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RESEARCH ARTICLE

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Pilot feasibility study of a home-based fall prevention exercise program (*StandingTall*) delivered through a tablet computer (iPad) in older people with dementia

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Abstract

Objective: To assess the feasibility and safety of *StandingTall*—an individually tailored, progressive exercise program delivered through tablet computers—in community-dwelling older people with dementia.

Methods: Fifteen community-dwelling older people with dementia (mean age = 83 ± 8 years; Montreal Cognitive Assessment 16 ± 5) received *StandingTall* for 12 weeks with caregiver assistance. Feasibility and safety were assessed using the System Usability Scale (SUS; scores = 0-100; a priori target >65), Physical Activity Enjoyment Scale (PACES-8; scores = 8-56), adherence (exercise minutes) and adverse events.

Results: Mean SUS scores were 68 ± 21/69 ± 15 (participants/caregivers). The mean PACES-8 score was 44 ± 8. In week 2, week 7 and week 12, mean (bias-corrected and accelerated 95% CI) exercise minutes were 37 (25-51), 49 (30-69) and 65 (28-104), respectively. In week 12, five participants exercised >115 minutes. One participant fell while exercising, without sustained injury.

Conclusions: *StandingTall* had acceptable usability, scored well on enjoyment and was feasible for participants. These results provide support for further evaluation of *StandingTall* in a randomised controlled trial with falls as the primary outcome.

KEYWORDS

accidental falls, biomedical technology, dementia, exercise, postural balance

1 | INTRODUCTION

Community-dwelling older people with dementia have physical impairments and more falls than their cognitively intact peers.[1] Compared to people without dementia, those with dementia have a two- to three-fold increased risk of hip fracture. They also have an increased risk of placement in residential care and death after a fall-related injury hospitalisation.[2]

Innovative and cost-effective strategies aimed at preventing physical decline and falls are needed.

Currently, there is limited evidence that falls can be prevented in people living with dementia in the community.[3] Balance and mood are independent predictors of falls and are potentially amenable to exercise.[4] There is some evidence that exercise improves physical and neuropsychological performance in people with dementia,[5,6] as well as preliminary findings that caregiver involvement is a practical way to increase home-based exercise dose.[7,8] Research suggests that older people, especially individuals who have recently fallen, prefer doing fall prevention exercise at home.[9] Home-based exercise is accessible to all and eliminates the need to access transport, which has previously been identified as a barrier to exercise participation due to availability and cost factors.[10]

Adherence to home-based fall prevention interventions is relatively poor, but may be improved if programs provide additional support (eg home visit and telephone), are physiotherapy led and include balance exercises.[11] However, within many health-care systems, long-term physiotherapy home visit and telephone support are not sustainable. Portable technological devices (eg tablet computers) are now widely available and provide a platform to offer cost-effective, convenient, interactive and progressive exercise programs, while also recording adherence, allowing for remote monitoring and timely feedback.

StandingTall is a fall prevention program delivered through tablet computers (iPads) via an app.[12] This program offers tailored, progressive balance training with an inbuilt coach to encourage adherence. A randomised controlled trial (RCT) powered to determine the programs efficacy for fall prevention in cognitively healthy older people is near completion.[12]

The aim of the current pilot feasibility study was to determine the safety and feasibility of the *StandingTall* program in community-dwelling older people with dementia by assessing system usability, enjoyment and adherence, as well as intervention-related adverse events, prior to conducting an RCT.

Practice Impact

This research demonstrates that *StandingTall*—a progressive and individually tailored balance training program delivered through tablet computers—is feasible for community-dwelling older people with dementia with caregiver supervision. These findings support further evaluation of *StandingTall* in a randomised controlled trial with falls as the primary outcome.

