

Spiraling Arms Effect on Lower Extremity Rate of Force Development: A Pilot Study

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BACKGROUND The “serape effect” is the anatomical linking of the upper extremity (UE), trunk, and lower extremity (LE) via the fascial system [1, 2, 3]. Specific muscles that comprise the serape are internal and external obliques, rhomboids, and serratus anterior [2, 3]. Arm swing influences the trunk and may affect LE energetics [4, 5]. Understanding of the kinetic chain relationships between the LE, trunk, and UE has implications for physical performance and rehabilitation. This pilot study evaluated arm swing motion in a spiral or swim-like motion on LE rate of force development (RFD). Spiraling is defined as supinating the forearm during arm flexion and pronating the forearm during arm extension. Spiraling movement is a dynamic activity that is proposed to rely on the increasing tension created in the fascial system due to the alternating supination/pronation.

METHODS Subjects (N=17; age: 22.88±1.57 yr; 173.47±10.0 cm; 72.91±16.56 kg) were introduced to the movement. They walked with normal arm swing or spiraling arms for a 10 m distance while striking a force platform during consistent gait. This procedure was repeated until three trials of each were collected. The sequence of spiral or normal was randomized via random sequence generator. AMTI[®] OR6-6 force platform was utilized for collection of kinetic data at a sampling rate of 1200Hz. The study was a single group repeated measures design to analyze the effect of using a novel arm movement pattern on LE RFD. This study was approved by the university Institutional Review Board.

RESULTS There was no significant difference in spiraling arms versus normal arm movement on RFD (7872±7999 and 6133±7249 Nm·sec⁻¹, respectively, p=0.113). Cohen’s d effect size was small, 0.228. Males had greater mean differences than females with increased RFD in spiraling compared to control (M: Δ3269 and F: Δ648 Nm·sec⁻¹), but there were not enough subjects to separate by sex for analysis.

CONCLUSIONS There were no significant differences between conditions. However, further research is warranted, particularly with male subjects. Using an instrumented treadmill to evaluate ground reaction forces and RFD during walking or running for successive strides may elucidate possible effects that cannot be detected from a single footfall on a force platform.

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