

Effect of Fall-Related Concerns on Physical, Mental, and Social Function in Community-Dwelling Older Adults: A Prospective Cohort Study

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OBJECTIVES: To determine the effect of fall-related concerns on physical, mental, and social function.

DESIGN: Community-based prospective cohort study (secondary analysis using control group data from a randomized controlled trial).

SETTING: Two municipalities in the south of the Netherlands.

PARTICIPANTS: Community-dwelling older adults (N = 260).

MEASUREMENTS: Two groups were created using Modified Falls Efficacy Scale scores (high and low levels of fall-related concerns). Five outcome measures representing physical, mental, and social function were included: activities of daily living (ADLs), symptoms of depression, feelings of anxiety, social participation, and social support interactions. Outcomes were measured at baseline and at 2, 8, and 14 months. Data were analyzed using analysis of covariance and mixed-effect regression models for longitudinal data, adjusting for age, sex, living status (alone or with another person), educational level, cognitive status, self-perceived health, and falls history at baseline.

RESULTS: At baseline, significantly more limitations in ADLs and social participation were found for older persons with high levels of fall-related concerns than for those with low levels of concern. These differences persisted over 14 months of follow-up and were consistent over time. No significant differences were found for symptoms of depression, feelings of anxiety, or social support interactions, except for feelings of anxiety at 14 months.

CONCLUSION: Older persons with higher levels of fall-related concerns reported up to 14 months poorer ADL and social participation for up to 14 months than those with lower levels of fall-related concerns. From a clinical

point of view, the clear relationship between fall-related concerns and ADL dysfunction and social participation may help to target groups who are at risk of developing adverse consequences of concerns about falls. *J Am Geriatr Soc* 62:2333–2338, 2014.

Key words: aged; concerns about falls; daily functioning; prospective studies; community-dwelling

Falling is a prevalent problem in community-dwelling older adults. Approximately 30% of the population aged 65 and older falls each year.¹ Concerns about falls, also called fear of falling, is likewise common in older adults, in those who have recently fallen and those who have not.² Depending on the measure applied and the population included, estimates of the prevalence of concerns about falls range from 3% to 85%.³ Previous studies showed that concerns about falls is associated with different adverse consequences, including limitations in activities of daily living (ADLs),^{4–10} symptoms of depression,^{6,7,11–14} and social dysfunction.^{4,6,10,12}

Nevertheless, there are serious voids in the current body of knowledge. First, most of the previous studies were cross-sectional^{3,6–11,13–18} and thereby did not take into account the consequences of concerns about falls over time. Second, studies have often focused on a narrow range of outcome measures (e.g., mobility impairments^{3,10,15–21} or mental functioning^{3,10,12,14}). Finally, few studies have examined the relationship between different levels of concern about falls and differences in function.^{3–6,10,14,17} In particular, this last point could be of clinical relevance, because knowledge about a differential effect of high and low levels of concern about falls could direct and prioritize healthcare interventions more effectively. Therefore, this study contributes by comparing people who experience at least some concerns about falls with those who experience more-serious concerns about falls on func-

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tion in its broadest sense (including physical, mental, and social aspects). In line with suggestions of earlier research, it was hypothesized that higher levels of concern about falls would predict more dysfunction in different domains than lower levels of concern.

METHODS

Participants and Data Collection

For this secondary analysis, data were used from 260 control group participants in a randomized controlled trial evaluating a cognitive behavioral group intervention aimed at reducing concerns about falls and related activity avoidance (International Standard Randomised Controlled Trial Number 43792817).²² This trial was conducted between 2002 and 2009 and showed positive effects regarding concerns about falls, related activity avoidance, daily activity, perceived control over falling, and recurrent falls. Participants were identified from the municipal registries in two Dutch communities and were eligible for the current analysis if they experienced at least some fall-related concerns and related activity avoidance, were aged 70 and older, and lived in the community. Older adults who were bedridden, permanently restricted by a wheelchair, awaiting nursing home admission, or participating in another study were excluded from participation. Participants provided written informed consent and were randomly allocated to the intervention or control group. Further details are described elsewhere.²² Data were collected in structured telephone interviews and written questionnaires at baseline and 2, 8, and 14 months after baseline. In the case of missing data in the questionnaires, participants were contacted by telephone to ensure data completion. The medical ethics committee of the Maastricht University, Academic Medical Centre, Maastricht, the Netherlands, approved this study (MEC 01–075.3).

