Plantar Pressure Differences Between Low and High-Risk Knee Osteoarthritis Long-Distance Recreational Runners

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Summary

Knee osteoarthritis (OA) commonly affects the elderly, but recreational athletes could be at risk of developing knee OA at a relatively younger age. This study therefore aimed to compare the plantar pressure differences between 'low' and 'high-risk' knee OA runners. Eleven male recreational long-distance runners were recruited and were categorized into these two forementioned groups. Participants walked barefoot over a 10-m walkway and ran on a treadmill in study-provided shoes. Plantar pressure measurements were compared. There were significant differences in mean plantar pressure between these groups in both walking and running ($p < 0.05$). Plantar pressure might potentially be used to identify 'high-risk' knee OA people but should be validated with a bigger sample size.

Introduction

Knee osteoarthritis (OA) is common, and incidence rates will rise as obesity rates increase [1]. There is however currently a lack of understanding of the biomechanical factors that predate knee OA [1]. Plantar pressure distribution changed with knee OA [2] but research on people with 'high-risk' knee OA is lacking. Knee OA risks are associated with certain sports [3] but no previous knee OA studies were carried out on sport players. This research therefore aimed to measure how ***plantar pressure differs*** between recreational sport players with ***'low' and 'high' knee OA risks***.

Methods

Eleven male recreational long-distance heel-strike runners were recruited (mean ± standard deviation; age: 30.0 ± 9.5 years, height: 1.72 ± 0.04 m, mass: 65.7 ± 7.8 kg). Participants with an average Knee Injury and Osteoarthritis Outcome Score (KOOS) 5 score under 90 were classified as having a 'high risk' of KOA ($n = 6$), and those above as having 'low risk' ($n = 5$). Participants walked barefoot for 10 m at a self-selected pace and ran for five minutes on an indoor treadmill. Plantar pressure was measured using the Strideway™ walkway (Tekscan Inc., Massachusetts, USA) and the Pedar-X® plantar pressure insole sensors (novel.de, Bavaria, Germany). Plantar pressure was normalized to body weight. Differences between groups were analyzed using the Mann-Whitney's U test ($\alpha < 0.05$). This study was approved by the Nanyang Technological University Institutional Review Board (IRB-2023-636).

Results and Discussion

The 'high-risk' group had significantly lower normalized mean plantar pressures at the metatarsal regions and right heel during walking (Figure 1). Although not significantly different, a similar trend was found for the left heel. This might possibly be due to stiffer joints and increased pain experienced as found in the higher KOOS pain score found in the 'high-risk' group.
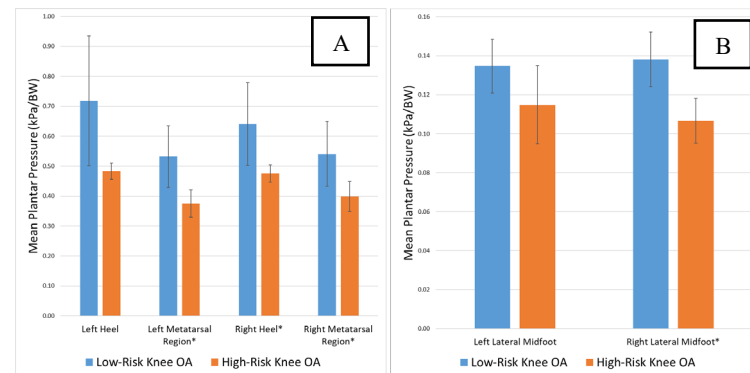
Figure 1: Mean normalized plantar pressure between low and high-risk knee OA participants during (A) walking and (B) running (BW = body weight) *Significantly different ($p < 0.05$)

During running, the 'high-risk' group exhibited significantly lower normalized mean plantar pressure of the right lateral midfoot. This trend was found also in the left foot although not statistically significant. Results should be validated with a bigger sample size.

Conclusions

Plantar pressure between 'low' and 'high-risk' knee OA runners were significantly different during walking and running conditions. Plantar pressure might potentially be used to identify 'high-risk' knee OA people.

Acknowledgments

References

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