Balance and falls in people with dementia: Impairment and intervention

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Balance and falls in people with dementia: Impairment and intervention

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The sub-studies:

1) Falls risk and balance and mobility dysfunction in Alzheimer’s disease (AD)

2) Change in falls risk and balance and mobility in AD

3) Feasibility and effectiveness of exercise program

4) Factors influencing exercise program adherence
The issues:

Falls & Dementia

- Falls consequences: injuries, hospitalisations
- 30% older people (≥ 65 years)
- 40-80% older people with dementia
- Falls—predictors of care-transition
Background:

Falls Risk & Balance Dysfunction

- Falls are multifactorial (intrinsic & extrinsic factors)
- Balance performance
  - a major risk of falling
  - modifiable risk factor
  - falls risk assessment/intervention
  - contributing to falls in people with dementia
Study 1: Balance and mobility dysfunction and falls risk in people with Alzheimer’s disease.

Aim: to identify the magnitude and type of balance/mobility impairments in people with Alzheimer’s disease (AD)

Methods: 25 participants with mild to moderate AD/
25 healthy controls
1 assessment occasion (2 groups)
Methods: measurements

- Balance/mobility performance
  - clinical measures
  - computerised posturography measures
    - static/dynamic
    - sensory challenge
    - single/dual task
- Falls
- Falls risk: Falls Risk for Older People-Community version (FROP-com), Physiological Profile Assessment (PPA)
- Physical activity level: Human Activity Profile questionnaire
Clinical measures: Functional Reach (FR), Step Test (ST), Timed Chair Stand (TCS), Timed Up and Go test (TUG (single/dual task))
Methods:

**Force platform measures:** static/dynamic balance, functional mobility

- **mCTSIB**
  - Limits of Stability
- **Walk Across**
  - Mobility functions
  - Walking
  - Turning
  - Sitting to standing
- **Step Quick Turn**
- **Sit to Stand**
### The Falls Risk for Older People (Community) (FROP-com)

#### Falls Risk Assessment Form

**Place UR sticker here or add patient details:**

<table>
<thead>
<tr>
<th>Name:</th>
<th>UR number:</th>
<th>Word:</th>
<th>Age:</th>
<th>Gender:</th>
<th>Admission Date:</th>
</tr>
</thead>
</table>

**General issues (do not score, but ensure appropriate action):**

- Has the patient been oriented to the word and routines, and a patient information brochure been provided? □ Yes □ No
- Patient’s environment assessed and safe (nursing type and height, bed height and assistive equipment eg monkey/handbrake) □ Yes □ No
- Is English the patient’s preferred language? □ Yes □ No

**Medical Staff**

**Recent fall (0-3):**

- Has the patient fallen recently?
  - Nil in 12 months (0)
  - 1 in the last 12 months (1)
  - 2 or more in 12 months (2)
  - 1 or more during their current hospitalisation (3)

**Did they sustain an injury?**

- No (0)
- Minor injury, did not require medical attention (1)
- Injurious injury, did require medical attention (2)
- Severe injury (fracture, etc) (3)

**Medications (0-3):**

- Is the patient on any medication?
  - No medication (0)
  - 1-2 medications (1)
  - 3 medications (2)
  - 4 or more medications (3)

**Does the patient take any of the following type of medication?**

- Sedative, hypnotic, psychotropic □ apply (3)
- Antidepressants □ apply (3)
- Anticoagulants, antiplatelet □ apply (3)
- ACE inhibitors, calcium based antihypertensives □ apply (3)

**Medical conditions (0-3):**

- Does the patient have a chronic medical condition affecting their balance & mobility?
  - Arthritis □ apply (0)
  - Respiratory conditions □ apply (0)
  - Parkinson’s Disease □ apply (0)
  - Diabetes □ apply (0)
  - Dementia □ apply (3)
  - Cardiac condition □ apply (0)
  - Stroke □ apply (0)
  - Other neurological conditions □ apply (0)
  - Lower limb Amputation □ apply (0)
  - Vestibular Disorder (dizziness, postural disorientations, Meniere’s Syndrome) □ apply (0)