Concerns About Falls

At baseline, concerns about falls were measured using the Modified Falls Efficacy Scale (MFES),²³ a 14-item 4-point Likert scale measuring self-perceived fall-related concerns when performing indoor and outdoor activities common to community-dwelling older adults, such as bathing and crossing a street. Summed scores on the MFES range from 14 to 56, with higher scores indicating more concerns about falls. A previous study showed high internal consistency (Cronbach alpha 0.95) and retest reliability (intra-class correlation coefficient 0.93) of the MFES.²³

Outcome Measures

Three domains of function were included as outcomes: physical, mental, and social function. Physical function was measured using the 11-item ADL-subscale of the Groningen Activity Restriction Scale (GARS),²⁴ with a range from 11 (no ADL limitation) to 44 (high ADL limitation). Mental function was assessed using two 7-item subscales of the Hospital Anxiety and Depression Scale: symptoms of depression (HADS-D) and feelings of anxiety (HADS-A).²⁵ Both questionnaires have a summed total

score between 0 and 21; higher scores indicate more symptoms of depression or feelings of anxiety, respectively. Social function was measured using two scales: the 15-item Frenchay Activities Index (FAI),²⁶ which assesses social participation, and the 12-item Social Support List—Interactions (SSL12–I),²⁷ which measures degree of social support interactions. FAI scores range from 15 to 60, with higher scores indicating more participation. SSL12–I scores range from 12 to 48, with higher scores indicating more social support.

Other Measures

Age, sex, educational level (low, middle, high), living status (alone or with another person), cognitive status as assessed using the Telephone Interview for Cognitive Status (TICS; range 0–44, higher scores indicating less impairment),²⁸ self-perceived health (“How do you rate your health?”: poor, fair, good), and falls history in the last 6 months (0, 1, >1) were measured at baseline, for descriptive purposes or as covariates.

Statistical Analysis

Based on the median score of 30 on the MFES, two groups were created: participants with low levels of concern about falls at baseline and those with high levels of concern. Descriptive statistics were summed for each group. Of the 260 participants in the study, four had missing baseline scores on the MFES, and were excluded from further analysis.

The effect of concerns about falls on the outcomes was tested separately for each of the five outcome measures. Only participants with data for at least two of the four measurement periods (baseline, 2, 8, and 14 months) for a specific outcome measure were used in the analysis. To address missing data (participants with missing data for one or two measurement periods, ranging from $n = 29$ to $n = 31$ for the five outcomes), a linear regression data-imputation procedure was applied. The data-imputation procedure used age, sex, living status, cognitive status, educational level, self-perceived health, falls in the previous 6 months, and the five outcome measurements (GARS, HADS-A, HADS-D, FAI, SSL12–I) of all 256 participants as predictors to estimate the missing values on each of the outcomes simultaneously. Participants missing data from three or four measurement periods (ranging from $n = 24$ to $n = 25$ for the different outcomes measures) were excluded from the longitudinal analyses. Additional analyses showed that participants missing data from none, one, or two measurement periods did not differ significantly from those with missing data from three or four measurement periods with respect to age, sex, living status, cognitive status, educational level, self-perceived health, falls in the past 6 months, and baseline MFES scores.

A sequence of two procedures was used to analyze the consequences of different levels of concern about falls. First, the baseline and three follow-up measurements of the five outcome variables were separately compared for the two falls concerns groups using an analysis of covariance (ANCOVA) procedure. A Bonferroni correction was used to adjust for the family-wise error rate. In the case of

statistically significant differences, the effect sizes for the variable composed of levels of concern about falls (using partial eta-squared) and the total model including covariates (using adjusted coefficients of determination (r^2)) were estimated. Effect size estimations as derived by Cohen were applied.²⁹ A partial eta-squared of 0.01 is considered a small, 0.06 a medium, and 0.14 a large effect,²⁹ and an adjusted r^2 of 0.02 reflects a small, 0.13 a medium, and 0.30 a large effect.²⁹ In the second and final step, whether there were different rates of change observable between the two groups of fall-related concerns was tested using a mixed-effect regression model including an interaction term between the time variable and the level of concern about falls. All ANCOVA procedures and mixed-effect regression models included the covariates age, sex, living status, educational level, cognitive status, self-perceived health, and falls history as assessed at baseline. Analyses were conducted using SPSS for Windows version 19.0 (SPSS, Inc., Chicago, IL).

RESULTS

Participants

Descriptive statistics of the participants according to level of fall-related concerns are presented in Table 1.

Outcomes

Differences in mean scores and standard deviations of the five outcome measures of the participants with high and low levels of concern about falls are presented in Table 2.

The results show significant differences for ADL dysfunction and social participation at baseline and at the three follow-up measurements according to high and low levels of fall-related concerns. Accompanying effect sizes

were moderate to large. With respect to symptoms of depression, feelings of anxiety, and social support interactions, no significant differences were found at baseline or any follow-up measurement, except for feelings of anxiety at 14 months. Mixed-effects regression models were used to analyze the consequences of concerns about falls on the five outcome measures by incorporating the interaction term of time and levels of fall-related concerns. The outcomes showed no significant results, indicating that trends over time between high and low levels of fall-related concerns were stable.

DISCUSSION

The aim of this secondary analysis was to determine whether initial high and low levels of fall-related concerns predict differences in physical, mental, and social function in community-dwelling older adults and whether such differences are sustained over time. High and low levels of fall-related concerns predicted significant differences in ADL dysfunction and social participation that were persistent over 14 months of follow-up. Such differences were not found for symptoms of depression, feelings of anxiety, and social support interactions, except for feelings of anxiety at 14 months. Accompanying effect size estimations were medium (social participation) to large (ADL dysfunction). The analyses of change in the five outcomes between high and low levels of concerns showed that the differences in these outcomes remained stable over the 14 months.

