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ORIGINAL RESEARCH

Reducing Fall Risk in Older Adults with COPD: Pilot Study to Test the Efficacy of a Home-Based Exercise Program with Virtual Care Support

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Purpose: Older adults with chronic obstructive pulmonary disease (COPD) have a higher risk of falls than their peers without COPD. Home-based exercise programs can improve balance and strength and reduce falls in older adults and could be an option for older adults with COPD who access virtual care. We pilot tested a 6-month home-based balance and strength exercise program with virtual care support aimed at improving strength and balance in people with COPD aged 50 years and over.

Patients and Methods: Adults aged 50 years and over with COPD who access a virtual care service were invited to participate in an exercise program designed to improve balance and strength and reduce fall risk.

Results: Thirteen people enrolled in the pilot program (mean age 72 ± SD 7 years, 9 females). Six participants (46%) reported having one or more falls in the 12-months prior to the study. A mixed model for repeated measures and Bonferroni correction for post hoc pairwise comparisons showed significant improvement in the Short Physical Performance Battery (SPPB) score between baseline and 6-months, effect size of 2.01; 95% CI [0.45–3.58], and between 3-months and 6-months, effect size of 1.65; 95% CI [0.48 to 2.81]. The alternate step test improved by more than 3 seconds between baseline and 3-months, effect size of −3.30; 95% CI [−5.94 to −0.66] and improved by 4 seconds between baseline and 6-months, effect size of −4.01; 95% CI [−7.42 to −0.61]. There was no significant difference in fear of falling between between baseline, 3 months or 6 months. The program had a high level of acceptability, with all participants intending to continue to do the exercises and 10/12 (83%) participants stating that they would recommend the program to other people with COPD. The program was feasible to implement, with 12/13 participants remaining in the program and attending exercise sessions.

Conclusion: On average, participants completed the exercises twice per week rather than the recommended 3 times per week. Despite this, the home-based exercise program improved strength and balance, as measured by the SPPB. The program was acceptable to participants and feasible to implement and has the potential to reduce the risk of falls in older people with COPD.

Keywords: accidental falls, exercise, chronic obstructive pulmonary disease, balance training, resistance training

Introduction

Chronic obstructive pulmonary disease (COPD) is the collective term for a number of lung diseases that interfere with normal breathing.[1] Symptoms include breathlessness, wheezing, coughing, fatigue and increased susceptibility to chest infections.[2] In 2019 COPD was the third most common cause of death globally.[3] It is estimated that the global prevalence of COPD is 10.3%, this is expected to rise due to ageing of the world's population in high-income countries and increasing smoking prevalence in low- and middle-income countries.[4] In Australia, COPD is the leading cause of avoidable hospital admissions.[5] Almost all people with COPD in 2022 in Australia (87%) had two or more chronic conditions.[6]

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Dyspnoea is the most common symptom of COPD.[7] People with COPD often have a sedentary lifestyle, as many avoid exercising to decrease their breathlessness, which results in reduced fitness and even more breathlessness on exertion.[2] People with COPD have an increased frequency of hospitalisations, which increase as the disease progresses, and an increased length of stay in hospital.[5] They also have an increased rate of co-morbidities, including heart problems, osteoporosis (due to steroid use), chest infections, anxiety and depression.[2] Falls and frailty are also commonly associated with COPD.[8,9] Frailty prevalence has been shown to be higher in people with COPD.[10] Frailty may also identify people with COPD who are at a higher risk of mortality[10] and frailty can reduce mobility and daily functioning, particularly with worsening disease.[11]

Falls in older people are a major health issue. A fall is defined as 'an unexpected event in which the participant comes to rest on the ground, floor or lower level'.[12] Approximately 30% of adults aged 65 years and over will fall each year.[13] The number of falls and fall-related injuries are likely to continue to increase, in part due to increases in the number of older people but also due to increasing morbidity and frailty.[14]

