ABSTRACT

**Background:** Stretching of the deep rotators of the hip is commonly employed in patients with lumbosacral, sacroiliac, posterior hip, and buttock pain. There is limited research demonstrating the effectiveness of common stretching techniques on the short external rotators of the hip.

**Purpose:** The objective of this study was to evaluate length change during stretching of the superior and inferior fibers of the piriformis, superior gemellus, obturator internus, and inferior gemellus.

**Study Design:** Repeated-measures laboratory controlled cadaveric study.

**Methods:** Seventeen hip joints from nine embalmed cadavers (5 male; 4 female) with an age between 49-96 years were skeletonized. Polypropylene strings were attached from the origin to insertion sites of the short external rotators. The change of length (mm) noted by excursion of the strings was used as a proxy for change in muscle length, when the hip was moved from the anatomical position to four specific stretch positions: 1) 45° internal rotation from hip neutral flexion/extension, 2) 45° external rotation from 90° hip and knee flexion, 3) 30° adduction from 90° of hip and knee flexion, and 4) 30° of adduction with the hip and knee flexed so the lateral malleolus contacted the lateral femoral epicondyle of the contralateral limb, were recorded.

**Results:** There was a significant effect on string displacement by stretch position, F (15,166) = 14.67, p < .0005; Wilk's Λ = .097, partial n2 = .540. The greatest displacement of the strings corresponding to the superior piriformis, inferior piriformis, and the superior gemellus occurred in 30° adduction from 90° of hip and knee flexion. The obturator internus and inferior gemellus had the largest string displacement with 45° internal rotation from neutral flexion/extension.

**Conclusions:** While all stretch positions caused a significant string displacement indicating length changes of the deep rotators of the hip, the three stretch positions that caused the greatest change were: 1) 30° adduction from 90° of hip and knee flexion, 2) 45° internal rotation from neutral flexion/extension, and 3) 45° external rotation with 90° hip and knee flexion.

**Clinical Relevance:** This study has clinical implications for the effectiveness of specific stretching techniques on the short external rotators of the hip with the potential to improve the validity of stretching protocols for patients with posterior hip or buttock pain. The piriformis and superior gemellus had a larger change in length when adducting the hip from 90° degrees of hip and knee flexion. The obturator internus and inferior gemellus had a greater length change when internally rotating the hip from neutral flexion/extension.

**Level of Evidence:** 3

**Key words:** anatomical modeling, posterior hip, reliability, stretching positions

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