The Efficacy of 12-week Progressive Home-Based Strength and Tai-Chi Exercise Snacking in Older Adults: A Mixed-Method Exploratory Randomised Control Trial

* detailed results

Supplementary file A

# Supplementary file A1 - Baseline characteristics comparisons

Table S1. Baseline characteristics for completing vs. withdrawing participants

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Completers vs Withdrawers** | | |
|  | **Completers N=64** | **Withdrawers N=26** | ***P* value** |
| **Female, n (%)** | 47(73) | 17(65) | .445 |
| **Age,** **mean ± SD** | 73.9±5.4 | 74.65±5.8 | .249 |
| **Height (cm),** **mean ± SD** | 167.3±9.8 | 168.6±6.5 | .266 |
| **Weight (kg), mean ± SD** | 74.7±15.5 | 73.7±11.8 | .295 |
| **Living alone, n (%)** | 20(31) | 10(38) | .511 |
| **Marital status, n (%)** |  |  | .965 |
| Married/ civil part. | 41(64) | 15(58) |  |
| Divorced/Separated | 10(16) | 5(19) |  |
| Widowed | 5(8) | 3(12) |  |
| Single | 5(8) | 2(7) |  |
| Cohabiting | 3(4) | 1(4) |  |
| **Employment, n (%)** |  |  | .577 |
| Retired | 59(92) | 23(88) |  |
| Doing unpaid work | 1(2) | 0(0) |  |
| Employed part-time | 4(6) | 3(12) |  |
| **Educational status, n (%)** |  |  | .378 |
| Secondary Education | 7(11) | 3(12) |  |
| Post-Secondary | 6(9) | 7(26) |  |
| Vocational Qualification | 12(19) | 3(12) |  |
| Undergraduate Degree | 25(39) | 7(26) |  |
| Post-graduate Degree | 12(19) | 5(19) |  |
| Doctorate (PhD) | 2(3) | 1(4) |  |
| **Physical function, mean (SD)** |  |  |  |
| SPPB S&B items (score /8) | 5.25(0.80) | 5.19(0.94) | .253 |
| SPPB strength (score /4) | 2.00(0.87) | 2.04(0.92) | .379 |
| 5 reps sit-to-stand speed (s) | 16.61(5.98) | 16.03(4.91) | .856 |
| SPPB balance (score) | 3.25(0.50) | 3.15(0.54) | .657 |
| 60-s sit-to-stand (N reps) | 21.06(6.70) | 22.31(9.19) | .161 |
| Right leg standing balance (s) | 24.90(22.39) | 27.39(23.31) | .626 |
| Left leg standing balance (s) | 25.67(21.60) | 25.24(21.07) | .656 |
| Differences between groups were analysed using Chi-square tests and unpaired t-tests. | | | |

# Supplementary file A2 – physical functional outcome measures

Table S2. The table shows the mean (SD) outcomes conducted remotely for all participants at each timepoint.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome** | **Intervention group** | | | | **Control group** | | | |
|  | **Week 0** | **Week 4** | **Week 8** | **Week 12** | **Week 0** | **Week 4** | **Week 8** | **Week 12** |
| **Physical function, n** | **44** | **30** | **28** | **28** | **46** | **39** | **36** | **36** |
| SPPB S&B items (score /8) | 5.24(0.9) | 7.42(1.2) | 6.83(1.3) | 7.02(1.1) | 5.31(0.8) | 5.68(0.9) | 5.47(0.9) | 5.60(1.0) |
| SPPB strength (score /4) | 2.08(1.0) | 3.52(1.1) | 3.10(1.2) | 3.24(1.0) | 2.03(0.8) | 2.48(0.9) | 2.30(0.8) | 2.45(0.8) |
| 5 reps sit-to-stand time (s) | 16.72(6.8) | 9.77(4.2) | 11.79(4.2) | 11.05(3.4) | 16.01(4.4) | 14.09(4.3) | 15.14(3.7) | 14.39(3.5) |
| SPPB balance (score) | 3.16(0.5) | 3.91(0.5) | 3.73(0.5) | 3.80(0.3) | 3.28(0.5) | 3.20(0.6) | 3.17(0.6) | 3.15(0.6) |
| 60-s sit-to-stand (N reps) | 22.6(7.9) | 31.9(8.5) | 27.6(10.6) | 29.7(10.0) | 21.7(7.1) | 25.4(7.4) | 24.0(7.0) | 24.9(6.7) |
| Right leg standing balance (s) | 28.1(22.4) | 38.0(21.7) | 33.1(22.5) | 32.9(22.7) | 23.7(22.7) | 27.2(21.6) | 25.8(21.7) | 26.4(21.9) |
| Left leg standing balance (s) | 30.5(21.9) | 35.3(22.0) | 37.4(22.3) | 35.4(23.1) | 21.6(20.0) | 22.7(18.2) | 20.1(19.7) | 24.6(20.2) |
| **Physical activity, n** | **44** | **30** | **28** | **27** | **46** | **39** | **36** | **36** |
| IPAQ score (MET-mins·week-1) | 2161(1839) | 2402(3005) | 2784(3092) | 2749(2575) | 2441(2162) | 2894(1557) | 2327(1555) | 2068(1817) |
| MVPA time (min·day-1) | 73.5(65.5) | 89.5(63.1) | 83.3(74.6) | 79.3(112.7) | 80.2(89.1) | 83.7(52.7) | 72.2(72.1) | 68.8(76.1) |
| Sedentary time (min·day-1) | 460(185.9) | 404(195.3) | 430(206.5) | 454(172.7) | 430(202.8) | 383(125.7) | 389(163.2) | 413(146.9) |
| Walking Time (min·day-1) | 60.8(48.7) | 61.1(87.6) | 78.0(89.8) | 76.3(56.8) | 56.5(34.5) | 80.0(38.9) | 55.9(36.7) | 57.2(62.9) |
| IADL (score) | 7.91(0.3) | 7.85(0.4) | 7.87(0.6) | 7.82(0.6) | 7.95(0.1) | 7.87(0.3) | 7.90(0.4) | 7.87(0.3) |
| **Exercise Cognitions, n** | **44** | **30** | **28** | **27** | **46** | **39** | **36** | **36** |
| Barrier self-efficacy | 61.4(19.6) | 50.1(21.4) | 49.7(21.5) | 52.2(22.4) | 57.3(21.8) | 52.3(21.6) | 53.7(21.5) | 52.8(21.4) |
| Competence | 19.9(5.7) | 18.3(5.8) | 18.1(6.0) | 18.8(6.6) | 19.9(5.6) | 18.1(5.7) | 17.9(5.6) | 17.5(5.5) |
| Habit strength | 32.6(19.0) | 37.4(20.7) | 34.0(22.3) | 35.3(21.6) | 30.4(17.7) | 31.9(17.3) | 30.7(21.6) | 32.3(19.8) |
| Outcome expectancies | 59.1(7.1) | 57.1(10.1) | 57.0(6.4) | 57.2(10.0) | 59.1(4.8) | 57.1(5.9) | 57.0(5.6) | 55.6(5.4) |
| Behaviour regulation | 34.4(27.8) | 35.5(24.8) | 30.4(28.2) | 33.7(26.6) | 30.8(26.8) | 26.2(24.8) | 29.6(29.3) | 28.4(27.5) |
| **Health and Wellbeing, n** | **44** | **30** | **28** | **27** | **46** | **39** | **36** | **36** |
| Vitality | 28.3(7.2) | 27.9(7.4) | 28.2(8.0) | 27.6(8.2) | 27.7(7.0) | 27.2(7.6) | 26.3(8.3) | 27.1(8.3) |
| Wellbeing (WEMWBS) | 52.3(8.3) | 54.7(8.6) | 53.0(9.3) | 53.5(8.9) | 52.1(9.1) | 53.7(9.0) | 52.9(9.8) | 51.6(9.9) |
| Satisfaction with life | 24.6(6.8) | 23.9(7.0) | 24.5(7.1) | 25.7(7.4) | 23.8(7.6) | 23.5(7.5) | 23.8(6.8) | 23.8(7.9) |
| Quality of life (EuroQoL score) | 6.46(1.7) | 6.60(1.7) | 6.73(2.1) | 6.98(1.9) | 7.09(2.0) | 7.10(1.9) | 7.05(2.4) | 7.17(2.2) |
| EQ-5D-5L (EQ VAS) | 79.4(14.0) | 81.1(15.7) | 79.2(16.7) | 79.6(13.6) | 74.3(17.8) | 77.1(14.9) | 77.1(19.8) | 73.3(17.4) |
| Physical health (SF-36) | 79.6(19.9) | 81.9(19.6) | 78.9(23.8) | 80.7(16.4) | 77.0(18.2) | 76.6(19.5) | 79.1(18.2) | 76.5(19.7) |
| Mental health (SF-36) | 78.0(14.8) | 81.6(14.3) | 81.6(14.8) | 80.9(14.8) | 77.4(14.7) | 79.1(15.6) | 78.6(14.6) | 77.9(14.7) |

