Original Article

SAGE Open Medicine

SAGE Open Medicine
Volume 8: 1–5

DOI: 10.1177/2050312120910359
journals.sagepub.com/home/smo
SAGE

Challenges associated with physical assessments for people living with dementia: Modifying standard assessment protocols

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Abstract

Objectives: Regular physical activity for older adults as they age is important for maintaining not only physical function but also independence and self-worth. To be able to monitor changes in physical function, appropriate validated measures are required. Reliability of measures such as the timed-up-and-go, five-repetition sit-to-stand, handgrip strength, two-minute walk, 30-second sit-to-stand, and four-metre walk has been demonstrated; however, the appropriateness of such measures in a population of adults living with dementia, who may be unable to follow instructions or have diminished physical capacity, is not as well quantified. This study sought to test modified standard protocols for these measures.

Methods: Modification to the standard protocols of the timed-up-and-go, five-repetition sit-to-stand, handgrip strength, two-minute walk, 30-second sit-to-stand, and four-metre walk was trialled. This occurred through modification of procedural components of the assessment, such as encouraging participants to use their hands to raise themselves from a seated position, or the incorporation of staged verbal cueing, demonstration, or physical guidance where required. The test–retest reliability of the modified protocols was assessed using Pearson's correlation, and performance variances were assessed using the %coefficient of variation. Intraclass correlations were included for comparisons to previous research and to examine measurement consistency within three trials.

Results: At least 64% of the population were able to complete all measures. Good test–retest reliability was indicated for the modified measures (timed-up-and-go = 0.87; five-repetition sit-to-stand = 0.75; handgrip strength = 0.94; two-minute walk = 0.87; the 30-second sit-to-stand = 0.93; and the four-metre walk = 0.83), and the %coefficient of variation (7.2%–14.8%) and intraclass correlation (0.77–0.98) were acceptable to good.

Conclusion: This article describes the methodology of the modified assessments, presents the test–retest statistics, and reports how modification of the current protocols for common measures of physical function enabled more older adults living with dementia in a residential aged care facility to participate in assessments, with high reliability demonstrated for the measures.

Keywords

Dementia, exercise physiology, functional assessments, geriatrics/gerontology, modified assessments, residential aged care

Date received: 17 July 2019; accepted: 4 February 2020

Introduction

Encouraging older adults to be physically active as they age is important for maintaining not only physical function but also independence and self-worth.[1] Monitoring maintenance or change in physical function requires the ability to accurately assess the functional and physical capacity of older adults. Valid and reliable physical assessments in adults aged 65 years and older, such as timed-up-and-go, five-repetition sit-to-stand, handgrip strength, two-minute walk, and the 30-second sit-to-stand, have been established for this purpose;[2,3]

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however, in the case of older adults, and particularly those with increasing physical or cognitive decline, the standardised protocols for these assessments may not take into account the capacity of the individual to actually undertake the assessment. Issues associated with the ability to perform assessments may be made worse for older adults living with dementia, whereby cognitive decline can lead to misunderstanding instructions or an inability to follow instructions, forgetting what to do,[4] or a fear of falling.[5]