2 | METHODS

2.1 | Participants

Fifteen community-dwelling participants with mild-moderate dementia were recruited from routine health services, for example cognitive disorders/memory/aged care clinics or individuals who had completed participation in other research projects and indicated a willingness to be contacted for future trials. Inclusion criteria included the following: ≥60 years, community-dwelling, mild-to-moderate dementia (diagnosed by a specialist clinician) and caregiver/person responsible willing to supervise the participant's exercises for up to 2 h/wk. Exclusion criteria included the following: severe dementia (Mini-Mental State Examination <12), indoor walking aid use, unstable medical conditions that preclude exercise participation, progressive neurological conditions other than dementia, acute/severe psychiatric conditions, inability to speak English, blindness, active delirium, current participation in another fall prevention trial or living in a residential aged care facility (RACF). The trial received ethical approval from the South Eastern Sydney Local Health District Human Research Ethics Committee, and all participants and their caregivers/person responsible consented to participation before baseline assessment.

2.2 | Intervention

2.2.1 | The StandingTall program (app)

The *StandingTall* exercise program trains static balance (eg semi-tandem, tandem) on firm and compliant surfaces and dynamic balance (eg heel/toe raises, stepping, stepping on/off a box).[12] Instructions on how to perform each exercise were provided with on-screen text, video demonstrations and voice-overs. Participants completed exercises with an on-screen video guide. The exercises were tailored to the participants' balance abilities. Baseline and monthly balance assessments were prompted and delivered using the app. The intensity of the exercise was monitored using a modified Rate of Perceived Exertion (RPE) scale[12] which participants (with caregiver assistance) completed after each exercise. Progression of the training intensity was adjusted based on RPE ratings to ensure the training remained challenging yet safe. The initial exercise dose was set at 40 minutes per week (weeks 1 and 2) and progressively increased to 60 minutes (weeks 3 and 4), 80 minutes (weeks 5 and 6), 100 minutes (weeks 7 and 8) and 120 minutes (weeks 9-12). The *StandingTall* app allows automatic data transfer of weekly exercise minutes, and participants could track their training duration within the app. The *StandingTall* app requires constant interaction with the program to progress, that is for each exercise repetition (repetition duration range 5-120 seconds). Therefore, if a participant and their caregiver were to walk away within a session, the exercise session would stop at that repetition and not proceed without further interaction from the participant/caregiver. Also, the app has a timeout feature: if during a session the participant/caregiver did not interact with the program for 2 hours, the exercise session was closed and data for the closed session were not saved. Other features of the *StandingTall* app include exercise scheduling, goal setting and education.

2.2.2 | Equipment, home visits and telephone support

Participants were provided with an iPad and exercise equipment (foam mat, step box, exercise mat), and received the home-based *StandingTall* program for 12 weeks.[12] During an initial home visit approximately 1 week after the baseline assessment, the research physiotherapist introduced the program to the participant and caregiver. The various features of the app (eg video demonstrations, exercising, scheduling exercises, tracking progress, setting goals) were explained and demonstrated. The participant performed *StandingTall's* baseline balance assessment under the guidance of the research physiotherapist to ensure the exercises were tailored to the participant's balance abilities. The research physiotherapist recommended a safe place within the home to perform the exercises. At 2 and 4 weeks after installation, participants and their caregivers received follow-up home visits. These visits were to ensure safe use and exercise progression, to provide help with setting individual goals and to discuss any issues related to the program. Participants not engaging in the minimum weekly training dose for two consecutive weeks were contacted by telephone to discuss any issues and encourage adherence. Phone support and additional home visits were available as needed/requested during the trial.

2.3 | Assessment

Baseline and re-assessments were conducted in participants' homes by trained research physiotherapists. At completion of the 12-week trial, re-assessments were conducted by a research physiotherapist who was not involved in any other aspect of the trial and was blind to baseline assessment data. The baseline assessment involved a structured interview with the participant and caregiver to obtain the following information: demographic factors, previous technology use and medical history. Neuropsychological and physical assessments were completed at baseline and re-assessment and are described below. These assessments were completed to characterise the sample and to assess feasibility for use in a larger trial assessing efficacy.