**Sensory loss & communication:**

- Does the patient have a sensory deficit that limits their functional ability?
  - Vision □ no (0) □ yes (1)
  - Hearing □ no (0) □ yes (1)
  - Speech □ no (0) □ yes (1)

- Is there a problem with communication (eg NDIS or Psychosis)? □ No (0) □ Yes (1)

<table>
<thead>
<tr>
<th>Cognitive status: (score 0-3 points)</th>
<th>Medical Staff care: ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ AMTS score 9-10 (3 points)</td>
<td>□ 7-8 (1 point)</td>
</tr>
<tr>
<td>□ 5-6 (2 points)</td>
<td>□ 4 or less (0 points)</td>
</tr>
</tbody>
</table>

**Nursing Staff:**

- Is the patient incontinent? □ Yes □ No
- Do they require frequent toileting or prompting for toileting? □ Yes □ No
- Do they require nocturnal toileting? □ Yes □ No

**Nutritional conditions (score 0-3 points):**

- Has the patient’s food intake declined in the past 6-12 months due to: □ Food refusal (0)
  □ Small change, but intake remains good (1)
  □ Moderate loss of appetite (2)
  □ Severe loss of appetite/poor oral intake (3)

- Weight loss during the last 6-12 months □ Nil (0) □ Minimal (<1 kg) (1) □ Moderate (1-5 kg) (2) □ Marked (>5 kg) (3)

**Occupational Therapist:**

- Observed behaviour or Activities of Daily Living & Mobility indicate:
  - Continuously aware of current abilities/needs appropriate assistance as required (0)
  - Generally aware of current abilities/occasional risk taking behaviour (1)
  - Underestimates abilities/misappropriately fearful of activity (2)
  - Overestimates abilities/frequent risk taking behaviour (3)

**Feet & footwear and clothing:**

- Does the patient have foot problems, e.g. corns, hammer toes, etc? □ Yes (0) □ No (1)
- Is the patient’s shoes footwear:
  - Poor fitting □ apply (0)
  - Poor grip on sole □ apply (0)
  - In-fleece soles □ apply (0)
  - Heels greater than 2 cm high □ apply (0)
  - Riggers or other inappropriate footwear □ apply (0)

**Does the patient’s clothing fit well (too long or loose fitting)? □ Yes (0) □ No (1)

**Physiotherapist:**

- Balance (score 0-3 points)

  - Were the patient’s scores on the Timed Up and Go test and the Functional Reach test within normal limits? □ Both within normal limits (0)
  □ One within normal limits (1)
  □ Both outside normal limits (2)
  □ Requires assistance to perform (3)

  - Normal limits - Timed up and Go test: < 12 seconds
  - Functional Reach: > 23 cm (0)

  - Transfers (score 0-3 points)

  - Is the patient independent in transferring and in their gait? (includes wheelchair mobility) □ Independent, no gait aid needed (0)
  □ Independent with a gait aid (1)
  □ Supervision needed (2)
  □ Physical assistance needed (3)

<table>
<thead>
<tr>
<th>Total Risk Score:</th>
<th></th>
</tr>
</thead>
</table>

**Score Legend:** XX = Low risk, X.5X = Medium risk, XX.XX = High risk

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**Sub total for this page:**

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>UR Number:</th>
</tr>
</thead>
</table>
The Physiological Profile Assessment (PPA)

- Postural Sway (Balance)
- Visual contrast sensitivity
- Leg muscle strength
- Reaction Time
- Lower limb proprioception
**Outcome measures**

<table>
<thead>
<tr>
<th>Falls risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static balance</td>
</tr>
<tr>
<td><strong>Dynamic balance</strong></td>
</tr>
<tr>
<td>- <em>Dynamic one leg stance</em></td>
</tr>
<tr>
<td>- <em>Dynamic bilateral stance</em></td>
</tr>
<tr>
<td><strong>Mobility and function</strong></td>
</tr>
<tr>
<td>- <em>Single task_not involving turning</em></td>
</tr>
<tr>
<td>- <em>Single task_involving turning</em></td>
</tr>
<tr>
<td>- <em>Dual task</em></td>
</tr>
<tr>
<td>- <em>Sit to Stand</em></td>
</tr>
</tbody>
</table>