Older adults with COPD are at a higher risk of falls than their healthier peers, due to poorer balance, reduced muscle strength and exercise capacity.[9,15,16] A prospective cohort study has found the fall prevalence to be 40% in people with COPD.[17] COPD guidelines recommend regular physical activity, mainly cardiovascular exercise in the form of walking, but have also recently changed to include muscle strengthening exercises twice a week, as well as noting balance exercises would be beneficial.[18]

A Cochrane systematic review and meta-analysis[19] found strong evidence that exercise programs can reduce the rate of falls in older people. The most effective exercise programs are those that focus mainly on balance and strength training.[19] The World Falls Guidelines recommend exercise programs for fall prevention among older adults living in the community, and these programs should include balance-challenging and functional exercises. The programs should be conducted three times a week or more, tailored to the individual, and progressively increased in intensity over at least 12 weeks. For enhanced effectiveness, these programs should be continued beyond the initial 12-week period.[20] Home-based exercise programs can reduce falls and may be suitable for people living in the community with COPD who are unable to access face-to-face programs.[21,22] Travel to a face-to-face program can be physically demanding for people with COPD, due to breathlessness and fatigue and the need for use of supplemental oxygen.[23]

The Illawarra Shoalhaven Local Health District of New South Wales (NSW), Australia, has a Virtually enhanced Community Care (VeCC) service. VeCC is a multidisciplinary service designed to support patients to manage their health conditions while remaining in the community and reducing potentially preventable hospital admissions. VeCC provides a combination of face-to-face and virtual care services including remote monitoring and care coordination, which is particularly beneficial for patients with chronic conditions such as COPD and heart failure.

As part of the VeCC Chronic Disease Management Service, patients are equipped with devices to monitor oxygen levels, blood pressure, blood glucose levels and temperature. This remote monitoring allows clinicians to assess patients' conditions in real-time, providing timely interventions when needed. The service aims to support patients in managing their conditions effectively at home, reducing the need for hospital visits and improving overall health outcomes.

The BEST at Home exercise program was recently evaluated for its effect on falls, balance, strength and fear of falling in a randomized controlled trial (RCT) in people aged 65 years and over living in the community.[24] The exercise program was based on the Otago Exercise Programme,[21,25] but with the instruction provided in small group workshops rather than individual home visits.[26] The BEST at Home RCT was conducted in the Illawarra and Shoalhaven areas in New South Wales, Australia with a healthy community cohort and there was a significant improvement in gait speed and reduction in fear of falling in the intervention group. The BEST at Home program also had a high level of acceptability with many participants stating that they would continue the exercise program and would recommend the program to others.[24] This healthy community cohort did not demonstrate a reduction in falls; however this may have been because the participants self-selected to enroll in the trial and their baseline level of physical function was too high to show benefits in terms of fall prevention. Therefore, the BEST at Home program was adapted for people with COPD, as they are a clinical population identified to be at a higher risk of falls due to reduced exercise capacity, muscle strength and poor balance.

Our pilot study aimed:

1. to determine the effects of the BEST at Home program on balance, strength and fear of falling in people with COPD who were enrolled in a virtual care program, and
2. to understand the acceptability and feasibility of incorporating a home-based balance and strength exercise program (BEST at Home) into a virtual care program for people with COPD.

We hypothesized that participant strength and balance would increase and fear of falling would decrease after taking part in the home-based exercise program.

Materials and Methods

Study Design

The design was a six-month before and after study, and participants were provided with the BEST at Home exercise program. Participants were assessed at baseline (week 1), three months and six months. The University of Wollongong and Illawarra Shoalhaven Local Health District Human Research Ethics Committee (2022/ETH01335) approved this study. The study reporting is in accordance with the Consolidated Standards of Reporting (CONSORT).[27] The trial was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12622001102763) on 10/08/2022 prior to commencement.

