The Relationship between Older Adults' Risk for a Future Fall and Difficulty Performing Activities of Daily Living

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Abstract: Functional status is often defined by cumulative scores across indices of independence in performing basic and instrumental activities of daily living (ADL/IADL), but little is known about the unique relationship of each daily activity item with the fall outcome. The purpose of this retrospective study was to examine the level of relative risk for a future fall associated with difficulty with performing various tasks of normal daily functioning among older adults who had fallen at least once in the past 12 months. The sample was comprised of community-dwelling individuals 70 years and older from the 1984-1990 Longitudinal Study of Aging by Kovar, Fitti, and Chyba (1992). Risk analysis was performed on individual items quantifying 6 ADLs and 7 IADLs, as well as 10 items related to mobility limitations. Within a subsample of 1,675 older adults with a history of at least one fall within the past year, the responses of individuals who reported multiple falls were compared to the responses of participants who had a single fall and reported 1) difficulty with walking and/or balance (FRAIL group, *n* = 413) vs. 2) no difficulty with walking or dizziness (NDW+ND group, *n* = 415). The items that had the strongest relationships and highest risk ratios for the FRAIL group (which had the highest probabilities for a future fall) included difficulty with: eating (73%); managing money (70%); biting or chewing food (66%); walking a quarter of a mile (65%); using fingers to grasp (65%); and dressing without help (65%). For the NDW+ND group, the most noteworthy items included difficulty with: bathing or showering (79%); managing money (77%); shopping for personal items (75%); walking up 10 steps without rest (72%); difficulty with walking a quarter of a mile (72%); and stooping/crouching/kneeling (70%). These findings suggest that individual items quantifying specific ADLs and IADLs have substantive relationships with the fall outcome among older adults who have difficulty with walking and balance, as well as among older individuals without dizziness or difficulty with walking. Furthermore, the examination of the relationships between items that are related to more challenging activities and the fall outcome revealed that higher functioning older adults who reported difficulty with the 6 items that yielded the highest risk ratios may also be at elevated risk for a fall.

Keywords: Accidental falls, older adults, gerontology, geriatrics, risk factors, activities of daily living.

1. INTRODUCTION

Unintentional falls among older adults are a serious public health concern. Nearly half of the people above the age of 85 and a third of those over the age of 65 have experienced a fall, and nearly half of those who fall will experience another fall within a year [1-4]. Among older adults, falls are the leading cause of death from injury [5]. Fall-related costs reached $30 billion in 2005, and are estimated to more than double by 2020 [6].

1.1. The Purpose of this Study

The primary goal of this retrospective comparative study was to identify the degree of relative risk for a future fall that is associated with reported difficulty with performing activities of daily living (ADL/IADL) and other mobility limitations in community-dwelling older adults who fell within the past 12 months. We set out to compare measures of the risk of falling associated with difficulty with performing each activity across two groups of individuals who experienced a single fall within the past year: 1) higher-functioning older adults who reported no difficulty with walking and dizziness (*NDW+ND*), and 2) older individuals who reported difficulties with either walking or dizziness, or with both. These problems are indicative of frailty, which is broadly defined in the literature as a multidimensional syndrome of vulnerability stemming from depletion of health, physical ability/energy, and/or cognitive reserves [7]. Consequently, we labeled this group as *FRAIL*. Obtaining a better understanding of the level of risk associated with each activity of daily living, as done in the present study, could have critical clinical implications through serving to better identify those individuals who may be at higher risk for another fall - *whether they experience dizziness and/or difficulty with walking or not*. To define the main concepts discussed herein, activities of daily living (ADL) correspond to basic activities of everyday life, such as bathing, dressing, eating, toileting, and transferring [8]. On the other hand, instrumental activities of daily living (IADL) comprise activities that are typically required for people to function independently within the community [9]. Moreover, relative risk or risk ratio is calculated by comparing the risk of a specific event (in this case, the risk of falling) across different groups of people [10], as done in this study.