Table S3. mean (SD) outcome measures (adjusted for sex and age) for all participants at week 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Physical function, n** | **30** | **39** |  |  |  |
| SPPB S&B items (score /8) | 7.42(1.2) | 5.68(0.9) | 1.73 | 1.31 - 2.16 | **<.0001** |
| SPPB strength (score /4) | 3.52(1.1) | 2.48(0.9) | 1.05 | 0.64 - 1.45 | **<.0001** |
| 5 reps sit-to-stand time (s) | 9.77(4.2) | 14.09(4.3) | -4.32 | -6.27 - -2.37 | **<.0001** |
| SPPB balance (score) | 3.91(0.5) | 3.20(0.6) | 0.71 | 0.45 - 0.96 | **<.0001** |
| 60-s sit-to-stand (N reps) | 31.9(8.5) | 25.4(7.4) | 6.48 | 3.07 - 9.89 | **0.0003** |
| Right leg standing balance (s) | 38.0(21.7) | 27.2(21.6) | 10.81 | 1.83 - 19.8 | **0.0186** |
| Left leg standing balance (s) | 35.3(22.0) | 22.7(18.2) | 12.57 | 4.14 - 21.0 | **0.0037** |
| **Physical activity, n** | **30** | **39** |  |  |  |
| IPAQ score (MET-mins·week-1) | 2402(3005) | 2894(1557) | -492 | -1574 - 590 | 0.3712 |
| MVPA time (min·day-1) | 89.5(63.1) | 83.7(52.7) | 5.77 | -32.7 - 44.2 | 0.7679 |
| Sedentary time (min·day-1) | 404(195.3) | 383(125.7) | 21.5 | -63.1 - 106 | 0.6170 |
| Walking Time (min·day-1) | 61.1(87.6) | 80.0(38.9) | -18.84 | -47.48 - 9.8 | 0.1964 |
| IADL (score) | 7.85(0.4) | 7.87(0.3) | 0.02 | -0.17 - 0.14 | 0.8254 |
| **Exercise Cognitions, n** | **30** | **39** |  |  |  |
| Barrier self-efficacy | 50.1(21.4) | 52.3(21.6) | -2.19 | -12.27 - 7.88 | 0.6679 |
| Competence | 18.3(5.8) | 18.1(5.7) | 0.19 | -2.48 - 2.87 | 0.8859 |
| Habit strength | 37.4(20.7) | 31.9(17.3) | 5.51 | -3.15 - 14.2 | 0.2102 |
| Outcome expectancies | 57.1(10.1) | 57.1(5.9) | 1.72 | -1.61 - 5.04 | 0.3096 |
| Behaviour regulation | 35.5(24.8) | 26.2(24.8) | 9.31 | -2.39 - 21.0 | 0.1179 |
| **Health and Wellbeing, n** | **30** | **39** |  |  |  |
| Vitality | 27.9(7.4) | 27.2(7.6) | 0.78 | -2.55 - 4.11 | 0.6429 |
| Wellbeing (WEMWBS) | 54.7(8.6) | 53.7(9.0) | 1.02 | -3.04 - 5.07 | 0.6215 |
| Satisfaction with life | 23.9(7.0) | 23.5(7.5) | 0.39 | -2.87 - 3.65 | 0.8115 |
| Quality of life (EuroQoL score) | 6.60(1.7) | 7.10(1.9) | -0.51 | -1.43 - 0.42 | 0.2837 |
| EQ-5D-5L (EQ VAS) | 81.1(15.7) | 77.1(14.9) | 3.94 | -3.24 - 11.12 | 0.2800 |
| Physical health (SF-36) | 81.9(19.6) | 76.6(19.5) | 5.32 | -2.3 - 12.93 | 0.1693 |
| Mental health (SF-36) | 81.6(14.3) | 79.1(15.6) | 2.45 | -4.29 - 9.17 | 0.4740 |
| IPAQ data were processed, cleaned, and analysed in accordance with recommendations outlined in the “Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire” manual. IPAQ = International Physical Activity Questionnaire (short form); MET = metabolic equivalent of task; MVPA = moderate-to-vigorous intensity physical activity; IADL = the instrumental activities of daily living; WEMWBS = the Warwick-Edinburgh Mental Wellbeing Scales; EQ-5D-5L = the EuroQoL five-dimension, five- level questionnaire; SF-36 = Short Form Health Survey. | | | | | |

Table S4. mean (SD) outcome measures (adjusted for sex and age) for all participants at week 8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Physical function, n** | **28** | **36** |  |  |  |
| SPPB S&B items (score /8) | 6.83(1.3) | 5.47(0.9) | 1.36 | 0.95 - 1.77 | **<.0001** |
| SPPB strength (score /4) | 3.10(1.2) | 2.30(0.8) | 0.79 | 0.40 - 1.19 | **0.0001** |
| 5 reps sit-to-stand time (s) | 11.79(4.2) | 15.14(3.7) | -3.35 | -5.26 - -1.44 | **0.0007** |
| SPPB balance (score) | 3.73(0.5) | 3.17(0.6) | 0.57 | 0.32 - 0.82 | **<.0001** |
| 60-s sit-to-stand (N reps) | 27.6(10.6) | 24.0(7.0) | 3.56 | 0.19 - 6.92 | **0.0383** |
| Right leg standing balance (s) | 33.1(22.5) | 25.8(21.7) | 7.24 | -1.58 - 16.1 | 0.1067 |
| Left leg standing balance (s) | 37.4(22.3) | 20.1(19.7) | 17.25 | 8.97 - 25.5 | **0.0001** |
| **Physical activity** | **28** | **36** |  |  |  |
| IPAQ score (MET-mins·week-1) | 2784(3092) | 2327(1555) | 457 | -569 - 1482 | 0.3811 |
| MVPA time (min·day-1) | 83.3(74.6) | 72.2(72.1) | 11.08 | -25.3 - 47.4 | 0.5486 |
| Sedentary time (min·day-1) | 430(206.5) | 389(163.2) | 41.1 | -39.1 - 121 | 0.3135 |
| Walking Time (min·day-1) | 78.0(89.8) | 55.9(36.7) | 22.08 | -4.86 - 49.0 | 0.1078 |
| IADL (score) | 7.87(0.6) | 7.90(0.4) | 0.03 | -0.18 - 0.12 | 0.6905 |
| **Exercise Cognitions, n** | **28** | **36** |  |  |  |
| Barrier self-efficacy | 49.7(21.5) | 53.7(21.5) | -3.93 | -13.62 - 5.77 | 0.4248 |
| Competence | 18.1(6.0) | 17.9(5.6) | 0.19 | -2.40 - 2.78 | 0.8832 |
| Habit strength | 34.0(22.3) | 30.7(21.6) | 3.26 | -5.25 - 11.8 | 0.4500 |
| Outcome expectancies | 57.0(6.4) | 57.0(5.6) | -0.46 | -3.6 - 2.69 | 0.7755 |
| Behaviour regulation | 30.4(28.2) | 29.6(29.3) | 0.79 | -10.72/12.3 | 0.8913 |
| **Health and Wellbeing, n** | **28** | **36** |  |  |  |
| Vitality | 28.2(8.0) | 26.3(8.3) | 1.86 | -1.40 - 5.12 | 0.2611 |
| Wellbeing (WEMWBS) | 53.0(9.3) | 52.9(9.8) | 0.08 | -3.88 - 4.04 | 0.9684 |
| Satisfaction with life | 24.5(7.1) | 23.8(6.8) | 0.72 | -2.48 - 3.92 | 0.6582 |
| Quality of life (EuroQoL score) | 6.73(2.1) | 7.05(2.4) | -0.32 | -1.21 - 0.57 | 0.4776 |
| EQ-5D-5L (EQ VAS) | 79.2(16.7) | 77.1(19.8) | 2.09 | -4.91 - 9.09 | 0.5559 |
| Physical health (SF-36) | 78.9(23.8) | 79.1(18.2) | -0.15 | -7.62 - 7.32 | 0.9684 |
| Mental health (SF-36) | 81.6(14.8) | 78.6(14.6) | 2.96 | -3.57 - 9.50 | 0.3717 |
| IPAQ data were processed, cleaned, and analysed in accordance with recommendations outlined in the “Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire” manual. IPAQ = International Physical Activity Questionnaire (short form); MET = metabolic equivalent of task; MVPA = moderate-to-vigorous intensity physical activity; IADL = the instrumental activities of daily living; WEMWBS = the Warwick-Edinburgh Mental Wellbeing Scales; EQ-5D-5L = the EuroQoL five-dimension, five- level questionnaire; SF-36 = Short Form Health Survey. | | | | | |