Eligibility/Recruitment/Participants

Participants were community-dwelling adults aged 50 years and over with a diagnosis of COPD who were enrolled in the Chronic Disease Management Service of VeCC in the Illawarra Shoalhaven Local Health District, no spirometry FEV1/FVC cutoffs were used. Participants in the Chronic Disease Management Service are provided with all equipment required to monitor their health, such as a pulse oximeter and tablet computer. Participants were recruited via a pop-up question on their virtual care tablet asking if they wanted to participate in a study to improve their balance and strength. If they selected yes, they were contacted by a pulmonary physiotherapist involved in the research.

Participants were screened for eligibility over the telephone. Participants were considered ineligible if they had any of the following: insufficient English language proficiency to read and comprehend program materials; a progressive neurological disease (eg Parkinson's disease, multiple sclerosis); joint replacement or fracture within the last six months; a medical condition precluding exercise (eg unstable cardiac disease, uncontrolled hypertension, uncontrolled metabolic diseases) or unable to obtain medical clearance to participate in exercise (as determined by their General Practitioner). Neurological conditions were excluded due to their higher risk of falls independent of COPD.[28]

Intervention

Participants were provided with a home-based exercise program that aimed to improve balance and strength in the lower body. The program was based on the Otago Exercise Programme[21,25] and included 13 balance and strength exercises, including tandem stand, tandem walk, sideways walking, backwards walking, hip abduction, knee extension and knee flexion, calf raises, semi squats, sit to stand, one leg stand and stair walking. Participants were instructed to perform 10–20 repetitions of the prescribed exercises at home three times per week. Participants were given ankle cuff weights (0.5kg – 3kg), with the weight determined by the physiotherapist at their first session and based on the participant's current functional ability. Participants also received an exercise manual containing diagrams and descriptions of the exercises and a copy of 'Staying Active and On Your Feet', a booklet about preventing falls.[29]

The exercise instruction was delivered face-to-face, in small group workshops at baseline and three months by a physiotherapist experienced in pulmonary rehabilitation and musculoskeletal conditions. The workshops were run in local community health centres or community venues and included approximately three participants per workshop. Exercise instruction workshops occurred at weeks 1 and 13 and were one hour in duration. Participants were advised to practice the exercises at home three times a week for 6 months. The program was tailored to each participant's level of

Table 1 Intervention Description Using the Template for Intervention Description and Replication (TIDieR) Checklist

Checklist item	
1. Brief name	Balance Exercise Strength Training (BEST) at Home (COPD)
2. Why	More than 25% of people aged 65 years and over fall at least once each year. Older adults with chronic obstructive pulmonary disease (COPD) have a higher rate of falls than healthy peers. Balance and strength training has been shown to reduce the risk of falling in older people.
3. What materials	Participants received: an exercise program designed to improve balance and strength in the lower limbs (including exercise instruction, printed manual and ankle weights), a booklet on preventing falls titled 'Staying active and on your feet'
4. What procedures	Participants received two group-based exercise instruction sessions, three video calls and three measurement sessions.
5. Who provided	Physiotherapists delivered the exercise instruction. Physiotherapists and trained research assistants conducted the measurements.
6. How	The exercise instruction was delivered face-to-face in small groups of approximately of 3 participants.
7. Where	In the community of the Illawarra and Shoalhaven regions, NSW, Australia.
8. When and how much	Exercise instruction sessions were held in weeks 1 and 13 (1 hour duration). Participants were asked to perform the exercises three times per week for 6 months. The first measurement session occurred at baseline before the participant was instructed in the exercises. The second and third measurement sessions were held at 3 months and 6 months. Video calls occurred at weeks 2, 4 and 8.
9. Tailoring	Exercises were individually tailored by the physiotherapist for each participant.
10. Modifications	No modifications were made.
11. How well (planned)	Adherence to the exercise program was assessed by self-reported exercise sessions, which were marked on calendars (and returned monthly)
12. How well (actual)	Participants were asked to perform the exercises 3 times per week. Participants completed an average of 55 sessions over the 6-month period (just over twice per week).

ability. At each workshop, the physiotherapist reviewed the exercises, corrected techniques, and adjusted or progressed the exercises based on each participant's capabilities. Participants were provided with additional ankle cuff weights as required. Participants were taught how to gradually increase the difficulty of each exercise and were encouraged to make the balance exercises more challenging as they progressed through the program (see Table 1 TIDieR checklist).