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1.2. A Brief Literature Review

The only mechanism for fall prevention is the engagement in multifactorial evaluations intended to identify the *risk factors* that can be modified through targeted preventative interventions [11]. Community-dwelling older adults generally rely on their primary care providers to detect and address increased fall risk levels. The leading bodies that address fall prevention efforts among older adults (i.e., the American and British Geriatrics Societies) have published *clinical practice guidelines*, which recommend routine screenings to effectively identify older adults who may be at an elevated risk for a future fall. Older individuals who are considered to be at high risk are those who present to the health care provider with an acute fall, or whose preliminary screenings reveal that they have experienced two or more falls within the past year. According to the American Geriatrics Society (AGS) [12], older adults who indicate having difficulty with walking and/or balance are also considered to be at higher risk, including those with a history of a single fall. The AGS guidelines for screening further recommend that individuals who report a single fall undergo a gait and balance evaluation. However, *if* no difficulty with walking or balance are reported or demonstrated, then they are not required to undergo further risk assessment. This could be problematic, as discussed below, and as suggested by the findings of the present study.

The underlying assumption associated with the AGS screening process for future risk of fall outlined in their clinical practice guidelines [12] is that individuals who have experienced a single fall and who do not report any difficulty with walking or dizziness are not at an elevated risk for falling. By making this distinction, such a clinical assumption allows the opportunity for older adults who *do* function at higher levels to be excluded from further fall risk evaluation. However, given that 50% of those who fall once will fall again, this is a risky assumption to make. In the present study, it is contended that, while some individuals who have fallen once and who have difficulty with walking or balance could indeed be at elevated risk, *those who do not report such difficulty may also be at-risk*. In order to identify them, their perceived difficulty with more challenging activities that are related to walking (and not simply just walking itself) ought to be considered as the criteria for screening.

Overall, the existing published evidence relating functional ability and ADLs to fall risk suggests that they are related and that a) higher-functioning adults may be at lower risk for falls [13], and b) individuals with decreased independence in performing their ADL/IADL and mobility limitations may be at higher risk for falls [14-16]. However, there is a paucity of investigations aimed at quantifying these relationships in terms of fall *risk*, as they relate to each *item* and not to the cumulative scores in the scales and indices used to assess functional and mobility limitations. To the authors' knowledge, there are no studies that specifically cover risk of future falls in relation to each of the basic and instrumental ADL/IADL items in community-dwelling older adults who experienced a single fall yet have no difficulty with walking or dizziness (i.e., one of the two groups targeted in the present study). While dizziness and difficulty with walking can certainly contribute to fall risk, given the existing fall risk models [1, 4], they are not necessarily the *only* factors that can lead to another fall and thus deserve attention to decrease older adults' likelihood of a future fall. The items selected to be tested in our study inquire about tasks that are very similar to those covered in the Falls Efficacy Scale [17] and the Activities-Specific Balance Efficacy Scale (ABC) [18], which quantify level of perceived fall risk during everyday activities that require strength, balance, and coordination.

Concerning the assessment of fall risk by medical doctors, there is evidence suggesting that many physicians, for a variety of reasons, tend to under-detect falls and gait abnormalities [19] and may need to be made more aware of the features that predict future falls [14]. Even worse, many of them simply do not follow the existing guidelines for routine evaluations [20]. Therefore, if the main criterion for risk assessments in those individuals who have fallen once is whether or not they have difficulty with walking or balance when they are being screened for fall risk, then many older adults may not be adequately identified to be at high risk if their physicians fail to recognize gait abnormalities. Moreover, given that the screening process relies substantially on older adults' self-reports of perceived difficulty with walking or balance, some older individuals may simply mislead their doctors with their responses, particularly due to the lack of a clear definition for what exactly constitutes "difficulty with walking" for older adults to report themselves.

1.3. Hypotheses

a) Items across the two indices of daily living skills (ADL/IADL) and the 10-item functional limitations scale would yield unique and meaningful relative risk ratios for the two groups of older adults targeted in this study,

b) the responses of the two groups would be related to the fall outcome for generally different items, with older adults experiencing no dizziness and no difficulty with walking showing stronger relationships between the fall outcome and more challenging activities, and c) the NDW+ND group would nonetheless be at elevated risk, which would indicate the need for further evaluation.

