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Assessment of resistance torque and resultant muscular force during Pilates hip extension exercise and its implications to prescription and progression.

Melo MO, Gomes LE, Silva YO, Bonezi A, Loss JF.

Laboratório de Pesquisa do Exercício, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.
melo.monica@terra.com.br

Abstract

BACKGROUND: The understanding of the external mechanics of **Pilates** exercises and the biomechanics of the joints may guide the prescription of **rehabilitation** exercises.

OBJECTIVES: To evaluate the resistance torque (Γ(R)) during hip extension (HE) exercises performed on the **Pilates** Cadillac. To perform a biomechanic analysis of the Γ(R) and the weighted mean moment arm (WMMA) in order to calculate the resultant muscle force (FM(R)) of the hip extensors and flexors. To present a mechanical criteria for progression of HE exercise on the **Pilates** Cadillac.

METHODS: Fourteen participants performed HE exercises on the Cadillac in four randomly assigned situations - using two springs (blue and red), which were attached in two positions (high and low). Angular positions were measured using an electrogoniometer. In order to calculate Γ(R), the muscle torque (Γ(M)) and FM(R), free-body diagrams and movement equations were used. The WMMA of the hip extensors and flexors were estimated from the literature.

RESULTS: The Γ(R) and FM(R) presented a similar behavior during all situations; however, the maximum Γ(R) values did not occur at the same joint position as the FM(R) maximum values. The WMMA of the hip flexors presented an increased-decreased behavior with greatest values around 55º of flexion, while the hip extensors presented a similar behavior with greatest values around 25º of flexion.

CONCLUSION: Biomechanic analysis of HE exercises and the evaluation of mechanical features in relation to the hip joint may be used as an objective criteria for the prescription and progression of HE exercise in **Pilates**.

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