**Measurements:** sub-domains
Our Findings:

Falls/Falls risk level

FROP_Com = The Falls Risk for Older People (Community),
PPA = The Physiological Profile Assessment

* significant difference between two groups (after the Bonferroni adjustment)
Our Findings:

Balance: Static (mCTSIB tested on force platform)

mCTSIB = modified Clinical Test of Sensory Interaction on Balance; EO = Eyes Open, EC = Eyes Closed, EOF = Eyes Open on Foam, ECF = Eyes Closed on Foam, Comp = Composite score

* significant difference between two groups (after the Bonferroni adjustment)
Balance: Static

- Greater sway in altered sensory conditions
- Sensory organisation
- Motor outputs responses

Our Findings:

Balance: Dynamic

LOS = Limits of Stability test; MVL = Movement Velocity, MXE = Maximum Excursion, DCL = Directional Control
* significant difference between two groups (after the Bonferroni adjustment)
Balance: Dynamic

- Voluntary tasks
- Anticipatory movement planning
Our Findings:

Mobility

TUG = Timed Up and Go test

* significant difference between two groups (after the Bonferroni adjustment)
Mobility

- Turning tasks

- Dual tasks

  - *deficits in divided attention and selective attention*\(^1,2\)
  
  - *differs in different types of additional task*

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Conclusion: People with mild to moderate Alzheimer’s disease…

- A higher falls risk

- Impaired balance and mobility
  - reaching, leaning tasks
  - stepping, turning tasks
  - altered sensory information (less stable surface/eyes closed)
  - single and dual tasks
Clinical Implications:

- Balance screening in people with mild to moderate Alzheimer’s disease
  - the Functional Reach test
  - the Step Test
  - the Timed Up and Go test

- Potential balance exercise program
**Study 2**: Change in falls risk and balance and mobility in people with Alzheimer’s disease

**Aim**: to determine change (over 1-year period) of balance/mobility impairments and falls risk in people with mild to moderate Alzheimer’s disease (AD)

**Methods**: - 15 participants with mild to moderate AD
  - 15 healthy controls
  - rate of change (from baseline assessment to reassessment at 1 year period)
Methods:

**Measurements:** at baseline and 1-yr follow-up assessment

- Balance/ mobility performance
- Falls
- Falls risk: Falls Risk for Older People-Community version (FROP-com), Physiological Profile Assessment (PPA)
Our Findings:

Falls/Falls risk level

- Total falls: at the 1 year follow-up assessment
  - Alzheimer’s disease (AD) group: 14 falls
  - Control group: 3 falls

- Percentages of fallers:
  - AD group: increased from 20% to 47%
  - Control group: decreased from 33% to 13%

- Falls risk level (Fall Risk for Older People-community version questionnaire): at the 1 year follow-up assessment
  - AD group: increased from 12.80 to 14.67
  - Control group: increased from 6.13 to 6.47
Our Findings:

