CHANGES OF ARM MOVEMENTS IN DUAL TASK CONDITION ON DIFFERENT WALKING ENVIRONMENT IN HEALTHY YOUNG ADULTS

Yao-Cheng Hsieh, Chiung-Yu Cho

Department of Physical Therapy, Medical College, National Cheng Kung University
Email: cycho@mail.ncku.edu.tw

INTRODUCTION

Most of the previous studies investigated dual task effects on gait performance. Few of them focused on changes of arm movements. However, arms movement seems to play an important role to regulate balance control during walking. The purpose of this study was to investigate whether dual task paradigm would influence upper extremity movement during walking. Furthermore, we would like to examine the effect of different walking surfaces on dual task gait.

METHODS AND PROCEDURES

We recruited fifteen healthy young adults. All participants were asked to perform both walking task alone (single-task condition) and in combination with cognitive task while walking (dual-task condition). In the single task condition, each subject was asked to walk on soft foam and hard floor separately. In the dual task condition, subjects were asked to perform stroop test and digit span test while walking. Three dimensional relative angles of shoulder, elbow and lumbersacral joint; Absolute angle of pelvis and trunk were used as outcome measures. Also, we would compare the gait parameters and cognitive task performance between different conditions. Multivariate Analysis of Covariance (MANCOVA) was used to compare movement amplitude of joint angle among different walking conditions and groups. Velocity was considered as a covariance.

RESULTS

In the preliminary results, we included thirteen healthy young adults (age 23±1.96 years). Compared with single task condition, young adults significantly decreased walking velocity ($p=0.034$) (Fig1) and step length ($p=0.01$), along with nearly significant increased stance time ($p=0.061$) in the dual task condition. But there was no significant difference in the movement amplitude of joint angle between different tasks.

Compared with hard floor condition, young adults significantly decreased walking velocity ($p=0.034$) (Fig1) and swing time ($p=0.001$), along with significantly increased step length ($p=0.029$), stance time ($p<0.001$), and movement amplitude of left shoulder flex/ext ($p=0.026$) abd/add ($p=0.025$), elbow flex/ext ($p<0.035$) varus/valgus ($p<0.005$) in the soft floor. Trunk/pelvis three dimensional movements ($p<0.001$) and lumbersacral joint A/P IR/ER movements ($p<0.001$) also significantly increased in the soft floor condition. There was no significant interaction between task and floor factors ($p>0.1$). For the cognitive task performance, only stroop test (1Hz) significantly decreased its scoring in the hard floor condition compared to the baseline performance ($p=0.043$).

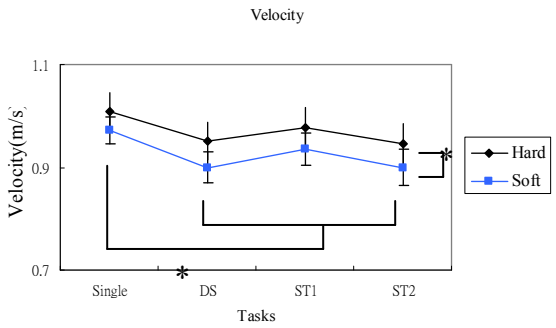

Fig 1. Walking velocity between different tasks and floors. (DS= digit span test, ST1= stroop test 1word/s, ST2= stroop test 1word/2s)

DISCUSSION

Preliminary results show that the dual task effects on our healthy young adults were mainly on the gait performance, but not on upper extremity movements. Since our young adults seemed to cope with dual task condition well, two tasks might not overload the central resources, and thus only provoked small interferences on the gait performance. Changes of gait patterns in the dual task condition were similar to previous studies. In the soft floor condition, healthy young adults change their movement pattern to cope with the challenging environment. They walked slower and increased joint movement amplitude to compensate for this situation.

SUMMARY

Healthy young adults change their gait pattern but not upper extremity movement to compensate the dual task condition. When confronting with soft foam challenging environment, young adults used a more conservative and protective strategy to compensate for this situation.

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