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PRACTICE EFFECT AND CUEING OF 2-MINUTE WALK TEST, 6-MINUTE WALK TEST AND 10-METER WALK TEST IN FRAIL OLDER ADULTS WITH AND WITHOUT DEMENTIA- RECOMMENDATIONS TO WALK TESTS PROTOCOLS

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ABSTRACT

Objectives: 1) To determine if there was a practice effect associated with walk tests performed by frail older adults with and without dementia, 2) to examine the role of systematic cueing in the walk tests for those with dementia, and 3) to make recommendations to testing protocols of the walk tests for frail older adults with and without dementia.

Setting: Residential and day care facilities.

Participants: 44 frail older adults with normal cognition (NON-DEM) and 39 older adults with Alzheimer's disease or dementia (DEM) who were able to walk independently for at least 15 meters.

Methods: All the participants completed multiple trials of 2-minute walk test (2MWT), 6-minute walk test (6MWT) and 10-meter walk test (10MeWT) on three separate testing occasions. The DEM group was facilitated to complete the walk tests using a progressive cueing system.

Results: Significant increases in the walking performance within the same testing occasion were found in the 2MWT (NON-DEM: $p = .002$; DEM: $p \leq .044$) and 6MWT (NON-DEM: $p \leq .004$; DEM: $p \leq .002$) for both groups but only in the 10MeWT ($p \leq .023$) for the DEM group. Significant increases in the walking performance across testing occasions were shown in the 2MWT ($p \leq .047$), 6MWT ($p \leq .005$) and 10MeWT ($p \leq .039$) for the NON-DEM group but not the DEM group (all $p > .05$). Multivariate regression analyses showed that the cognitive function of the DEM group was independently and inversely associated with the level of cueing provided during the walk tests ($p \leq .007$).

Conclusion: Practice effect associated with the walk tests was found within and across testing occasions for frail older adults with normal cognition, and only within the same testing occasion for those with dementia. Systematic cueing should be provided for those with dementia to

complete the walk tests. Testing protocols of the walk tests have been recommended for these two population groups.

Keywords: Practice effect; Cueing; Dementia; Physical assessment; Walking; Mobility

1. INTRODUCTION

Walk tests are frequently used by clinicians to evaluate walking ability of their patients. Time-based 2-minute walk test (2MWT) and 6-minute walk test (6MWT), which measure the distance covered in a specific period of time, aim at measuring patients' exercise capacity (Butland et al., 1982). The distance-based 10-meter walk test (10MeWT), which measures the walking speed used to cover a specific distance, reflects the individuals' general mobility (Bohannon et al., 2018). These walk tests consist of different characteristics in measuring walking ability of frail older adults. The 6MWT is the most frequently used walk test and has been shown effective in predicting peak exercise capacity in many population groups (Solway et al., 2001). However, frail older adults may be unable to tolerate the long distance of walking. The 2MWT is a shorter version of the 6MWT that has been shown more feasible in older adults with significant muscle weakness, poor endurance or cognitive impairment (Brooks et al., 2007; Maring et al., 2013). The 10MeWT, which requires even less time to complete, has been regarded as a functional "vital sign" that indicates general health status and predicts risk of institutionalization and discharge location in older populations (Fritz and Lusardi, 2009). Since these walk tests are easy to administer and do not require expensive equipment, they have been used to evaluate the effectiveness of interventions for frail older adults with normal cognition (Lord et al., 2003; Tarazona-Santabalbina et al., 2016) and dementia (Roach et al., 2011; Rolland et al., 2007).

Practice effect, the successive improvements of performance in the consecutive trials of a physical performance test, has been demonstrated to potentially affect the accuracy of the walk tests (Hamilton and Haennel, 2000; Peel and Ballard, 2001; Sciurba et al., 2003; Wu et al., 2003). Improved motor skills and coordination, increased confidence, motivation, and familiarity

with the testing procedures, and reduced anxiety may all contribute to the practice effect (Adsett et al., 2011; Brooks et al., 2002; Sciurba et al., 2003; Spencer et al., 2008). The magnitude of the practice effect related to the walk tests have been reported from 2.5 to 11.7% in healthy adults (Bohannon et al., 2015; Gibbons et al., 2010; Kervio et al., 2003; Peel and Ballard, 2001; Rikli and Jones, 1998; Wu et al., 2003) and from 4.0 to 35.3% in people with chronic conditions (Adsett et al., 2011; Brooks et al., 2002; Butland et al., 1982; Hamilton and Haennel, 2000; Hernandes et al., 2011; Jenkins and Cecins, 2010; Light et al., 1997; Sciurba et al., 2003; Spencer et al., 2008). However, no study has investigated if practice effect is present in frail older adults with and without dementia during the walk tests. Multiple chronic conditions and cognitive impairment in these population groups may limit their capacities to improve their walking performances. Identification of the presence of practice effect associated with the walk tests would enhance the reliability and accuracy of these clinical tools in these population groups.

Significant practice effect associated with the walk tests has been previously reported when the walk tests were repeated on the same occasion or on the same day (Adsett et al., 2011; Gibbons et al., 2010; Jenkins and Cecins, 2010), over consecutive days (Brooks et al., 2002; Hernandes et al., 2011; Kervio et al., 2003) and consecutive weeks (Bohannon et al., 2015; Guyatt et al., 1984) in younger adults with normal cognition. The practice effect has been shown to persist even up to two to six months (Spencer et al., 2018, 2008; Wu et al., 2003). On the contrary, prior studies on people with chronic lung disease (Eiser et al., 2003) and healthy older adults (Peel and Ballard, 2001) found that the practice effect existed only if the walk tests were repeated on the same occasion, not over an one-week interval. It is unclear if practice effect, if present, is more

significant in multiple trials within one testing occasion or over multiple occasions for frail older adults with and without dementia. This knowledge would have an important implication for the testing protocols of these walk tests, particularly how to arrange practice walks to minimize the practice effect, for these population groups.

Poor short-term memory and executive function, difficulties to follow instructions, and psychological and behavioral symptoms are the common clinical features found in people with dementia that can reduce their capacities to complete physical performance tests (Rockwood et al., 2000). Providing systematic verbal and physical cues has been shown effective in facilitating the performance of people with dementia in physical performance tests (Nordin et al., 2006; Ries et al., 2009; Tappen et al., 1997; Trautwein et al., 2019). Our previous study has demonstrated that providing systematic cues could maximize the consistency of the performances of older adults with dementia in the walk tests (Chan and Pin, 2018). However, it is unknown if there is any interaction between cueing and the cognitive function of older adults with dementia. Examining the role of systematic cueing on the walk tests would provide research evidence how the walk tests should be conducted accurately for older adults with dementia.

The purposes of this study were threefold. Firstly, we investigated if there was any practice effect associated with the 2MWT, 6MWT and 10MeWT performed by frail older adults with and without dementia. Specifically, the changes in the walking performance in consecutive trials of the walk tests within the same testing occasion, and across multiple testing occasions were evaluated for both groups. We hypothesized that practice effect existed but differently in these

two groups: the walking performances of those without dementia would improve within and across testing occasions, but those with dementia would improve only within an occasion but not across occasions, due to their reduced short-term memory and learning capacities. Secondly, we evaluated the relationship between their cognitive function and the level of cueing provided in the walk tests. This would provide insights into the role of systematic cueing in the walk tests for those with dementia. Lastly, based on our findings, we would recommend the testing protocols of the walk tests for these two population groups.