Balance and mobility performance

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Control Group</th>
<th>AD Group</th>
<th>B Coefficient (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>12-Mo</td>
<td>Baseline</td>
<td>12-Mo</td>
</tr>
<tr>
<td></td>
<td>Performance</td>
<td>Performance</td>
<td>Performance</td>
<td>Performance</td>
</tr>
<tr>
<td>Functional</td>
<td>31.98 (4.40)</td>
<td>28.27 (4.52)</td>
<td>29.04 (4.93)</td>
<td>24.64 (6.70)</td>
</tr>
<tr>
<td>reach, cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step Test, steps/15 sec</td>
<td>16.36 (2.10)</td>
<td>15.64 (2.68)</td>
<td>13.53 (3.36)</td>
<td>11.47 (3.16)</td>
</tr>
<tr>
<td>Timed Up and Go test, sec</td>
<td>12.59 (3.15)</td>
<td>12.59 (3.33)</td>
<td>16.16 (7.76)</td>
<td>17.81 (9.13)</td>
</tr>
<tr>
<td></td>
<td>14.52 (5.08)</td>
<td>13.99 (4.93)</td>
<td>17.99 (7.95)</td>
<td>19.66 (8.54)</td>
</tr>
<tr>
<td>Modified CTSIB, degree/sec</td>
<td>1.32 (0.72)</td>
<td>1.39 (0.73)</td>
<td>1.33 (0.56)</td>
<td>1.59 (0.55)</td>
</tr>
<tr>
<td>LOS_MXE, %LOS</td>
<td>79.20 (9.68)</td>
<td>82.87 (8.44)</td>
<td>72.71 (11.45)</td>
<td>72.57 (11.64)</td>
</tr>
<tr>
<td>LOS_DCL, %</td>
<td>71.20 (7.79)</td>
<td>70.80 (9.21)</td>
<td>66.43 (9.80)</td>
<td>64.07 (12.45)</td>
</tr>
<tr>
<td>Walk Across step width, cm</td>
<td>14.91 (3.13)</td>
<td>15.55 (2.10)</td>
<td>15.57 (4.87)</td>
<td>15.46 (4.58)</td>
</tr>
<tr>
<td>Walk Across step length, cm</td>
<td>43.11 (13.61)</td>
<td>45.08 (10.84)</td>
<td>36.29 (11.55)</td>
<td>37.72 (16.05)</td>
</tr>
<tr>
<td>Walk Across speed, cm/sec</td>
<td>54.68 (19.91)</td>
<td>57.07 (12.89)</td>
<td>42.57 (14.71)</td>
<td>41.92 (14.74)</td>
</tr>
<tr>
<td>Step/Quick Turn_sway velocity, deg/sec</td>
<td>41.73 (14.34)</td>
<td>40.99 (5.45)</td>
<td>48.05 (7.00)</td>
<td>48.79 (10.02)</td>
</tr>
</tbody>
</table>
Conclusion: After 1 year follow up, people with mild to moderate Alzheimer’s disease...

- greater rate of increase in the number of falls
- accelerated risk of falling
- greater rate of balance and mobility deterioration
  - reaching, leaning tasks
  - stepping, turning tasks
  - Single, dual tasks
Clinical Implications:

- Falls risk and balance/mobility screening
- Reviewing falls risk and balance/mobility performance
  - Dynamic balance
  - Mobility during turning tasks
  - Mobility under dual task conditions
- Potential balance exercise program at an early stage
Study 3: Feasibility and effectiveness of exercise program in people with mild to moderate Alzheimer’s disease.

Aims:  
- to evaluate the feasibility/safety of a home-based balance exercise program  
- to provide evidence of program effectiveness

Methods:  
40 participants with mild to moderate Alzheimer’s disease  
6 month home-based programs:  
  i) balance exercise;  
  ii) education program
Methods: Home-based programs

(6 home visits & 5 phone calls)

1. Home-based balance exercise program

- based on “Otago programme”
- included balance and strengthening exercises
- by a physiotherapist
- an exercise booklet
- exercise 5 days/week
Methods: Home-based programs

(6 home visits & 5 phone calls)

2. Home-based education (control) program

- based on study by Graff et al., 2007
- included education/information sessions
- by an occupational therapist
Methods:

measurements

- Balance/mobility performance
- Falls
- Falls risk: Falls Risk for Older People-Community version (FROP-com), Physiological Profile Assessment (PPA)
- Physical activity level: Human Activity Profile questionnaire
Our findings/conclusion:

- **Program completion**: Exercise program (11 of 19) vs. Control program (18 of 21).

  Higher drop-out rate in exercise program:
  - *different nature of the two program*
  - *caregivers’ limitations*
Our findings/conclusion:

- **Exercise program:**
  - no falls/ adverse events
  - 83% adherence
  - reduced risk of falling (FROP-com score)
  - improve standing balance and mobility performance

**Home-based balance exercise delivered by PT**
- *can be implemented safely*
- *may reduce falls risk, improve balance/mobility in Alzheimer’s disease*
- *further study is required*
Study 4: Factors influencing exercise adherence

**Aims:** to explore factors that influence commencement and adherence to the exercise program

**Methods:** phenomenological theoretical framework, semi-structure interview

10 participants with Alzheimer’s disease (AD) and 9 caregivers
Our findings:

