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Rapid Communication

Daily Ambulation Activity and Task Performance in Community-Dwelling Older Adults Aged 63–71 Years With Preclinical Disability

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Background. The purpose of this study was to examine differences in daily ambulation activity and task modification between community-dwelling older adults above and below an empirically derived physical threshold that has been linked to independence.

Methods. 20 community-dwelling older adults (72.8 ± 6 years) were categorized into groups based on functional performance using the Continuous scale Physical Functional Performance Test total score (Cs-PFP). Individuals with Cs-PFP $\geq$ 57 were assigned to the high functioning group (HIGH; $n = 10$) with all others assigned to the lower functioning group (LOW; Cs-PFP < 57; $n = 10$). Dependent variables included steps/day, number of tasks reported with difficulty, and number of tasks reported with modification.

Results. HIGH took significantly more steps/day (HIGH: 9503 ± 4623; LOW: 5048 ± 2917, $p = .019$) compared to LOW. Groups reported having difficulty with a similar number of tasks (HIGH: 0.4 ± 1; LOW: 1.0 ± 1, $p = .092$) but LOW reported modifying a significantly larger number of tasks (HIGH: 0.3 ± 1; LOW 1.4 ± 1, $p = .049$).

Conclusions. Older adults with preclinical disability have reduced daily ambulatory activity compared to older adults with high function despite a similar independent living status. Individuals compensate for reduced physical reserves by modifying the method of performing a task. Identifying early declines in physical ability through task modification and daily ambulation will provide the opportunity for timely intervention to older adults desiring to remain independent within a community-dwelling environment.

PHYSICAL reserve is the physiological capacity in excess of that needed during daily activities (1). Physical reserve provides a margin of safety that absorbs age- or disease-related changes without a loss in function (2). As physical reserve deteriorates, individuals approach a threshold of independence below which any further loss of peak capacity is associated with a 17-fold to 20-fold decrease in physical function (3). If physical capacity falls below the ability required for performance of daily tasks, then resultant functional limitation can bring about loss of independence (1).

Individuals living independently with physical capacities near or below the threshold have been identified as having preclinical disability (4–6). These individuals develop strategies for daily tasks by modifying the environment, procedures, time spent, or frequency of task performance to accommodate physical declines (7–9). These self-initiated strategies can forestall changes in living status that may be necessitated by loss of physical ability. This study provides unique insight into differences in daily ambulation and task performance for a group nearing dependency and accommodating physical declines.

The purpose of this study was to examine ambulation and task modification of older adults living independently and scoring below the threshold of independence as established by the Continuous scale Physical Functional Performance Test (Cs-PFP). Independent community dwellers scoring below 57 on the Cs-PFP can be classified with preclinical disability. We hypothesized that older adults performing below the threshold would take fewer steps/day and modify more tasks than those above the threshold.

Methods

Twenty older adults (aged 63–71 years) participated in this cross-sectional study. Eligibility criteria included independent adults aged 65 years and older living within the community. Individuals were assessed by SF36 Physical Function domain (SF36PF) to ensure a broad range of physical abilities. SF36PF scores $\geq$85 are indicative of older adults without chronic conditions (10,11), while scores $<$85 indicate a transition to disability (12,13). Exclusion criteria included inability to walk, unstable cardiovascular disease or diabetes, unhealed bone fracture, severe

Table 1. Selected Demographic, Physical, and Functional Characteristics of Community-Dwelling Older Adults Scoring Above and Below the Threshold of Independence as Determined by the Cs-PFP

