

Age-dependent differences in the knee joint loadings during walking – a cross-sectional study

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Summary

The aim of this study was to compare knee reaction forces in different age groups of inactive individuals during walking. Analysis was based on results of numerical simulations in AnyBody Modelling System. Simulations were conducted on 100 inactive individuals across five age groups: 18-25, 26-35, 36-45, 46-55, and 56-65. The resultant reaction forces at the knee joint were analysed for each age group. The numerical simulation results indicate that the knee load during walking can vary with age.

Introduction

Walking is one of the most basic movements of the human body. The pattern of gait changes with age, reflecting changes in the dynamics of movement and in motor control. The level of musculoskeletal loading is affected by these changes. The aim of this study was to compare knee reaction forces in different age groups of inactive individuals during walking.

Methods

Analysis was based on results of numerical simulations in AnyBody Modelling System. The gait simulations were carried out on the basis of the kinematic and dynamic data recorded during the experimental study described in detail in Jandačka et al [1]. Simulations were carried out for a total of 100 inactive people (50 females, 50 males), 20 people (10 females, 10 males) in each of the following age groups: 18-25, 26-35, 36-45, 46-55, 56-65. Inactive people were defined as those who did not run and were not in compliance with public health recommendations for physical activity. People in each age group did not differ significantly in walking speed. For each participant, six gait cycles were simulated.

Results and Discussion

The resultant reaction forces at the knee joint during gait were analysed. The values were normalised to the subjects' body weight. The results of the numerical simulations show that the load on the knee when walking can vary according to age. Figure 2 shows the resultant reaction force at the knee joint during walking in the 18-25 and 56-65 age groups for females and males. Irrespective of gender, during the first half of the stance phase of gait, i.e. between 0 and 30% of the gait cycle, higher loads on the knee joint were observed in older people (56-65 years). In contrast, during terminal stance, older women (56-65) loaded the knee significantly less than young women (18-25). The opposite relationship was observed in

men. Higher loads between 30-50% of the gait cycle were observed in men aged 56-65.

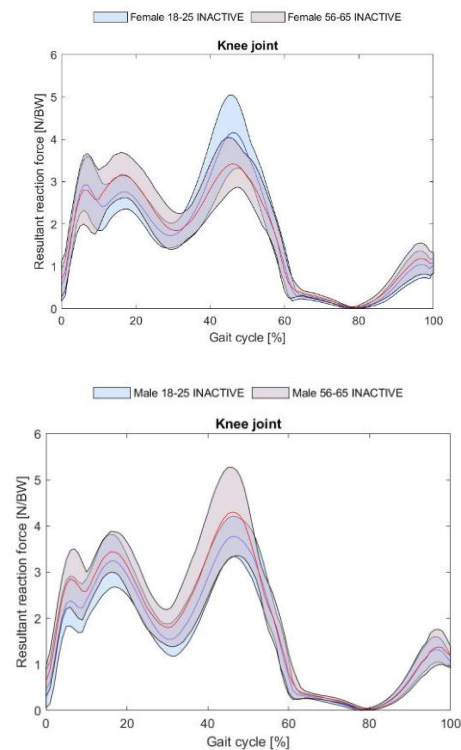


Figure 1: Resultant reaction force at the knee joint during walking in the 18-25 and 56-65 age groups for females and males.

Conclusions

The results of the numerical simulations suggest that knee load during walking may vary with age.

Acknowledgments

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References

- [1] Jandačka D. et al. (2020), Running and Physical Activity in an Air-Polluted Environment: The Biomechanical and Musculoskeletal Protocol for a Prospective Cohort Study 4HAIE, *Int. J. Environ. Res. Public Health*, **17**: 9142.