1.4. Assumptions

This research study was created based on certain assumptions. Specifically, all participants: a) were community-dwelling/non-institutionalized adults and did not report having any acute illnesses or disorders, both physically and mentally, nor any serious cognitive impairment, b) defined fall as involuntary and unintentional, not including events that resulted from loss of consciousness, seizures, paralysis, or other intrinsic event [21], c) were able to read and speak English, as well as comprehend the questions related to the study, and d) provided complete and honest answers. It should also be noted that the variables assessed in this study should not be viewed as *causes* of falls, but as factors *related to* falls.

2. METHODS

2.1. Participants

We analyzed publically available data collected in the 1984-1990 Longitudinal Study of Aging (LSOA) [22], which is based on a sample of 7,478 individuals drawn from the Supplement on Aging (SOA) to the 1984 National Health Interview Survey (NHIS). Of the 7,478 respondents, *1,675* (22.40%) indicated that they had experienced *at least one fall within the past year*, which is below the general rate of one out of three commonly reported in fall-related literature [1-4]. The individuals who reported falling were significantly older (x bar = 78.15, SD = 6.21) than the individuals who reported no falls (x bar = 76.43, SD = 5.32), $F(1, 7477) = 128.04$, $p < 0.001$. Of those who fell, 828 (49.43%) indicated that they only fell once and were, on average, one year younger (x bar = 77.6, SD = 5.99) than the 847 (50.57%) participants who reported experiencing more than one fall (x bar = 78.7, SD = 6.37), a difference that was statistically significant ($p < 0.001$). Post-hoc Sheffe test revealed that individuals over 80 years of age had significantly higher rates of fallings ($p < 0.001$). Figure **1** displays the mean age of the non-fallers, single-fallers, and recurrent fallers.

Women accounted for 62% of all the fallers. The rate of falls among women was higher (20%) than among men (13.6%), both for single falls (11.6% vs. 8.2%) as well as recurrent falls (8.5% vs. 5.4%). Although the difference in fall rates among the sexes is statistically significant, as revealed through a Chi-square test of independent samples, the magnitude of the difference is marginal, $\chi^2(1, 7478) = 51.52$, $p < 0.001$, $\varphi = 0.08$. Additionally, there was no significant interaction between age and sex for falls, $F(26, 5786) = 1.176$, $p = 0.245$. For the purposes of this study, the subsequent analyses and descriptions will only include individuals who reported experiencing at least one fall during the past 12 months. Of those who indicated having just one fall (N = 828), 50.12% (n = 415) reported having no difficulty with walking or dizziness (NDW+ND), while 49.88% (n = 413) had difficulty with walking, balance, or both (FRAIL).

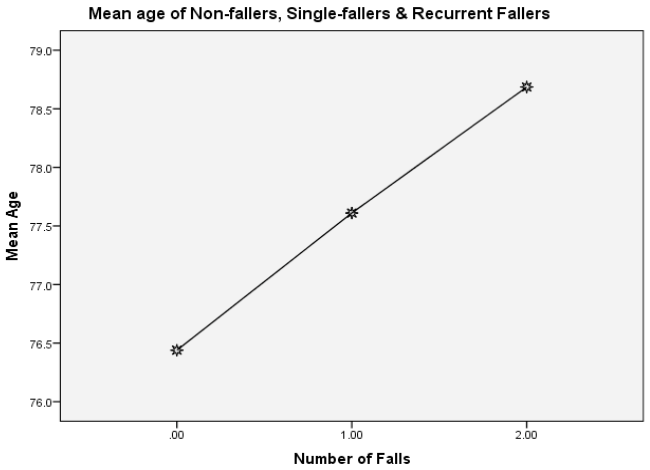

Figure 1: Mean age of non-fallers, single-fallers and recurrent fallers.