The physiotherapist conducted follow-up video calls with participants at weeks 2, 4 and 8 via the tablet provided to the participant by VeCC. During these video calls the physiotherapist checked if the participant was completing the exercises, monitored the exercise technique and asked if they were having any issues with the exercises and their COPD. The physiotherapist also answered any questions asked by the participant. Participants were also able to contact the physiotherapist if they had any questions in between their scheduled video calls.

Outcome Measures

Quantitative/Physical Measures

Outcome measures were completed at baseline, three, and six months, and included balance, strength, gait speed and fear of falling. There were two primary outcomes, lower limb function, assessed with the Short Physical Performance Battery (SPPB)[30–33] and fear of falling, assessed with the short version of the Falls Efficacy Scale-International (FES-I).[34,35]

There were several secondary outcomes. Lower limb strength and balance were assessed with the sit to stand, standing balance, four meter walk,[30] the alternate step test[36] and a knee extension (quadriceps) strength test.[37] The assessments of strength and balance were conducted by physiotherapists and trained research assistants.

Falls were self-recorded with monthly calendars for a 6-month period, commencing from their first workshop. A fall was defined as 'an unexpected event in which the participant comes to rest on the ground, floor, or lower level'.[12] Calendars were returned in reply paid, pre-addressed envelopes. If calendars were not returned, participants were telephoned and asked if they had any falls for that month. Participants who reported a fall on their calendar were telephoned to confirm the fall and obtain details about fall location, any injuries and if treatment was sought.

Qualitative/Process Measures

Questionnaires were self-completed during sessions at baseline, 3 months and 6 months. The baseline questionnaire included questions about demographic details, comorbidities, prescription medications, falls in the past 12 months, fear of falling (short FES-I), and self-rated balance perception. In order to measure program adherence, participants were asked to record on their calendars the days that they completed the exercises each month. Acceptability and feasibility were also assessed by questions at 3 months and 6 months.

Participant acceptability of the program was assessed by:

- whether participants would recommend participation in the program to other people with COPD, and
- whether participants intended to continue to do the exercises.

The feasibility of implementation was assessed by:

- the retention of participants in the program, assessed by the number of participants who withdrew consent or participation, and
- overall exercise adherence and attendance data at exercise sessions

Statistical Analysis

Baseline characteristics were summarised either by central tendency (mean) and dispersion (standard deviation) or frequency and percentage. Primary and secondary quantitative outcomes captured at baseline, 3-months and 6-months were assessed for changes over time. All outcomes were assessed for the assumption for sphericity in repeated measures analysis of variance using Mauchly's test, prior to conducting a one-way repeated measures ANOVA. In the event of a violation of this assumption and missing values, a mixed linear model for repeated measures using restricted maximum likelihood estimation was conducted for all outcomes. A first-order autoregressive within-subject residual was applied to account for within-subject correlation. The effect of time was assessed for all outcomes, where a significant time effect was apparent, a comparison of baseline with each 3- and 6-month visit, and 3-month versus 6-month was made. To adjust for post-hoc multiple comparison testing, the Bonferroni correction was applied. StataCorp. 2024. Stata Statistical Software: Release 18.5 College Station, TX: StataCorp LLC was used for all statistical analysis and the statistical significance level was at $\alpha = 0.05$.

Results

Participants

Baseline Characteristics

Recruitment occurred between during September and October 2022. A total of 96 clients from VeCC were asked via a question on their tablet if they would like to participate in a research study aiming to improve strength and balance in people with COPD. Twenty people declined participation; 41 people did not respond to the question and 1 person was discharged from the service. A total of 34 people expressed interest in the program and were screened for eligibility, 2 were excluded due to Parkinson's Disease, 1 was unable to obtain medical clearance from their GP, 18 failed to return their consent form and this was deemed as declining to participate, and 13 enrolled in the study.