2.3.1 | System usability and enjoyment

At re-assessment, participants and caregivers rated the usability of *StandingTall* using the System Usability Scale (SUS) and participants rated exercise enjoyment while using *StandingTall* using the 8-item Physical Activity Enjoyment Scale (PACES-8).[13,14] The SUS is a simple, reliable and valid 10-item scale that required participants and their caregivers to rate usability in relation to effectiveness, efficiency and satisfaction.[15,16] Each item is scored on a 5-point Likert scale (strongly disagree = 1, strongly agree = 5), and higher scores (range = 0-100) represent better usability.[15] A score of 65 or above, set a priori based on previous literature, was deemed acceptable. The SUS has been used extensively in previous research, and overall, a median SUS score of 68 has been described as average experience.[16,17] We set our a priori target just below this (in the high marginally acceptable range for usability) because our participants were older, we predicted they would have limited technology experience and there is scarce research rating exercise/fall prevention technology usability for comparison. Both older age and inexperience have been demonstrated to negatively affect SUS scores.[16-19] Exercise enjoyment was rated by participants using PACES-8, which includes eight bipolar statements (eg I find it pleasurable/I find it unpleasurable) scored on a 7-point scale. Higher scores (range = 8-56) represent greater enjoyment.

2.3.2 | Adherence

The *StandingTall* app recorded weekly training duration (minutes), and data were automatically transferred to a secure server.

2.3.3 | Adverse event monitoring

All participants and their caregivers were instructed to contact research staff should they experience any adverse events (eg muscle strain, fall) as a result of the intervention. They also filled in weekly falls calendars via the app as an alternative means of adverse event monitoring. Participants were instructed to include any fall including slips and trips, in which they lost their balance and unexpectedly landed on the floor/ground or lower level, even if the fall was not their fault or did not cause harm.[20]

2.3.4 | Neuropsychological assessment

The Montreal Cognitive Assessment (MoCA) was used to assess global cognition.[21] Trail Making Test (TMT) Part A assessed processing speed.[22] TMT Part B assessed executive function.[22] Mood was assessed with the Geriatric Depression Scale (15 items).[23] Concern about falls was assessed with the 10-item Iconographical Falls Efficacy Scale.[24] The Zarit Burden Interview was used to assess the impact of caring for a person with dementia, and higher scores (range = 0-48) indicate greater impact.[25]

TABLE 1 Participant and caregiver baseline characteristics

Characteristic, n (%), mean ± SD or median (IQR)	Participant (n = 15)	Caregiver (n = 15)
Demographics		
Age, y	83 ± 8	70 ± 11
Female	7 (47)	9 (60)
Years of education	11 (10-12)	—
Outdoor walking aid use	5 (33)	—
Fall past year	9 (60)	—
Medical history		
Stroke	4 (27)	—
Transient ischaemic attack	1 (7)	—
Hypertension	7 (47)	—
Hypotension	2 (13)	—
Acute myocardial infarction	0 (0)	—
Congestive cardiac failure	0 (0)	—
Arrhythmia	5 (33)	—
Diabetes	3 (20)	—
Peripheral vascular disease	2 (13)	—
Osteoarthritis	8 (53)	—
Previous technology use		
Own a computer	5 (33)	12 (80)
Use a computer	3 (20)	12 (80)
Own a tablet computer	2 (13)	8 (53)
Use a tablet computer	2 (13)	8 (53)
Own a mobile phone	7 (47)	14 (93)
Use a mobile phone	6 (40)	14 (93)
Montreal Cognitive Assessment (caregivers >60 y)[a]	16 ± 5	28 (24-29)

Note: Montreal Cognitive Assessment (/30)—higher scores are better.
[a]n = 6 (n = 5 >60 y of age declined assessment, n = 3 caregivers were <60 y of age, n = 1 missing data).

2.3.5 | Physical assessment

The Short Physical Performance Battery (SPPB) was used to assess physical function and includes measures of balance, sit-to-stand ability and gait speed, and has previously been demonstrated to have very good reliability in older people with dementia (intraclass correlation coefficient [ICC] = .88).[26,27] The SPPB includes threshold (10 s) for three standing balance tests: feet together, semi-tandem and tandem. Feet apart and near-tandem stance were also assessed. The SPPB sit-to-stand task requires participants to complete five sit-to-stands; timing starts from the seated position and continues until the participants are in the standing position of the fifth sit-to-stand. Previous research in community-dwelling older people with dementia has demonstrated very good reliability for the five-repetition sit-to-stand test (ICC = .89).[27] Gait speed was assessed over two trials (the faster was used for SPPB scoring) and, depending on space, was measured at usual pace over 3.66 or 6 metres (m), including acceleration and deceleration phases (ie 2.4 and 4 m test distances). Reliability of gait speed assessed over short distances in older people with dementia has previously been reported to be excellent (ICC = .97-.98).[28] Mobility was assessed with the Timed Up and Go test performed at a comfortable and safe pace, which has previously been demonstrated to have good-to-excellent reliability in people with dementia (ICC = .75-.99).[27-29]

