Manual Therapy, Posturology & Rehabilitation Journal
ISSN: 2236-5435

REVIEW ARTICLE

Risk of contralateral anterior cruciate ligament injury due to kinesiophobia: A narrative review

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Abstract

Background: Fear of movement after a primary anterior cruciate ligament (ACL) rupture has been a risk factor for the emergence of a contralateral anterior cruciate ligament (CACL) injury. **Objective:** Investigate the relationship between kinesiophobia and CACL. **Methods:** This is a narrative review that investigated the relationship between kinesiophobia and CACL injury. The search for articles was performed in the digital databases Pubmed, Cochrane, Lilacs, Pedro and Web of Science, published in any language over a ten-year period. Articles that evaluated and followed athletes with kinesiophobia who returned to sport were included. **Results:** A total of three articles were eligible for analysis, with two showing a relationship between high kinesiophobia in patients who ruptured the ACL, while one study showed no differences between kinesiophobia in patients who ruptured the ACL compared to athletes without injury. **Conclusion:** This study demonstrated that athletes who have a high level of kinesiophobia during ACL reconstruction surgical recovery have a moderate risk of rupture of the CACL.

Keywords: kinesiophobia; anterior cruciate ligament; risk factors.

BACKGROUND

Ligament injuries often cause joint instability, reducing functionality. Rehabilitation after anterior cruciate ligament (ACL) reconstruction is of paramount importance to return to functional or sporting activities and prevent recurrence[1]. Once rehabilitated, there are risk factors for a new injury to the contralateral anterior cruciate ligament (CACL), which are anatomical, genetic, environmental, sex, return to sport, age, neuromuscular deficiency, ligament laxity, presence of a primary rupture, biomechanics, body mass index, choice of graft, with autograft from the central third of the patellar ligament and flexor tendons being the most commonly used, and kinesiophobia[2-4].

Kinesiophobia can be defined as the "fear of movement". This phobia arises after a harmful experience where the individual fears a painful recurrence, thus avoiding physical activity in the injured region[5]. It is clear that CACL injury rates exceed ipsilateral recurrence rates[3], reported in their study that 69.6% of patients with ACL injury who returned to sport ruptured the contralateral ACL within 2 years. Kinesiophobia has been shown to be related to the risk of ACL injury which, as compensation, in order to preserve the operated ACL, ends up overloading the opposite knee, creating the risk of a new injury[6,7].

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Received: 19 Aug, 2024.
Accepted: 08 Oct, 2024.
Published: 19 Nov, 2024.

Considering the risk of injury and given the influence of kinesiophobia on the emergence of this during rehabilitation, the objective of this study is to carry out a literature review to investigate the relationship between kinesiophobia and CACL injury.

METHODS

This is a narrative review on the risk of new CACL injury in athletes who return to sport with a high kinesiophobia index after primary ligament reconstruction. In which a bibliographic survey was carried out in the digital databases Pubmed, Cochrane, Lilacs, Pedro and Web of Science. The search for articles was carried out from January to March 2024. The search strategy to collect studies that have investigated the relationship between kinesiophobia and contralateral ACL injury was using the descriptors for combinations of the keywords: "Fear, Movement" OR "Fear of injury" OR "Psychological readiness" OR "Kinesiophobia" OR "Self-reported function" AND "Anterior cruciate ligament" OR "Anterior cruciate ligament reconstruction" OR "Return to sport".

The inclusion criteria were studies published no more than ten years ago and, in any language, which evaluated kinesiophobia after primary ACL rupture, including patients who had a minimum follow-up of 1 year. Randomized controlled studies, case studies and prospective cohort studies were included for evaluation. Studies that applied other interventions with the aim of modifying the level of kinesiophobia, other than standard post-surgical rehabilitation in the case of physiotherapy, were excluded. Furthermore, articles that reported using a graft from the contralateral knee to reconstruct the injured ACL were excluded. Finally, we did not consider systematic reviews for the progress of the study.

During the search, the articles found were selected by an initial screening by title, then the abstract of the remaining studies was read. The studies that met the inclusion criteria were read in full and evaluated by two researchers individually. If there was disagreement about the studies, a third researcher was called to verify the decision.

RESULTS

Between January and March 2024, a total of 436 articles were identified through the database search, which were then evaluated by title. Of these, only 24 articles were eligible by title and advanced to reading of the abstract and selected according to the inclusion and exclusion criteria. Of this narrowing, 21 were excluded because they did not meet the inclusion criteria, 12 articles did not disclose the number of contralateral ruptures during the follow-up period, and 9 were excluded because they did not aim to evaluate kinesiophobia but only to demonstrate the rate of new contralateral injury after returning to sport.

Consequently, these studies were not part of the analysis. Immediately after reading the abstract and applying the inclusion and exclusion criteria, 3 articles were read in full. The same 3 studies met the eligibility criteria and were included in the review conducted for methodological evaluation (Figure 1).