The mean age was 72 years (±SD 7), 69% (9/13) were female. Six participants (46%) reported having one or more falls in the 12 months prior to the study. The baseline characteristics of participants is presented in Table 2. The flow of participants through the study is shown in Figure 1.

Table 2 Characteristics of Participants at Baseline

Characteristics	All (n=13)
Age (years), mean (SD)	72 (7)
Female: n (%)	9 (69)
Fallen in the past 12 months: n (%)	6 (46)
Self-rated balance fair/poor: n (%)	6 (46)
Self-rated fear of falling ≥ moderate: n (%)	2 (15)
Total medications (n), mean (SD)	8.1 (4)
Medical conditions (0–17)[a], mean (SD)	6.8 (3)
Arthritis: n (%)	6 (46)
Osteoporosis: n (%)	4 (31)
Depression: n (%)	6 (46)
Anxiety: n (%)	5 (39)
Diabetes: n (%)	5 (39)
Short FES-I, mean (SD)	12.7 (5)
Previously completed a Pulmonary Rehabilitation Program: n (%)	6 (46)

Notes: [a]Possible medical conditions included: arthritis, osteoporosis, asthma, chronic obstructive pulmonary disease, angina, heart disease, heart attack, neurological disease, stroke/transient ischaemic attack, peripheral vascular disease, diabetes mellitus, upper gastrointestinal disease, depression, anxiety/panic disorder, visual impairment, hearing impairment, degenerative disc disease.
Abbreviation: FES-I, Falls Efficacy Scale-International.

Quantitative/Physical Measures

The assumption of sphericity was violated for the primary outcome SPPB, and secondary outcomes: sit to stand and knee extension. The assumption held for the four-metre walk, standing balance, the alternative step test and the short FES-I. All physical measures trended in the direction of participant improvement, with significant findings for the SPPB and the alternate step test. The SPPB score increased by over 2 points from baseline to 6 months (mean difference of 2.01; 95% CI [0.45 to 3.58]) and increased by 1.65 points from 3 to 6 months (mean difference of 1.65; 95% CI [0.48 to 2.81]). The alternate step test improved by more than 3 seconds from baseline to 3 months (mean difference of −3.30; 95% CI [−5.94 to −0.66]) and improved by 4 seconds from baseline to 6 months (mean difference of −4.01; 95% CI [−7.42 to −0.61]). See Table 3. There was no evidence of a significant difference in fear of falling between between baseline, 3 months or 6 months. During the 6-month study period two falls were reported by two participants. One fall resulted in a fracture and the other fall resulted in no injury.

Adherence

All (100%) participants attended the week 1 session. Twelve participants (12/13, 92%) attended both the three-month and six-month sessions. There was a high level of adherence for the video calls that were performed at weeks 2, 4 and 8. Participants reported completing the exercise sessions just over twice per week with an average of 55 (SD 19, range 15–79) exercise sessions over the 6-month period, as determined by the exercise sessions recorded on the monthly calendars.