2.2. Procedure

Three different procedures were used to collect the interview data in the Longitudinal Study of Aging (LSOA), including personal interviewing in the household, telephone/computer-assisted telephone interviewing (CATI), as well as mailing paper questionnaires. Specially trained Bureau of the Census staff conducted the interviews for the project. The NHIS basic questionnaire was used to collect basic health information about all household members. SOA interviews were conducted in person whenever possible. The data are available publically and do not include any individual identifiers.

2.3. Measurement

The demographic variables included in the present study were *age* and *sex.* Risk ratios, calculated for each of the items, were modeled after the *Katz Index of Independence in Activities of Daily Living* [23]; the 10-item mobility limitation was adopted from the *Nagi*

Scale [24]; and the instrumental activities of daily living (IADLs) were modeled after the *Duke University Center for the Study of Aging and Human Development Index* [25]. The more general construct that was adopted in this study as the main determining factor for identifying higher functioning older adults is their perceived difficulty with "walking." Although walking is generally considered as one of the ADLs, for the purpose of this study it was isolated, given the AGS criterion [12] that was specified as part of the recommended screening process. Similarly, an item regarding "sometimes having dizziness" was also isolated, and those individuals who reported no difficulty with walking and no dizziness were selected as the "NDW+ND" subsample/group. This was done because, according to the AGS screening guidelines, these individuals would *not* be considered at-risk and would not have further evaluations. The remaining respondents who provided a positive response to the item "Sometimes I have trouble with dizziness," as well as those who indicated that they fell due to dizziness, were included in the FRAIL group because, using the AGS guidelines for screening [12], they would be considered at high risk and would be recommended to undergo further evaluations.

3. RESULTS

We used SPSS 22.0 (IBM SPSS Inc., Armonk, NY) for all data analyses. Risk ratios were calculated for 23 items via SPSS construction of 2 x 2 contingency tables. Each table included the dichotomous responses to a) the functional status measures (0 = "no difficulty", 1 = "difficulty") and b) the fall outcome (0 = "single fall" and 1 = "two or more falls"). This was done due to the fact that the goal of this study was to determine risk for a future fall among participants who reported a history of a single fall, based on the responses from the participants who fell more than once. The same analysis was carried out for each of the two single fall groups - the FRAIL group and the NDW+ND group. The strength of the association between the functional status items and the fall outcome was quantified through Cramer's *V* contingency coefficient (*V*). Choosing this coefficient was optimal, as it is robust to chi-square significance obtained merely because of large sample size alone, and has greater generalizability across numerous contingency tables of varied sizes [26]. Concerning the criterion used, we set as the minimum threshold for the measure of association a *V* value of 0.10 (10%), with values above this level being indicative of a substantive relationship between the items. Additionally, for each item, we chose to convert the relative risk ratios to probabilities using the *p* = odds/1+odds formula. Reporting results in percentage form enhances the interpretability of the change in fall risk associated with reported difficulty engaging in each of the activities (vs. no reported difficulty).

The results of the risk analysis revealed that there were variations in fall risk ratios across each of the items, and that there were differences between the two groups of respondents across the relative risks ratios for each of the survey items. Measures of associations (*V*) were also obtained for each relationship between ADL/IADL items and the fall outcome, and were found to be statistically weak. For the FRAIL group, all of the chi-square tests and measures of association were significant at $p < 0.05$ level, whereas in the higher functioning group, only 17 items revealed significant relationships, with only 14 meeting the minimum threshold criterion.

