

CHAPTER 1

INTRODUCTION

The significant contributions of higher cognitive function on gait have received considerable attention in recent years (1). Gait is no longer considered as an automatic task with less involvement of cognitive control. Substantial evidence has demonstrated that cognitive function plays a critical role in the regulation of gait, particularly in older adults (2). The dependency on cognitive function especially executive function and attention for gait control is even markedly notable in individuals with cognitive impairment (3). For example, individuals with Alzheimer's disease (AD) demonstrated significant gait changes and high risk of falls. The rate of falls in AD was approximately two or three times higher than individuals without cognitive decline (1). In line with this notion, recent longitudinal studies have revealed that gait changes predict subsequent development of dementia (3). Although the associations between cognitive function and gait performance have been documented, the role of specific cognitive function on gait control is not well understood.

Most of previous studies that investigated the relationship between cognition and gait performance were done in people with AD and Parkinson's disease (3-5). It is difficult to advance an understanding on the effects of specific cognitive function on gait performance using information derived from these patient populations due to the involvements of global cognitive functions and physical conditions. One approach to overcome this limitation is to study people who are at an early stage of

cognitive decline and without physical disturbances (compared to their age-matched healthy elders) or so called “Mild Cognitive Impairment (MCI)”. Individuals with MCI are at the transitional state between healthy ageing and very early dementia (6). Among individuals with MCI, amnesic type (aMCI) is proposed to be the majority group. It was reported that people with aMCI progress to AD at a rate of 10% to 15% per year (7). People with aMCI are generally have limited cognitive impairment in only few specific domains, specifically, episodic memory, attention, and executive function (8). Thus, they are at an optimal stage to be investigated the role of specific cognitive functions on gait performance.

To date, only few studies have investigated gait performance in individuals with MCI especially the effects of cognition on gait. Dual-task paradigm is commonly used to assess an interaction between cognition and gait (2, 9, 10). In most studies, the secondary task was used to increase the cognitive demand by divided the participant’s attention from the primary task (i.e. walking). Only one recent study attempted to examine the association between specific cognitive demand and gait in people with MCI (2). Montero-Odasso et al (2) found that participants with MCI showed a reduction in gait velocity while engaging in dual-task challenges (i.e. counting backwards by one, animal naming). Results showed that low executive function and working memory were significantly associated with a slow gait velocity. Therefore, gait velocity appears to be one sensitive gait parameter indicating gait changes in persons with MCI. However, there are certain limitations in the study by Montero-Odasso and colleagues (2). First, gait velocity was the only parameter that was measured in their study. Other quantitative gait variables demonstrated to be sensitive in identifying gait changes-related to falls were not investigated. Second,

this study included both participants with amnesic MCI (aMCI) and non-amnesic (naMCI). It is well documented that each MCI subtype presents with different clinical manifestations (11). Thus, gait characteristic changes may be different between each MCI subtype.

Therefore, the aim of the present study was to investigate the effects of specific cognitive domains, mainly attention and executive function on gait performance in individuals with aMCI (8). Information derived from the present study would advance our understanding on the foundation of how specific cognitive domains play a role in gait control in people with aMCI. Consequently, clinical implications such as a guideline to design an intervention program that tailors individual specific problems may be emerged.

Purposes and hypotheses of the study

1.1 Research question

How do specific cognitive efforts (i.e. attention and executive function) affect gait performance in individuals with amnesic Mild Cognitive Impairment and healthy controls?

1.2 Purpose

To investigate the effects of specific cognitive domains (i.e. attention and executive function) on gait performance in individuals with aMCI compared to healthy controls.

1.3 Hypothesis

The effects of adding cognitive effort during walking (i.e. dual-task condition) will deteriorate gait performance of individuals with aMCI more than that of healthy controls.

Note: Gait deterioration was demonstrated by decreasing in walking speed and stride length, and increasing in stride length and swing time variability (12, 13).