



Original research

Is impaired knee confidence related to worse kinesiophobia, symptoms, and physical function in people with knee osteoarthritis after anterior cruciate ligament reconstruction?



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ABSTRACT

Objectives: To compare knee confidence and kinesiophobia (fear of re-injury) in those with and without knee osteoarthritis following anterior cruciate ligament reconstruction, and determine whether poorer knee confidence is associated with greater kinesiophobia, worse knee-related symptoms, and functional impairments in those with knee osteoarthritis.

Design: Cross-sectional.

Methods: Sixty-six individuals, 5–12 years following anterior cruciate ligament reconstruction, with ($n = 30$) and without ($n = 36$) knee osteoarthritis were included. Knee injury and Osteoarthritis Outcome Score quality-of-life question (Q3), assessed knee confidence and Tampa Scale of Kinesiophobia assessed kinesiophobia. In the osteoarthritis group, knee-related symptoms (International Knee Documentation Committee and Anterior Knee Pain Scale), self-reported function (Knee injury and Osteoarthritis Outcome Score activities daily living), sport/recreation (Knee injury and Osteoarthritis Outcome Score-sport and recreation), and performance-based function (hopping, one leg rise tasks) were assessed. Between-group differences in knee confidence and kinesiophobia were evaluated with the Chi square test and analysis of variance, respectively. In the osteoarthritis group, between-group differences (none, mild/moderate and severe/extreme problems with knee confidence) in kinesiophobia, symptoms and function were determined with analysis of variances: $p < 0.05$.

Results: Following anterior cruciate ligament reconstruction, participants with knee osteoarthritis had significantly worse knee confidence ($p = 0.010$) and greater kinesiophobia ($p = 0.006$) than those without osteoarthritis. In those with knee osteoarthritis, poorer knee confidence was significantly associated with worse symptoms (Anterior Knee Pain Scale, $p = 0.001$; International Knee Documentation Committee, $p < 0.001$), kinesiophobia ($p = 0.030$), Knee injury and Osteoarthritis Outcome Score-activities of daily living ($p = 0.005$), Knee injury and Osteoarthritis Outcome Score-sport and recreation ($p = 0.001$), single-leg hop ($p = 0.011$), side-to-side hop ($p = 0.013$) and one leg rise ($p = 0.001$).

Conclusions: Psychological impairments are evident in people with knee osteoarthritis following anterior cruciate ligament reconstruction, compared to those without. Future studies should further investigate the psychological impairments associated with knee osteoarthritis after anterior cruciate ligament reconstruction.

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1. Introduction

Anterior cruciate ligament (ACL) injury is a well-recognised risk factor for post-traumatic knee osteoarthritis (OA), with 50–70% of people developing knee OA 10–15 years following injury.^{1,2} Surgical reconstruction (ACLR) does not reduce the risk of OA.³ Knee OA after ACLR primarily affects younger adults,⁴ with potential to limit physical activity.⁵ Consequently, any physical and psychological impairments may adversely impact quality of life and work

participation. Recently, our research team observed that greater knee OA severity is associated with worse symptoms and poorer function at 5–10 years following ACLR.⁶ While functional impairments such as muscle weakness and poorer functional performance are well-described in ACLR populations,^{5,7} the nature and impact of psychological impairments remain largely unknown, especially in those with knee OA.

Knee confidence and kinesiophobia are two psychological factors that are likely to be impaired in those with knee OA following ACLR. Kinesiophobia, defined as “an irrational and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or (re) injury”,⁸ predicts return to sport after ACLR.^{9,10} Furthermore, people who have not returned to sport are less confident about their ACLR knee than those who have.^{9,10} Worse knee confidence is also described in people with knee OA, and associated with higher pain and greater knee instability.¹¹ Knee OA is highly prevalent after ACLR, and factors such as knee confidence and kinesiophobia play a key role in those recovering from ACL injury^{9,10} and in those at risk of¹² or with knee OA.¹¹ Thus, it is important to understand whether the presence of knee OA following ACLR in younger adults increases these psychological impairments, beyond those seen after ACLR alone.

Psychological and functional impairments are likely to co-exist and be inter-related.^{9,11,12} Worse kinesiophobia is associated with lower physical activity levels after ACLR⁹ and reduced daily functioning¹³ in those with knee OA. While no studies have investigated knee confidence in those with knee OA after ACLR, lower knee-related confidence is associated with lower physical function¹² and quadriceps strength¹¹ in older knee OA populations. Thus, it appears that knee confidence and kinesiophobia are psychological impairments that may contribute to, or result from, functional impairments. It is important to understand whether the relationship between psychological and functional impairments is seen in young adults with knee OA following ACLR. Knowledge of this relationship may provide a more comprehensive approach to rehabilitation.