2. METHODS

2.1 Study design

This study was the second study of the series examining the psychometric properties of the 2MWT, 6MWT and 10MeWT for frail older adults with dementia (Chan and Pin, 2018). The current study adopted a non-experimental design with repeated measures. All the participants completed the walk tests on three separate testing occasions based on the published testing protocols (Crapo et al., 2002; Pin, 2014). To examine the practice effect related to the walk tests, the walking performances within one testing occasion, and across three testing occasions were compared. Moreover, the relationship between the required level of cueing during the walk tests and the cognitive function of the participants with dementia was examined.

2.2 Participants

The study participants were recruited from January to May 2016 in a day care center and a residential care facility providing permanent ongoing health and social care services to older adults with moderate to severe disabilities. Individuals were recruited if they were: 1) aged 65 years or above; 2) able to ambulate 15 meters independently with or without walking aid; 3) scored three or above in the Fatigue, Resistance, Ambulation, Illnesses and Loss of Weight (FRAIL) scale (Morley et al., 2012; Woo et al., 2015); and 4) diagnosed with dementia or Alzheimer's disease for the dementia group. The FRAIL scale is a frailty screening questionnaire with the total score ranging from zero to five. Individuals who scores zero are regarded as non-frail, scoring one to two as pre-frail and three or above as frail (Morley et al., 2012; Woo et al., 2015). For those who had a confirmed diagnosis of dementia or Alzheimer's disease, or scored below the cut-off point of 19 in the Chinese Mini-Mental State Examination (CMMSE) (Chiu et al., 1994) entered the dementia (DEM) group. The rest would join the normal cognition (NON-DEM) group. Individuals with acute or uncontrolled cardiac or pulmonary conditions, active exacerbation of musculoskeletal conditions that affected their walking ability, severe hearing or visual impairment that impeded effective communication, and recent hospitalization in the past 30 days were excluded. The health care professionals working in the two facilities identified potential participants, who were further screened by a physical therapist (the first author, WC) for their walking abilities, medical conditions, cognitive status and frailty level to ensure they were eligible to the study and safe to perform the walk tests. Figure 1 shows the recruitment process of the study.

2.3 Procedures

The study complied with the Declaration of Helsinki. Ethics approvals were sought from the Hong Kong Polytechnic University and the participating centers. The latters were to allow access to the medical records of the participants. All the participants in both groups and their family members or guardians of the participants in the DEM group received written information about the study, including the objectives, assessments, potential harms and benefits and duration of the study, via face-to-face communication. Informed written consent was signed by the participants in the NON-DEM group and the family members or guardians of the participants in the DEM group by proxy.

Demographic data, including age, gender, height, weight, body mass index and past medical history, were retrieved from the medical records of all the participants. Functional assessments, including the Elderly Mobility Scale (EMS) (Smith, 1994) on general mobility, Berg Balance Scale (BBS) (Berg et al., 1992) on balance control and Modified Barthel Index (MBI) (Leung et al., 2007) on functional independence were conducted by the physical therapist (WC) on a separate occasion.

The data was collected from March to July 2016. Two experienced physical therapists (Assessor A, the first author WC; and Assessor B, a physical therapist of the day care center) administered the walk tests for both groups independently (figure 1). Each participant completed all the walk tests in two weeks. Assessor A conducted each walk test for the participants on two occasions, while Assessor B performed each test on another separate occasion. The testing occasions were at least one day apart to give adequate rest to the participants. All the tests were conducted at

about the same time of the day for each participant. The sequences of the testing occasions were randomized for each participant by drawing lots. Both assessors were blinded to the previous test results to reduce potential bias. The test-retest (ICC=0.91-0.98) and inter-rater reliability (ICC=0.86-0.96) of these walk tests were shown to be excellent in the DEM group (Chan and Pin, 2018).

2.4 Measures

A 15-meter levelled corridor with non-slippery hard surface colored markings at every two-meter interval was used for the walk tests. Bright-colored traffic cones were placed at both ends of the corridor to indicate the turning spots. Two chairs were placed next to the traffic cones. The participants were instructed to sit on one of the chairs and rest for at least ten minutes before each testing occasion. The participants completed the walk tests using their usual walking aids. They were asked to wear comfortable clothing and non-slip footwear. The same footwear was used on every testing occasion. No vigorous exercise was allowed two hours before each testing occasion. Heart rate, blood pressure and oxygen saturation were monitored before and after each trial. These vital signs had to return to the baseline before the next trial began (Crapo et al., 2002; Pin, 2014). The participants were instructed to report to the assessors if they had any dizziness, chest pain, intolerable dyspnea, excessive musculoskeletal pain, nausea and undue fatigue. They were allowed to sit down and rest on one of the chairs or suspend the test if needed. The participants would be excluded from the study if they experienced any acute change to their medical conditions that might prevent them from performing the tests safely.

2.4.1 2-minute Walk Test (2MWT) (Pin, 2014)

The participants were instructed to "walk at your comfortable, usual pace" with no encouragement, timing information and feedback given during the test. Three trials were conducted on each occasion. A minimum ten minutes of rest was given between trials. The distance covered in the two minutes was recorded as the 2MWT for each trial.

2.4.2 6-minute Walk Test (6MWT) (Crapo et al., 2002)

The participants were instructed to cover the 15-meter corridor as many times as possible during a six-minute period. Standardized encouragement, "you're doing well, keep it up", and the number of minute left were given by the assessor every minute during the test. Two trials were performed on each occasion. At least 20 minutes of rest was provided between trials. The distance covered in the six minutes was recorded as the 6MWT for each trial.

2.4.3 10-meter Walk Test (10MeWT) (Fritz and Lusardi, 2009)

The 10MeWT was measured simultaneously in the 2MWT (10MeWT-2M) and 6MWT (10MeWT-6M) as in our previous study (Chan and Pin, 2018) because the testing protocols and the environmental set-up of the 2MWT, 6MWT and 10MeWT were highly similar. The simultaneous measurements could also reduce the number of repeated testing, resulting in less fatigue and lower demand on attention span particularly for those with dementia. The compliance to the walk tests would therefore be maximized. The time used in the middle ten meters of the

15-meter walking path in the first leg of each trial was recorded. The walking speed was calculated by dividing ten meters by the time used (meter/second).

2.4.4 The cueing system

The system was originally developed to guide clinicians to provide systematic and consistent verbal and physical assistance during physical performance assessments for people with dementia (Beck et al., 1993; Ries et al., 2009). In this study, the assessors provided cues to the participants in the DEM group in the following escalating sequence: 0) no cue; 1) verbal prompt; 2) modelling/gesturing; 3) one-off physical prompt; 4) intermittent physical prompt; 5) intermittent physical guidance; and 6) complete physical guidance. The participants would receive cues from the assessors when: 1) their walking direction started to deviate from the walking path; 2) when they started to run or slow down; or 3) when they stopped during the walk tests. The maximum level of cueing provided in each trial was recorded. Prior to our data collection, training was provided to the two assessors to ensure that the cues were provided based on the published protocol (Chan and Pin, 2018). Appendix A shows the details of the cueing system.

2.5 Statistical analyses

The characteristics between the NON-DEM and DEM groups were compared using independent *t*-test or Chi-square test. The walking performances in the last trial on each testing occasion between the two groups were compared using one-way analysis of covariance (ANCOVA) with the statistically significant variables as covariates.

The performances within the same occasion were compared using repeated measure analysis of variance (ANOVA) with Bonferroni correction for the three trials of the 2MWT and 10MeWT-2M, and paired *t*-test for the two trials of the 6MWT and 10MeWT-6M. The performances across the testing occasions were then compared in a chronological order using repeated measure ANOVA with Bonferroni correction.