<table>
<thead>
<tr>
<th>Decision to commence the program</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants with AD (n = 10)</strong></td>
<td><strong>Caregivers (n = 9)</strong></td>
</tr>
<tr>
<td>1. Possible benefits</td>
<td>1. Possible benefits</td>
</tr>
<tr>
<td>2. Positive attitude/prior exercise experience</td>
<td>2. Positive attitude/prior exercise experience</td>
</tr>
<tr>
<td>3. Assist with research</td>
<td>3. Assist with research</td>
</tr>
<tr>
<td>4. Advice from health professionals</td>
<td>4. Advice from health professionals</td>
</tr>
<tr>
<td>5. Minimise caregiver’s burden</td>
<td></td>
</tr>
</tbody>
</table>
### Decision to commence the program

<table>
<thead>
<tr>
<th>Participants with AD (n = 10)</th>
<th>Caregivers (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible benefits</td>
<td>1. Possible benefits</td>
</tr>
</tbody>
</table>

C. 6, Female:

“*If we can get the confidence back and the walking back, the quality of life would be maintained. So that was the reason why we got stuck into it.*”
<table>
<thead>
<tr>
<th>Decision to commence the program</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants with AD (n = 10)</strong></td>
</tr>
<tr>
<td>Positive attitude/prior exercise experience</td>
</tr>
</tbody>
</table>

**P. 4, Female:**

“I was always a great walker… I was a runner…I took first prize all the time…I used to go the gym…swimming.”

**P. 7, Male:**

*[too old to exercise?]* “Nonsense! You are giving up, if you have got that attitude.”
### Decision to commence the program

<table>
<thead>
<tr>
<th>Participants with AD (n = 10)</th>
<th>Caregivers (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assist with research</td>
<td>3. Assist with research</td>
</tr>
</tbody>
</table>

**P. 9, Female:**

“A lot of it was because I like to do things to help other people…we both do a lot volunteering.”

**C. 6, Female:**

“If we can help, if mum can help with all this, it is going to help me when I get to that stage…future baby boomers.”
### Decision to commence the program

<table>
<thead>
<tr>
<th>Participants with AD (n = 10)</th>
<th>Caregivers (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise caregiver’s burden</td>
<td></td>
</tr>
</tbody>
</table>

**P. 5, Female:**

“Well, to get out and not be a burden on xxx (daughter).”
Our findings:

<table>
<thead>
<tr>
<th>Adherence to the program (Facilitators)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Program characteristics (n = 6 P, 9 C)</td>
</tr>
<tr>
<td>- 6-month duration</td>
</tr>
<tr>
<td>- 15-20 minute exercise session</td>
</tr>
<tr>
<td>- Exercise program complexity/preference</td>
</tr>
<tr>
<td>2. Physiotherapists (n = 10 P, 9 C)</td>
</tr>
<tr>
<td>- Professionalism</td>
</tr>
<tr>
<td>- Supportive characteristics</td>
</tr>
<tr>
<td>3. Exercise recording sheet (n = 3 P, 3 C)</td>
</tr>
<tr>
<td>4. Caregivers’ support (n = 2 P, 6 C)</td>
</tr>
<tr>
<td>5. Participants’ sense of commitment (n = 2 P, 5 C)</td>
</tr>
<tr>
<td>6. Perceived benefits (n = 3 P, 2 C)</td>
</tr>
</tbody>
</table>
## Adherence to the program (Facilitators)

1. **Program characteristics (n = 6 P, 9 C)**
   - 6-month duration
   - 15-20 minute exercise session
   - Provision of an exercise booklet
   - Exercise program complexity/preference

---

**C. 5, Female:**

“*I think they (PT visits) were pretty well spread-out.”*

---

**C. 6, Female:**

“*The exercises were very clear and xxs (PT) wrote instructions if she varied them and mum would have that on the table and she would flip over and ‘how do I do this?’ It was easy for her to follow.”*
Adherence to the program (Facilitators)

1. Program characteristics (n = 6 P, 9 C)
   - 6-month duration
   - 15-20 minute exercise session
   - Provision of an exercise booklet
   - Exercise program complexity/preference

C. 7, Female:

“I would sit here and tell him (participant) what to do next…I should have had a director’s chair that I could sit in…I just used to sit there and say ‘well now we’ll do this one’ and so forth.”
Adherence to the program (Facilitators)