2.4 | Statistical analysis

Data were analysed with SPSS (SPSS Inc), v25. One participant moved interstate and withdrew from the study after week 5, and at week 10, one participant was admitted to hospital (unrelated to the intervention) and then moved to a RACF. Participants who were physically unable to perform a physical test were given a score of 3 SD above the baseline population mean (STSx5: n = 1 baseline/re-assessment). For TMT B, six participants were cognitively unable to perform the test at baseline and re-assessment, so no score was imputed, two participants were cognitively unable at baseline but able at re-assessment and one was cognitively unable at re-assessment; these participants were given a score of 3 SD above the baseline population mean. Scores of 3 SD above the baseline mean were selected because these data were not missing at random and reflected an inability to perform the tests. This ensured such participants did not receive scores that were better than participants who could complete the assessments. Demographic data were dichotomised at their mean or median to explore their influence on SUS scores, but statistical comparisons were not made due to the small sample size. Pearson's correlation with bias-corrected and accelerated (BCa) bootstrap 95% confidence intervals (CIs) was used to assess the relationship between system usability (SUS) and exercise enjoyment (PACES-8). The total weekly exercise minutes were not normally distributed; therefore, one-sample *t* tests were used to calculate mean weekly exercise minutes with BCa bootstrap 95% CI. The BCa 95% CIs are based on 1000 bootstrap samples with Mersenne Twister seed number = 2000. Paired-samples *t* tests or related-samples Wilcoxon signed-rank tests were used to compare continuous baseline and re-assessment data depending on their distribution.

3 | RESULTS

Participant and caregiver baseline characteristics are reported in Table 1. The participants had a mean age of 83 ± 8

TABLE 2 Weekly exercise minutes and reasons for non-adherence to the *StandingTall* exercise program

		Reasons for non-adherence, n (%)								
	Exercise minutes Mean (BCa bootstrap 95% CI)[a]	Holidays	Health-related	Heat	Tired	Too busy	Technological problems	Declined	PUA to meet minutes	Unable to contact
Week 1	20 (15-25)									
Week 2	37 (25-51)		2 (13)	1 (7)	2 (13)	2 (13)	1 (7)	1 (7)		
Week 3	41 (27-53)									
Week 4	32 (17-47)	2 (13)	4 (27)				1 (7)	2 (13)		
Week 5	44 (25-61)									
Week 6[b]	46 (26-65)	1 (7)	4 (27)			2 (13)		1 (7)	1 (7)	2 (13)
Week 7	49 (30-69)									
Week 8	43 (21-67)	1 (7)	4 (29)		1 (7)	1 (7)		1 (7)	2 (14)	1 (7)
Week 9	50 (26-77)									
Week 10	54 (28-82)		4 (29)		1 (7)			1 (7)	3 (21)	1 (7)
Week 11[c]	53 (26-83)									
Week 12	65 (28-104)									

Abbreviation: PUA, physically unable.

[a]Bias-corrected and accelerated (BCa) bootstrap confidence intervals are based on 1000 bootstrap samples, Mersenne Twister seed number = 2000.

[b]One participant moved interstate to live with family and therefore withdrew from the study.

[c]One participant was in hospital, then moved into residential care and was therefore unable to participate for the final 2 wk of the program.

