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Short communication

P 061 – Determination of biomechanical influences of increased femoral anteversion (twisted leg) on running for developing individual

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1. Introduction

Increased femoral anteversion (IFA) angle, the forwardly rotated femoral head is high in newborn, decreases by ages and reaches normal values by completion of bone growth [1,2]. Our previous study demonstrated that, for neurologically intact participants, IFA not only augments internal-hip-rotation and foot progression but also reduces the peak knee extension and total knee range in sagittal plane during walking [3]. During running, knee flexion range and the load on extension mechanism are higher than walking. Therefore, the relation between increased hip internal rotation and anterior knee pain (AKP) during running in older ages still under investigation.

2. Research question

How does IFA influence running biomechanics in neurologically intact children?

3. Methods

Four typically developed children (TDC) (Age:8.25 ± 1.71,Weight:26.70 ± 5.96 kg, Height:129.25 ± 7.27 cm) with no IFA and six TDC with IFA (Age:8.50 ± 3.78, Weight:30.30 ± 11.67 kg,Height:134.67 ± 17.4 cm) were participated in this study. IFA was defined as increased hip-internal-rotation angle (≥69°) and decreased external-hip-rotation angle (≤20°) by goniometrical measurement [4,5]. Kinematic parameters were assessed by 3D motion capture system (ELITE2002;BTS,Milan,Italy) at a self-selected running speed on ground. Interested gait parameters were, peak hip-internal-rotations, peak pelvic obliquities, peak pelvic rotation, knee varus angle in stance. Normality test (Shapiro–Wilk test) and student-t test were used for statistical analysis ($p < 0.05$).

4. Results

Mean hip-internal-rotation 74.92 ± 6.16° and 47.88 ± 6.38°, mean hip-external-rotation 11.75 ± 8.93° and 32 ± 11.8° were found for IFA and TDC group respectively. The running velocities for both groups were found similar (IFA:2.42 ± 0.29 m/sec, TDC:2.18 ± 0.14 m/sec for the TDC, $p = 0.16$). No difference was found between peak hip adduction angle($p = 0.49$) and peak pelvic obliquity($p = 0.84$). Peak hip-internal-rotation angle($p = 0.02$) and knee-varus angle in stance($p = 0.01$) were higher, peak-pelvic-internal rotation($p = 0.03$) were significantly lesser in IFA than TDC group (Fig. 1a-b-c).

5. Discussion

The results of this study agreed with the literature, stance phase hip-internal-rotation and knee-varus higher in IFA group [6,7]. However, in those reports, participants were elder than the participants of our study.

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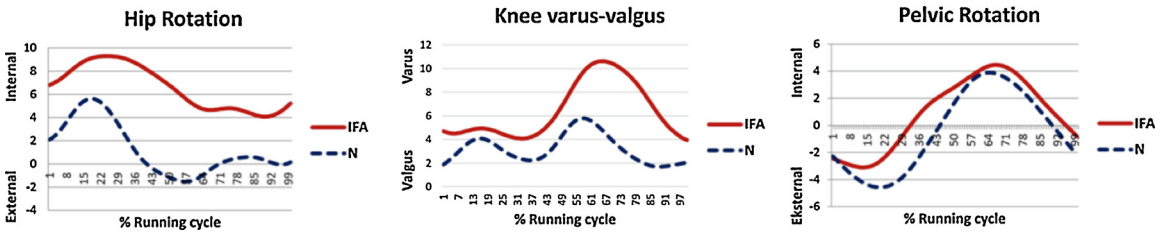

Fig. 1. Kinematics of Pelvic rotation (a), Hip rotation (b), Knee varus-valgus (c) during running.

Decreased pelvic internal rotation is thought to be a compensatory effect to increased internal rotation of the hip. It is found that hip-internal-rotation and knee varus angles at stance phase were increased in IFA group. Those alterations can be predisposing for AKP and consequently cause knee osteoarthritis in the future. Moreover, altered hip and knee biomechanics can contribute overuse sport injuries for individuals with IFA. Further researches are needed to investigate the effects of IFA on AKP.

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