

Title: Cognitive-Motor Interference In Mobility Function Among People With Chronic Stroke

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OBJECTIVES: Functional ambulation necessitates the ability of dividing attention to maintain walking balance while engaging in a cognitive task (i.e. dual-task condition). However, attention has a finite capacity. Performing the mobility and cognitive tasks simultaneously may result in deterioration of performance in one or both tasks, compared with the performance when each task is performed separately. This phenomenon is called cognitive-motor interference (CMI). Mounting evidence has shown that CMI is more compromised in people after stroke. The objective of this study was to examine how the nature and complexity level of the motor and cognitive tasks influenced the CMI patterns in different dual-task conditions among people with chronic stroke.

METHODS: Sixty-one people with chronic stroke (15 women and 46 men, mean age: 62.9±7.8 years) participated in the study. Subjects performed three different walking tasks with increasing level of difficulty (walking forward with comfortable speed, obstacle course, and backward walking with comfortable speed). Two domains of cognitive tasks (verbal fluency, and mental tracking: serial-3-subtractions, serial-7-subtractions) were performed

simultaneously while performing the walking tasks to examine the interaction effect of dual-tasking. The sequence of tests was randomized to minimize order effect. The outcomes were walking time (in seconds) and correct response rate (CRR) of the cognitive task in all conditions. Two-way repeated measures analysis of variance (within-subject factors: 1. Task condition (single Vs dual), 2. Level of difficulty of mobility task or cognitive task) was conducted to compare the walking time and CRR in different conditions.

RESULTS: Regardless of the type and difficulty level of the cognitive tasks used, the walking time was increased if a cognitive task was added, compared to the walking time under the corresponding single-task condition. A significant interaction effect was observed, indicating that increase in walking time was dependent on the difficulty level of the mobility task and cognitive task used (mental tracking task, $F= 15.51$, $p<0.001$, partial $\eta^2=0.205$; verbal fluency task, $F= 22.76$, $P<0.001$, partial $\eta^2=0.275$). The increase in walking time was more apparent when a more difficult mobility task (i.e., backward walking) and cognitive task (serial-7-subtraction) was used. For CRR, adding the walking task led to a significant decline in its performance and the decrement in CRR was increased with increasing level of difficulty of the mobility task (mental tracking task, $F=4.73$, $P=0.012$, partial $\eta^2=0.073$; verbal fluency task, $F=6.87$, $p=0.003$, partial $\eta^2=0.103$). By examining the effect sizes (partial η^2), it was found that the verbal fluency task had more effect on CMI compared with the mental tracking task.

CONCLUSIONS: The nature and level of difficulty of the walking task and cognitive task interact to determine the CMI in dual-task conditions among people with chronic stroke.

Key-words: dual-task, interaction effect, mobility, chronic stroke

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