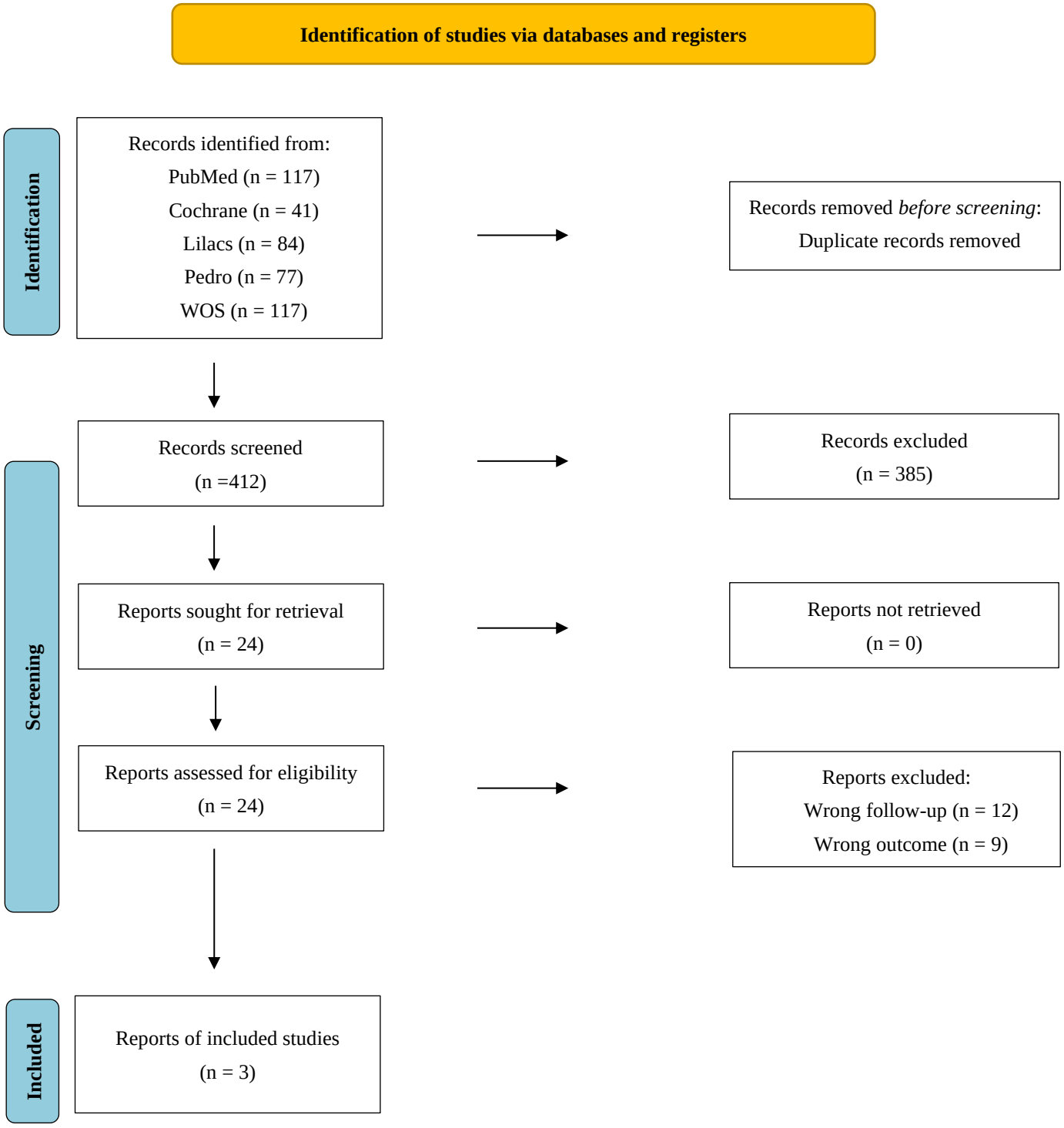

Figure 1. PRISMA flow diagram of study identification, screening, eligibility assessment, and inclusion.

In their study, Tagesson and Kvist, et al.[7] performed a 5-year follow-up after primary ACL reconstruction. Objective assessments of tibial translation, pre-injury activity level, self-reported function, and kinesiophobia were performed 2 weeks before reconstruction and 5 weeks after ACL restoration. Kinesiophobia was quantified by the "knee injury and osteoarthritis outcome score" (KOOS) questionnaire, the ACL quality of life questionnaire, and the Tampa kinesiophobia scale (TSK). Nineteen participants were followed in the study, of which 5 had a new injury, of which 2 (10.5%) patients suffered a

CACL rupture. They were compared in an injured group (5 patients; 2 men and 3 women with a mean age of 21 years) and an uninjured group (14 patients; 9 men and 5 women with a mean age of 21 years). The result obtained estimated that the injured group had a significantly greater fear of a new injury compared to the uninjured group (median 13 [1-20] vs. 28 [0-100]; p=0.005). In addition, the two patients who suffered a contralateral ACL rupture later reported on the questionnaire a great fear of a new injury (score 0, on a scale of 0-100 points), as well as a significant increase in static translation of the tibia in both knees before ACL reconstruction compared to those who did not suffer another ACL injury.