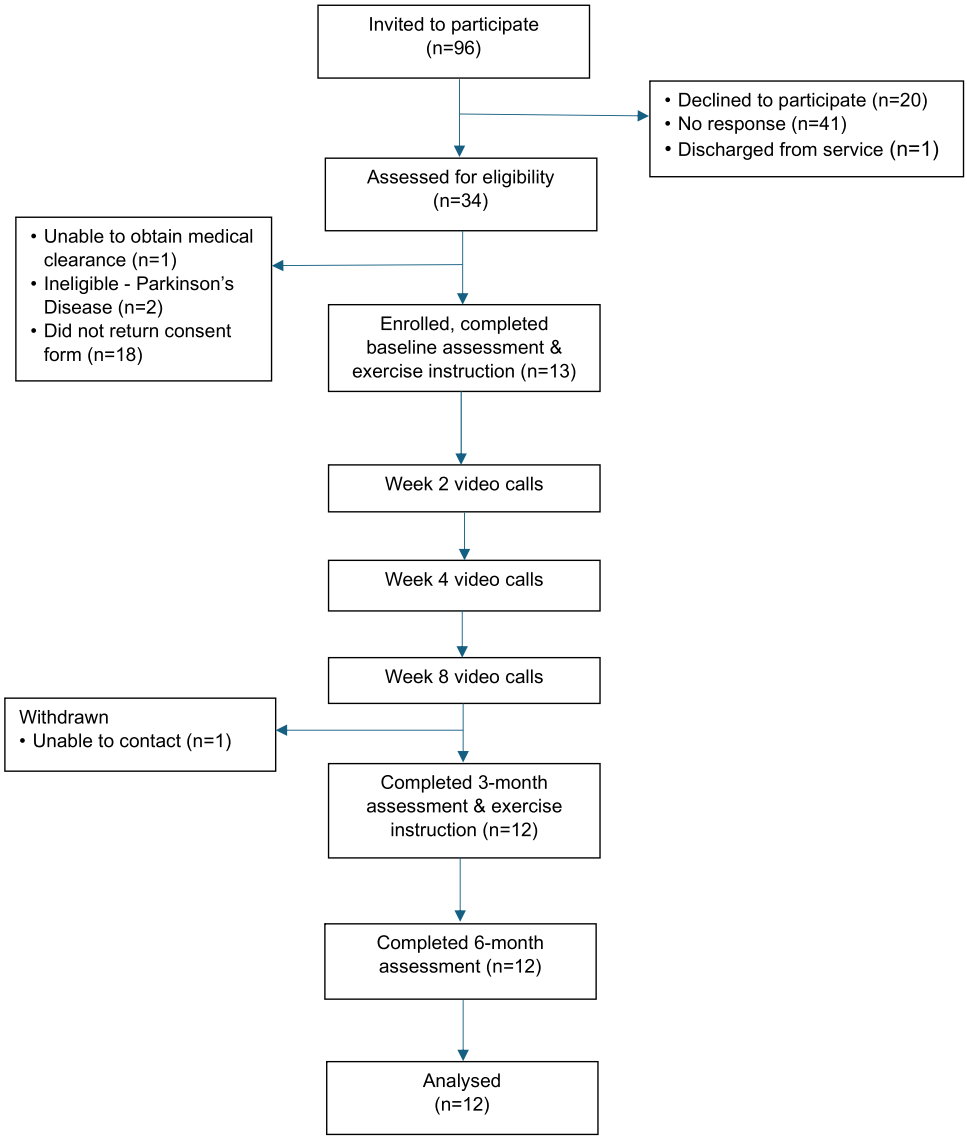

Figure 1 Design and flow of participants through the trial.

Process Measures

Acceptability Questions

Participants completed questions on their thoughts of the intervention at 3 and 6 months. Twelve participants completed the 3-month questionnaire. At 3 months, 12 out of 12 (100%) participants felt that the face-to-face exercise instruction session gave them enough information to do the exercises at home. Most participants (11/12, 92%) felt confident doing the exercises at home and felt the video calls helped with performing the exercises. Participants were asked what additional support they would have liked throughout the program. The top responses, reported by 6/12 (50%) participants were text message reminders to exercise and more information on COPD and exercise.

Twelve participants completed the 6-month questionnaire. Participants reported on features they liked about the BEST at Home – COPD program at 6 months. The most reported positive features were that the exercises could be completed at home (n=12/12, 100%), the exercises could be done anytime (n=12/12, 100%) and that the staff are helpful (n=12/12, 100%). At 6 months, 6 out of 12 (50%) participants reported that they had difficulty completing the exercises regularly, with the most common reasons being: injury (n=4/6, 67%), ill health (n=3/6, 50%) and lack of motivation (n=2/6, 33%). At 6 months, the mean rating of perceived program benefit on strength and balance was 8.1 out of 10. All participants

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Table 3 Intervention Effects of Primary and Secondary Outcomes