Table S5. mean (SD) outcome measures (adjusted for sex and age) for all participants at week 12

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Physical function, n** | **28** | **36** |  |  |  |
| SPPB S&B items (score /8) | 7.02(1.1) | 5.60(1.0) | 1.42 | 1.00 - 1.85 | **<.0001** |
| SPPB strength (score /4) | 3.24(1.0) | 2.45(0.8) | 0.79 | 0.38 - 1.19 | **0.0002** |
| 5 reps sit-to-stand time (s) | 11.05(3.4) | 14.39(3.5) | -3.34 | -5.29 - -1.38 | **0.0009** |
| SPPB balance (score) | 3.80(0.3) | 3.15(0.6) | 0.65 | 0.39 - 0.91 | **<.0001** |
| 60-s sit-to-stand (N reps) | 29.7(10.0) | 24.9(6.7) | 4.77 | 1.36 - 8.18 | **0.0065** |
| Right leg standing balance (s) | 32.9(22.7) | 26.4(21.9) | 6.53 | -2.44 - 15.5 | 0.1523 |
| Left leg standing balance (s) | 35.4(23.1) | 24.6(20.2) | 10.81 | 2.39 - 19.2 | **0.0123** |
| **Physical activity, n** | **27** | **36** |  |  |  |
| IPAQ score (MET-mins·week-1) | 2749(2575) | 2068(1817) | 681 | -388 - 1750 | 0.2104 |
| MVPA time (min·day-1) | 79.3(112.7) | 68.8(76.1) | 10.46 | -27.3 - 48.3 | 0.5860 |
| Sedentary time (min·day-1) | 454(172.7) | 413(146.9) | 40.7 | -42.5 - 124 | 0.3363 |
| Walking Time (min·day-1) | 76.3(56.8) | 57.2(62.9) | 19.07 | -9.03 - 47.2 | 0.1825 |
| IADL (score) | 7.82(0.6) | 7.87(0.3) | 0.05 | -0.21 - 0.09 | 0.4859 |
| **Exercise Cognitions, n** | **27** | **36** |  |  |  |
| Barrier self-efficacy | 52.2(22.4) | 52.8(21.4) | -0.56 | -10.52 - 9.41 | 0.9125 |
| Competence | 18.8(6.6) | 17.5(5.5) | 1.33 | -1.32 - 3.98 | 0.3238 |
| Habit strength | 35.3(21.6) | 32.3(19.8) | 2.95 | -5.66 - 11.6 | 0.4988 |
| Outcome expectancies | 57.2(10.0) | 55.6(5.4) | 1.62 | -1.65 - 4.88 | 0.3305 |
| Behaviour regulation | 33.7(26.6) | 28.4(27.5) | 5.29 | -6.36 - 16.9 | 0.3706 |
| **Health and Wellbeing, n** | **27** | **36** |  |  |  |
| Vitality | 27.6(8.2) | 27.1(8.3) | 0.46 | -2.85 - 3.77 | 0.7825 |
| Wellbeing (WEMWBS) | 53.5(8.9) | 51.6(9.9) | 1.86 | -2.17 - 5.89 | 0.3624 |
| Satisfaction with life | 25.7(7.4) | 23.8(7.9) | 1.87 | -1.37 - 5.11 | 0.2553 |
| Quality of life (EuroQoL score) | 6.98(1.9) | 7.17(2.2) | -0.19 | -1.10 - 0.73 | 0.0855 |
| EQ-5D-5L (EQ VAS) | 79.6(13.6) | 73.3(17.4) | 6.25 | -0.88 - 13.39 | 0.6849 |
| Physical health (SF-36) | 80.7(16.4) | 76.5(19.7) | 4.19 | -3.38 - 11.76 | 0.2754 |
| Mental health (SF-36) | 80.9(14.8) | 77.9(14.7) | 2.97 | -3.70 - 9.64 | 0.3799 |
| IPAQ data were processed, cleaned, and analysed in accordance with recommendations outlined in the “Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire” manual. IPAQ = International Physical Activity Questionnaire (short form); MET = metabolic equivalent of task; MVPA = moderate-to-vigorous intensity physical activity; IADL = the instrumental activities of daily living; WEMWBS = the Warwick-Edinburgh Mental Wellbeing Scales; EQ-5D-5L = the EuroQoL five-dimension, five- level questionnaire; SF-36 = Short Form Health Survey. | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lab-based functional outcome** | **Intervention group** | | | | **Control group** | | | |
|  | **Week 0** | **Week 4** | **Week 8** | **Week 12** | **Week 0** | **Week 4** | **Week 8** | **Week 12** |
| **Lab-based physical function, n** | **27** | **22** | **21** | **21** | **22** | **20** | **19** | **19** |
| SPPB (score) | 7.7(0.7) | 10.2(1.4) | 10.7(1.6) | 11.2(1.2) | 7.8(0.6) | 8.0(2.3) | 8.8(1.0) | 8.9(1.0) |
| SPPB strength (score) | 1.7(0.5) | 2.8(1.1) | 3.1(1.3) | 3.4(1.0) | 1.7(0.5) | 2.2(1.0) | 2.5(0.8) | 2.5(0.7) |
| 5 reps sit-to-stand time (s) | 16.5(3.7) | 13.0(3.3) | 12.3(4.4) | 11.5(3.4) | 16.4(4.6) | 15.5(4.4) | 14.2(3.3) | 14.1(3.6) |
| SPPB balance (score) | 3.1(0.6) | 3.1(1.6) | 3.0(1.7) | 3.1(1.7) | 3.1(0.4) | 2.8(1.0) | 2.8(1.2) | 2.7(1.2) |
| SPPB gait speed (score) | 2.9(0.5) | 3.5(0.6) | 3.7(0.6) | 3.8(0.4) | 3.0(0.4) | 3.1(0.7) | 3.1(0.5) | 3.3(0.6) |
| SPPB 4-metre walk (s) | 5.3(0.8) | 4.7(0.8) | 4.5(0.7) | 4.2(0.8) | 5.4(0.7) | 5.3(0.9) | 5.4(0.7) | 5.1(0.8) |
| 60-s sit-to-stand (N reps) | 21.3(6.8) | 23.0(5.5) | 24.7(6.8) | 25.6(6.2) | 20.1(4.7) | 20.8(6.7) | 22.2(6.5) | 22.3(6.1) |
| Right leg standing balance (s) | 30.5(26.2) | 31.7(22.3) | 34.0(24.1) | 34.6(23.7) | 20.2(18.5) | 15.9(16.7) | 18.7(17.3) | 16.9(14.4) |
| Left leg standing balance (s) | 30.0(24.3) | 34.3(23.2) | 35.1(23.2) | 33.4(21.3) | 21.8(18.1) | 23.8(20.0) | 23.2(22.1) | 18.7(17.3) |
| Time-up-and-go (s) | 10.7(2.7) | 10.0(2.4) | 9.6(2.4) | 8.8(1.7) | 11.1(2.0) | 11.7(2.1) | 10.5(2.1) | 10.5(2.1) |
| Right leg chair sit-and-reach (cm) | -12.8(11.1) | -8.7(9.4) | -6.2(9.3) | -5.4(8.9) | -10.8(11.4) | -7.7(10.5) | -5.6(11.1) | -5.5(9.9) |
| Left leg chair sit-and-reach (cm) | -12.2(11.1) | -8.1(9.8) | -5.4(9.2) | -5.0(9.0) | -13.3(12.6) | -6.8(10.8) | -4.7(10.4) | -6.3(10.5) |
| **Keiser outcomes, n** | **21** | **21** | **21** | **21** | **19** | **19** | **19** | **19** |
| Peak force of last rep (N) | 1034.3(227.2) | 1021.2(252.8) | 1013.3(229.6) | 1123.5(300.1) | 1190.9(422.7) | 1164.6(432.4) | 1185.8(435.1) | 1191.2(406.7) |
| Peak force of last rep/weight | 1.5(0.4) | 1.5(0.4) | 1.5(0.5) | 1.6(0.5) | 1.6(0.5) | 1.6(0.5) | 1.6(0.6) | 1.6(0.5) |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