Despite recent evidence for the reliability of a number of these measures in adults with dementia,[6] the reliability of measures such as handgrip strength and timed-up-and-go within this population has been questioned.[5] For example, a previous study involving adults living with dementia reported that protocols were altered to incorporate additional prompting for participants who were unable to follow the instructions, and that participants needed to use the arms of the chair when completing sit-to-stand or timed-up-and-go measures, as participants had reduced confidence in their balance.[5] Two of the twelve participants in this study did not complete all of the measures due to agitation. In the context of a separate study, an exercise physiologist (EP)-led, 12-week exercise programme for older adults living with dementia in a residential aged care facility, physical assessments were completed by EPs as per standard protocol. It was apparent that a proportion of residents (70% for the timed-up-and-go and five-repetition sit-to-stand, 50% for the two-minute walk, and 20% for the handgrip strength test) were unable to participate in the planned physical assessments in accordance with current standardised protocols.[7] For example, the handgrip strength test requires participants to begin the test with their arm raised above their head, squeezing the dynamometer as they bring their arm down to their side in a controlled manner. Completing the dual action was demonstrated to be difficult for people with cognitive decline in the EP-led study. This inability to participate related to difficulties not only associated with understanding and following the instructions provided by the EP, attributable to declining cognition, but also to situations where participants reported feeling a lack of physical control and, subsequently, a fear of falling. Factors such as this led to issues in accurately assessing individual participants and, from a research perspective, led to missing data. Previous research has also shown that even when older adults with dementia have been able to complete the tests, the reliability of the measure is reduced.[5] It is unknown whether modifying tests to make them achievable for a greater sample of this population would make them more or less reliable. Within a mixed sample of community dwelling and residential care–based participants living with dementia, analysis of the two-minute walk test, incorporating a six-step cueing system, demonstrated excellent test–retest reliability (0.98), suggesting modifications may actually improve reliability.[8] Chan and Pin[8] used a six-step cueing system to quantify the amount of guidance provided to participants when undertaking the assessments; this was found to be useful in guiding individuals to complete the assessments. This article presents the outcomes on reliability of common functional measures when modified to accommodate reduced cognitive and physical function in a sample of older adults in residential care.

Methods

Participants (n = 14) in the trial of the modified assessments were older adults living with dementia in a residential aged care facility in South Australia, Australia. Residents were offered the opportunity to participate in the assessments, regardless of their level of cognitive decline or functional status (i.e. ambulatory, in a princess chair – a mobile chair that reclines and has a footrest for people who are non-weight-bearing; or in a mobicline – a mobile chair that reclines and has a footrest for people who can weight-bear). Informed, written consent was obtained from residents and provided by proxy from their legally authorised representative in situations where residents were unable to consent for themselves, prior to study initiation.

Physical and functional outcome measures assessed muscle strength, aerobic capacity, and functional mobility. The specific outcome measures were timed-up-and-go,[9] five-repetition sit-to-stand,[10] handgrip strength,[11] two-minute walk,[12] and the 30-second sit-to-stand.[13] The standard protocols of the timed-up-and-go and the five-repetition sit-to-stand require the participant to stand up from a seated position, with the participant's arms crossed over the participant's chest and each hand on the opposite shoulder. The timed-up-and-go, five-repetition sit-to-stand, and 30-second sit-to-stand were modified so that participants could use their hands to steady themselves as they pushed up from and returned to the seated position in the chair. To reduce confusion associated with a dual action process, the handgrip strength assessment was modified so that participants could rest their arm on the armrest of the chair, rather than having to begin the assessment with their arm raised above their head and lowered to their side as the dynamometer is squeezed. The two-minute walk was initially modified to enable the participant to be physically guided; however, it was decided that the four-metre walk could assess mobility across a shorter distance, which would reduce the likelihood of fatigue for the resident, but still enable the resident to be supported if necessary. As such, the four-metre walk was then included in the assessment protocol as a means of assessing mobility.[14]

For participants with cognitive decline, a staged cueing system was used to guide the participant through the assessment. Using the two-minute walk as an example, the cueing process occurred as follows:

1. The EP verbally explains the instructions simply and clearly, such as, 'For two minutes you are going to walk as far as you can, turning at the cone at each end'.

2. As per point 1 plus a demonstration of the activity.
3. As per point 2 plus while completing the assessment, the EP talks the participant through and provides continuous instructions/guidance, for example, 'keep walking straight, walk to the cone, turn around now and walk straight to the other cone'.
4. As per point 3 plus the EP uses touch, such as a hand for guidance, if required and appropriate.

This approach is adapted for each of the test protocols where the EP begins with a simple clear instruction, and if the participant requires further assistance to complete the test, the EP progresses by adding demonstration, continuous verbal cueing, and finally cueing by touch, for all activities except for the handgrip strength test. In this instance, the participant is instructed how to hold the dynamometer and how the test will proceed, and if necessary, a demonstration is provided. The EP provides verbal guidance, such as 'keep squeezing as hard as you can'. The EP does not assist the participant to squeeze the dynamometer, but may help to hold the dynamometer steady. The level of modification that was required for the participant on each task was recorded and repeated at the retest assessment; additional cueing could be provided at retest if required. Future assessments can be done at the same level for comparison.