3.1. Findings on the FRAIL Group

For the FRAIL group, there were 15 items that met our criterion of a minimum *V* value of 0.10 (10%). However, the relationships between the items were relatively low and only ranged from 0.100 to 0.155 (16%). For this group, the probability of a future fall associated with the 15 items meeting the selected minimum threshold ranged from almost 60% to 73%. The highest risk ratio (RR) related to the fall outcome was obtained for the item representing reported difficulty with *eating* independently, RR = 2.72 (95% CI = 1.54-4.79, $V = 0.112$, $p < 0.001$). This result indicates that the probability of a future fall for those who reported difficulty with eating was 73% higher than for those individuals who reported no difficulty with eating. Interestingly, difficulty with *managing money* without help had the second highest relative risk ratio for the fall outcome and yielded the strongest relationship, RR = 2.34 (95% CI = 1.65-3.31, $V = 0.155$, $p < 0.001$). Importantly, the probability of a fall among individuals who reported difficulty with managing money was nearly 70% higher than for those who reported no difficulty with this task.

Trouble with biting or chewing food without assistance had the second strongest relationship with the fall outcome and the third highest risk ratio, RR = 1.92 (95% CI = 1.47-2.51, $V = 0.150$, $p < 0.001$). This suggests that the probability of falling for the second time for respondents who reported difficulty with biting or chewing food was 66% (vs. no difficulty with the tasks, respectively). The next three items that had the highest risk for a future fall were related to difficulty with

Table 1: Relative Risk Ratios and Measures of Association for the Frail Group

Difficulty with:	R.R.	95% C. I.		*Cramer's V*	*Sig.*
		Lower	Upper		
Managing money	2.335	1.648	3.308	0.155	0.000
Trouble biting or chewing food	1.916	1.465	2.506	0.150	0.000
Walking a quarter of mile	1.853	1.391	2.468	0.134	0.000
Using fingers to grasp	1.849	1.377	2.484	0.129	0.000
Shopping for personal items	1.666	1.279	2.170	0.122	0.000
Dressing	1.819	1.328	2.492	0.118	0.000
Doing light housework	1.762	1.292	2.403	0.118	0.000
Doing heavy housework	1.649	1.231	2.210	0.113	0.001
Eating	2.717	1.542	4.787	0.112	0.000
Being on feet for 2 hours	1.713	1.267	2.316	0.111	0.000
Walking up 10 steps w/o rest	1.599	1.222	2.093	0.109	0.001
Getting outside	1.540	1.184	2.002	0.101	0.001
Preparing own meals	1.601	1.183	2.166	0.100	0.002
Getting in or out of bed or chair	1.585	1.194	2.105	0.100	0.001
Reaching up over head	1.519	1.173	1.968	0.100	0.001
Stooping/crouching/kneeling	1.631	1.197	2.221	0.098	0.002
Bathing or showering	1.507	1.154	1.968	0.094	0.003
Using the telephone	1.727	1.199	2.486	0.094	0.003
Lifting/carrying 25 lbs	1.566	1.157	2.118	0.092	0.004
Using toilet	1.683	1.185	2.389	0.092	0.003
Reach out as if to shake hands	1.928	1.122	3.312	0.076	0.016
Lifting/carrying 10 lbs	1.345	1.037	1.743	0.072	0.025
Sitting for 2 hours	1.362	1.003	1.850	0.062	0.048

walking a quarter of a mile, RR = 1.85 (95% CI = 1.39-2.47, $V = 0.134$, $p < 0.001$), *using fingers to grasp,* RR = 1.85 (95% CI = 1.38-2.49, $V = 0.129$, $p < 0.001$), and *dressing,* RR = 1.82 (95% CI = 1.33-2.49, $V = 0.118$, $p < 0.001$). The probabilities for a future fall related to difficulty with the above mentioned activity items were 65% for each. The remaining 10 items all yielded a probability for a future fall between 60% and 65%. These results are illustrated in greater detail in Table **1**.

3.2. Findings on the NDW+ND Group

For the NDW+ND group, the strength of significant associations between activity item and fall risk outcome was low, yet still higher than the associations relative to the FRAIL group, ranging from 0.107 to 0.190. Although all 14 items were significantly associated with the fall outcome, two of the items had 95% confidence intervals that were too large to convey meaningful risk ratios. Those items were related to experiencing difficulty with *getting in and out of bed or chair* and with *getting outside*. The results of our cross-tabulations show that less than 1% of the respondents in this group indicated having difficulty with each of those activities; this is a reasonable outcome, as individuals who do not have difficulty with walking or balance would not typically report having any difficulty engaging in activities of this nature.

