Cumulative Occupational Physical Load as a Risk Factor for Knee Osteoarthritis

Allison M. Ezrat1, Jolanda Cibere1,2, Mieke Koehoorn1, Eric C. Sayre2, Linda Li1,2
1University of British Columbia, Vancouver, BC, Canada 2Arthritis Research Centre of Canada, Vancouver, BC, Canada

Background

Excessive and repetitive mechanical joint loading performed during occupational tasks has been found to be associated with the presence of knee osteoarthritis (OA). Most studies have been cross-sectional, using radiography to classify knee OA, and very few attempt to quantify lifetime occupational exposure. A magnetic resonance imaging (MRI) based definition of OA has recently been published, which may provide new insights into earlier disease.

How can we measure occupational joint loading?

There is no consensus on the best approach to measuring an individual’s exposure to cumulative occupational physical loading (COPL) tasks at the knee.

We developed a new self-report method of measuring an individual’s occupational knee load over their lifetime, which takes into account the numbers of years in a job, its activity level, and if kneeling or knee bending is involved.

This measure showed good agreement when compared to an external expert ratings based measure (r=0.69; 95% CI=0.52, 0.80).

Study Design and Participants

Cross-sectional analysis of population-based symptomatic and asymptomatic knee cohorts recruited as a random sample from Vancouver, Canada.

All participants were between 40 to 79 years old.

Symptomatic cohort were from the Model for the Diagnosis of Early Knee Osteoarthritis (MoDEKO). Eligible participants had:
1) Pain, aching, or discomfort in or around the knee on most days of the month at any time in the past.
2) Pain, aching or discomfort in or around the knee in the past 12 months.

The Asymptomatic Cohort for Early Knee Osteoarthritis (ACE-KOA) included participants who answered no to the 2 knee pain questions.

Methods

Population-based stratum sampling weight was applied to data.

COPL was grouped into quarters (QCOPL).

Logistic regression was used to examine the association between QCOPL and the presence of OA, after adjusting for covariates (age, sex, body mass index, and any significant two-way interaction terms).

Separate analyses were conducted for SOA and MRI-OA.

Analysis

MRI-OA (Tibiofemoral)3

The presence of both Group A features or one Group A and two or more of Group B features

Group A

Group B

Definite osteophyte formation

Subchondral bone marrow lesion or cyst

Full thickness cartilage loss

Meniscal subluxation, maceration, or degenerative tear

Partial thickness cartilage loss

Bone Attrition*

MRIOA (Patellofemoral)3

All of the following involving the patella and/or the anterior femur

Definite osteophyte formation

Partial or full thickness cartilage loss

MRI-OA: defined using a novel definition by Hunter et al outlined in the following table.

MRI-OA (Patellofemoral)3

All of the following involving the patella and/or the anterior femur

Definite osteophyte formation

Partial or full thickness cartilage loss

Results

A monotonic statistically significant relationship was found between QCOPL and SOA with adjusted odds ratio (OR) of 8.16 (95% CI = 1.89, 35.27) for QCOPL 4 (highest) vs. QCOPL 1 (lowest), and 5.73 (95% CI = 1.36, 24.12) for QCOPL 3 vs. 1.

For the association between COPL and MRI-OA, adjusted ORs were also monotonic and statistically significant: QCOPL 4 vs. 1 (OR= 9.54; 95% CI = 2.65, 34.27); QCOPL 3 vs. 1 (OR= 9.04; 95% CI = 2.65, 30.88); QCOPL 2 vs. 1 (OR = 7.18; 95% CI = 2.17, 23.70).

Limitations

Cross-sectional study design requires cautious interpretation.

Secondary data analysis.

Other variables such as history of previous injury or sports participation not included.

Conclusions: A dose-response relationship between COPL and both SOA and MRI-OA was found. MRI-OA is a new definition, which has potential to capture early structural disease in a way not previously quantified. Our results provide impetus for further prospective, longitudinal studies in this area.