Pearson correlation (*r*) and multivariate linear regression were used to explore the relationship between the cognitive function of the participants and the level of cueing provided by both assessors in the last trial of the walk tests on each occasion for the DEM group. All the demographic and functional outcome variables, including age, gender, body mass index, past medical history, number of chronic diseases, use of walking aids, EMS, BBS and MBI, were controlled in the regression model.

The SPSS software (version 22.0) was used to perform all statistical analyses. A significance level of 0.05 was used for all analyses.

3. RESULTS

Table 1 compares the characteristics and the performances between the two groups of participants. The NON-DEM group had significantly higher body mass index ($p = .01$), CMMSE ($p < .001$) and MBI ($p < .001$), and higher proportion of having hypertension ($p = .041$) and heart

diseases (p= .023). After controlling for these covariates, there was no significant difference in all the walking performances between the two groups (all p> .05).

Table 2 shows the comparisons of the walking performances across the trials within the same occasion. For the NON-DEM group, there was a significant increase between the first and third trials on Occasion 1 of Assessor A (p= .002) in the 2MWT. Significant increases between the two trials on Occasion 1 of Assessors A (p< .001) and B (p= .004) were also found in the 6MWT. No significant increase within the same occasion was shown in both 10MeWT-2M and 10MeWT-6M (all p> .05). For the DEM group, there were significant increases between the first and second trials on Occasions 1 (p= .014) and 2 of Assessor A (p= .044), and the first and third trials on all the occasions (all $p\leq$ .007) of both Assessors in the 2MWT. Significant increases between the two trials on both Occasions 1 (p= .001) and 2 of Assessor A (p= .002) were shown in the 6MWT. In the 10MeWT-2M, significant increases were found between the first and second trials on Occasion 2 of Assessor A (p= .002), and the first and third trials on Occasion 1 of Assessor A (p= .012). Significant increase was also shown on the testing occasion of Assessor B (p= .023) in the 10MeWT-6M.

The comparisons of the walking performances across the three testing occasions are shown in Table 3. For the NON-DEM group, significant increases were found in the first trial of the 2MWT (p= .047) between the first and second occasions, and in the first (p= .004) and second trials (p= .021) of the 2MWT between the first and third occasions. Significant increases were shown in all trials of the 6MWT between the first and second occasions (all $p\leq$.001), and

between the first and third occasions (all $p \leq .005$). Of the 10MeWT-2M, significant increases were shown in the first ($p=.008$) and second trials ($p=.001$) between the second and third occasions, and in the second trial ($p=.039$) between the second and third occasions. Significant increases were also demonstrated in all the trials of the 10MeWT-6M between the first and second occasions (all $p \leq .002$), and between the first and third occasions (all $p \leq .001$). For the DEM group, no significant change was found across the testing occasions in all the walk tests (all $p > .05$).

Pearson correlation tests have showed that the level of cueing on all the testing occasions of the walk tests was negatively correlated with the CMMSE score in the DEM group ($r = -0.54$ to -0.72; all $p < .001$). Table 4 shows the results of multiple linear regression between the patients' characteristics and the level of cueing in the DEM group. After adjusting for the demographic and functional outcome variables, the CMMSE score remained independently associated with the level of cueing in all the walk tests on all occasions ($R^2 = 0.45 – 0.75$; all $p \leq .007$). The number of chronic diseases was also associated with the level of cueing on Occasions 1 ($p=.028$) and 2 of Assessor A ($p=.012$). Prior history of bone fractures was also associated with the level of cueing on Occasion 2 of Assessor A ($p=.041$).

4. DISCUSSION

The present findings have confirmed our hypotheses that the practice effect existed in the frail older participants with normal cognition and dementia, but the patterns of the practice effect were different between these two groups. Significant improvements in the walking performance

were noticed across multiple trials within the same testing occasion of the 2MWT and 6MWT (Table 2) and across multiple testing occasions of all the walk tests for the NON-DEM group (Table 3). Improvements were only found across multiple trials within the same occasion but not across occasions for the DEM group (Tables 2 and 3). The results have implied that a different arrangement of practice walks for frail older adults with and without dementia is necessary to minimize the practice effect related to the walk tests performed by these two population groups. The participants in the DEM group with more severe cognitive impairment required a higher level of cueing, i.e. more verbal and physical cueing in the walk tests (Table 4). A recent consensus reached by a panel of experts working in the care of people with dementia has stated that physical performance assessments should be tailored for the specific characteristics of dementia, and external cues are necessary during assessments (Trautwein et al., 2019). Our findings have provided further support to the consensus that systematic cueing should be an integral part of the testing protocols of the walk tests for older adults with dementia in order to obtain accurate assessment results from this group.

4.1 Practice effect

Among the participants with normal cognition, the magnitude of the increases in the walking performance ranged from 0.6 to 4.9% across trials within the same occasion (Table 2), and from 2.7 to 9.8% across occasions (Table 3). The magnitude of the practice effect reported in previous studies on different population groups were generally larger than our findings (same occasion: 4.0-11.0% (Adsett et al., 2011; Gibbons et al., 2010; Jenkins and Cecins, 2010); across multiple occasions: 2.5-14.2% (Bohannon et al., 2015; Brooks et al., 2002; Hernandes et al., 2011; Kervio et al., 2003). The frail, older participants with multiple chronic conditions in the current study

might have limited capacities to improve their walking performances across the repeated trials, resulting in a smaller practice effect.

The practice effect associated with the walk tests was demonstrated within the same testing occasion, but not across occasions for the participants with dementia. Reduced short-term memory is one of the key clinical features of people with dementia (World Health Organization and Alzheimer's Disease International, 2012). We speculate that they had difficulties in recalling their previous walking performances because of reduced short-term memory, so they could not take reference to their previous performances in the subsequent occasion. Lower motivation and confidence in physical activity have also been reported in this population group (van Alphen et al., 2016), which may have contributed to the reduced capacity to improve in the consecutive trials. To the authors' knowledge, there were previous studies investigating practice effect associated with neuropsychological and functional measures performed by people with dementia (Claus et al., 1991; Hoppes et al., 2003), but none on the practice effect regarding to physical performance measures. The current study was the first to demonstrate the presence of practice effect associated with the walk tests performed by this population group.

Incorporating practice walk in the walk tests with an optimal number of repetitions and timing is essential to minimize the practice effect effectively. Practice walks should be conducted prior to the actual measurement until there is no further significant increase in the walking performance. One to two practice walks have previously been recommended before the actual trial of the 2MWT (Butland et al., 1982; Eiser et al., 2003; Guyatt et al., 1984) and 6MWT (Eiser et al.,

2003; Guyatt et al., 1984; Hamilton and Haennel, 2000; Hernandes et al., 2011; Jenkins and Cecins, 2010; Rikli and Jones, 1998; Spencer et al., 2008; Wu et al., 2003), but very few studies have explicitly stated the exact timing to administer these practice walks. Based on our findings, we would suggest that one practice walk is required for both 2MWT and 6MWT, and no practice walk is necessary for the 10MeWT for frail older adults with normal cognition. A separate practice occasion should be conducted at least 24 hours prior to the actual trial for frail older adults with normal cognition to reduce the practice effect. For the frail older adults with dementia, two practice walks are recommended for the 2MWT and 10MeWT, and one practice walk for the 6MWT.