Variable	Baseline	3-Month	6-Month	3-Month Minus Baseline	6-Month Minus Baseline	6-Month Minus 3-Month
	Mean (SD)			Mean Difference (95% CI)^		
SPPB (0–12)[a]	8.5 (3.8) n=13	9.1 (3.2) n=12	10.6 (2.5) n=11	0.37 [−0.75 to 1.49]	2.01 [0.45 to 3.58]*	1.65 [0.48 to 2.81]*
Falls Efficacy Scale-International (7–28)[b]	12.7 (4.6) n=13	13.2 (4.4) n=12	12.5 (4.0) n=12	0.91 [−1.39 to 3.21]	0.11 [−2.88 to 3.11]	−0.79 [−3.10 to 1.51]
Sit to stand (sec)[b]	19.8 (10.8) n=13	14.1 (6.6) n=11	14.0 (8.0) n=11	−4.11 [−8.62 to 0.40]	−5.50 [−11.4 to 0.44]	−1.39 [−6.10 to 3.31]
Alternate step test (sec)[b]	13.8 (5.8) n=13	10.2 (3.7) n=12	9.7 (2.1) n=11	−3.30 [−5.94 to −0.66]*	−4.01 [−7.42 to −0.61]*	−0.71 [−3.46 to 2.04]
Gait speed, time to walk 4m (sec)[b]	4.3 (1.0) n=13	3.9 (1.8) n=12	3.7 (1.2) n=11	−0.29 [−1.03 to 0.45]	−0.59 [−1.56 to 0.37]	−0.30 [−1.07 to 0.47]
Knee extension strength, average of left and right legs, kg[a]	15.9 (8.9) n=13	16.8 (8.5) n=12	16.6 (7.1) n=11	0.85 [−3.48 to 5.19]	1.03 [−4.72 to 6.78]	0.18 [−4.33 to 4.69]
Standing balance, sum of feet together, semi-tandem, tandem times, sec, 0–30[a]	26.6 (4.7) n=13	28.4 (2.8) n=12	29.3 (2.4) n=11	1.62 [−1.18 to 4.41]	2.63 [−0.66 to 5.93]	1.02 [−1.90 to 3.93]

Notes: [a]Higher scores reflect better performance. [b]Lower scores reflect better performance. *Significant at alpha=0.05; ^Effect differences using mixed model for repeated measures.

Abbreviations: SPPB, Short Physical Performance Battery; CI, confidence interval.

(n=12/12, 100%) intended to continue performing the exercises, and 10 out of 12 (83%) would recommend the exercise program to other people with COPD.

There were no adverse events reported throughout the study.

Discussion

This pilot study found a significant improvement in lower limb function (including balance, lower limb strength and mobility) after completion of the BEST at Home exercise program. All other physical measures trended in the direction of participant improvement. There was no intervention effect on fear of falling.

Participants reported a high level of acceptability of the program, with all participants indicating that they intended to continue the exercises and 83% would recommend the exercise program to other people with COPD. All participants reported that they liked that the exercises could be completed at home, and they could be done anytime. Half of the participants reported barriers to completing the exercises on a regular basis. The most reported barriers were injury, ill health, and lack of motivation. As suggested by participants, the program could be revised to include text messages and more information on exercise and COPD. These findings show opportunities for refinement of the program.

This exercise program appears to be feasible in terms of retention of participants in the program and attendance at exercise sessions. It was encouraging to see a high retention rate, with most participants remaining in the program and attending the follow-up sessions. The overall adherence to the exercise program was lower than the 3 times per week prescribed. On average participants completed the exercise program just over twice per week for the 6 month duration of the pilot, which may not have been a high enough dose of exercise to prevent falls.[38]

One participant was lost to follow up and had reported personal family issues prior to discontinuing. Anecdotal evidence from participants was that they did not always feel well enough to exercise and some participants had extended hospital stays during the pilot. Given the high rates of comorbidity in people with COPD[6] and high rates of hospital admission,[5] it is important to maintain contact with participants to encourage them to resume exercise again at a suitable level after any break.