# Supplementary file A3 – subset participants’ outcome measures

Table S6. The table shows the mean (SD) outcomes conducted in lab settings for subset participants at each timepoint.

Table S7. mean (SD) outcome measures (adjusted for sex and age) conducted in the lab for subset lab-based participants at week 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Lab-based physical function, n** | **22** | **20** |  |  |  |
| SPPB (score) | 11.12(4.0) | 8.89(2.3) | 2.24 | 1.57 - 2.90 | **<.0001** |
| SPPB strength (score) | 3.38(1.1) | 2.51(1.0) | 0.87 | 0.34 - 1.39 | **0.0014** |
| 5 reps sit-to-stand time (s) | 11.5(3.3) | 13.9(4.4) | -2.34 | -4.51 - -0.17 | **0.0351** |
| SPPB balance (score) | 3.96(1.6) | 3.11(1.0) | 0.84 | 0.54 - 1.15 | **<.0001** |
| SPPB gait speed (score) | 3.82(0.6) | 3.25(0.7) | 0.56 | 0.25 - 0.88 | **0.0006** |
| SPPB 4-metre walk (s) | 4.18(0.8) | 5.10(0.9) | -0.93 | -1.36 - -0.48 | **0.0001** |
| 60-s sit-to-stand (N reps) | 26.2(5.5) | 22.8(6.7) | 3.43 | -0.22 - 7.08 | 0.0650 |
| Right leg standing balance (s) | 32.3(22.3) | 18.2(16.7) | 13.64 | 2.02 - 25.3 | **0.0221** |
| Left leg standing balance (s) | 31.5(23.2) | 20.4(20.0) | 11.17 | -0.42 – 22.8 | 0.0586 |
| Time-up-and-go (s) | 8.74(2.4) | 10.67(2.1) | -1.94 | -3.11 - -0.76 | **0.0015** |
| Right leg chair sit-and-reach (cm) | -7.56(9.4) | -6.32(10.5) | -1.24 | -7.24 - 4.75 | 0.6806 |
| Left leg chair sit-and-reach (cm) | -7.43(9.8) | -6.69(10.8) | -0.74 | -6.63 - 5.16 | 0.8040 |
| **Keiser outcomes, n** | **21** | **19** |  |  |  |
| Peak force of last rep (N) | 1258(252.8) | 1260(432.4) | -1.75 | -170 - 166 | 0.9834 |
| Peak force of last rep/body mass (N/kg) | 17.1(1.0) | 16.8(1.0) | 0.32 | -2.53 - 3.16 | 0.8227 |
| The Keiser outcomes are sum for peak force for right and left legs, and the Keiser data show in the table are translated data (i.e., what the pedals were doing). | | | | | |

Table S8. mean (SD) outcome measures (adjusted for sex and age) conducted in the lab for subset lab-based participants at week 8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Lab-based physical function, n** | **21** | **19** |  |  |  |
| SPPB (score) | 10.21(1.6) | 8.42(1.0) | 1.79 | 1.13 - 2.45 | **<.0001** |
| SPPB strength (score) | 2.85(1.3) | 2.21(0.8) | 0.64 | 0.12 - 1.16 | **0.0168** |
| 5 reps sit-to-stand time (s) | 12.9(4.4) | 15.1(3.3) | -2.21 | -4.37 - 0.06 | **0.0442** |
| SPPB balance (score) | 3.83(1.7) | 2.94(1.2) | 0.89 | 0.59 - 1.18 | **<.0001** |
| SPPB gait speed (score) | 3.56(0.6) | 3.13(0.5) | 0.43 | 0.12 - 0.74 | **0.0070** |
| SPPB 4-metre walk (s) | 4.64(0.7) | 5.21(0.7) | -0.57 | -1.00 - -0.14 | **0.0107** |
| 60-s sit-to-stand (N reps) | 23.7(6.8) | 21.6(6.5) | 2.07 | -1.56 - 5.69 | 0.2586 |
| Right leg standing balance (s) | 30.3(24.1) | 24.3(17.3) | 11.65 | -0.14 - 23.2 | **0.0474** |
| Left leg standing balance (s) | 32.8(23.2) | 26.6(22.1) | 6.23 | -5.23 - 17.7 | **0.0285** |
| Time-up-and-go (s) | 9.93(2.4) | 11.51(2.1) | -1.58 | -2.74 - -0.42 | **0.0084** |
| Right leg chair sit-and-reach (cm) | -11.05(9.3) | -8.02(11.1) | -3.03 | -8.98 - 2.92 | 0.3134 |
| Left leg chair sit-and-reach (cm) | -10.83(9.2) | -6.85(10.4) | -3.97 | -9.84 - 1.89 | 0.1804 |
| **Keiser outcomes, n** | **21** | **19** |  |  |  |
| Peak force of last rep (N) | 1156(229.6) | 1233(435.1) | -77.35 | -246 - 90.8 | 0.3601 |
| Peak force of last rep/body mass (N/kg) | 15.7(1.0) | 16.3(1.03) | -0.61 | -3.45 - 2.24 | 0.6693 |
| The Keiser outcomes are sum for peak force for right and left legs, and the Keiser data show in the table are translated data (i.e., what the pedals were doing). | | | | | |

Table S9. mean (SD) outcome measures (adjusted for sex and age) conducted in the lab for subset lab-based participants at week 12

