

MASTER'S THESIS

A comparison of infant-carrying methods with physical stress in Hong Kong Chinese female adults

Lu, Kui

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**A Comparison of Infant-carrying Methods with
Physical Stress in Hong Kong Chinese Female Adults**

LU Kui

**A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Philosophy**

Principal Supervisor: Dr. Lobo H.T. LOUIE

Hong Kong Baptist University

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Abstract

This study was designed to compare the methods of carrying infant at the back and in front of the chest with physical stress in Hong Kong female adults during a 30-min continuous walking activity on treadmill. Nine female adults performed walking activity on a treadmill with speed ranged from 2.5-3 mph and gradient at 0% for 30 minutes in the three conditions of (i) no infant carrying (CON), (ii) carrying an infant dummy of 7.5 kg at the back (Back_C), and (iii) carrying the identical infant dummy in front of chest (Chest_C). The differences in subjects' physical stress among the three trials were examined by comparing their (1) overall physical exertion, (2) kinematics gait performance, and (3) perceived and physiological fatigue on trunk extensors. Subjects' overall physical exertion was reflected by their oxygen consumption ($\dot{V}O_2$), heart rate (HR), pedometry (PO), and ratings of perceived exertion (RPE) and magnitude of breathing effort (RBE). Kinematics gait performance was examined by measuring stride length (SL), head angle (HA), and trunk angle (TA). Rating of perceived fatigue on trunk extensors (RPF) was used to reveal subjects' perception of muscle fatigue. The differences in the rate of change of root mean square (RMS) and mean power frequency (MPF) of surface electromyographic signal output recorded from erector spinae (ES) of trunk extensors in a 60-sec trunk-holding test between pre- and post-walking activity were used to identify the occurrence of physiological fatigue in ES. For overall physical exertion, subjects' $\dot{V}O_2$, HR and RPE ($P < 0.01$) were increased from CON values in Back_C and Chest_C trials. No difference in these parameters was found between the two loaded trials. For kinematics gait performance, SL in Chest_C was shorter than that

in CON ($P<0.01$). No difference was found between Back_C and CON and between Chest_C and Back_C ($P>0.05$). CON HA in Back_C was increased while it was decreased in Chest_C ($P<0.05$). TA in Back_C was greater than those in CON and Chest_C ($P<0.05$). No difference was found between CON and Chest_C ($P>0.05$). For perceived and physiological fatigue on trunk extensors, CON RPF was increased in both loaded trials ($P<0.01$). No difference was found between Back_C and Chest_C ($P>0.05$). For RMS and MPF, no difference was found among three trials. In conclusions, carrying infant could augment the physical demand for performing short-term walking activity independent to the method of Chest_C and Back_C. However, by considering the kinematics gait performance, Chest_C method might cause relative greater physical stress in trunk extensor by comparing with Back_C method. Although Chest_C method during short-term walking activity did not induce physiological fatigue in trunk extensors, the potential risk of the chronic fatigue and eventually the MSD in the loaded muscles resulting from the Chest_C method used in a prolonged intermittent manner should not be overlooked.

Keywords: Overall physical exertion, Kinematics gait performance, Trunk extensors, Perceived muscle fatigue, EMG

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