Assessment of the modified measures occurred on two occasions, seven days apart, and included three trials each of the timed-up-and-go, five-repetition sit-to-stand, handgrip strength, 30-second sit-to-stand, and the four-metre walk, and a single trial of the two-minute walk. The stage of cueing for each assessment activity was recorded with the results of that activity. This study was approved by the University's Human Research Ethics Committee (Protocol no. 0000035728).

Statistical analyses

IBM SPSS Statistics version 25 was used for statistical analyses. Descriptive statistics were used to report demographic characteristics. Pearson's correlation was used for the test–retest on the highest value (i.e. strongest handgrip, highest number of sit-to-stands in 30 s) or shortest time (i.e. timed-up-and-go and five-repetition sit-to-stand) for each physical assessment. Intraclass correlations (ICCs) were computed from data on the first testing session where there were three trials of the measure to assess measure consistency, and performance variances were assessed using percent coefficient of variation (%CV). With power set at 80% and an alpha of 0.05, a sample size of 10 participants was required for correlational analysis with a Pearson's correlation coefficient of at least 0.8. The high correlation coefficient was based on previously published test–retest statistics.[2]

Results

Fourteen participants (100% female, mean age = 84.5 years, range = 69–94 years) completed the modified physical assessments. Ninety percent of the participants had some level of cognitive decline, as determined by Psychogeriatric Assessment Scale (PAS), with scores above four indicative of cognitive decline;[15] seven of these participants had scores in the 16–21 range, suggesting severe levels of cognitive decline. Nine participants were ambulatory, with six of those participants not requiring any form of mobility device; the other three participants used either a four-wheeled walker or rollator frame. For the five participants who were not ambulatory, two participants were in mobiclines, two participants were in princess chairs, and one participant used a wheelchair for support. The modified assessments improved the proportion of participants able to complete the assessments. For example, compared to a previous cohort, all participants were able to complete the handgrip assessment and 64% were able to complete the timed-up-and-go, a 30% improvement. Furthermore, the test–retest reliability statistics indicate good to excellent reliability of the modified assessments (Pearson's correlations ranging between 0.75 and 0.94). Consistency of the assessments was at comparable levels to non-modified version of the tests (ICCs ranging between 0.77% and 0.98%; %CV ranging between 7.2% and 14.8%) (Table 1).

Discussion

The purpose of this study was to trial and provide evidence for the reliability of physical function assessments that were modified for older adults living with dementia. This modified approach was intended to enable a higher proportion of older adults living in residential aged care to participate in the evaluation of a separate study, a 12-week EP-led exercise programme and provide a more accurate reflection of any changes in physical function due to participation in the programme. Difficulties associated with declining cognitive function and an inability to follow instructions alone, or coupled with declining functional capacity, impeded some participants' ability to complete standardised assessments. Modifying the standard protocols contributed to higher rates of participation in the assessments, with good test–retest reliability for the modified assessments.

Modification to the standard protocols included verbal cueing, demonstration of the activity prior to and during the assessment, and if necessary, physical guidance to complete the assessment activity, all following a staged cueing system. For three activities, procedural components of the assessment were modified. Specifically, in the case of the timed-up-and-go, five-repetition sit-to-stand, and the 30-second sit-to-stand, the standardised protocol requires the participant to stand up from a seated position, with the participant's arms crossed over the participant's chest and each hand on

Table 1. Test–retest reliability of standard and modified assessment protocols for timed-up-and-go, five-repetition sit-to-stand, handgrip strength, two-minute walk, and 30-second sit-to-stand physical assessments.