4.2 The role of systematic cueing

An inverse association between the level of cueing required in the walk tests and the cognitive function of the participants with dementia has been demonstrated in the current study. The participants with poorer cognitive function required more assistance from the assessors during the walk tests (Table 4). The CMMSE score was the most statistically significant variable associated with the level of cueing (β= -0.59 to -0.82). The regression models have explained 45.4-75.2% of the variance of the required level of cueing. Earlier studies have documented that people with dementia had difficulties in complying with the testing protocols of physical performance assessments (Rockwood et al., 2000; Tappen et al., 1997). Testing protocols of physical performance assessments have been adjusted in order to improve the compliance and success rate of people with dementia in completing the assessments (Fox et al., 2014; Tappen et al., 1997). This might have explained the reported poor reliability of performance assessments, including walk tests for this population group (Fox et al., 2014; Tappen et al., 1997). Our

previous study has already shown that systematic cueing was effective in facilitating frail older adults with dementia to complete the walk tests (Chan and Pin, 2018). No study has been conducted to investigate whom and how to systematically provide the cueing. The present results have further shown that the required level of cueing in the walk tests were dependent on the cognitive status of the older adults with dementia.

The level of cueing required in the walk tests was also significantly associated with the number of chronic diseases and the history of previous bone fracture of the participants with dementia. Specifically, the participants with more chronic diseases and no previous bone fracture required higher level of cueing during the walk tests (Table 4). Those with chronic diseases might have multi-system problems, such as in the visual or auditory systems, that affected their orientation in the walk tests. It is possible that those without previous bone fracture might be more able to walk around freely, increasing the chance to deviate from the designated walking pathway. The relationship between the required level of cueing, comorbidities and previous bone fracture in people with dementia warrants further investigations. Future studies may also be required to examine how different chronic diseases and types of bone fracture might influence the amount of assistance via cueing required by people with dementia in the walk tests.

Based on our findings, we have made recommendations to the testing protocols of these walk tests for these two population groups (Appendices B and C).

4.3 Study limitations

Our study recruited older adults receiving day care or residential care, who had relatively stable medical conditions. The results may not be applicable to those receiving acute care. We did not exclude the older adults who previously performed the walk test; hence some of our participants might be more familiar with the testing protocols of the walk tests when compared with those who were naive to the tests. The number of trials of the walk tests on individual testing occasions was based on the previous guidelines (Crapo et al., 2002; Pin, 2014). It is unclear whether the participants would have any further improvement beyond the trials conducted on each occasion. This can only be verified with further studies. The sample size of our study was relatively small; hence future studies with larger sample sizes should be conducted to confirm our findings. The length of the corridor used in the present study was only 15 meters, which was shorter than the published guidelines (30 meters, or not less than 20 meters) (Crapo et al., 2002; Pin, 2014). Shorter corridor might increase the number of turns at the end of the corridor, resulting in shorter distance in the 2MWT and 6MWT. The practice effect might be due to increased efficiency in turning. The potential effects of the differences in the testing settings on the practice effect should be considered. Furthermore, the 10MeWT was measured within the 2MWT and 6MWT. Conducting these walk tests separately may show different findings.

5. CONCLUSION

Practice effect associated with the 2MWT, 6MWT and 10MeWT existed in frail older adults with and without dementia. The practice effect was found within and across testing occasions for frail older adults with normal cognition, and only within the same testing occasion for those with dementia. Recommendations have been made to the testing protocols of these walk tests based on the present findings. To minimize the practice effect, a separate practice occasion should be

arranged, and one practice walk of the 2MWT and 6MWT during the actual testing occasion is required for frail older adults with normal cognition. For those with dementia, two practice walks of the 2MWT and 10MeWT, and one practice walk of the 6MWT are required. Systematic cueing should be provided in the walk tests for older adults with dementia based on their cognitive function.

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Table 1. Comparisons of characteristics and walking performances between 2 groups of participants.

Characteristics	NON-DEM (n=44)	DEM (n=39)	*p*-value^
Age, mean ± SD (years)	85.0 ± 5.0	87.1 ± 6.2	.083
Gender, n (%)			.071
Male	11 (25.0)	3 (7.7)	
Female	33 (75.0)	36 (92.3)	
Setting, n (%)			.77
Day care center	20 (45.5)	19 (48.7)	
Residential care facility	24 (54.5)	20 (51.3)	
Body mass index, mean ± SD (kg/m^2)	24.0 ± 3.5	22.0 ± 3.3	.01
Past medical history, n (%)			
Hypertension	35 (79.6)	23 (59.0)	.041
Heart disease	18 (40.9)	7 (18.0)	.023
Osteoarthritis	17 (38.6)	16 (41.0)	.82
Diabetes	16 (36.4)	9 (23.1)	.19
Stroke	12 (27.3)	12 (30.8)	.73
Previous fracture of any type	9 (20.5)	14 (35.9)	.12
Number of chronic diseases, mean ± SD	5.8 ± 2.4	5.9 ± 2.9	.86
CMMSE, mean ± SD	26.1 ± 2.9	13.2 ± 5.5	<.001
Use of walking aids, n (%)			.28

Unaided	14 (31.8)	17 (43.6)	
Stick	17 (38.6)	9 (23.1)	
Quadripod	5 (11.4)	3 (7.7)	
Rollator	5 (11.4)	9 (23.1)	
Frame	3 (6.8)	1 (2.6)	
EMS (0-20)*, mean ± SD	17.8 ± 2.6	17.4 ± 3.0	.51
BBS (0-56)*, mean ± SD	46.5 ± 8.3	44.1 ± 10.0	.25
MBI (0-100)*, mean ± SD	92.9 ± 5.8	86.5 ± 9.1	<.001
Walk tests†			
2MWT, mean ± SD (m)			
Assessor A Occasion 1	71.8 ± 22.4	63.3 ± 21.6	.36
Assessor A Occasion 2	72.5 ± 23.1	63.1 ± 22.0	.53
Assessor B	73.5 ± 23.9	63.6 ± 22.8	.64
6MWT, mean ± SD (m)			
Assessor A Occasion 1	230.3 ± 76.7	194.0 ± 79.4	.85
Assessor A Occasion 2	235.8 ± 78.2	198.6 ± 77.0	.99
Assessor B	237.5 ± 78.8	203.6 ± 80.0	.98
10MeWT-2M, mean ± SD (m/s)			
Assessor A Occasion 1	0.68 ± 0.21	0.63 ± 0.21	.11
Assessor A Occasion 2	0.69 ± 0.22	0.60 ± 0.21	.53
Assessor B	0.70 ± 0.24	0.62 ± 0.23	.51
10MeWT-6M, mean ± SD (m/s)			

Assessor A Occasion 1	0.73 ± 0.24	0.64 ± 0.26	.59
Assessor A Occasion 2	0.76 ± 0.26	0.65 ± 0.22	.95
Assessor B	0.77 ± 0.26	0.73 ± 0.29	.20

^ Independent *t*-test or chi-square were used to compare the characteristics. One-way ANCOVA, controlling for age, gender, body mass index, history of hypertension and heart disease, and MBI, was used to compare the walking performances.

† The walking performances in the last trial of each testing occasion were used to compare between 2 groups.

* The bracket indicates the possible ranges of scores of the outcome measures. A higher score reflects a better performance.

