Daily Life Function in WHI Women: Environmental Modifications that Aid Aging in Place

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Outline: Aging and Functional Ability

I. Aging, Physical Function, and Functional Independence
   • Background on aging and functional independence
   • Relationships between physical function and functional independence in WHI women over 80 years

II. Strategies that promote functional independence
   • Home environmental modifications use
   • Longitudinal relationships between home environmental modifications and functional independence
Background

• 40% of community-dwelling older adults currently experience some type of functional limitation or disability (Martin et al., 2010).

• Overall disability prevalence rises sharply with age, averaging 25% among U.S. adults aged 45–64 and 35% among adults aged 65 years and older (CDC, 2009).

• Given the aging demographic of the U.S. population, that the majority of older adults (>75 years) are women, and that incident disability in this age and gender group is higher, women are living longer with functional limitations that decrease their independence (Gill et al., 2003; Lin et al., 2012).

• Multiple trajectories of successful aging (Hsu & Jones, 2012) related to lifestyle indicators.
Objectives

• Examine influence of longitudinal trajectories of physical function (PF) on functional independence (FI) outcomes in community dwelling older WHI women currently >80 years, beginning at age 65.

• Identify those who consistently maintained or exhibited only small declines in their PF over time.

• Determine which factors are most protective of women’s late-life FI.

Methods

• Participants (80+ cohort) (N=10,748)
  – PF data collected from initial enrollment to the most recent assessment before age 80
  – FI (ADL and IADL) survey data collected after age 80

• Measures
  – Physical function (SF-36 PF sub-scale)
  – Functional independence (Basic and Instrumental ADLs)
  – Covariates

Methods

• Analyses
  – Individual trajectories (intercept and slope)
    • PF before age 80
    • FI after age 80
  – Cluster analysis classified PF trajectories into different classes
  – PF class trajectories used to predict ADL and IADL outcomes (most recent measure after age 80 and slope (change rate) after age 80 in unadjusted and adjusted regression models (ANCOVA)

Results

• Three PF trajectory groups were identified:
  • Maintaining or increasing physical function (N = 3,341; 32.0%)
  • Slowly declining physical function (N = 5,148; 49.0%)
  • Rapidly declining physical function (N = 1,989; 19%)

• Characteristics of women who maintained PF:
  • Majority were 80-84 yrs.; had at least a HS education; white; income ≥35,000; BMI <25; reported very good health; no hx. of hip fx. ≥ 55 yrs.; no hx. of CVD; no depression

Results

Figure 1. Scatter plots of SF-36 physical functioning by group (Maintaining; Rapidly Declining; Slowly Declining) with overall fitted lines.
### Results

<table>
<thead>
<tr>
<th>Functional Independence</th>
<th>Model</th>
<th>Total Sample</th>
<th>Rapidly Declining Physical Functioning</th>
<th>Slowly Declining Physical Functioning</th>
<th>Maintaining Physical Functioning</th>
<th>Overall p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>LSM (SE)</td>
<td>LSM (SE)</td>
<td>LSM (SE)</td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.9999</td>
</tr>
<tr>
<td>ADL</td>
<td>Unadjusted</td>
<td>4.11 (0.64)</td>
<td>4.24 (0.01)*</td>
<td>4.10 (0.01)†</td>
<td>4.06 (0.01)†</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td></td>
<td>Adjusted</td>
<td>4.18 (0.01)</td>
<td>4.10 (0.01)†</td>
<td></td>
<td>4.08 (0.01)†</td>
<td></td>
</tr>
<tr>
<td>IADL</td>
<td>Unadjusted</td>
<td>2.28 (0.74)</td>
<td>2.58 (0.02)*</td>
<td>2.24 (0.01)†</td>
<td>2.18 (0.01)†</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td></td>
<td>Adjusted</td>
<td>2.46 (0.02)</td>
<td>2.25 (0.01)†</td>
<td></td>
<td>2.23 (0.01)†</td>
<td></td>
</tr>
<tr>
<td>ADL slope (score/y)</td>
<td>Unadjusted</td>
<td>0.020 (0.20)</td>
<td>0.040 (0.004)</td>
<td>0.016 (0.003)†</td>
<td>0.014 (0.003)†</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td></td>
<td>Adjusted</td>
<td>0.028 (0.005)</td>
<td>0.017 (0.003)</td>
<td></td>
<td>0.019 (0.003)</td>
<td></td>
</tr>
<tr>
<td>IADL slope (score/y)</td>
<td>Unadjusted</td>
<td>0.044 (0.19)</td>
<td>0.077 (0.004)</td>
<td>0.038 (0.003)†</td>
<td>0.034 (0.003)†</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td></td>
<td>Adjusted</td>
<td>0.058 (0.004)</td>
<td>0.040 (0.003)†</td>
<td></td>
<td>0.043 (0.003)†</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Adjusted models include all covariates: age at visit with physical functioning; education; race/ethnicity; income <$35,000; baseline body mass index (kg/m²); self-reported health; history of hip fracture ≥55 y; history of cardiovascular disease defined as having been diagnosed with coronary heart disease, adjudicated stroke (ischemic, hemorrhagic), venous thromboembolism, congestive heart failure, and peripheral artery disease among women aged 80 and older in the Women’s Health Initiative Study cohort; smoking status; alcohol intake; and depression. ADL range = 2–6; IADL range = 4–12. ADL = activity of daily living; IADL = instrumental activity of daily living; LSM = least square mean.