In a prospective cohort study, Paterno et al, et al.[8] recruited 40 patients after ACL reconstruction who completed rehabilitation and were cleared to return to sports and were followed for 24 months for injury screening. The participants' level of kinesiophobia, activity level after medical clearance, knee function through 4 single leg hop tests, and isometric quadriceps muscle strength were assessed; all tests occurred within 4 weeks after returning to sports. Kinesiophobia was measured using the abbreviated version of the "Tampa Scale of Kinesiophobia" (TSK-11). The TSK-11 score was used to divide the participants into 2 groups: those with high fear (with a score $\geqslant$17 points on the questionnaire; n=19) and those with low fear (with a score $\leqslant$16 points on the questionnaire; n=21). Fifteen participants (37.5%) had a second ACL injury, of which 7 (17.5%) suffered a contralateral ACL injury, but participants who suffered contralateral injuries showed no difference in the TSK-11 score (16.0±1.8) compared to participants without injury (17.3±4.2; p=0.43). However, the authors observed that participants with fear demonstrated lower sports participation, 7 times more jump asymmetry and 6 times more asymmetry of quadriceps isometric strength.

In the prospective longitudinal study, McPherson, et al.[9], 567 patients started the study, however, only 329 patients completed the 12-month study to assess the level of kinesiophobia after ACL reconstruction, and another 2 to 4 years after surgery to determine additional injuries, being 118 women and 211 men (mean age 25.3±8.7 years). They assessed the level of kinesiophobia using the "anterior cruciate ligament return to sport after injury" scale two weeks before ACL reconstruction and 12 months after reconstruction. Patients were divided into two groups: injured and non-injured. The injured group is expressed in patients who reported a second ACL injury (of the graft or contralateral knee) after returning to sport. The non-injured group is expressed in patients who did not report a second injury after returning to sport. Of the patients, 329 returned to sport and 52 (16%) suffered a second ACL injury, of which 18 (5.47%) had contralateral ruptures, where a higher level of kinesiophobia was observed after 12 months compared to non-injured patients (60.9 vs 67.2 points; p=11). The authors identified that a score of 77 points by the ACL-RSI presented a sensitivity of 90% of detection in injured and non-injured patients, since scores $\leqslant$77 indicate risk of a second injury.

DISCUSSION

This study sought to identify, through a narrative review, the interaction between kinesiophobia and second CACL injury. Despite the lack of studies with low levels of methodological evidence addressing this topic, we were able to develop this study.

However, we found the following results, which demonstrate that there is a concomitance between kinesiophobia and second CACL injury. Based on the above, three scientific articles confirm and agree with the conclusion. In general, the following studies provided relevant information regarding the second ACL injury, with decreased psychological readiness being a major predictor of the occurrence. In view of this, studies report that younger patients are more affected and may present decreased psychological readiness in relation to those who did not have an injury, increasing the chances of a recurrence of ipsilateral or contralateral injury. Tagesson, et al.[7] in particular provides information on joints prior to ACL reconstruction surgery, where he states that patients demonstrated static tibial translation in both knees and exacerbated generalized ligament laxity, in addition, to extreme fear of making the movement, something that can also directly impact their psychological readiness after surgery, increasing the chances of a new CACL injury. The study demonstrates that patients with a high level of kinesiophobia may have a second ACL injury, one to two years after ACL reconstruction surgery. Studies relate pivoting, cutting and landing sports as great risks for ACL injury due to the great pressure imposed on this structure[9-12].

The painful experience combined with surgical implications such as muscle atrophy, joint fibrosis, and arthrogenic inhibition of the quadriceps and hamstrings during rehabilitation contribute to biomechanical changes and self-reported knee function[13 -15]. Above all, this overload generated in the contralateral knee directly reflects on the athlete's physical function, which, added to high kinesiophobia when exposed to sport again, runs a greater risk of a new contralateral rupture[16-20]. The small sample included limits the answer to our target question. Although it is a common report presented in clinical rehabilitation practice, the scarcity of studies in the literature on the subject leaves a large gap, making it impossible to deepen the subject.

CONCLUSION

The present study demonstrates that athletes with high levels of kinesiophobia can have a moderate risk of rupture of the CACL during surgical recovery. This risk may increase depending on the characteristics of the athlete and the level of self-reported fear. Further work should be done to determine the relationship on the injured contralateral knee resulting from fear of movement reported by the athlete.

Author Contributions: J.Z., A.D., E.S. and H.S. conceived the idea for the study. J.Z., G.C., L.N. and R.Q. contributed to the design and planning of the research. All authors were involved in data collection. T.R. analysed the data. J.Z., E.S., H.S. and R.P. wrote the first draft of the manuscript. J.Z., T.R. and L.N. coordinated funding for the project. All authors edited and approved the final version of the manuscript.

Financial Support: This research did not receive any financial support.

Conflict of interest: There are no conflicts of interest.

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