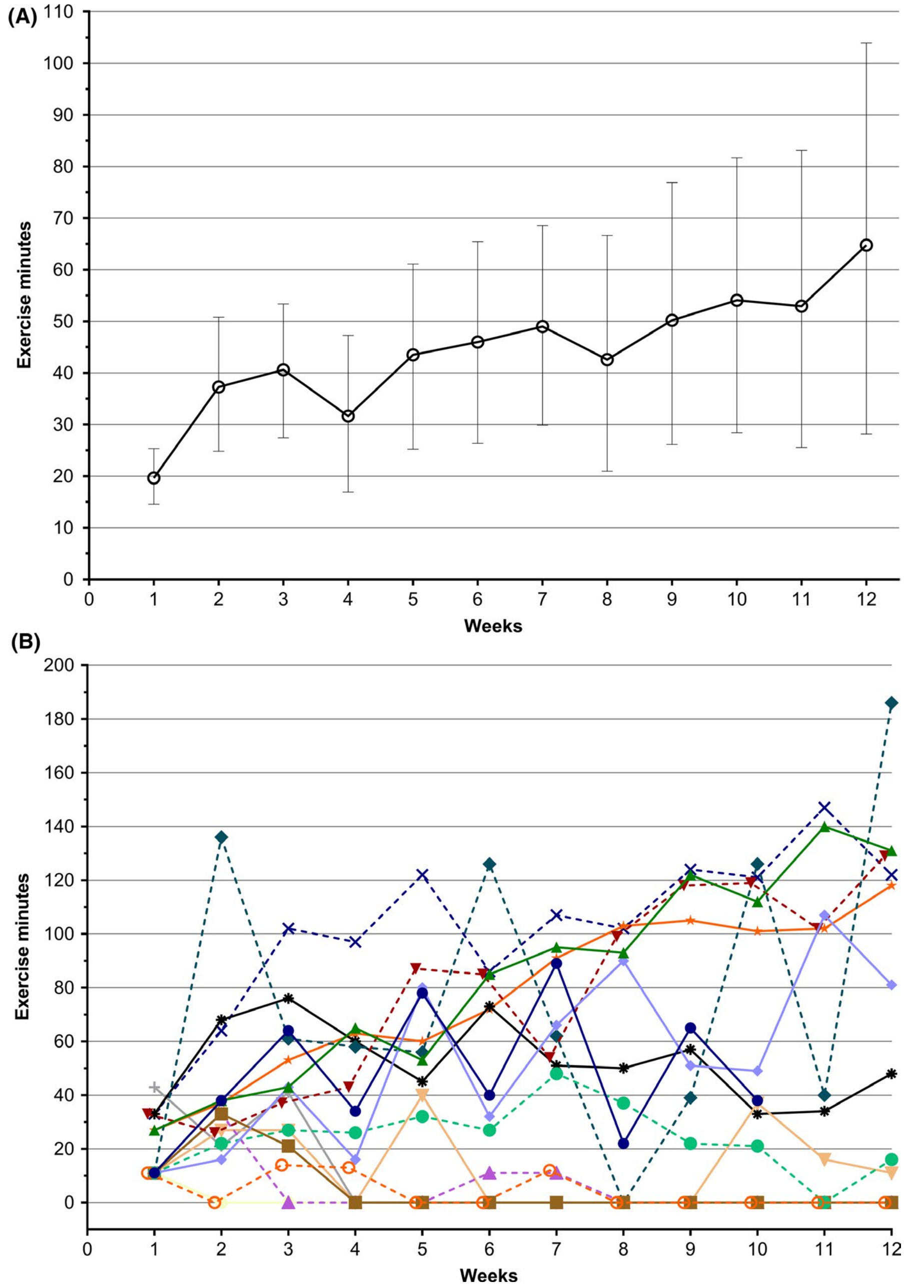

FIGURE 1 A, Mean (bias-corrected and accelerated bootstrap 95% CI) exercise minutes during the 12-wk intervention. n = 1 moved interstate and withdrew after week 5; n = 1 was hospitalised (unrelated to the intervention) and then moved to a residential aged care facility after week 9. B, Individual participant exercise minutes during the 12-wk intervention

(standard deviation) years and a mean MoCA score of 16 ± 5 at baseline. Forty-seven per cent were female, and 60% reported a fall in the previous year (Table 1). Caregivers had a mean age of 70 ± 11 years, and 60% were female (Table 1). Caregivers reported more technology use than participants.