2MWT- 2-minute walk test; 6MWT- 6-minute walk test; 10MeWT-2M- 10-meter walk test-2-minute; 10MeWT-6M- 10-meter walk test-6-minute; BBS- Berg Balance Scale; CMMSE-Chinese Mini-Mental State Examination; DEM- dementia group; EMS- Elderly Mobility Scale; NON-DEM- normal cognition group; MBI- Modified Barthel Index

1 Table 2. Comparisons of walking performances across trials within the same testing occasion.

Walk tests	Mean ± SD					
	NON-DEM (n=44)			DEM (n=39)		
	Assessor A Occasion 1	Assessor A Occasion 2	Assessor B	Assessor A Occasion 1	Assessor A Occasion 2	Assessor B
2MWT (m)						
Trial 1	68.9 ± 22.0	71.4 ± 23.2	71.6 ± 22.4	60.4 ± 21.0	60.8 ± 21.4	59.4 ± 24.0
Trial 2	70.2 ± 22.4	71.2 ± 22.3	73.0 ± 23.2	62.2 ± 20.7	62.9 ± 22.9	61.7 ± 23.6
Trial 3	71.8 ± 22.4	72.3 ± 23.2	73.5 ± 23.9	63.3 ± 21.6	63.1 ± 22.0	63.6 ± 22.9
Change (%)	3.0 ± 5.4 (4.3%)	1.2 ± 3.5 (1.6%)	1.9 ± 6.8 (2.7%)	2.8 ± 5.5 (4.7%)	2.3 ± 4.4 (3.8%)	4.2 ± 7.8 (7.1%)
p-value^ (Trials 1 and 2) (Trials 1 and 3) (Trials 2 and 3)	.001 .16 .002 .084	.049 1.00 .11 .14	.10 .48 .20 1.00	.002 .014 .007 .33	.005 .044 .006 1.00	.003 .22 .005 .22
6MWT (m)						

Trial 1	219.4 ± 74.5	231.6 ± 75.7	228.2 ± 73.5	183.7 ± 75.5	190.6 ± 69.3	195.8 ± 84.4
Trial 2	230.3 ± 76.7	235.8 ± 78.2	237.5 ± 78.8	194.0 ± 79.4	198.6 ± 77.0	203.6 ± 80.0
Change (%)	10.8 ± 10.8 (4.9%)	4.3 ± 14.4 (1.8%)	9.3 ± 20.5 (4.1%)	10.3 ± 18.5 (5.6%)	8.1 ± 15.1 (4.2%)	7.8 ± 27.5 (4.0%)
p-value*	<.001	.057	.004	.001	.002	.084
10MeWT-2M (m/s)						
Trial 1	0.66 ± 0.23	0.68 ± 0.22	0.69 ± 0.24	0.58 ± 0.19	0.57 ± 0.20	0.58 ± 0.24
Trial 2	0.66 ± 0.21	0.68 ± 0.22	0.70 ± 0.23	0.59 ± 0.22	0.61 ± 0.22	0.61 ± 0.22
Trial 3	0.68 ± 0.21	0.69 ± 0.22	0.70 ± 0.24	0.63 ± 0.21	0.60 ± 0.21	0.62 ± 0.23
Change (%)	0.02 ± 0.09 (2.5%)	0.01 ± 0.05 (1.9%)	0.00 ± 0.06 (0.62%)	0.04 ± 0.09 (7.5%)	0.03 ± 0.09 (4.8%)	0.04 ± 0.12 (7.3%)
p-value^	.28	.15	.54	.010	.008	.20
(Trials 1 and 2)	1.00	1.00	1.00	1.00	.002	.52
(Trials 1 and 3)	.67	.24	1.00	.012	.19	.11
(Trials 2 and 3)	.15	.45	1.00	.074	.92	1.00

10MeWT-6M (m/s)						
Trial 1	0.71 ± 0.24	0.76 ± 0.25	0.76 ± 0.24	0.63 ± 0.22	0.63 ± 0.20	0.65 ± 0.23
Trial 2	0.73 ± 0.24	0.76 ± 0.26	0.77 ± 0.26	0.64 ± 0.26	0.65 ± 0.22	0.73 ± 0.29
Change (%)	0.02 ± 0.08 (3.0%)	0.00 ± 0.07 (0.59%)	0.01 ± 0.07 (1.2%)	0.02 ± 0.16 (2.7%)	0.02 ± 0.09 (2.9%)	0.08 ± 0.21 (12.6%)
p-value*	.079	.69	.42	.53	.23	.023

*Repeated measure ANOVA with Bonferroni correction was used

^Paired *t*-test was used

2MWT- 2-minute walk test; 6MWT- 6-minute walk test; 10MeWT-2M- 10-meter walk test-2-minute; 10MeWT-6M- 10-meter walk test-6-minute; DEM- dementia group; NON-DEM- normal cognition group

8 Table 3. Comparisons of walking performances across testing occasions.

Walk tests	Mean ± SD					
	NON-DEM (n=44)			DEM (n=39)		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
2MWT (m)						
Occasion 1	67.8 ± 20.8	70.2 ± 22.0	71.6 ± 22.3	59.3 ± 21.1	61.5 ± 21.5	62.3 ± 22.6
Occasion 2	71.3 ± 23.2	71.3 ± 23.1	72.8 ± 23.6	60.9 ± 22.6	62.8 ± 22.8	63.4 ± 22.1
Occasion 3	72.7 ± 23.3	72.9 ± 22.8	73.5 ± 23.5	60.4 ± 21.8	62.4 ± 23.0	64.3 ± 21.7
Change (%)	4.9 ± 9.4 7.2%	2.7 ± 6.4 3.9%	1.9 ± 6.0 2.7%	1.1 ± 9.0 1.8%	0.90 ± 9.8 1.5%	2.1 ± 8.0 3.3%
p-value* (Occasions 1 and 2) (Occasions 1 and 3) (Occasions 2 and 3)	.002 .047 .004 .46	.014 .48 .021 .30	.055 .29 .11 .88	.44 .65 1.00 1.00	.53 .34 1.00 1.00	.18 .59 .35 1.00
6MWT (m)						
Occasion 1	216.1 ± 71.2	228.6 ± 77.8		184.2 ± 79.4	196.7 ± 80.8	

Occasion 2	230.3 ± 76.5	236.8 ± 77.6		190.1 ± 78.6	199.0 ± 79.9	
Occasion 3	232.8 ± 75.3	238.1 ± 78.2		195.8 ± 71.8	200.6 ± 75.9	
Change (%)	16.8 ± 22.5 7.8%	9.5 ± 18.9 4.2%		11.6 ± 31.7 6.3%	3.9 ± 21.7 2.0%	
p-value* (Occasions 1 and 2) (Occasions 1 and 3) (Occasions 2 and 3)	<.001 <.001 <.001 .80	.001 .001 .005 1.00		.043 .063 .084 .42	.59 1.00 .82 1.00	
10MeWT-2M (m/s)						
Occasion 1	0.65 ± 0.23	0.66 ± 0.21	0.68 ± 0.21	0.57 ± 0.20	0.59 ± 0.22	0.61 ± 0.23
Occasion 2	0.68 ± 0.23	0.68 ± 0.23	0.69 ± 0.23	0.57 ± 0.21	0.61 ± 0.22	0.60 ± 0.21
Occasion 3	0.70 ± 0.24	0.71 ± 0.23	0.70 ± 0.23	0.59 ± 0.22	0.62 ± 0.21	0.63 ± 0.22
Change (%)	0.05 ± 0.11 8.1%	0.04 ± 0.07 6.4%	0.02 ± 0.07 2.7%	0.02 ± 0.13 3.3%	0.03 ± 0.18 5.4%	0.02 ± 0.11 3.2%
p-value* (Occasions 1 and 2)	.003 .17	.001 .71	.22 1.00	.29 1.00	.37 .16	.24 1.00