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | Intervention | Control | Estimated mean difference | 95% CI | P value |
| **Lab-based physical function, n** | **21** | **19** |  |  |  |
| SPPB (score) | 10.60(1.2) | 8.84(1.0) | 1.76 | 1.10 - 2.43 | **<.0001** |
| SPPB strength (score) | 3.14(1.0) | 2.56(0.7) | 0.58 | 0.05 - 1.10 | **0.0310** |
| 5 reps sit-to-stand time (s) | 12.3(3.4) | 14.0(3.6) | -1.71 | -3.88 - 0.46 | 0.1202 |
| SPPB balance (score) | 3.77(1.7) | 3.17(1.2) | 0.60 | 0.29 - 0.91 | **0.0002** |
| SPPB gait speed (score) | 3.72(0.4) | 3.10(0.6) | 0.62 | 0.31 - 0.94 | **0.0001** |
| SPPB 4-metre walk (s) | 4.47(0.8) | 5.37(0.8) | -0.90 | -1.34 - -0.50 | **0.0001** |
| 60-s sit-to-stand (N reps) | 25.3(6.2) | 22.7(6.1) | 2.58 | -1.07 - 6.23 | 0.1630 |
| Right leg standing balance (s) | 31.8(23.7) | 22.7(14.4) | 11.26 | -0.36 - 22.9 | 0.0573 |
| Left leg standing balance (s) | 33.3(21.3) | 24.9(17.3) | 8.41 | -3.18 - 20 | 0.1530 |
| Time-up-and-go (s) | 9.55(1.7) | 10.63(2.1) | -1.09 | -2.26 - 0.09 | 0.0706 |
| Right leg chair sit-and-reach (cm) | -8.37(8.9) | -6.37(9.9) | -2.00 | -8.00 - 4.00 | 0.5082 |
| Left leg chair sit-and-reach (cm) | -7.91(9.0) | -5.04(10.5) | -2.87 | -8.77 - 3.03 | 0.3347 |
| **Keiser outcomes, n** | **21** | **19** |  |  |  |
| Peak force of last rep (N) | 1148(300.1) | 1254(406.7) | -106.54 | -275 - 61.7 | 0.2092 |
| Peak force of last rep/body mass (N/kg) | 15.8(1.0) | 16.7(1.0) | -0.94 | -3.78 - 1.91 | 0.5111 |
| The Keiser outcomes are sum for peak force for right and left legs, and the Keiser data show in the table are translated data (i.e., what the pedals were doing). | | | | | |

# Supplementary file A4 – TFA survey outcomes

Figure S1. Acceptability of the intervention at different study timepoints. Data are means ± SD. \* indicates ratings were reverse-coded (i.e., higher scores are favourable for all items).

Table S10. Acceptability of the intervention scores (mean and SD) based on TFA dimensions.

|  |  |  |  |
| --- | --- | --- | --- |
| **TFA survey** | **Intervention group** | | |
| **Week 4** | **Week 8** | **Week 12** |
| General acceptability | 4.37(0.67) | 4.62(0.56) | 4.64(0.49) |
| Enjoyment | 4.00(0.69) | 4.00(0.46) | 4.04(0.74) |
| Burden\* | 3.57(1.10) | 3.52(0.99) | 3.64(0.91) |
| Ethicality | 3.63(0.72) | 4.14(0.79) | 3.86(0.93) |
| Effectiveness | 4.03(0.76) | 4.34(0.61) | 4.18(0.72) |
| Opportunity cost\* | 3.73(1.01) | 4.21(0.68) | 3.96(0.74) |
| Self-efficacy | 4.10(0.84) | 4.31(0.81) | 3.96(0.92) |
| Coherence\* | 4.40(0.86) | 4.52(0.74) | 4.36(0.87) |
| Overall mean | 3.98(0.32) | 4.21(0.34) | 4.08(0.31) |
|  |  |  |  |
| Data are mean(SD).  \*indicates ratings were reverse-coded (i.e., higher scores are favourable for all items). | | | |

# Supplementary file A5 – interview quotes

Table S11. Participant quotes based on the semi-structured interviews are presented along with individual characteristics [Study ID; age; sex].

