

Abstract

Evaluation of the relationship of hip morphological and physiological factors with increased injury risk in amateur runners

Objective

The aim of this study is to analyze the effect of hip joint morphological changes occurring in amateur runners on biomechanical and functional variables within the musculoskeletal system, as well as to determine whether such abnormalities may predispose to injury in amateur long-distance runners.

Material and methods

The study covered 67 men aged 30-50 years (42.7 ± 7.4) regularly engaged in long-distance running at the amateur level. The weekly mileage of the subjects ranged from 20 to 100 kilometers (average $44.9 \text{ km} \pm 23.2 \text{ km}$). The subjects were members of amateur running groups, based in Małopolska district.

A group of runners, selected on the basis of specific criteria, underwent X-ray examination of hip joints. X-ray examination performed in AP and lateral positions of hip joints allowed the subjects to be divided into two groups. The FAI group (with diagnosed femoroacetabular impingement) included runners whose X-ray examination showed changes in hip joint morphology, and the n-FAI group (with no apparent changes of femoroacetabular impingement) included runners whose X-ray examination showed no changes in hip joint morphology. For the purpose of data analysis, an additional division of the subjects was made. Based on the data from the questionnaire, two groups were created, to which runners were assigned based on the weekly mileage they covered. The first group included runners whose weekly mileage did not exceed 42 kilometers. The second group included runners whose weekly mileage was at least 42 kilometers. All subjects underwent biomechanical and functional tests. Hip joint ranges of motion were examined. The quality of functional patterns was assessed using the Functional Movement Screen. Dynamic balance (Y-Balance Test) and static balance (Flamingo Balance Test) tests were conducted. In the biomechanical part, the load distribution on the feet during running and the strength of knee extensor and flexor muscles under isokinetic conditions were evaluated.

Results

The results indicate that hip joint morphological changes of the femoroacetabular impingement type affect biomechanical and functional variables within the musculoskeletal system among amateur long-distance runners. Reduced hip internal rotation motion and worsened performance in functional tests were observed in runners with FAI. The group of subjects with FAI showed worse results in the Y-Balance and Flamingo Balance Test, as well as in the Functional Movement Screen global score, compared to those of the control group. The presence of morphological changes in the hip joint affects the load distribution on feet. A higher load on the foot on the non-occupied side of the lower limb in the medial limb was shown in the FAI group of runners compared to runners in the n-FAI group. The presence of femoroacetabular impingement affects the lower limb muscle strength of runners. The subjects in the FAI group presented higher values of force variables under isokinetic conditions compared to the control group. There was no effect of weekly mileage covered on the results achieved in tests and trials.

Conclusions

The effect of hip morphological changes on hip joint range of motion, results of the Y-Balance and Flamingo Balance Test, and load distribution on the feet indicate an increased risk of injury in FAI subjects compared to control subjects. The results obtained in the FMS test and in the measurement of isokinetic strength of lower limb muscles do not clearly prove a difference in injury risk between the study groups. The analysis of results, carried out due to mileage, allowed to exclude the influence of distance run, i.e. external load on the presentations of functional and biomechanical patterns. The comparison ruled out the influence of external load on the injury risk.

Keywords

hip joint morphological changes, femoroacetabular impingement, functional tests, Y-Balance Test, Flamingo Balance Test, Functional Movement Screen, load distribution on feet, isokinetic force, injury risk