1. Program characteristics (n = 6 P, 9 C)
   - 6-month duration
   - 15-20 minute exercise session
   - Provision of an exercise booklet
   - Exercise program complexity/preference

C. 5, Female:

“Home-visit does spur you on, you know, you think ‘well, she (PT) is coming next week, we better get busy’ (laughing)…you need that little just sometimes to keep you wound up.”
Adherence to the program (Facilitators)

2. Physiotherapists (n = 10 P, 9 C)
   - Professionalism
   - Supportive characteristics

C. 6, Female:

“She (PT) was not intrusive…she was not going to be here…for two hours and then you would be saying to yourself ‘God, I wish she would go away!’ , but she did the right thing, she just came, did it and went. Very professional she was.”
Adherence to the program (Facilitators)

3. Exercise recording sheet (n = 3 P, 3 C)

P. 9, Female:
“Cause you have got to fill that form in and if it was blank all the time, it would be a bit of a problem, wouldn’t it? (laughing).”

C. 6, Female:
“That (exs sheet) is necessary because after that month is over, she can look back and go ‘oh gee I did a good job’ and xxx (PT) would go ‘you have not missed a week, you have not missed a day’…it is like giving the kids a gold star.”
## Exercise recording sheet

### Home Exercise recording sheet for: ________________________________

Please tick each day that each exercise is completed

| EXERCISE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|----------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1. Trunk stretching | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Calf stretching | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 2. Quadriceps strength | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Toe raises | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Heel raises | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 3. Tandem stance | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Standing with EC | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Reaching | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Stand, walk, turn | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 4. Walking | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |

If you have any concerns regarding any of the exercise, please cease the exercise and contact the Physiotherapist (__________________________, phone ____________________________)

If you have been unable to do the exercises 5 times each week, please list reasons:

__________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________
### Adherence to the program (Facilitators)

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>4.</td>
<td>Caregivers’ support (n = 2 P, 6 C)</td>
</tr>
<tr>
<td>5.</td>
<td>Participants’ sense of commitment (n = 2 P, 5 C)</td>
</tr>
</tbody>
</table>

**P. 4, Female:**

“He (caregiver) will often sit and watch and say ‘oh you could do a little bit better than that, try it’. Yeah, well it makes you do it”

**P. 5, Female:**

“Well what I start, I want to finish”
Adherence to the program (Facilitators)

6. Perceived benefits (n = 3 P, 2 C)

P. 4, Female:
“I realised that it was good for me…and I just kept doing it.”

C. 2, Male:
“Well, it is doing her (participant) good. She thought she was, with the exercises she was improving, so we kept on with it.”
<table>
<thead>
<tr>
<th>Adherence to the program (Barriers)</th>
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</thead>
<tbody>
<tr>
<td>1. Pre-existing/acute health conditions (n = 2 P, 4 C)</td>
</tr>
<tr>
<td>2. Dislike of structured exercise (n = 1 P, 1 C)</td>
</tr>
<tr>
<td>3. Being away from home (n = 1 P)</td>
</tr>
<tr>
<td>4. Caregivers’ factors (n = 1 P, 1 C)</td>
</tr>
<tr>
<td>- health condition</td>
</tr>
<tr>
<td>- other commitments</td>
</tr>
<tr>
<td>5. Inclement weather (n = 2 P)</td>
</tr>
</tbody>
</table>
Conclusion:

- **Pre-intervention strategies:**
  - provision of knowledge of potential benefits of exercises
  - evaluation of both participants and caregivers capability/preferences

- **Individualising the program:**
  - intensity/complexity for participants
  - availability/constraints for caregiver

- **Strategies to support participants through the program**
  - ongoing support (from caregiver/PT)
  - provision of self-monitoring/evaluation
  - planning for any modifications/flexibility
Conclusion: from all the studies

- Falls risk and balance assessment:
  - screening
  - further investigation
  - follow up assessment

- Individualized balance exercise program with supports

Improving balance and mobility may consequently reduce risk of falling helping in extending length of time people with AD can live in their community
Publications:


Thank you

Questions?