|  |  |
| --- | --- |
| TFA domains | Quotes |
| Overall point of views | *I think the programme is pretty good, very comprehensive. I found it really useful. I think they’re good exercises. [ESCTS058; 74yrs; female]*  *It was very accessible for me. I’ve tried exercising before – well, I tried going to classes – I never made it through the class, so this – for me – was much better because I felt I was doing it – it was not too long – so I should be able to manage it most days – so I was really pleased, actually. [ESTCS079; 73yrs, female]*  *I thought it was very clearly explained. I thought the videos were excellent. I liked the structure of it. I thought that was really good and very, you know, you kept it quite simple, it’s deceptive because it covered a lot. There's a lot of information there, but you did it in a way that made it very accessible… It was enjoyable and it also felt – it felt achievable because the thought of snacking – five minutes. I think it's a very good way…I think it's a very clever way of introducing it. It's very manageable. That's the thing. [ESTCS040; 73yrs; female]* |
| Affective attitude | **Attitude and feelings**  *I’ve been very grateful, actually, for the opportunity to do them, because I, sort of, mentally thought I should do exercise, and I don’t. So, it has motivated me to want to do them. Each day, I always do them...* *I, kind of, thought, ‘This is life changing, in a way.’ …somehow, I just got more positive, and now I do feel more positive, actually, about life, really… feeling more energised and positive. [ESTCS059; 78yrs; male]*  *Well, it made me move the muscle ‘cause I’m housebound. I can’t go out and walk without having a pusher or something, so it was a little bit of exercise which I wouldn’t have had… It was a feeling of ‘A job well done’ – you know, you feel pleased with yourself – a sense of achievement. [ESTCS066; 85yrs; male]*  *I think ‘Energised’ – ‘Bit powerful’ – you know, ‘More stable’ – ‘Pleased to achieve it’ – yes – but also, in my body… ‘Stronger,’ I think, and then perhaps ‘More alert’ – ‘More energised in my mind’ – my whole being. [ESTCS060; 68yrs; female]*  *I found it interesting, enjoyable and it allowed me to challenge myself on the strength test (Keiser test/1RM)… I definitely felt sense of accomplishment when I beat my records on the strength tests. I really went all out to beat my record and improve the numbers of those I did. [ESTCS034; 71yrs; female]*  **Preference**  *The exercises were easier than the Tai-Chi because the Tai-Chi was multi-tasking and I don’t think I multi-task very well! Yeah, so I think I preferred snacking because I could do it almost unconsciously. [ESTCS081; 70yrs; female]*  *I've enjoyed doing the Tai-Chi. The exercise one you could say it's easier in a sense so you can do it more automatically. Whereas the Tai-Chi, you've got to be more, you know, more mindful with it. So yes, it's good. [ESTCS040; 73yrs; female]*  *I think learning the Tai Chi, actually, has been the most useful. Because it starts off fairly gently, and you go through, learning all of those different positions has been good… I like the ‘Cloud Hand’ very much – that’s a lovely one to do – and that’s quite restful as well. [ESTCS057; 69yrs; female]*  *I probably enjoyed the Tai-Chi exercises more. It’s more gentle, and I just feel more spiritual and in tune with it, I think. [ESTCS063; 68yrs; female]*  *I prefer the Tai-chi, and mentally, I prefer them. But in practice, they are harder, so I know I need to persevere with them more, because they are a little bit more challenging. [ESTCS059; 78yrs; Male]*  **Perspectives on exercise programme and its intensities**  *The exercises, I soon got up to level three, because I found I was capable of doing… Maybe in the last four weeks, having a different set of exercises just to bring some variety. Maybe to change some of the exercises – or, if I had a bigger range of exercises. Yeah, I feel like some movements are too easy. [ESTCS031, 85yrs, female]*  *I suppose changing some of the exercises, you know, varying the exercises a little bit so that it didn’t get boring* *because if you do things over and over again, I don’t think you do your best because you sort of think – oh well we’ll do that one, I know a quick way of doing that. Whereas if you challenge yourself a little bit by changing it, you know, say one week one way of doing it… [ESTCS032; 73yrs; female]*  *I think the only thing that’s not included in the programme is anything weight bearing for the arms. I know there’s the stretching, but it would, I think, be even better if there was a can of baked beans in each hand. [ESTCS055; 76yrs; female]*  *I suppose the Tai Chi movements take a bit of time to get your head round and I have looked at the videos and things and all of a sudden it will click and you know what you’re doing initially. So I think that’s probably why I went up to level three but then I went back down to level two because I knew what I was doing at that point and I hadn’t got the mental energy to start something new or to learn a different movement, but that’s just because I just wasn’t feeling particularly well. [ESTCS082; 72yrs; female]* |
| Burden | **General burden**  *It wasn’t too long, and it didn't take too much effort to do it.* *But the effort to find a break into the day, and remembering to do it, it was often late in the evening, and I thought, ‘Oh, no, I haven't done them yet, I should do them,’ but then I didn’t. We’ve been away a couple of times, but otherwise it was fine. [ESCTS051; 69yrs; female]*  *It didn’t really take a lot of time but, sometimes, it was more difficult than others to fit it in, but it didn’t take a lot of time. [ESTCS061; 67yrs; female]*  **Physical demand**  *I found the Ta-Chi snacking slightly more difficult, more challenging... like physically demanding because it's - maybe I'm not so used to that. It’s balance, it’s newer. [ESTCS049; 71yrs; female]*  *I kind of feel I prefer the Tai-chi, and I think that those exercises (exercise snacking) are significantly useful. But I find they’re a little bit harder. [ESTCS059; 78yrs; male]*  *There’s one where we stand on one leg and do it. I think it’s to exercise the knees, the kicking. That’s fine. It’s this bit, the standing on one leg, that’s hard.* *It’s just I probably put too much weight on, because I’m not good at standing on one leg, as you know. [ESTCS007; 84yrs; male]*  *I think if I’d done it (sit-to-stand) for 30 seconds, that would have been fine. But I think the minute is just too long, and that really, I found that I was putting off doing it because of the whole minute doing it up and down. [ESTCS046; 80yrs; male]*  *The one that I find difficult to do because it’s partly balance is this one (the single-leg squat) where you’re... it requires a lot of strength as well. That was the most physically taxing for me. [ESCTS014; 81yrs; female]*  *I think the two most difficult ones were the single-leg lunges – backward lunge – that’s difficult – and the Tai Chi one where you have to stand on one leg and put the leg out (the front-heel kick) – that’s quite tricky.* *Well, it is difficult. I like it – I actually quite enjoy that, but it just takes a little while to be able to keep my balance. [ESTCS063; 68yrs; female]*  *The level three of the fourth exercise of the Tai-Chi (open Tai-chi), the raising onto your tip toes and then going back onto the heels* (*calf raise and heel stand). I found that very challenging balance wise. It didn’t hurt but I found it very difficult. [ESCTS034; 71yrs; female]*  *I have a problem with my trunk, so I found the trunk rotation ones – I knew my limitations, so I never got beyond ‘Level Two’ on doing the trunk rotation one, and I took that very slowly… [ESTCS018; 68yrs; female]*  *For me, the arm ones were quite hard because I’ve got a bit of* *autoimmune muscular problem in my arms, so they get very tired. Also I’m not very good at squatting – you know, the single-leg squat… I can’t get my knee right down [ESTCS060; 68yrs; female]*  **Cognitive and time demand**  *The Tai-chi onces… It’s a ‘Brain and mind are attached.’ also like a…cognitive training.* *For me to think about moving my arms – kicking my legs at the same time – all of those coordination things was quite difficult. [ESTCS017; 72yrs; male]*  *I think because with the Tai Chi there was a lot of remembering to sort of – you know I’ve been doing this and my hands are all over the place. With the exercises you know there was none of that it was just doing the exercises… [ESTCS081; 70yrs; female]*  *I think at first, at least, I felt I was getting more out of the exercise bit than out of the tai chi bit. But that’s probably because with the tai chi, it took some while before I settled down into what I was doing. I think it’s about the right level for you to be able to remember it all without too much trouble. [ESTCS055; 76yrs; female]*  *The Tai-Chi exercises like I said, not that they were difficult to perform, but more that they were difficult to memorise and so whereas I could do the Western exercises just from the paper or even remember what to do and do the Western exercises watching the telly, for instance.* *Whereas the Tai-Chi exercises, I had to more concentrate on and give it my full attention. [ESTCS012; 74yrs; female]*  *I think it is about doing things slowly (Tai-chi), you know. I mean, I try like doing mindful things, try all these sorts of things but it is – it has to be a conscious effort for me. [ESTCS040; 73yrs; female]* |
| Opportunity costs | **General views**  *Fairly easy to wedge it in (daily routine), yes. You’ve got to make a point, because it’s something, when you’ve been around as long as we have been, you settle into a routine, of course you do. You’re trying to lever in 20 minutes of something. You say, ‘Only 20 minutes.’ [ESTCS007; 84yrs; male]*  *I just think it's very clever, you know, just say, look five minutes can make a difference and it can make a difference. It does. It has made a difference. You know so I would like give myself a kick up the bum and say oh come on. [ESTCS040; 73yrs; female]*  *I tried to do it in a similar time of the day – I tried to make certain that the room was a nice room to do the exercises in. Nothing to distract me – was all quite neat and tidy – I had a drink alongside me – a nice big clock. I actually put the radio on as well to listen to a bit of music while I do it. I made it quite a special event! [ESTCS057; 69yrs; female]*  **Reasons of missing out the sessions**  *Looking after grandchildren, picking another one up from Uni that sort of thing and time constraints, but usually we manage quite well. [ESTCS032; 73yrs; female]*  *I started off really well, the first month I think I missed out a day, but I have found it difficult sticking to it in this last month. We've been away a bit more, and there's been quite a lot on in the run up to Christmas... [ESTCS051; 69yrs; female]*  *It wasn’t too much time – but, on the days when I was really, really busy… if I don’t do it first thing in the morning, I find it difficult, then, to do it later on. I mean, sometimes, I managed it – just depends on… if I was a bit tired that day – I didn’t feel very well – or I was very busy over Christmas, and quite stressed. [ECTCS079; 73yrs; female]*  **Ideas of enhancing self-discipline**  *I think that what we should have done is to have done it regularly at a certain time every day. I think that would have been quite interesting to see whether if we’d done it maybe after breakfast in the morning whether you are less tired. But of course, we have lots of other commitments, so it’s a matter of fitting it in with everything else. [ESTCS014; 81yrs; female]*  *I did find, when I was busy, that I’d sort of sometimes leave it and think, ‘Ooh, gosh – I’ve gotta do it at some point’ or, ‘It’s probably best if I did it straight thing in the morning, and just before bed – then I know I can manage that.’ I’d try and do it at other times in the day – it didn’t really work. [ESTCS060; 68yrs; female]* |