3.1 | System usability and enjoyment

The mean SUS scores were 68 ± 21 for participants and 69 ± 15 for caregivers. The mean PACES-8 score for participants was 44 ± 8. Scores suggested acceptable ranges for both scales. Two participants did not recall the *StandingTall* program and therefore did not rate usability or enjoyment. Participants who were older, less educated and had lower baseline MoCA scores reported lower SUS scores (age: ≥84 years = 66 ± 32, <84 years = 71 ± 10; education: <10 years = 57 ± 29, ≥10 years = 75 ± 14; MoCA: <17 = 65 ± 27, ≥17 = 73 ± 15). Participants who reported owning and using a computer had higher SUS scores (computer: owns = 74 ± 14 does not own = 64 ± 26; uses = 82 ± 10, does not use = 63 ± 23). Caregivers who were older and did not use a computer reported lower SUS scores (age: ≥70 years = 63 ± 15, <70 years = 76 ± 14; computer: does not use = 62 ± 19, uses = 71 ± 14). More detailed analyses of the PACES-8 showed that the bipolar statements that rated the lowest were 'it's not at all invigorating/it's very invigorating' and 'it's not at all exhilarating/it's very exhilarating', with mean scores for these statements of 5 ± 2 and 5 ± 1, respectively. There was no correlation between participant rated usability (SUS) and exercise enjoyment (PACES-8; r [BCa 95% CI] = −0.01 [−0.66, 0.73], $P = 1$).

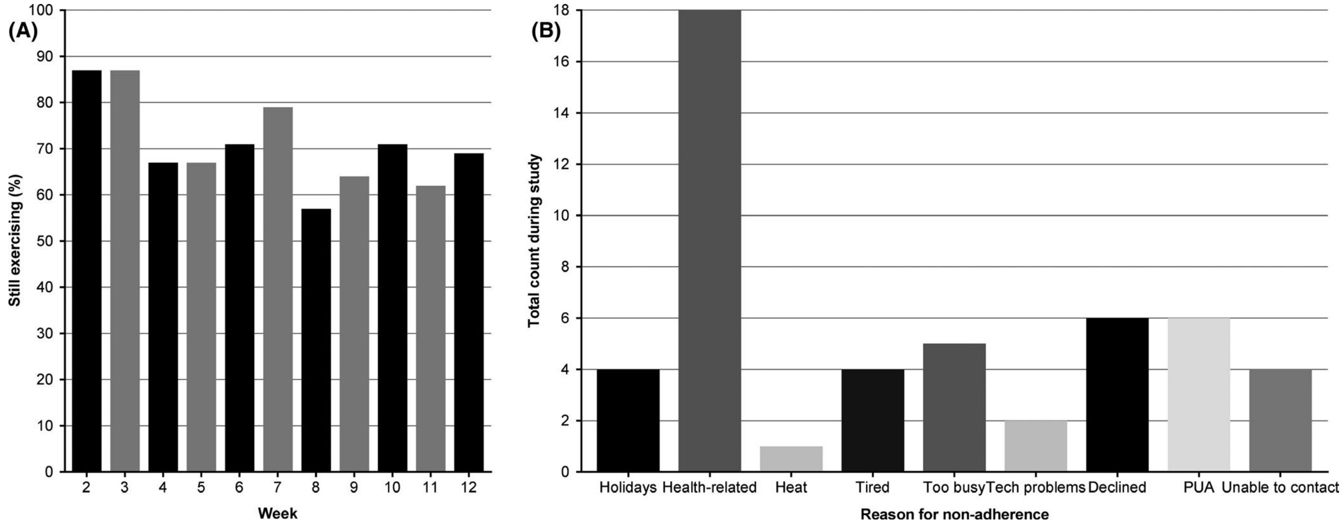

FIGURE 2 A, Exercise participation during the 12-wk intervention: percentage of participants still recording exercise minutes. n = 1 moved interstate and withdrew after week 5; n = 1 was hospitalised (unrelated to the intervention) and then moved to a residential aged care facility after week 9. B, Reasons for non-adherence (total count) during the 12-wk intervention. PUA = physically unable to meet exercise minutes; tech = technological

3.2 | Adherence

Mean (BCa bootstrap 95% CI) exercise minutes are reported in Table 2 and Figure 1A, and individual exercise minutes are reported in Figure 1B. The proportion of participants recording exercise minutes is presented in Figure 2A, and reasons for non-adherence are presented in Table 3, with total counts presented in Figure 2B. At week 12, participants performed a mean of 65 (BCa 95% CI [28, 104]) minutes of exercise, and five participants were performing >115 minutes of exercise. Health-related factors (eg cataract surgery, influenza and bronchitis) were the most common reasons for non-adherence.