Physical assessment measure	Published reliability of the standard protocol (ICC)	ICC trial 1 to trial 3 on the first occasion of assessment (Cronbach's α)[a]	Participants able to complete modified protocol (%)	Test–retest reliability (Pearson's)	Coefficient of variation (%)
Timed-up-and-go[2]	0.98	0.91	64	0.87	11.9
Five-repetition sit-to-stand[3]	0.81	0.95	64	0.75	12.7
Handgrip strength[2]	0.98	0.98	100	0.94	9.8
Two-minute walk[8]	0.98	[b]	64	0.87	[b]
Four-metre walk[14]	0.96	0.84	64	0.83	7.2
30-second sit-to-stand[2]	0.92	0.77	64	0.93	14.8

ICC: intraclass correlation coefficient.
[a]ICCs were calculated from the three measures collected on the first test occasion.
[b]The two-minute walk was completed once on each measurement occasion and does not have an ICC or coefficient of variation value.

the opposite shoulder. This standard protocol may cause the participant to fear that they will fall as they stand or return to a seated position, and contravenes safety recommendations that older adults use their hands and arms to guide their movement to and from a seated position.[16] While modifying the standard protocols of these assessments does alter the muscle groups being assessed, it allows a more global assessment of strength. Furthermore, these modifications increase the safety of the assessment by enabling the participant to hold onto the arm rests of the chair, thereby reducing the risk of the participant falling.

Despite previous evidence for the reliability of the assessments when following standard protocol in the adult population, the inappropriateness of the standard protocol for the timed-up-and-go and handgrip strength for older adults living with dementia has been identified by other research in this field.[5] These findings support a modified approach to physical assessment protocols in this population. Modification of the assessments so that they are easier and safer for the participant to perform increases the participant completion rate, resulting in benefits from a research perspective also. Increased participation likely contributes to more complete data collection and, subsequently, a more realistic evaluation of the impact, if any, of an intervention being investigated.

The findings of this study support those of Chan and Pin,[8] where staged verbal cueing, demonstration, and physical guidance were shown to be effective modifications to standard protocol to accommodate the capacity of older adults living with dementia, while maintaining the integrity of the measure itself. From an individual perspective, modification of the assessments to suit individual capabilities provides greater scope to monitor the progress of residents. Due to the small sample size, the impact of cueing itself on the reliability of the measure was not assessed; however, this is something that should be considered in a larger sample.

It was the intention of this study to address the limitations of the standard assessments for older adults living with dementia. This occurred to an extent; however, there was still a proportion of participants who could not perform the modified assessments due to their level of functional capacity. This means that despite modifying assessment protocols to enable more older adults living with dementia to participate in functional assessments for monitoring purposes, there will still be some of this population who will not be able to perform these assessments, regardless of the type of protocol modification made. The size of the %CV for the 30-second sit-to-stand could be considered high. However, at 14.7%, it still sits within the acceptable range (10%–20%) reported by Alfonso-Rosa et al.[2] The five-repetition sit-to-stand had a lower %CV compared to the 30-second sit-to-stand, possibly due to fatigue over the three, 30-second, trials, but when the highest score was used for the test–retest, Pearson's correlation was higher for the 30-second (0.93) than the five-repetition (0.75) sit-to-stand assessment. This may make it a more appropriate assessment to use in a test–retest situation.

It is acknowledged that the sample size was small. However, it was larger than the 10 participants calculated as necessary to achieve correlations of at least 0.8, and was similar to that in previous research that has undertaken assessment of the reliability of physical function measures in a population of older adults living with dementia.[5]

Conclusion

The test–retest reliability of the modified physical assessment protocols for commonly used measures was examined, demonstrating reliability of these assessments in the context of functional assessment of older adults living with dementia in a residential aged care facility. Using a modified approach provided the opportunity for more residents to participate in the assessments, and arguably increased the safety of the assessments, through the adaptation of protocols to suit the participants' capabilities. From a research perspective, the ability to include participants with a greater range of functional ability

in assessments provides a more realistic reflection of the impact, if any, of an intervention. From an individual perspective, using measures that allow more participants to be involved provides greater scope to be able to report back to the participants and to monitor their ongoing physical function. This facilitates outcome evaluations and the encouragement of older adults to continue to perform physical activity, contributing further to independence and self-worth.