Overall, the individuals in the NDW+ND group displayed moderate levels of fall risk, and the probabilities for falling among those who reported difficulty with engaging in some of these activities ranged from about 65% to 79%. The item with the highest relative risk ratio was having difficulty with *bathing or showering* independently, RR = 3.71 (95% CI = 1.74-7.89, $V = 0.144$, $p < 0.001$), suggesting a 79% probability of a future fall among those who reported difficulty perform-ing this activity independently. Difficulty with *managing money* independently had the second highest relative risk ratio, RR = 3.41 (95% CI = 1.53-7.58, $V = 0.127$, $p = 0.002$), indicating a 77% probability of a future fall for those who had difficulty engaging in this activity.

Older adults who reported having difficulty with *shopping for personal items* independently were 3 times more likely to fall than those who reported no difficulty with this task, RR = 3.03 (95% CI = 1.54-5.97, $V = 0.134$, $p = 0.001$). Difficulty with *preparing own meals* independently was also associated with nearly 3 times the likelihood for a second fall, RR = 2.99 (95% CI = 1.32-6.78, $V = 0.112$, $p = 0.006$). The probability of falling for those with difficulties engaging in this activity was about 75%. Experiencing difficulty with *walking up 10 steps without rest* had a relatively strong relationship with the fall outcome, as well as an elevated risk

Table 2: Relative Fall Risk Ratios and Measures of Association for the NDW+ND Group

Difficulty with:	R.R.	95% C. I.		*Cramer's V*	*Sig.*
		Lower	Upper		
Stooping/crouching/kneeling	2.281	1.617	3.216	0.190	0.000
Walking a quarter of mile	2.542	1.710	3.779	0.188	0.000
Being on feet for 2 hours	2.229	1.564	3.175	0.180	0.000
Walking up 10 steps w/o rest	2.576	1.671	3.972	0.175	0.000
Doing heavy housework	2.240	1.468	3.417	0.161	0.000
Bathing or showering	3.710	1.743	7.894	0.144	0.000
Getting in or out of bed or chair	7.298	2.014	26.445	0.140	0.000
Shopping for personal items	3.026	1.535	5.967	0.134	0.001
Managing money	3.409	1.532	7.583	0.127	0.002
Picking up/lifting 10 lbs	2.321	1.357	3.972	0.127	0.002
Trouble biting or chewing food	1.886	1.253	2.840	0.122	0.002
Reaching up over head	1.993	1.242	3.200	0.115	0.004
Preparing own meals	2.992	1.320	6.784	0.112	0.006
Getting outside	4.467	1.360	14.678	0.107	0.007
Dressing	3.531	1.169	10.670	0.094	0.017
Lifting/carrying 25 lbs	1.506	1.065	2.131	0.094	0.020
Doing light housework	2.340	1.029	5.318	0.084	0.037
Sitting for 2 hours	1.579	0.899	2.776	0.064	0.110
Reaching out as if to shake hands	2.573	0.571	11.601	0.051	0.203
Using toilet	2.874	0.477	17.333	0.048	0.228
Using the telephone	1.647	0.725	3.741	0.048	0.229
Using fingers to grasp	1.322	0.758	2.306	0.039	0.325
Eating	0.633	0.065	6.121	-0.016	0.690

ratio, RR = 2.58 (95% CI = 1.67-3.97, V = 0.175, $p < 0.001$), with the probability of a fall being over 72%. Similarly, reported difficulty with *walking a quarter of a mile* yielded a strong association and risk, RR = 2.54 (95% CI = 1.71-3.78, V = 0.188, $p < 0.001$). For the NDW+ND group, the strongest relationship was between fall risk and experiencing difficulty with *stooping/crouching/kneeling,* RR = 2.28 (95% CI = 1.62-3.22, V = 0.190, $p < 0.001$). The probability of falling for individuals who reported difficulty with stooping/crouching/kneeling was about 70%. The remaining 5 items had relative risk ratios ranging from 1.89-2.24, as illustrated in greater detail in Table **2**.