Measure	HIGH ($n = 10$)	LOW ($n = 10$)	p Value
Age (y)	71 ± 6	75 ± 5	.093
Height (cm)	167.7 ± 10	170.0 ± 11	.619
Weight (kg)	74.1 ± 16	75.1 ± 15	.897
Female (%)	70	70	
Cs-PFP	71.0 ± 12	47.4 ± 6	<.001
Upper body strength	76.6 ± 16	61.9 ± 6	.018
Lower body strength	65.6 ± 17	41.1 ± 9	.001
Upper body flexibility	78.5 ± 9	66.0 ± 12	.018
Balance/coordination	65.9 ± 12	39.3 ± 7	<.001
Endurance	73.4 ± 10	46.9 ± 7	<.001
SF12 PCS	52.8 ± 4	43.4 ± 8	.004
SF12 MCS	55.3 ± 6	54.6 ± 6	.795
SF36PF	88.5 ± 10	78.5 ± 12	.051

Notes: Values are means ± *SD*. HIGH = individuals scoring ≥ 57 on the Cs-PFP total; LOW = individuals scoring < 57 on Cs-PFP total.

Cs-PFP = Continuous scale Physical Functional Performance Test Total Score; SF12 PCS = SF12 physical component score; SF12 MCS = SF12 mental component score; SF36PF = SF36 physical function score.

hypertension, or leg amputation. Participants signed a consent form approved by the Institutional Review Board Human Subjects Committee.

Eligible participants were classified into two groups based on the threshold of independence as determined by the Cs-PFP (14,15). Participants scoring ≥57 on the Cs-PFP were classified as higher functioning (HIGH) with all others classified as lower functioning (LOW). A Cs-PFP total score of 57 is associated with thresholds in oxygen consumption and strength that accurately predict functional limitations and dependency in living status (3). Participants completed a self-reported instrument of task performance and a performance-based assessment of ambulation.

The Cs-PFP was developed from data on older adults with a broad range of physical abilities and has been shown to have convergent, construct, and face validity for 16 everyday household tasks (14). The Cs-PFP is based on 16 ordinary activities of daily life, performed at maximal effort within the bounds of safety and comfort. Performance on the 16 tasks was scaled 0 to 100 and used to calculate a total score and five domain scores (15). Domain scores included upper and lower body strength, upper body flexibility, balance/coordination, and endurance. The laboratory for the Cs-PFP adhered to published dimensions (14) and used the published protocol (15) and scripted dialog with minor changes tailored for the laboratory. Performance data were scored using the web-based data reduction program at http://www.coe.uga.edu/cs-pfp.

The SF36PF of the SF36 Health Measure (16) was administered for screening purposes. SF36PF consists of 10 questions assessing self-perceived health-related limitations on basic to strenuous physical activities with scores scaled 0 to 100 (17). Physical and mental function was also determined by the SF12 questionnaire resulting in a physical (SF12 PCS) and mental component summary (SF12 MCS) (18,19).

Table 2. Task Performance and Ambulation of Community-Dwelling Older Adults Scoring Above and Below the Threshold of Independence as Determined by the Cs-PFP

Measure	HIGH ($n = 10$)	LOW ($n = 10$)	p Value
Task Difficulty (#)	0.4 ± 1.3	1.0 ± 1.4	.092
Task Modification (#)	0.3 ± 0.7	1.4 ± 1.4	.049
Steps/day	9502 ± 4623	5048 ± 2917	.019

Notes: Values are means ± *SD*. HIGH = individuals scoring ≥ 57 on the Cs-PFP total; LOW = individuals scoring < 57 on Cs-PFP total.

Cs-PFP = Continuous scale Physical Functional Performance Test Total Score.

Self-reported functional decline, as assessed by task difficulty (TD) and modification (TM), were determined by a modified version of the Supplement on Aging National Health Interview Survey (4,20). This questionnaire covers 27 tasks related to mobility, upper extremity function, instrumental activities of daily living, and self-care. Six tasks related to mobility and ambulation were selected for analysis. Tasks included walking for a half mile, 150 feet, and around the home, getting out of bed, and walking up/down 10 steps. Results were reported as number of tasks performed with difficulty (TD) and modification (TM).