(Occasions 1 and 3) (Occasions 2 and 3)	.008 .13	.001 .039	.35 .89	1.00 .35	.81 1.00	.85 .14
10MeWT-6M (m/s)						
Occasion 1	0.70 ± 0.23	0.72 ± 0.24		0.62 ± 0.23	0.66 ± 0.25	
Occasion 2	0.76 ± 0.25	0.76 ± 0.25		0.64 ± 0.22	0.70 ± 0.29	
Occasion 3	0.77 ± 0.25	0.78 ± 0.27		0.65 ± 0.20	0.67 ± 0.23	
Change (%)	0.07 ± 0.08 9.8%	0.06 ± 0.08 8.0%		0.02 ± 0.13 3.7%	0.01 ± 0.11 0.83%	
p-value* (Occasions 1 and 2) (Occasions 1 and 3) (Occasions 2 and 3)	<.001 <.001 <.001 .83	<.001 .002 .001 1.00		.59 1.00 .90 1.00	.35 .79 1.00 1.00	

*Repeated measure ANOVA with Bonferroni correction was used

2MWT- 2-minute walk test; 6MWT- 6-minute walk test; 10MeWT-2M- 10-meter walk test-2-minute; 10MeWT-6M- 10-meter walk test-6-minute; DEM- dementia group; NON-DEM- normal cognition group

13 Table 4. Multivariate linear regression between participants' characteristics and level of cueing in the DEM group.

Walk tests	R^2	Independent variables								
		CMMSE			Number of chronic diseases			Previous bone fracture		
2MWT/10MeWT-2M		*B (S.E.)*	*β*	*p*-value	*B (S.E.)*	*β*	*p*-value	*B (S.E.)*	*β*	*p*-value
Assessor A Occasion 1	0.65	-0.19 (0.043)	-0.70	<.001						
Assessor A Occasion 2	0.67	-0.16 (0.038)	-0.65	<.001						
Assessor B	0.58	-0.17 (0.045)	-0.67	.001						
6MWT/10MeWT-6M										
Assessor A Occasion 1	0.75	-0.24 (0.039)	-0.82	<.001	0.18 (0.077)	0.33	.028			
Assessor A Occasion 2	0.66	-0.20 (0.045)	-0.71	<.001	0.24 (0.089)	0.45	.012	-1.14 (0.53)	-0.35	.041

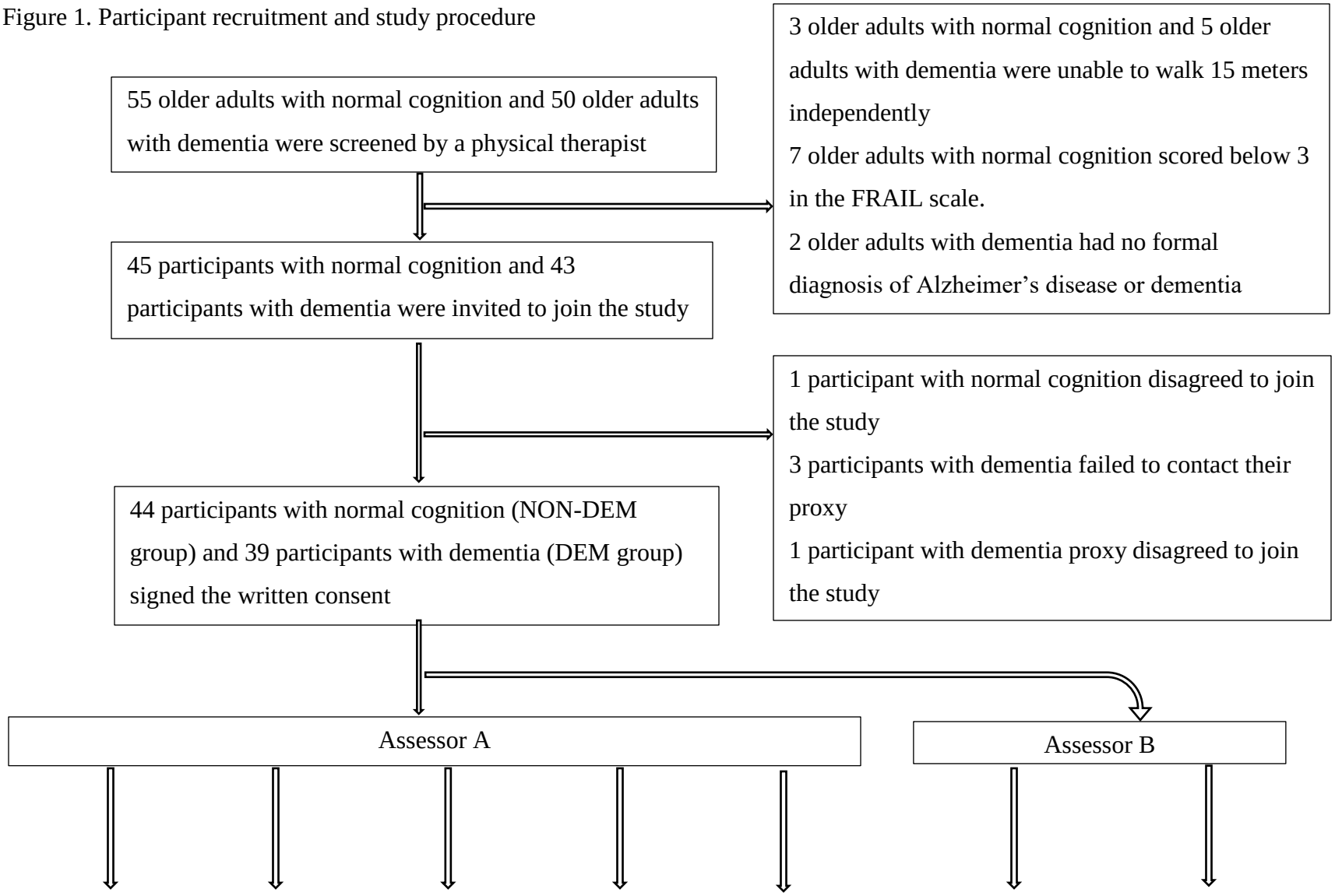
Assessor B	0.45	-0.16 (0.055)	-0.59	.007						

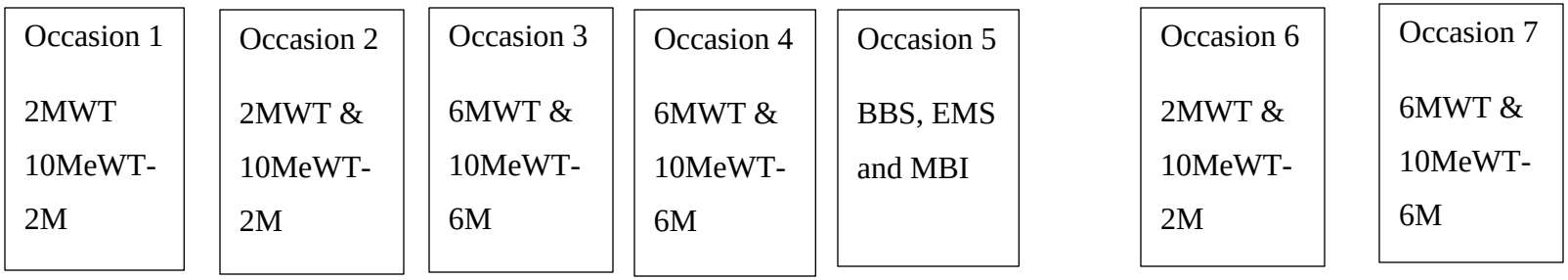
Only the independent variables that were significantly associated with the level of cueing are shown.

The level of cueing provided in the last trial of each occasion were used in the regression analyses. The demographics, including age, gender, body mass index, past medical history, number of chronic diseases, CMMSE, use of walking aids, EMS, BBS and MBI, were entered in the regression models.