3.3 | Adverse events

One participant tripped on the box and fell while performing a step-up exercise from the *StandingTall* program. Several safety strategies were in place, for example caregiver supervision and a chair was close by for support. The participant had mild left-sided hip pain that subsided within 2-3 days, did not seek medical intervention/assessment and continued participation in the study. The SUS and PACES-8 scores were 75 and 46, respectively, for the participant who fell. The caregiver Zarit Burden Interview scores were high at baseline and re-assessment (baseline = 35, re-assessment = 37), and the caregiver's SUS score was 63 for the participant who fell. No other intervention-related adverse events were reported.

3.4 | Neuropsychological and physical performance at baseline and re-assessment

Of the 13 participants available for re-assessment; one participant was unable to participate in the physical re-assessment secondary to an arthritis flare (multi-joint). For participants and caregivers with baseline and re-assessment data, the neuropsychological and physical performance scores are presented in Table 3. There was a significant reduction in concern about falling, and Zarit Burden Interview scores did not significantly change over time (Table 3).

4 | DISCUSSION

Our findings indicate that home-based, individually tailored exercise using the *StandingTall* program with the assistance of caregivers is feasible and safe for community-dwelling older people with dementia. The mean a priori SUS target of 65 was met by both participants and caregivers, and the *StandingTall* exercise program scored well on enjoyment.

While adherence to the program was variable, participants were undertaking a mean of 65 minutes of exercise in week 12 and five participants completed more than 115 minutes at this time point. The recommended exercise dose for fall prevention in cognitively healthy older people is 3+ hours per week of moderate-to-high challenge balance exercises.[30] While the exercise dose achieved in this study is below this recommended level, it is worth highlighting that the *StandingTall* app records actual exercise minutes. In contrast, the exercise session duration reported in other studies includes rests and instructions, therefore inflating the total exercise time. Furthermore, fall prevention targets are not known for this group of people and they may differ to those reported in cognitively healthy older people.

Adherence to fall prevention exercise programs has previously been reported to be approximately 50%,[31] with only 21% of participants fully adherent,[11] and attrition in

TABLE 3 Participant and caregiver neuropsychological and physical performance at baseline and re-assessment

Variable, n (%), mean ± SD or median (IQR)	n[a]	Baseline	Re-assessment	Statistic
Cognitive (participant)				
MoCA	13	16 ± 5	16 ± 6	$t(12) = 0.09$, $P = 1$
TMT A, s	13	136 (64-150)	98 (56-162)	$Z = -0.73$, $P = .5$
TMT B, s	7[b]	290 ± 147	249 ± 123	$Z = -0.51$, $P = .6$
Psychological (participant)				
Geriatric Depression Scale	13	1 (1-2)	2 (1-4)	$Z = 1.38$, $P = .2$
Icon-FES	13	17 (13-22)	15 (13-20)	$Z = -2.00$, $\boldsymbol{P = .046}$
Physical (participant)[c]				
Semi-tandem able to stand 10 s	12	11 (92)	12 (100)	n/a
Near-tandem able to stand 10 s	12	9 (75)	9 (75)	n/a
Tandem able to stand 10 s	12	6 (50)	7 (58)	n/a
Total standing balance time, s	12	44 ± 8	45 ± 7	$t(11) = -0.57$, $P = .6$
Five-repetition STS, s	12	14 (10-19)	14 (13-18)	$Z = 1.33$, $P = .2$
Gait speed, m/s	12	0.76 ± 0.21	0.72 ± 0.20	$t(11) = 1.04$, $P = .3$
SPPB score	12	9 ± 3	9 ± 2	$t(11) = 0.21$, $P = .8$
Timed Up and Go, s	12	13 (10-19)	13 (9-17)	$Z = -0.39$, $P = .7$
Impact of caring for a person with dementia (caregiver)				
Zarit Burden Interview	14	20 ± 10	20 ± 11	$t(13) = 0.55$, $P = .6$