The aims of this study were twofold. Firstly, to compare knee confidence and kinesiophobia between those with and without knee OA after ACLR; and secondly, to investigate the relationship between knee confidence and kinesiophobia, knee-related symptoms, and functional impairments in those with knee OA after ACLR. We hypothesized that those with knee OA after ACLR would have poorer knee confidence and greater kinesiophobia than those without knee OA. In addition, we hypothesized that poorer knee confidence would be associated with greater kinesiophobia, worse knee-related symptoms and worse functional impairments in those with knee OA after ACLR.

2. Materials and methods

Volunteers who had undergone a primary ACLR (hamstring-tendon or patellar-tendon graft) five to 12 years prior were recruited from the community via advertisements and referrals from orthopedic surgeons, allied health and medical practitioners. Exclusion criteria for all participants were: (i) aged <18 years at the time of ACLR; (ii) subsequent arthroplasty performed on the reconstructed knee; (iii) concomitant pain from the hips, ankles, feet or lumbar spine; (iv) neurological or medical conditions; (v) contraindications for x-ray (pregnancy, breastfeeding); and (vi) an inability to understand written and spoken English. Participants with OA were included if they were symptomatic¹⁴ and had radiographic knee OA (Kellgren and Lawrence (KL) grade ≥ 2) in at least one compartment (tibiofemoral or patellofemoral) of the reconstructed knee¹⁵ (OA group). Participants were included in the no-OA group if they were asymptomatic¹⁴ without radiographic

knee OA (KL ≤ 1 in all knee compartments). A trained observer (KMC) assessed all radiographs, blinded to symptoms. All participants provided written informed consent prior to undergoing radiographs and data collection. Data pertaining to age, gender, height, and weight were recorded. Ethics approval for the study was obtained from the University of Melbourne Human Research Ethics Committee (0931086).

Knee confidence was assessed in all participants. Since there is no specific patient-reported outcome measure for knee confidence, we used Item 3 of the Knee Injury and Osteoarthritis Outcome Score (KOOS) quality of life (QOL) subscale,¹² “How much are you troubled with lack of confidence in your knee?” Participants responded on a five-point Likert scale, which consisted of: not at all (0); mildly (1); moderately (2); severely (3); and extremely (4). Kinesiophobia was assessed in all participants using the Tampa Kinesiophobia Scale.¹⁶ The Tampa Scale quantifies fear of movement and re-injury due to movement and physical activity. It consists of statements on subjective experience of injury and physical activity on a scale from 0 to 68, where 68 indicates greater fear of re-injury due to movement.

In the OA group, knee-related symptoms were assessed using the 2000 International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form¹⁷ and the Anterior Knee Pain Scale (AKPS).¹⁸ The IKDC measures knee-related symptoms and function in daily living and sports activities on a scale from 0 to 100, with zero indicating lowest levels of knee function and maximum knee symptoms. The IKDC is widely used in assessing symptoms in individuals with knee pathology including ligament and articular cartilage injury and arthritis.¹⁹ The AKPS measures items including limp, weight-bearing, walking, stairs, squatting, running, pain, swelling. A score of zero on AKPS indicates maximum anterior knee pain symptoms and disability.²⁰

In the OA group, patient-reported functional impairments were measured using the KOOS activities of daily living (ADL) and sport and recreation (S/R) subscales.²¹ A normalized score (0–100) was calculated for each subscale, where 100 indicated no limitations with function in ADL and S/R, and zero indicated maximum limitations. Physical activity levels relating to work and sporting activities were evaluated using the Tegner Activity Scale (TAS).²² A score of zero indicated sick leave or disability pension because of knee problems, and a score of 10 indicated participation at the level of national or international elite competitive sports.

The following physical tests were used to evaluate performance-based functional impairments in the OA group:

- (i) Single-leg hop for distance evaluated as the maximum horizontal distance (centimeters) hopped by the participant with the ACLR leg;²³
- (ii) Side to side hop, evaluated by the maximum number of hops performed by the participant over two parallel strips (40 cm apart) in a 30-second period;²⁴ and
- (iii) One leg rise test, evaluated by the number of times the participant could stand up from a sitting position using only the ACLR leg (up to a maximum of 50 repetitions).²⁵

Data were analyzed with the Statistical Package for the Social Sciences (PASW Statistics 18, SPSS Inc., Chicago, IL). Between-group differences in participant characteristics were assessed using independent t-tests for continuous variables, and Chi square tests for categorical variables. Between-group differences in knee confidence categories and Tampa Scores were evaluated with Chi square tests and analysis of variance (ANOVA), respectively ($p = 0.05$). Any knee confidence category with less than three individuals was combined with the category below. Two combined categories were formed: “mildly or moderately troubled by lack of confidence” and “severely or extremely troubled by lack of knee confidence”.¹² Thus, within each group (OA and no-OA), three categories were formed

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