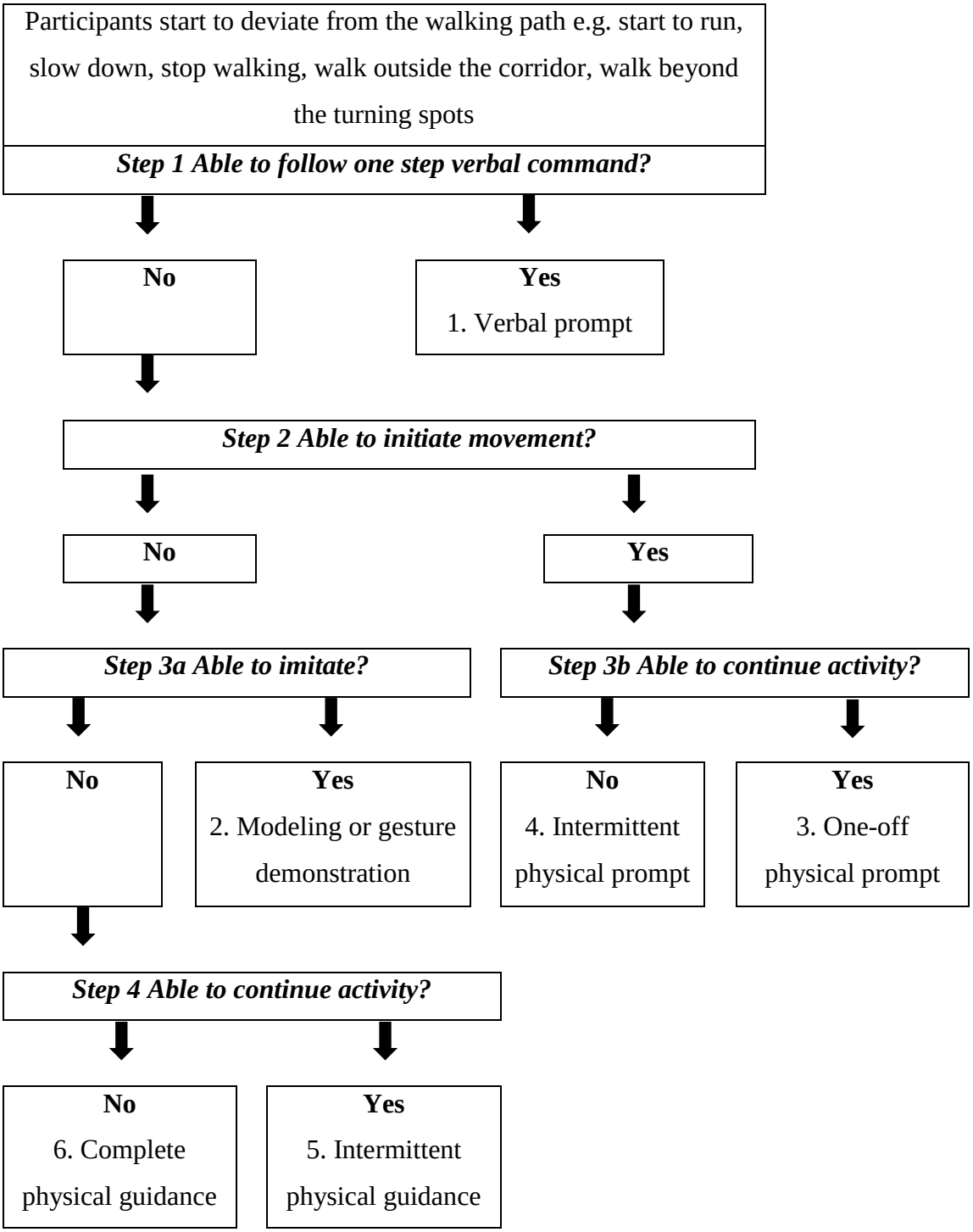
2MWT- 2-minute walk test; 6MWT- 6-minute walk test; 10MeWT-2M- 10-meter walk test-2-minute; 10MeWT-6M- 10-meter walk test-6-minute; *B*- unstandardized regression coefficient; *S.E.*- standard error; β- standardized regression coefficient; BBS- Berg Balance Scale; CMMSE- Chinese Mini-Mental State Examination; DEM- dementia group; EMS- Elderly Mobility Scale; MBI- Modified Barthel Index.

Figure 1. Participant recruitment and study procedure




Occasion 1
2MWT
10MeWT-
2M
Occasion 2
2MWT &
10MeWT-
2M
Occasion 3
6MWT &
10MeWT-
6M
Occasion 4
6MWT &
10MeWT-
6M
Occasion 5
BBS, EMS
and MBI
Occasion 6
2MWT &
10MeWT-
2M
Occasion 7
6MWT &
10MeWT-
6M

Appendix A. The progressive cueing system in the walk tests



Level	Cue	Descriptions
1	Verbal prompt	The assessor provides verbal commands to ask the patient to either stop running, keep walking, come back to the walking path or turn at the traffic cone.
2	Modeling or gesture demonstration	The assessor demonstrates how to sustain walking, walk on the walking path or turn at the turning spots. The patient is asked to watch the demonstration and follow the movement.
3	One-off physical prompt	The assessor taps the patient on the shoulder once to draw his/her attention. The assessor then asks him/her to sustain walking (as in "verbal prompt").
4	Intermittent physical prompt	The assessor taps the patient on the shoulder repeatedly during the walk test to draw his/her attention. The assessor then asks him/her to sustain walking (as in "verbal prompt").
5	Intermittent physical guidance	The assessor walks in front of the patient, hold one of his/her hand and walk for a few meters to guide the direction of the walking or to initiate the walking.
6	Complete physical guidance	The assessor walks in front of the patient and hold one of his/her hand continuously throughout the walk test to guide the direction of the walking or to sustain the walking.

Points to note:

- A few seconds would be given to the participants to react to the cue before using a higher level of cueing.
- The frequency and extent of the verbal and physical assistance provided should be kept minimal to facilitate the participants to initiate and continue their walking.
- Avoid using too much force to pull the patient's hand in the levels 5 and 6 of cueing to minimize influence on their pace of walking.
- At least one practice trial should be used to determine which level of cueing is going to be provided to the patient during the walk test for record.

Appendix B. Proposed testing protocols of 2-minute and 6-minute walk tests for frail older adults.

	Special concerns for older adults with dementia
Location	
• The ideal walking path is a 30-meter long, levelled, straight, indoor, non-slip and enclosed corridor with a hard surface. • The turning spots should be marked with a brightly colored traffic cone. • A starting line should be marked on the floor using brightly colored tape. • The walking path should be marked every two meters using colored tape either on the floor or on the wall next to the path. • If the weather allows, and if a 30-meter walking path is not available, the test may be performed outdoor. • The length of the walking path and the number of turns patients must make should be recorded.	• The walking path should be located in a quiet, spacious, indoor and enclosed area to minimize distraction. • People other than the assessor and the patient should be prohibited from entering the area.
Patient Preparation	
• Patients should wear comfortable clothing and appropriate walking shoes. • Patients should use their usual walking aids (e.g. stick, rollator or frame). • Patients' medical regimen should be continued. • A light meal is allowed before early morning or early afternoon test. • No vigorous exercise is allowed within two hours of beginning the test.	• The test should be performed by personnel whom the patient is familiar with (e.g. physical therapist working in the facility). • The assessor should show an effective interaction with the