Qualitative research has identified unpredictable disruptions to participation in programs for people with COPD. The causes of these disruptions included illness (eg exacerbation of their COPD or worsening co-existing condition), health care appointments and other conflicting priorities.[23] Service provider flexibility to overcome these challenges are

important if people are going to continue or re-establish participation in an exercise program after an interruption. Attendance at pulmonary rehabilitation programs is relatively low,[39,40] and home exercise programs may provide greater flexibility in terms of attendance/participation for people with COPD.

Only two falls were reported during the 6-month study period, which is much lower than the 13 falls (from 6 participants) reported in the 12 months prior to the baseline questionnaire. There appeared to be fewer falls experienced during the intervention period, but this would need to be confirmed with more robust methods, including a comparison control group and longer follow-up period.

We acknowledge that there was no impact on fear of falling as measured by the short FES-I. The mean score for the short FES-I was in the moderate range (FES-I: 9–13) for all time points.[35] This is in contrast to other research that has found an increased level of fear of falling in people with COPD[41] and a significant reduction in fear of falling following a pulmonary rehabilitation program.[42] This may have been the result of our small sample size in this pilot and should be explored further.

Limitations of this pilot include having no control group in a small single group study. Given the small study size there was no power to adjust for baseline differences and account for regression to the mean (RTM). However, results from baseline to month 3 are comparable which suggests any RTM effect is small or negligible. Recruitment into the study was lower than anticipated and we did not reach our target sample size of 50 participants. Due to ethics requirements, the staff from VeCC were unable to encourage patients to participate in the study. In real-world implementation, staff would be talking to their patients about the exercises and their importance in managing their health condition/s. Participants self-selected to participate, and this may have resulted in a more motivated subset. A spike in Covid cases around the time of recruitment may have also made this population hesitant to enroll in a new program that involved some face-to-face sessions. The data for falls were self-reported by participants, however all participants who reported a fall were followed up by the research team to determine the circumstances of the fall. There was also a sub-optimal level of adherence to the program, as self-reported by participants, with participants not reaching the recommended dose of three sessions per week to prevent falls. However, due to reduced muscle strength and deconditioning in people with COPD, performing the exercises twice per week in this program was enough to show an increase in balance and strength.

This challenge in recruiting participants with COPD may be related to anxiety around breathlessness and exercise. It has been noted that patients with COPD experience worse psychological health than people with other chronic health conditions,[2] which may impact their motivation to enroll in exercise programs or research. Chronic illness and poor psychological health have been associated with lower adherence to exercise,[43] which was noted in this pilot, therefore patients may require additional encouragement and support to participate in an exercise program. Some of this additional support could be provided in the form of text message reminders and more information on exercise and COPD, as identified by participants in this program.

To avoid this apprehension of enrolling in an exercise program for COPD, a program such as this could be incorporated into standard care provided in virtual care programs for people with COPD. Participants may feel more comfortable working with staff who are already involved in their care and understand their current health status. Staff would be able to provide additional support and reassurance to patients in relation to the exercises.

Conclusion

This home-based exercise program appears to be acceptable to participants and has the potential to increase strength, balance and mobility in older people with COPD. While improvements were observed, adherence levels did not reach the recommendations for fall prevention. Adherence to the program could be addressed with additional behavior change strategies, and support and flexibility from service providers. A larger scale randomized controlled trial should be designed to confirm the present findings and provide evidence for the benefit of balance and strength training in people with COPD accessing virtual care.

Clinical Trial Registration

The trial was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12622001102763) on 10/08/2022 prior to commencement.

Data Sharing Statement

The data that support the findings of this study are available on request from the corresponding author.

Ethics Approval

The University of Wollongong and Illawarra Shoalhaven Local Health District Human Research Ethics Committee (2022/ETH01335) approved this study. All participants gave written informed consent before data collection began. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether in the conception, study design, execution, data collection, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article. All authors reviewed the article before submission and have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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