Acknowledgements

The authors would like to thank the residents who participated in the study.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval for this study was obtained from the University of South Australia Human Research Ethics Committee (Protocol no. 0000035728).

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by National Health and Medical Research Council (NHMRC), Cognitive Decline Partnership Centre (CDPC) Grant (Activity 29).

Informed consent

Written informed consent was obtained from all subjects or their legally authorised representatives (by proxy, in the case of participants who did not have the decisional capacity) before the study.

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References

1. Post D, Corlis M, Penington A, et al. Exercise physiology in aged care: perceptions and acceptability from the perspectives of family members and care staff in the residential aged care environment. *Dementia*. Epub ahead of print 29 November 2018. DOI: 10.1177/1471301218816246.
2. Alfonso-Rosa RM, Del Pozo-Cruz B, Del Pozo-Cruz J, et al. Test–retest reliability and minimal detectable change scores for fitness assessment in older adults with type 2 diabetes. *Rehabil Nurs* 2014; 39(5): 260–268.
3. Schaubert KL and Bohannon RW. Reliability and validity of three strength measures obtained from community dwelling elderly persons. *J Strength Cond Res* 2005; 19(3): 717–720.
4. Rockwood K, Awalt E, Carver D, et al. Feasibility and measurement properties of the functional reach and the timed up and go tests in the Canadian study of health and aging. *J Gerontol A Biol Sci Med Sci* 2000; 55(2): M70–M13.
5. Fox B, Henwood T, Neville C, et al. Relative and absolute reliability of functional performance measures for adults with dementia living in residential aged care. *Int Psychogeriatr* 2014; 26(10): 1659–1667.
6. McGough EL, Lin S-Y, Belza B, et al. A scoping review of physical performance outcome measures used in exercise interventions for older adults with Alzheimer disease and related dementias. *J Geriatr Phys Ther* 2019; 42(1): 28–47.
7. Parfitt G and Corlis M. Activity 29: exercise physiology in aged care, evaluation of an implementation project. Final Report to the NHMRC Cognitive Decline Partnership Centre (CDPC), 2019, https://cdpc.sydney.edu.au/wp-content/uploads/2019/06/Activity-29-Exercise_Prescription_Final_Report-1.pdf
8. Chan WLS and Pin TW. Reliability, validity and minimal detectable change of 2-minute walk test, 6-minute walk test and 10-meter walk test in frail older adults with dementia. *Exp Gerontol* 2019; 115: 9–18.
9. Podsiadlo D and Richardson S. The timed ‘up & go’: a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc* 1991; 39(2): 142–148.
10. Bohannon RW, Bubela DJ, Magasi SR, et al. Sit-to-stand test: performance and determinants across the age-span. *Isokinet Exerc Sci* 2010; 18(4): 235–240.
11. Roberts HC, Denison HJ, Martin HJ, et al. A review of the measurement of grip strength in clinical and epidemiological studies: towards a standardised approach. *Age Ageing* 2011; 40(4): 423–429.
12. Bohannon R, King N and Gershon R. Two-minute walk test (2MWT) performance by adults 18-85 years: normative values, reliability and responsiveness. *Arch Phys Med Rehabil* 2014; 96: 472–477.
13. Jones CJ, Rikli RE and Beam WC. A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. *Res Q Exerc Sport* 1999; 70(2): 113–119.
14. Peters DM, Fritz SL and Krotish DE. Assessing the reliability and validity of a shorter walk test compared with the 10-meter walk test for measurements of gait speed in healthy, older adults. *J Geriatr Phys Ther* 2013; 36(1): 24–30.
15. Dyer SM, Gnanamanickam ES, Liu E, et al. Diagnosis of dementia in residential aged care settings in Australia: an opportunity for improvements in quality of care. *Australas J Ageing* 2018; 37(4): E155–E158.
16. Queensland Health. Chair transfer. Queensland Government Department of Health, 2009, https://www.health.qld.gov.au/__data/assets/pdf_file/0011/425000/btb_chairtx.pdf