Average daily ambulation (steps/day) was assessed while wearing a DigiWalker Stepcounter (Lifestyles, Inc., Kansas City, MO) over a 7-day period. The step-counter is a pedometer that displays total number of steps taken since the last reset (21,22). Participants were educated on pedometer placement and given a walking log with instructions for recording number of steps/day. Participants wore the pedometer for 7 consecutive days and recorded number of steps taken at the end of each day. Participants mailed the completed walking log to the investigator.

Statistical analyses were performed using SPSS version 10.0 (SPSS, Inc., Chicago, IL). Independent t tests were used to detect group differences in physical function and number of steps/day. Mann-Whitney U tests were used to detect differences in task difficulty and task modification. Significance was set at alpha = .05.

Results

Selected physical characteristics and functional assessments are reported in Table 1. All participants lived in their own home (95%) or apartment (5%); 80% lived with a spouse with all others living alone. Physical functional performance on the Cs-PFP was significantly higher in the HIGH group compared to the LOW group ($p < .05$; Table 1). The HIGH group reported significantly higher physical function (SF12 PCS, $p < .05$) but similar mental function (SF12 MCS, $p = .795$; Table 1). Ambulation for each group is illustrated in Table 2. The HIGH group had significantly higher daily ambulation as assessed by average steps/day ($p < .05$). While groups did not differ in number of tasks reported as difficult (TD, $p = .092$; Table 2), there was a significant difference in number of tasks reported as modified (TM, $p < .05$; Table 2).

Discussion

Older adults scoring below the threshold of independence take fewer steps/day and modify more tasks than individuals

above the threshold. These changes are evident despite all participants living independently and having similar physical characteristics. Groups did not differ in mental capabilities, suggesting any differences in functional performance were attributed to physical differences. High functioning older adults exhibited an average functional performance 14.0 units above the threshold (Cs-PFP 71.0–57), a measure of physical reserve. Lower functioning older adults performed 9.6 units below the threshold (57–47.4), an indicator of preclinical disability. Group means on self-reported physical function (SF36PF) approached significance and provided some insight, as a score <85 is associated with a transition to disability (12,13). In our sample, lower functioning older adults perceived themselves to be functioning at a level associated with a transition to disability and performed below the threshold of independence despite a living status similar to high functioning older adults. These characteristics are indicative of preclinical disability.

Lower-functioning older adults modified more mobility-related tasks than high functioning older adults. Task modification is a primary characteristic of individuals with preclinical disability (5). Older adults who perform below the threshold of independence yet remain independent are compensating for declines in physical capacity by altering task performance in order to accomplish daily tasks. There was no difference between groups in task difficulty, but this measure had low statistical power to detect a difference.

Reduced daily ambulation activity may place individuals at greater risk of becoming dependent (23). We believe this work to be unique in showing daily ambulation activity as assessed by steps/day in relation to whole body physical functional performance. High functioning older adults took 1.88-fold more steps/day than lower functioning older adults despite similar living status and environmental demand. Studies suggest 10,000 steps/day are associated with significant health benefits (24–26). Our results indicate that individuals averaging 9500 steps/day have significantly higher physical function that is above the threshold of independence. Lower functioning older adults averaging 5000 steps/day could be at increased risk of disability requiring perhaps a single event to thrust them below the ability to remain independent.

This study was limited by the cross-sectional design to assess the relationship between mobility tasks, ambulation, and physical function. The amount of social support received was unknown. Individuals with high levels of support could maintain independence despite having reduced physical capacities and reserves. In future studies, individuals need to be studied over time to understand if lower ambulation leads to institutionalization and dependency.

Conclusion

Daily ambulation and task modification are indicators of preclinical disability. Individuals with greater capacity in ambulation and task performance tend to retain physical reserves in later life. Individuals performing below the threshold of independence have lower daily ambulation and may be at a stage of preclinical disability with increased risk of dependency. In spite of declining function, many individuals desire to remain in place in homes requiring high levels of physical function (27). The ability to detect declines in physical reserves prior to physical inability would allow for early intervention to those who would like to remain independent (4).

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