

Sex Differences in the Stride Frequency of Walking while Carrying a Toddler Manikin

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Despite the frequency and necessity of infant/toddler-carrying by parents and other caregivers, very little research has focused on the energetic and behavioral consequences of this activity in adults. In particular, sex differences in carrying behavior and biomechanics has been virtually ignored.

PURPOSE: Our specific goal was to determine whether women and men carrying a toddler-sized manikin on their hip or their shoulders choose different stride frequencies at a given speed when asked to walk around the perimeter of a gym at moderate to brisk free walking speeds.

METHODS: To determine how child-carrying affects the free walking gait choices of adults as a function of sex and task, we calculated the walking speed of 6 females and 6 males as they walked around the perimeter of a gym while performing 6 tasks in a random order. Tasks consisted of all combinations of 3 loading conditions carrying a 10kg toddler proportioned manikin on the shoulders or hip, or a comparable mass waist and 2 walking speed directives (“walk-all-day” or “brisk” walks). Stride frequency and walking speed were determined from videotape using a stop watch. Speed was calculated from the time required to walk between two markers 3.7 meters apart, stride frequency was determined over 4 consecutive strides.

RESULTS: When speed directive was accounted for, females walked faster than males ($p=0.001$), and this effect was only enhanced by including body mass in the regression model (i.e. body mass differences could not explain the sex difference in walking speed). At a given walking speed, females used higher stride frequencies than males ($p<0.001$) and stride frequency increased as the load position changed from belt, to shoulder, to hip ($p=0.006$). Adding body mass to the model removed the sex effect.

CONCLUSIONS: Although the carrying task was a larger burden for the females due to their smaller body mass, females consistently chose faster walking speeds than males for a given speed directive, and higher stride frequencies for a given walking speed. Sex differences appeared to be the result of differences in body mass and the relative size of the toddler load. Supported by 3M Faculty/Student Collaborative Grant #212607 and the Endowed Professor in the Sciences at St. Catherine University, St. Paul, Minnesota.