

# THE INFLUENCE OF FOOTWEAR ON THE KNEE JOINT DURING GAIT

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## INTRODUCTION

It is known that increased adduction moments at the knee joint are positively correlated with knee joint dysfunctions such as osteoarthritis [1,2]. These diseases are usually diagnosed following the development of symptomatic pain. A positive correlation between increased adduction moment and increased pain has also been established [2,3]. It is generally accepted within the existing literature that knee moments are at their lowest when an individual is barefoot [4,5]. However, as it is impractical to recommend barefoot walking for everyday life, it is therefore pertinent to identify a footwear condition in which moments at the knee are either reduced to those levels observed when barefoot. It then hoped that a reduction in knee moment will correspond to a reduction in pain. This investigation has two distinct aims; 1) to confirm differences in adduction moments at the knee joint in individuals suffering with and without knee pain; 2) to investigate the influence of a footwear condition on adduction moments in both healthy individuals and in those suffering with knee pain disorders.

## METHODS

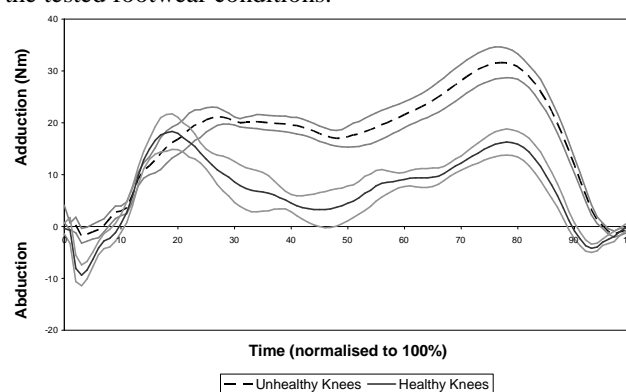
Two volunteer groups were recruited; group one consisted of females suffering with knee pain and group two were age and gender matched controls. Two experimental conditions were tested; a barefoot condition and a neutral running shoe condition. Six self-paced walking trials were performed for each condition along a 6m gait walkway. Lower body kinematic and kinetic analysis was performed using a 7 camera ProReflex infrared motion capture system in conjunction with 2 integrated AMTI force platforms. Data analysis was conducted using Qualisys Track Manager (version 2.0.381) and C-Motion Visual 3D software (version 3.13). Knee angles, forces and abduction/adduction moments were subsequently calculated.

## RESULTS AND DISCUSSION

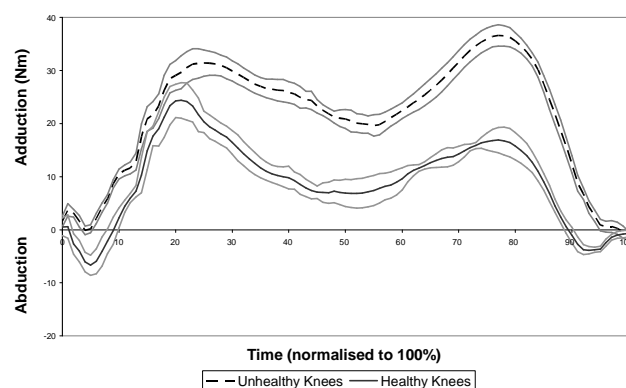
During the stance phase of gait, it is usual to observe two adduction moment peaks. It was anticipated that both the first and second peak adduction moments would be higher in the unhealthy knees than the healthy knees. This was found to be the case. In the unhealthy knees, the first and second peaks were found on average to be 22.03Nm and 31.74Nm respectively and 18.66Nm and 16.52Nm in the healthy knees, in the barefoot condition (figure 1). Interestingly, in the unhealthy knees, the second peak adduction moment was found to be significantly larger than the first.

In the running shoe condition, the first and second mean adduction peaks were found to be 31.79Nm and 36.63Nm respectively for the unhealthy knees and 25.20Nm and 17.79Nm in the healthy knees (figure 2). As anticipated, the adduction moments were therefore significantly larger in the unhealthy knees than in the healthy knees. In

addition, the adduction moments were also notably larger in the running shoe footwear condition, regardless of knee health state. A further finding to note is that the first peak adduction moment was found to occur >5% later in stance in the unhealthy knees than in the healthy knees in both of the tested footwear conditions.



**Figure 1:** Mean adduction moment at the knee joint in barefoot condition.



**Figure 2:** Mean adduction moment at the knee joint in running shoe condition.

## CONCLUSION

Both aims of this investigation were achieved as differences in knee adduction moments were established both between healthy and unhealthy knees, and between footwear conditions. However further investigation will be necessary in order to identify a footwear condition which might improve adduction moments in both healthy and unhealthy knees.

## REFERENCES

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