• Patients should sit at rest in a chair for at least ten minutes prior to the test.	patient, such as using calm voice, providing clear one-step commands, and keeping constant eye contact.
Measurement	

• The test should be repeated, if needed, about the same time of the day (e.g. morning or afternoon session) to reduce intra-day variability.
• Pre-test:
  o Check for contraindications, measure and record blood pressure and pulse rate when the patient is sitting in the chair.
  o Pulse oximetry is optional. If it is performed, measure and record baseline pulse rate and oxygen saturation based on manufacturer's instructions.
  o Have the patient stand and rate their overall dyspnea and fatigue using the Borg scale.
• During the test:
  o A pacer could be used to ensure safety and provide assistance when needed. Another individual may act as the timer, or the pacer may act as the timer.
  o The pacer, if used, should walk half a meter behind patients so as not to disturb their walking pace.
• Post-test:
  o Distance traveled during the test is recorded using the marking on the floor or on the wall.
	• Pre-test: check if the patient has any significant behavioral or psychological symptoms on each testing occasion.
	• Acknowledge the patient's feelings and provide reassurance if the patient has behavioral or psychological symptoms.
	• The test should be postponed if the patient has uncontrolled behavioral or psychological symptoms.
	• The Borg scale should not be applied to those with moderate to severe dementia who have difficulties in

○ Record the Borg dyspnea and fatigue level, pulse rate and oxygen saturation. ○ The number of turns made by patients should be recorded. ○ All the vital signs should return to the baseline before beginning of the next trial. • The patient should be given at least ten minutes and 20 minutes rest between consecutive trials of 2-minute walk test and 6-minute walk test respectively.	grading their dyspnea and fatigue. • Systematic cues should be given to the patient based on the published protocol when the patient starts to deviate from the path, starts running or stops walking during the test (Chan and Pin, 2018).
Instructions	
'The purpose of this test is to find out how far you can walk in two minutes/six minutes. You will start from this point and follow the path to the cone. You should pivot briskly around the cone like this (demonstrate to the patient how to go around the cone briskly) and continue back the other way without stopping. You will walk back and forth between the two cones. Don't run or jog. When the two minutes/six minutes are up, I will say 'STOP'. I want you to stop where you are. If you become too short of breath or tired during the test to continue, you can stop at any time. When you feel more comfortable, you may start walking again. I will walk behind you to make sure that you are safe. You should not talk during the test, but I do want you to tell me if you develop any chest pain or tightness or if you become dizzy or light-headed during the test. Do you have any questions? Are you ready? Please begin when I say 'GO'."	• The instructions and demonstration should be repeated before each trial if the patient cannot remember and needs clarification.
Encouragement	
• 2-minute walk test: no encouragement is needed.	

• 6-minute walk test: standardized phrases for encouragement, including “you are doing well” and “keep up the good work”, and the remaining time of the test should be provided every one minute.	
Practice walk	
• One practice walk is required. • A separate practice occasion should be conducted at least 24 hours prior to the formal testing occasion.	• 2-minute walk test: two practice walks are required. • 6-minute walk test: one practice walk is required. • The assessor should use the practice walk to observe the walking pace of the patient and determine which level of cueing should be provided during the test. • A separate practice occasion is not required.
Safety concerns	
• The patient should be instructed to report any chest pain, dizziness, intolerable dyspnea, excessive musculoskeletal pain, nausea and fatigue. • The patient has the right to request for rest or stop the test if he/she experiences any discomfort.	

• If the test is stopped for any reason, the patient should sit on a chair or lie supine depending on the severity of the event. • Blood pressure, pulse rate and oxygen saturation should be monitored. • Consult physician if necessary.	

Appendix C. Proposed testing protocol of 10-meter walk test for frail older adults.

	Special concerns for people with dementia
Location	
• The ideal walking path is a 20-meter long, levelled, straight, indoor, non-slip and enclosed corridor with a hard surface. • The first five meters of the path is for acceleration. The last five meters is for deceleration. The middle ten meters is for steady-state walking. • A starting and ending line should be marked on the floor using brightly colored tape. • The five-meter and 15-meter position of the walking path should be marked using tape with a different color. • If a 20-meter walking path is not available, shorter distances can be used, as long as there is adequate room for acceleration and deceleration (e.g. three meters for acceleration, six meters for steady-state walking and three meters for deceleration). • The length of the walking path should be recorded.	• The walking path should be located in a quiet, spacious, indoor and enclosed area to minimize distraction. • People other than the assessor and the patient should be prohibited from entering the area.
Patient Preparation	
• Patients should wear comfortable clothing and appropriate walking shoes. • Patients should use their usual walking aids (e.g. stick, rollator or frame) for ambulation. • Patients' medical regimen should be continued. • A light meal is allowed before early morning or early afternoon test.	• The test should be performed by personnel whom the patient is familiar with (e.g. physical therapist working in the facility). • The assessor should show an effective

• No vigorous exercise is allowed within two hours of beginning the test. • Patients should sit at rest in a chair for at least ten minutes prior to the test.	interaction with the patient, such as using calm voice, providing clear one-step commands, and keeping constant eye contact.
Measurement	

• The test should be repeated, if needed, about the same time of the day (e.g. morning or afternoon session) to reduce intra-day variability.
• Pre-test:
  o Check for contraindications, measure and record blood pressure and pulse rate when the patient is sitting in the chair.
• During the test:
  o A pacer could be used to ensure safety and provide assistance when needed. The pacer act as the timer.
  o The pacer, if used, should walk half a meter behind patients so as not to disturb their walking pace.
  o The pacer starts the stopwatch as soon as the patient's lead leg (or assistive device) crosses the first marker, and stops the stopwatch as soon as the patient's lead leg (or assistive device) crosses the second marker.
• Post-test:
  o Time used to walk the middle ten meters is recorded.
	• Pre-test: check if the patient has any significant behavioral or psychological symptoms on each testing occasion.
	• Acknowledge the patient's feelings and provide reassurance if the patient has any behavioral or psychological symptom.
	• The test should be postponed if the patient has uncontrolled behavioral or psychological symptoms.
	• Systematic cues should be given to the patient based on the published protocol when the

○ Walking speed is calculated dividing ten meters by the time used.	patient starts to deviate from the path, starts running or stops walking during the test (Chan and Pin, 2018).
Instructions	
'The purpose of this test is to find out how fast you can walk over a ten-meter path. You will start from this point, follow the path and walk straight until you reach the other end of the path. You should walk at your comfortable, usual pace. Don't run or jog. I will walk behind you to make sure that you are safe. You should not talk during the test, but I do want you to tell me if you develop any chest pain or tightness or if you become dizzy or light-headed during the test, and you can stop at any time. Do you have any questions? Are you ready? Please begin when I say 'GO'."	• The instructions and demonstration should be repeated before each trial if the patient cannot remember and needs clarification.
Encouragement	
• No encouragement is needed.	
Practice walk	
• Practice walks within the same occasion is not required but should be considered. • A separate practice occasion should be conducted at least 24 hours prior to the formal testing occasion.	• Two practice walks are required. • Practice walks are necessary for the assessor to observe the walking pace of the patient and determine which level of cueing should be provided during the test.

	• A separate practice occasion is not required.
Safety concerns	
• The patient should be instructed to report any chest pain, dizziness, intolerable dyspnea, excessive musculoskeletal pain, nausea and fatigue. • The patient has the right to request for rest or stop the test if he/she experiences any discomfort. • If the test is stopped for any reason, the patient should sit on a chair or lie supine depending on the severity of the event. • Blood pressure, pulse rate and oxygen saturation should be monitored. • Consult physician if necessary.	