*Comparison between maintaining physical function trajectory with slowly declining physical function trajectory, p < .01.

†Comparison between maintaining or slowly declining physical function trajectories with rapidly declining physical function trajectory, p < .01.

Results

Overall:

Most recent ADL and IADL:

• Greater independence in ADL and IADL predicted by maintaining or slowly declining PF, excellent or very good self-reported health, no history of hip fracture after age 55, and no history of CVD (all p<.0001).

• In addition, greater independence in IADL is predicted by BMI less than 25 (p<.05) and no depression (p<.0001).

Change in ADL and IADL:

• Less decline in ADL predicted only by excellent or very good self-reported health (p<.0001).

• Less decline in IADL predicted by maintaining or slowly declining PF (p<.01), self-reported excellent or very good health, and in addition, no history of hip fracture after age 55 (all p<.0001).

Summary & Conclusions

• Maintaining PF in older adulthood (after age 65) predicts greater FI in late-life (after age 80).

• WHI women report mostly independent ADL and IADL function but that they “need a little help” especially with IADL function.

• There are unique risks for IADL limitations and decline in IADL function.

• Clinical implications

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Background

- Difficulty performing basic and instrumental activities of daily living has adverse effects on health, safety, and mortality (Gitlin et al., 2006; Keeler et al., 2010) increases the need for personal assistance or relocation to a residential care facility (Jette et al., 1992; Naik et al., 2004), and decreases capacity to age in place (Gill & Kurland, 2003; Han et al., 2013).

- Decreased ability to age in place increases healthcare costs (Counsell et al., 2007; Jutkowitz et al., 2012) for all adults over the age of 75 (Jones et al., 2009) and especially for women who are the majority (Stevens et al., 2008).

- An important strategy for increasing daily life participation regardless of the level of functional limitation is to modify the home physical environment with adaptations that range widely in cost and complexity (Chase et al., 2012; Wahl et al., 2012).
Objectives

• **What are the latent patterns of self-reported HEMs strategies?**
  – Characterize HEMs classes in older women.

• **How are key risk factors associated with latent patterns of HEMs strategies?**
  – Determine the relationships between key hypothesized risk factors and HEMs classes.

• **How do concurrent and distal repeated measures of FI vary across latent patterns of HEMs strategies, controlling for key risk factors?**
  – Determine concurrent and distal repeated measures of FI conditional on HEMs classes, controlling for key hypothesized risk factors.
Methods

• Participants
  – Proposed study includes all WHI participants (88,500 women) enrolled in years 3-5 of Extension 2 and year 1 of the third extension.
  – Estimated 67,500 women with HEMs data and distal repeated measures of FI outcomes.

• Variables of interest
  – Home Environmental Modifications (HEMs) (2013-2014 survey supplement)
  – Demographic and lifestyle characteristics
Methods

2013-2014 Survey Supplement: Home Environmental Modifications
Self-Report of Falls

As people grow older they sometimes need to make changes to their home so that it is a safer and easier place to live. Please read the list below and mark any changes or additions that you have made to your home for yourself or someone else. Be sure to mark all that apply.

- Railings or banisters
- Grab bars
- Indoor or outdoor ramps
- Non-slip surfaces
- Tacking down carpets/rugs
- Decreasing clutter
- Increasing lighting
- Sink/counter heights
- Other
- No changes

In the last year, did you fall at home? Yes/No


The next questions ask about how much help (if any) you need to do routine activities for yourself. Help can be defined as getting assistance from another person or using a device. Mark one answer. Responses are: By myself without help/With some help/Completely unable to do this by myself

- Can you:
  - Feed yourself;
  - Dress and undress yourself;
  - Get in and out of bed yourself;
  - Take a bath or shower

- Can you:
  - Do your own grocery shopping;
  - Keep track of and take your medications
Methods

• Analyses
  • Latent class analyses (LCA): characterize distinctive patterns of HEMs
  • LCA with covariates to model HEMs classes relationships with key risk factors
  • LCA and linear mixed models with repeated measures: Determine concurrent and distal FI conditional on HEMs classes

Conceptual diagram of data analytic plan: latent class analysis with covariates and a distal outcome

