.

[34] Ardern CL, Glasgow P, Schneiders A, et al. *2016 Consensus statement on return to sport from the First World Congress in Sports Physical Therapy, Bern.* Br J Sports Med. 2016;50(14):853–864.