Higher scores indicate better performance: MoCA (/30), total standing balance time (/50 s), gait speed and SPPB (/12). Lower scores indicate better performance: TMT A/B, Geriatric Depression Scale (/15), Icon-FES (/40), five-repetition STS, Timed Up and Go and Zarit Burden Interview (/48). Significant findings ($p < 0.05$) are bold.

Abbreviations: Icon-FES = Iconographical Falls Efficacy Scale; MoCA = Montreal Cognitive Assessment; SPPB = Short Physical Performance Battery; STS = sit-to-stand; TMT = Trail Making Test.

[a]Two participants could not be re-assessed; n = 1 moved interstate and therefore withdrew after week 5; and n = 1 was hospitalised (unrelated to the intervention) and then moved to a residential aged care facility after week 9.

[b]Six participants cognitively unable to perform the test at baseline and re-assessment, respectively.

[c]One participant was unable to participate in physical re-assessment secondary to an arthritis flare unrelated to the intervention.

these programs has been reported to be about 20%.[32] In the current study, 69% of participants were exercising and five participants were fully adherent during week 12. Adherence over longer time frames using this tablet-based exercise program needs to be examined, as well as how adherence influences fall and physical outcomes in an appropriately powered RCT.

The SUS is a reliable and valid standardised questionnaire for assessing perceived usability of technology, and previous research has demonstrated that a sample of 8-12 users is sufficient to reliably assess usability.[16,18] Scores of 68, 70-85 and 50 are considered average, good to excellent and unacceptable, respectively.[16,17] Age has been shown to negatively impact scores, while previous experience and greater

Internet self-efficacy have been shown to positively impact scores.[16-18] In this study, the average age of caregivers was 70 years and participants 83 years, and only 53% and 13% of caregivers and participants owned and used tablet computers, which may have negatively affected usability scores. Using mean/medians to dichotomise the sample, our data support previous findings, in that participants and caregivers who were older and had less technology experience reported lower SUS scores. Cognition and education may also influence SUS scores, but these findings need validating in larger samples. One previous study evaluated system usability of an exergame system aimed at preventing falls in older people and reported a mean SUS score of 62, and as with the current study, older participants had lower usability ratings.[19] Usability of the *StandingTall* app compared favourably to the previously evaluated home-based exergame system.[19]

Importantly, our caregiver-supervised home-based exercise program did not affect how caregivers rated the impact of caring for a person with dementia (Zarit Burden Interview). This suggests that the intervention did not adversely affect relationships between caregivers and the person with dementia. However, it will be important for any future fall prevention research involving dyads to measure the impact of caring for community-dwelling older people with dementia to capture positive/negative effects and weigh these with other intervention outcomes.

One participant fell while exercising resulting in mild hip pain that resolved quickly without intervention. The participant and his caregiver were using a number of safety precautions, they had a chair nearby, the caregiver was providing supervision and they were adhering to the research physiotherapist's instructions on where to perform the exercises. After each exercise, the *StandingTall* program requires participants and their caregivers to rate exercise intensity, and this information is used to tailor the exercise program. For this participant, it is possible that exercise intensity was rated too low, which progressed the exercises to a more difficult level. Therefore, in future trials, additional participant and caregiver training is recommended to ensure the implications of accurately rating exercise intensity are fully understood. Caregivers' cognitive performance may also need consideration (in this case, the caregiver declined cognitive assessment). There were no other adverse events reported.

5 | CONCLUSIONS

The *StandingTall* program had acceptable usability, scored well on enjoyment and was feasible for community-dwelling older people with dementia. Additional caregiver and participant training may be required with respect to rating exercise intensity. These findings provide support for further evaluation of *StandingTall* in an RCT with falls as the primary outcome in this population.

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CONFLICTS OF INTEREST

No conflicts of interest declared.

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