- HEMsC = categorical latent class variable of home environmental modifications
- Yx = observed categorical indicators of HEMsC
- FA = distal functional independence outcome
Table 1. Demographic characteristics of women who do and do not report home environmental modifications use.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Home Environmental Modifications Use (N=39851)</th>
<th>No Home Environmental Modifications Use (N=34981)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current age (yrs)</td>
<td>79.53 (79.46, 79.59)</td>
<td>77.76 (77.69, 77.82)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Education: HS or less</td>
<td>6424 (16.2)</td>
<td>6497 (18.7)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td>2204 (5.5)</td>
<td>1907 (5.5)</td>
<td>0.0025</td>
</tr>
<tr>
<td>Hispanic</td>
<td>880 (2.2)</td>
<td>933 (2.7)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>35326 (88.8)</td>
<td>30942 (88.6)</td>
<td></td>
</tr>
<tr>
<td>General Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>3735 (10.0)</td>
<td>5471 (16.6)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Very Good</td>
<td>15643 (41.9)</td>
<td>15631 (47.4)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>14342 (38.4)</td>
<td>10030 (30.4)</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>3351 (9.0)</td>
<td>1744 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>247 (0.7)</td>
<td>105 (0.3)</td>
<td></td>
</tr>
<tr>
<td>CVD</td>
<td>7706 (19.3)</td>
<td>5321 (15.2)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Any Cancer</td>
<td>9664 (24.3)</td>
<td>7920 (22.6)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Broken Hip</td>
<td>1153 (2.9)</td>
<td>617 (1.8)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Fall at home in past year</td>
<td>11079 (28.1)</td>
<td>5542 (16.5)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Obese (BMI&gt;=30) at baseline</td>
<td>11491 (29.1)</td>
<td>7912 (22.8)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CES-D SF score</td>
<td>0.029 (0.027, 0.030)</td>
<td>0.023 (0.021, 0.024)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Depressed (CES-D&gt;0.06)</td>
<td>2698 (7.5)</td>
<td>1850 (5.8)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Live Alone</td>
<td>14495 (40.3)</td>
<td>13060 (41.2)</td>
<td>0.0250</td>
</tr>
<tr>
<td>ADL Limitation</td>
<td>1194 (3.0)</td>
<td>442 (1.3)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>IADL Limitation</td>
<td>3900 (9.8)</td>
<td>1590 (4.5)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Table 2. Frequency of self-reported use of home environmental modifications in women with and without any functional limitations.

<table>
<thead>
<tr>
<th>Home environmental modifications</th>
<th>Any limitation in ADLs (N=1636)</th>
<th>Any limitation in IADLs (N=5490)</th>
<th>No limitation in ADLs (N=73196)</th>
<th>No limitation in IADLs (N=69342)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railings or banisters</td>
<td>477 (32.65)</td>
<td>1572 (31.33)</td>
<td>12488 (17.89)</td>
<td>11393 (17.20)</td>
</tr>
<tr>
<td>Grab bars</td>
<td>859 (58.80)</td>
<td>2745 (54.70)</td>
<td>22704 (32.53)</td>
<td>20818 (31.43)</td>
</tr>
<tr>
<td>Indoor or outdoor ramps</td>
<td>279 (19.10)</td>
<td>722 (14.39)</td>
<td>2952 (4.23)</td>
<td>2509 (3.79)</td>
</tr>
<tr>
<td>Non-slip surfaces</td>
<td>305 (20.88)</td>
<td>937 (18.67)</td>
<td>6431 (9.21)</td>
<td>5799 (8.75)</td>
</tr>
<tr>
<td>Tacking down carpets/rugs</td>
<td>209 (14.31)</td>
<td>606 (12.08)</td>
<td>4504 (6.45)</td>
<td>4107 (6.20)</td>
</tr>
<tr>
<td>Decreasing clutter</td>
<td>614 (42.03)</td>
<td>1962 (39.10)</td>
<td>18682 (26.77)</td>
<td>17334 (26.17)</td>
</tr>
<tr>
<td>Increasing lighting</td>
<td>405 (27.72)</td>
<td>1351 (26.92)</td>
<td>12967 (18.58)</td>
<td>12021 (18.15)</td>
</tr>
<tr>
<td>Sink/Counter height</td>
<td>89 (6.09)</td>
<td>242 (4.82)</td>
<td>1906 (2.73)</td>
<td>1753 (2.65)</td>
</tr>
<tr>
<td>Other</td>
<td>233 (15.95)</td>
<td>702 (13.99)</td>
<td>4038 (5.79)</td>
<td>3569 (5.39)</td>
</tr>
<tr>
<td>Any changes</td>
<td>1194 (72.98)</td>
<td>3900 (71.04)</td>
<td>38657 (52.81)</td>
<td>35951 (51.85)</td>
</tr>
</tbody>
</table>
Summary

- Women who use HEMs have worse health.
- Women who use HEMs report more ADL and especially more IADL limitations.
- Women with ADL limitations report the most use of all HEMs items.
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