4. DISCUSSION

The purpose of this study was to quantify the relative fall risk associated with activity items from the ADL and IADL indices as well as with 10 items related to more challenging tasks. Additionally, we intended to determine whether or not there were differences in relative fall risk across those items among a) older adults with a history of a single fall - who reported having difficulty with walking or dizziness - and b) those who reported no difficulty related to these items. The results supported our previously mentioned hypotheses. Concerning the items that had the strongest V relationships and highest fall risk ratios for the NDW+ND group, the most noteworthy items related to the fall outcome were experiencing difficulty with showering (79%); managing money (77%); shopping for personal items (75%); walking 10 steps without rest (72%); walking a quarter of a mile (72%); and stooping/crouching/kneeling (70%). For the FRAIL group, the items were having difficulty with eating (73%); managing money (70%); biting or chewing food (66%); walking a quarter of a mile (65%); using fingers to grasp (65%); and dressing without help (65%). Two of the top 3 items associated with the highest probability of a future fall for the FRAIL group, i.e., eating as well as biting or chewing food, are the most basic ADLs. Neither of those items was relevant in the NDW+ND, which supports the classification of the two groups based on their perceived functional abilities. Additionally, the older adults in the FRAIL group reported difficulty with using fingers to grasp, which is another basic skill.

As previously mentioned, it is important to view the obtained relationships in terms of associations and not in terms of causality. These findings support the notion that other latent risk factors (i.e., older adults' overall frailness) may be contributing to the increased risk associated with difficulty performing these basic tasks. Individuals in the NDW+ND group were regarded as higher functioning precisely because it was presumed

that they would have no difficulty with such basic activities of functioning. The above findings also suggest that using some of the activity items of the ADL index with populations of higher functioning older adults may not be fruitful for fall risk detection, as the activities on that index do not effectively capture the relatively small limitations of this group.

There were two items that yielded high risk ratios in both groups: difficulty with *managing money* and difficulty *walking a quarter of a mile*. Interestingly, the relative risk ratio associated with each of these items in the two groups varied somewhat significantly, with the FRAIL group exhibiting lower risk ratios than the NDW+ND group (70% vs. 77%; and 65% vs. 72%, respectively). These findings are rather surprising, and further research is needed to better understand the 7% difference between the two groups concerning these items, as we would expect that higher functioning adults would have lower risk ratios than the FRAIL adults. One potential explanation of the result about difficulty with managing money item is that, perhaps, older adults who do not have trouble with walking or dizziness but have difficulty managing money are individuals with serious cognitive problems. Hence, they are at an increased risk for falling, given that cognitive problems are known to be fall risk factors [27]. The result regarding difficulty walking quarter mile item should also be further investigated, as a person who does not have difficulty with walking and dizziness would typically be at a lower risk for falling than an individual who has difficulty with walking. It is possible that participants who were in the NDW+ND group were more likely to walk for prolonged periods of time and consequently increase their risk exposure for a fall (as opposed to the individuals in the FRAIL group, how would likely not take prolonged walks). These two conjectures should be verified in future studies.

The findings on older adults in the NDW+ND group concerning the fall outcome were somewhat unexpected, especially regarding difficulty with: showering (79%); shopping for personal items (75%); walking 10 steps without rest (72%); and stooping/crouching/ kneeling (70%). These results are reasonable, however, as these activity items describe tasks that are more challenging, thus they are more characteristic of the higher functioning group. Generally speaking, they seem to imply that fall risk for those older individuals may be related more closely to the *behavioral* dimension, as opposed to the *biological* dimension that seems to be associated with the responses from those in the FRAIL group. The findings on this group should be investigated further in future studies.

