Amplitude and phasing of trunk motion is critical for the efficacy of gait training aimed at reducing ambulatory loads at the knee

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The purpose of this study was to determine the contribution of changes in amplitude and phasing of medio-lateral trunk sway to a change in the knee adduction moment when walking with increased medio-lateral trunk sway. Kinematic and kinetic data of walking trials with normal and with increased trunk sway were collected for 19 healthy volunteers using a standard motion analysis system. The relationship between the change in first peak knee adduction moment (ΔKAM) and change in trunk sway amplitude (ΔSA; difference between maximum contralateral trunk lean and maximum ipsilateral trunk lean) and phasing (SP; time of heel-strike relative to time of maximum contralateral and time of maximum ipsilateral trunk lean) was determined using nonlinear regression analysis. On average, subjects increased their SA by 9.7 ś 3.6 deg ($P < 0.001$) with an average SP of 98.8 ś 88.8 ms resulting in an average reduction in the first peak knee adduction moment of -55.2 ś 30.3% ($P < 0.001$). 64.3% of variability in change in peak knee adduction moment with the increased trunk sway condition was explained by both differences in SA and SP, and the relationship among these parameters was described by the regression equation ΔKAM = 27.220-4.128 [middle dot] ΔSA-64.785 [middle dot](SP). Hence, not only the amplitude but also the phasing of trunk motion is critical. Not only lower limb movement but also lumbar and thoracic lateral flexion should be considered in the decision making process for an optimal intervention aimed at reducing the load on the medial compartment of the knee during walking. However, these promising findings originated from studies on healthy subjects and their relevance for gait training interventions in patients with presumably painful knee osteoarthritis remains to be determined.
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