| Perceived effectiveness | **Physical health**  *The strength, balance, and also ability to just push yourself that little bit extra, …Yeah – definitely strength in my legs and those arm exercises, I think, are really good…* *I did notice that my balance was improving. [ESTCS018; 68yrs; female]*  *I found the exercise snacking you found this more helpful, yeah. I think it’s good for your bones and strengthening your legs. And this is my favourite [waving arms] (multi-dimensional arm raises). I like that. I think because it opens your chest out you know and you’re stretching. It helped… like mobility in the shoulders, yes. [ESTCS028; 77yrs; female]*  *I could feel it strengthening me, improving my balance and strengthening my arms a little bit, I could feel it strengthen my arms as well as my legs. I found the heel tapping actually more useful than I thought it would be, I could feel I was using those different muscles...* *I think the ones with the ankle, the tipping, because I don't really stretch those or do that, I mostly stretch my other muscles. [ESTCS051; 69yrs; female]*  *It has improved my knees. I could get up and down quite easily before, but sometimes, I would struggle, and I don’t find I do anymore. I can get up from kneeling no trouble at all. It’s really good.* *And I think my balance is improving. Some of the exercises near the beginning, I held onto a chair so that I didn’t lose my balance, and now I can do it all without a chair. I’m managing to stand on one leg for longer now...* *I found the ankle exercises very good. I think the ankle exercises are excellent, and really good for your ankles, and so easy to do. There’s no excuse for not doing it. [ESTCS053; 78yrs; male]*  *It helps my legs, my knees and my hips, which I have a problem. I have a walking problem. So, it strengthens them, and I think I feel a bit more capable of doing a bit more walking. I would say that strength wise, certainly. Actually, shoulder and so on has definitely improved,* *and I do feel more confident in that, in lifting my arms, or doing things. So, it’s not a massive change, but it is sufficiently a level of change that it does make my life easier.* *I feel better even about lifting shopping and stuff, because I feel a bit stronger, and that sort of stuff. [ESTCS058; 74yrs; female]*  *This particular one (ankle rotation). I know when I started out, my thigh muscles were very good. My calf muscles were very good. But my ankles were rubbish and I had noticed my ankles have become a lot steadier and a lot stronger just doing these exercises...* *it was my balance and the ankles that I noticed. [ESTCS034; 71yrs; female]*  *I would say, you know, sort of in terms of arthritis and balance. I think my balance, I’m really pleased with my balance. Yes, I think I’ve really - a lot of the exercises you know, like you know the Tai-Chi one with your feet going round.* *I really liked the balancing. So I think my balance I feel has really improved a lot and I feel like my joints as well. My knees are improved, I would say my knee joints are improved.* I*n terms of general flexibility definitely. My (upper body) flexibility is really improved. I’d say yes. Considerably really, although I felt my problems was mostly like lower body, you know, my knees and my legs but in fact when I came to do the exercises, and especially the Tai-Chi, that I realised, oh I'm not as flexible. I can't turn round as much as I used to be able to. I'm not as flexible. So that's been really good to be working on that. And some of the knee exercises, you’re going up with your knee, you know. That was really helpful because it made me realise my knees had got more range. [ESTCS040; 73yrs; female]*  **Wellbeing**  *It gives you a feeling of wellbeing – that you’ve done something, and you’ve started the day well.* *So, from that point of view, it sort of set a good routine for the day, and I suppose it does make you think about your posture a bit more and how you carry yourself. [ESTCS057; 69yrs; female]*  *It was good and it’s given me confidence to think that I can improve my physical health you know, even at this advanced age. I can do a little bit each day just to feel more in control and more healthy, you know. [ESTCS045; 69yrs; female]* |
| Intervention coherence | **General views**  *I didn’t find them difficult to understand at all but I sometimes find them difficult to do and that was the things where anything, sort of lower squats. [ESTCS040; 73yrs; female]*  *It’s quite simple to learn and it's really useful having you doing it on the video. That was very useful. [ESTCS049; 71yrs; female]*  *it was very useful to have. It was good having a PDF, that was pretty good but when I was watching you and those other two guys doing it, it just cemented it much better into my mind, as to how I was meant to be doing it. [ESTCS051; 69yrs; female]*  *No not particularly, as I said, it all goes along with the fact that I wasn’t so familiar with the Tai Chi. I think if I’d been familiar with it – the other movements obviously I’ve been doing one way or another for most of my life, you know, different exercises when I was a child that sort of thing; whereas Tai Chi is a different thing, different element, which was interesting but took more thinking about because I wasn’t familiar with it. I’m not saying it was bad, it was just different! [ESTCS032; 73yrs; female]*  *I needed to do that because some of the Tai Chi if you follow these instructions, they’re very complicated. You’ve got to watch it on the video… [ESTCS028; 77yrs; female]*  *I didn't reach the level three really because I found some of the exercise difficult to even understand, Tai-Chi. [ESTCS045; 69yrs; female]*  **Future suggestions**  *I wish you’d gone through it for us, the exercises, because a couple of times, we wondered whether we were doing it right. Make sure we were doing it correctly, that we’d interpreted the words and the video correctly. [ESTCS031; 85yrs; female]*  *Maybe that’s what’s missing…at some stage, maybe at the very first time you meet people, to make sure they’re doing the exercises correctly. [ESTCS028; 77yrs; female]* |
| Ethicality | **General views**  *I would certainly recommend it to other people – to have a go. I mean, we’ve just stayed with friends – they are a little bit younger than us but they’re not in physically such good shape. They would find some movements really difficult to do. But even if you stuck to the simplest – the first level, it would be a good thing to do… good for some of them… people got a new knee, or something. [ESTCS017; 72yrs; male]*  *I mean one of my friends, she’s younger than I am anyway but she’s enjoying it (another participant) and I live in a place with people over 60 and when I talked about this, they have been interested… [ESTCS028; 77yrs; female]*  *It must be very motivating for people who are very sedentary or no confidence and that sort of thing. [ESTCS049; 71yrs; female]*  **Thoughts on remote and lab-based assessments**  *I found the video call easy, no problem at all. The lab sessions were absolutely fine. In fact, I’d say that’s almost the best bit coming over, having an update, an afternoon out, we’ll come over and actually see you, and try to give it a good test, and see the progress…* *an indication like that of improvement is a form of encouragement.* *You can know if you improve, or not, and you can have something like motivation to keep doing the exercises. [ESTCS007; 84yrs; male]*  *My broadband did not work sometimes. But both are fine.* *I think to do the two are fine but it’s good to have a one-to-one session and you’re good at sort of encouraging me to go far. [ESTCS028; 77yrs; female]*  *I mean, obviously, not being terribly familiar with Zoom calls… you were the first one I’ve ever done – still getting to grips with it! – but that’s actually been quite fast-learning thing. [ESTCS057; 69yrs; female]*  *I think it’s nice at the lab session to have some kind of feedback, and that is useful. There is a, sort of, sense of… We hope it’s progress, but even if it weren’t, it would still be useful to have a physical person there to say, ‘Perhaps we need to look at this another way, or something.’ To have that sort of feedback… [ESTCS059; 78yrs; male]* |
| Self-efficacy | *I did enjoy it. I’m very glad I did it. It was good and it’s given me confidence to think that I can improve my physical health you know, even at this advanced age. [laugh] I can do a little bit each day just to feel more in control and more healthy, you know. [ESTCS045; 69yrs; female]*  *The family think we’re being very good…I think it’s been good. We’ve talked to our friends about it – been quite proud… [ESTCS017; 72yrs; male]*  *It’s sort of waking my body and my mind up! (laughs) It’s what we need really. Body and mind are intertwined so yeah… If a bus came, I thought – no I can walk, instead of waiting for the bus I walk. If I’ve got shopping, I’ll walk. [ESTCS028; 77yrs; female]*  *I shall keep up with the exercises. I think I might go more into the Tai Chi and have a look at that more, rather than sticking rigidly to that, so I might sort of look more into Tai Chi... I think the exercise snacking to start with and then I think looking more into the Tai Chi because I find the Tai Chi interesting.* *I’m also thinking about going to Pilates. [ESTCS032; 73yrs; female]*  *I’ve certainly improved. I’m gradually doing more of each movement in the time allowed, although that’s pretty much plateaued now.* *We’ve gradually managed to do more from the start to now. That’s a really good achievement, yes. [ESTCS055; 76yrs; female]*  *I feel motivated, and I feel that even on the times when I think, ‘Gosh, exercises,’ in fact, I still feel motivated. I think, ‘I must get them done.’ So, it’s like tick that box, I need to do it. Really, I suppose, possibly, we should think about doing them twice a day. [ESTCS058; 74yrs; female]*  *I think, for me, I know I do need to try again to start walking further, and to try to marry that up with breathing to get stronger and more proactive, I suppose, about moving and walking, yes. So, walk to get the paper, because at the moment we drive, or I drive to go and get the paper, but I need to start walking again. I hope that this will give me that strength to be able to do that again. [ESTCS059; 78yrs; male]*  *That (Tai-chi snacking) was very calming. I, even, thought of joining a Tai Chi class because it’s very doable – and it’s very calming. I felt a sense of achievement – yeah – I was glad I was doing it. I wanted to keep it up and still continue doing it… lengthen the sessions – just seeing how well I get on. [ESTCS079; 73yrs; female]* |