Overall, the results of the risk analysis revealed that the magnitude of association between activities and the fall outcome was statistically low. Fall risk is multifactorial and complex, while each of the items that were significantly associated with the fall outcome represent common, often basic activities of daily functioning. Therefore, the relationships between fall risk and such activities, even if they are of relatively low magnitude, could be meaningful when attempting to identify older adults who may be at risk of experiencing a future fall, especially given that each respondent already reported one fall. Above all, because falling in older age could be a matter of life and death, any strategy that could help predict a future fall is better than relying on chance alone.

Our findings add to the understanding of the relationship between functional status and fall risk, particularly as it relates to each of the items most commonly used in geriatric research and clinical practice; however, this study had several limitations. Because this was a secondary analysis of an existing dataset, the exact definition of a fall used for the original study could not be verified. Extensive research of documentation related to the original study [22] yielded no indication of the precise definition that may have been used. Therefore, it is possible that some respondents *may* have included in their responses falls that occurred as a result of some intrinsic event such as loss of consciousness; however, given the large sample of individuals who reported falls (n = 1675), it is doubtful that this could have affected the findings substantially. Also, because the collection of data for this study took place in the 80s, there may have been some aspects of fall risk that have changed since then, but it is difficult to reliably identify any such factor.

Research participants were first asked whether they had any difficulty with performing any of the activities included in the analysis. Subsequently, any positive response was followed up with a request to rate the level of difficulty as “some,” “a lot,” or “unable (to perform the activity)”. For the present study, we only obtained risk ratios for the set of *dichotomous* responses addressing difficulty with performing an activity. Thus, one suggestion for further research includes attempting to replicate the findings concerning the fall outcome at various *degrees* of difficulty, to obtain a more precise risk ratio with respect to the level of difficulty with performing an activity. Greater knowledge pertaining to the level of activity impairment will help better distinguish older individuals who may be at an elevated risk for a fall.

Suggestions for further research also encompass replicating the present findings using data from other community-dwelling older adults who were sampled more recently. The popular use of the different variations of the "ADL/IADL scales" during routine geriatric assessments, along with remarkable technological advances in patient record-keeping, have generated nearly two decades worth of data pertaining to the variables included in this study's analysis. By corroborating the present results in future research on the definitive relationships between difficulties with performing particular activities of daily living and falls, geriatric practitioners could identify at-risk older adults with greater confidence. It is important to use accepted and widely used assessment tools (i.e., "ADL scales") that are often readily available, particularly for primary care doctors, who may be the only point of contact between a community-dwelling older adult and the health care system. Lastly, a call to geriatric health service practitioners is in order, for them to work with researchers and provide clinical data regarding functional status and falls. If more practitioners share anonymous patient information and supply data regarding older adults' functional status, measured via the variations of the "ADL scales," then the collaboration between practitioners and researchers would help further our understanding of fall risk and identify those older adults at higher risk, in turn allowing us to administer targeted interventions more effectively.

5. CONCLUSIONS

The results of this retrospective study, although in need of being replicated in future research, suggest that health care providers could efficiently screen their patients for risk of a future fall by using information that is often already available to them in their patients' charts. Indeed, due to the fact that assessing ADL/IADL is typically part of older adults' annual physical evaluation process, many physicians would not need to collect additional information that is not routine for their practice in order to conduct fall risk assessment. This is important, because primary care physicians often have a limited amount of time that they are able to devote to each patient. Geriatric patients in particular often have chronic health conditions, and discussing them may often occupy a significant portion of their medical visit. Based on our findings, we suggest that the results of the assessment of activities of daily living (ADL/IADL) and perceived mobility limitations be included in older patients' fall screening process. This could be done in medical settings by making sure to administer to older patients measures of mobility assessment and ADL/IADL. Older adults could complete these forms on their own while waiting to be seen by their doctors, or with the help of a "minimally trained office staff" member [28]. Using daily activity measures as fall screening tools could also improve older adults' communication of perceived functional status without consuming any 'face-to-face time' with their physician. Ideally, each of the items on those daily activity measures should be assigned a weight based on obtained risk ratios, in order to allow the doctor to more effectively and efficiently determine the level of risk associated with each response.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

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