# Supplementary file A6 – the impact of living status on physical function outcome measures

Table S12. Raw data showing mean (SD) of physical function outcome measures at each time point, along with estimated mean differences (EMD) and p-values between groups at each follow-up assessment. EMD and p-values were obtained using linear mixed models adjusted by sex, age, and **living status** for all follow-up measures.

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| **Outcome** | **Week 0** | | **Week 4** | | | | **Week 8** | | | | **Week 12** | | |
|  | |  | | ***Between group EMD***  ***[95%CI]*** | ***p value*** |  | | ***Between group EMD***  ***[95%CI]*** | ***p value*** |  | | ***Between group EMD***  ***[95%CI]*** | | ***p value*** |
| Int | Con | Int | Con | Int | Con | Int | Con |
| **Participants, n** | **44** | **46** | **30** | **39** |  |  | **28** | **36** |  |  | **28** | **36** |  | |  |
| SPPB S&B items (/8) | 5.24 (0.9) | 5.31 (0.8) | 7.42 (1.2) | 5.68 (0.9) | *1.75*  *[1.32 – 2.18]* | **<.001** | 6.83 (1.3) | 5.47 (0.9) | *1.37*  *[0.95 - 1.79]* | **<.001** | 7.02 (1.1) | 5.60 (1.0) | *1.44*  *[1.01 - 1.87]* | | **<.001** |
| SPPB strength (/4) | 2.08  (1.0) | 2.03  (0.8) | 3.52  (1.1) | 2.48  (0.9) | *1.08*  *[0.66 - 1.50]* | **<.001** | 3.10  (1.2) | 2.30  (0.8) | *0.83*  *[0.43 - 1.24]* | **0.001** | 3.24  (1.0) | 2.45  (0.8) | *0.82*  *[0.41 - 1.24]* | | **0.001** |
| 5 reps STS time (s) | 16.72  (6.8) | 16.01  (4.4) | 9.77  (4.2) | 14.09  (4.3) | *-4.48*  *[-6.48 - -2.48]* | **<.001** | 11.79  (4.2) | 15.14  (3.7) | *-3.52*  *[-5.48 - -1.55]* | **<.001** | 11.05  (3.4) | 14.39  (3.5) | *-3.49*  *[-5.5 - -1.49]* | | **<.001** |
| SPPB balance (/4) | 3.16  (0.5) | 3.28  (0.5) | 3.91  (0.5) | 3.20  (0.6) | *0.69*  *[0.43 - 0.95]* | **<.001** | 3.73  (0.5) | 3.17  (0.6) | *0.55*  *[0.3 - 0.8]* | **<.001** | 3.80  (0.3) | 3.15  (0.6) | *0.63*  *[0.37 - 0.9]* | | **<.001** |
| 60-s STS (reps) | 22.6  (7.9) | 21.7  (7.1) | 31.9  (8.5) | 25.4  (7.4) | *6.57*  *[3.07 – 10.08]* | **<.001** | 27.6  (10.6) | 24.0  (7.0) | *3.65*  *[0.19 – 7.11]* | **0.039** | 29.7  (10.0) | 24.9  (6.7) | *4.86*  *[1.35 - 8.36]* | | **0.007** |
| R leg balance (s) | 28.1  (22.4) | 23.7  (22.7) | 38.0(  21.7) | 27.2  (21.6) | *10.62*  *[1.4 - 19.8]* | **0.024** | 33.1  (22.5) | 25.8  (21.7) | *7.04*  *[-2.03 - 16.1]* | 0.127 | 32.9  (22.7) | 26.4  (21.9) | *6.34*  *[-2.87 - 15.6]* | | 0.176 |
| L leg balance (s) | 30.5  (21.9) | 21.6  (20.0) | 35.3  (22.0) | 22.7  (18.2) | *11.9*  *[3.33 – 20.6]* | **0.007** | 37.4  (22.3) | 20.1  (19.7) | *16.6*  *[8.13- 25.1]* | **<.001** | 35.4  (23.1) | 24.6  (20.2) | *10.2*  *[1.58 – 18.8]* | | **0.021** |
| Int= intervention group, con= control group. | | | | | | | | | | | | | | | |

Table S13. Comparison of EMDs and p-values between linear mixed models adjusted for sex and age only, and those adjusted for sex, age, and **living status** for outcome measures.

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| **Outcome** | **Week 4** | | | | **Week 8** | | | | | **Week 12** | | | |
| adjusted by sex and age | | adjusted by sex, age, and living status | | adjusted by sex and age | | adjusted by sex, age, and living status | | adjusted by sex and age | | | adjusted by sex, age, and living status | |
| ***Between group EMD***  ***[95%CI]*** | ***p value*** | ***Between group EMD***  ***[95%CI]*** | ***p value*** | ***Between group EMD***  ***[95%CI]*** | ***p value*** | ***Between group EMD***  ***[95%CI]*** | ***p value*** | ***Between group EMD***  ***[95%CI]*** | | ***p value*** | ***Between group EMD***  ***[95%CI]*** | ***p value*** |
|  |  |  |  |  |  |  |  |  |  | |  |  |  |
| SPPB S&B items (/8) | *1.73*  *[1.31 – 2.16]* | **<.001** | *1.75*  *[1.32 – 2.18]* | **<.001** | *1.36*  *[0.95 - 1.77]* | **<.001** | *1.37*  *[0.95 - 1.79]* | **<.001** | *1.42*  *[1.00 - 1.85]* | | **<.001** | *1.44*  *[1.01 - 1.87]* | **<.001** |
| SPPB strength (/4) | *1.05*  *[0.64 - 1.45]* | **<.001** | *1.08*  *[0.66 - 1.50]* | **<.001** | *0.79*  *[0.40 - 1.19]* | **<.001** | *0.83*  *[0.43 - 1.24]* | **0.001** | *0.79*  *[0.38 - 1.19]* | | **<.001** | *0.82*  *[0.41 - 1.24]* | **0.001** |
| 5 reps STS time (s) | *-4.32*  *[-6.27 - -2.37]* | **<.001** | *-4.48*  *[-6.48 - -2.48]* | **<.001** | *-3.35*  *[-5.26 - -1.44]* | **<.001** | *-3.52*  *[-5.48 - -1.55]* | **<.001** | *-3.34*  *[-5.29 - -1.38]* | | **<.001** | *-3.49*  *[-5.5 - -1.49]* | **<.001** |
| SPPB balance (/4) | *0.71*  *[0.45 - 0.96]* | **<.001** | *0.69*  *[0.43 - 0.95]* | **<.001** | *0.57*  *[0.32 - 0.82]* | **<.001** | *0.55*  *[0.3 - 0.8]* | **<.001** | *0.65*  *[0.39 - 0.91]* | | **<.001** | *0.63*  *[0.37 - 0.9]* | **<.001** |
| 60-s STS (reps) | *6.5*  *[3.1 - 9.9]* | **<.001** | *6.57*  *[3.07 – 10.08]* | **<.001** | *3.6*  *[0.2 - 6.9]* | **0.038** | *3.65*  *[0.19 – 7.11]* | **0.039** | *4.8*  *[1.4 - 8.2]* | | **<.001** | *4.86*  *[1.35 - 8.36]* | **0.007** |
| R leg balance (s) | *10.81*  *[1.83 - 19.8]* | **0.019** | *10.62*  *[1.4 - 19.8]* | **0.024** | *7.3*  *[-1.6 - 16.1]* | 0.107 | *7.04*  *[-2.03 - 16.1]* | 0.127 | *6.5*  *[-2.4 - 15.5]* | | 0.152 | *6.34*  *[-2.87 - 15.6]* | 0.176 |
| L leg balance (s) | *12.6*  *[4.1 - 21.0]* | **0.004** | *11.9*  *[3.33 – 20.6]* | **0.007** | *17.3*  *[9.0 - 25.5]* | **<.001** | *16.6*  *[8.13- 25.1]* | **<.001** | *10.8*  *[2.4 - 19.2]* | | **0.012** | *10.2*  *[1.58 – 18.8]* | **0.021** |