The results of other studies are partly inconsistent with the outcomes derived from the current study. A previous study of two groups of older adults with different levels of concern about falls compared the difference in change in a broad array of functioning as determined using the Medical Outcomes Study 36-item Short-Form Survey

Table 1. Sociodemographic and Health-Related Characteristics of Participants with High and Low Levels of Concern About Falls

Characteristic	Total, N = 256	Low, n = 127	High, n = 129	P-Value
Age, mean \pm SD	77.9 \pm 5.0	77.6 \pm 5.1	78.3 \pm 4.9	.25 ^a
Female, %	72.7	67.7	77.5	.09 ^b
Living alone, %	53.1	45.7	60.5	.02 ^b
Educational level, %				
Low	59.2	61.4	57.0	.13 ^b
Middle	24.7	19.7	29.7	
High	16.1	18.9	13.3	
Cognitive status, mean \pm SD	32.3 \pm 3.8	32.4 \pm 3.4	32.1 \pm 4.1	.08 ^a
Self-perceived health, %				
Poor	4.7	3.1	6.2	.002 ^b
Fair	62.1	53.5	70.5	
Good	32.2	43.3	23.3	
Number of falls in previous 6 months, %				
0	44.5	52.0	37.2	.03 ^b
1	18.8	18.9	18.6	
\geq 2	36.7	29.1	44.2	
Concerns about falls, mean \pm SD	30.0 \pm 10.2	21.5 \pm 4.4	38.3 \pm 6.8	<.001 ^a

SD = standard deviation.

^aStudent *t*-test.

^bPearson chi-square test.

Table 2. Physical, Mental, and Social Functioning at Baseline and Follow-Up Measurements by High and Low Levels of Concern About Falls

Outcome	Unadjusted Mean ± Standard Deviation			Analysis of Covariance Group Comparison P-Value ^{a,b,c}	Concerns About Falls Only ^d	Effect Size ^e
	Low	High	Total		Full Model ^e	
Activity of daily living dysfunction^f						
Baseline	15.1 ± 3.0	19.5 ± 4.2	17.3 ± 4.3	<.001	0.22	0.32
2-month follow-up	15.2 ± 3.6	19.9 ± 4.5	17.5 ± 4.7	<.001	0.19	0.36
8-month follow-up	16.4 ± 4.0	20.3 ± 5.3	18.4 ± 5.1	<.001	0.11	0.26
14-month follow-up	15.2 ± 3.6	20.5 ± 5.4	17.8 ± 5.3	<.001	0.20	0.36
Symptoms of depression^f						
Baseline	6.0 ± 3.7	7.3 ± 4.1	6.7 ± 3.9	>.013	—	—
2-month follow-up	5.8 ± 4.0	7.4 ± 4.2	6.6 ± 4.2	>.013	—	—
8-month follow-up	6.2 ± 4.2	7.1 ± 4.4	6.7 ± 4.3	>.013	—	—
14-month follow-up	6.2 ± 3.8	7.4 ± 4.0	6.8 ± 4.0	>.013	—	—
Feelings of anxiety^f						
Baseline	6.5 ± 4.1	8.4 ± 4.8	7.4 ± 4.6	>.013	—	—
2-month follow-up	6.2 ± 4.3	8.0 ± 4.9	7.1 ± 4.7	>.013	—	—
8-month follow-up	6.7 ± 4.2	8.2 ± 5.0	7.5 ± 4.7	>.013	—	—
14-month follow-up	6.5 ± 4.2	8.5 ± 5.0	7.5 ± 4.7	.01	0.03	0.14
Social participation^g						
Baseline	39.9 ± 7.1	36.8 ± 7.0	38.4 ± 7.2	.003	0.04	0.31
2-month follow-up	39.6 ± 7.1	36.0 ± 7.8	37.8 ± 7.7	.001	0.05	0.27
8-month follow-up	39.1 ± 7.6	36.0 ± 7.1	37.6 ± 7.5	.003	0.04	0.27
14-month follow-up	38.8 ± 7.6	35.7 ± 7.7	37.2 ± 7.8	.006	0.03	0.32
Social support interactions^g						
Baseline	30.7 ± 6.5	29.9 ± 7.0	30.3 ± 6.7	>.013	—	—
2-month follow-up	30.2 ± 6.5	28.7 ± 7.7	29.5 ± 7.2	>.013	—	—
8-month follow-up	30.3 ± 7.1	28.9 ± 8.1	29.6 ± 7.6	>.013	—	—
14-month follow-up	29.8 ± 7.1	28.5 ± 7.8	29.1 ± 7.5	>.013	—	—

^aComparing high and low levels of concern about falls at each measurement.

^bBaseline covariates included in the model: age, sex, living alone status, educational level, cognitive status, self-perceived health, and falls in the past 6 months.

^cSignificance of the test statistic was based on a corrected α -level of .013, using a Bonferroni-correction.

^dEstimate of the effect size of the variable concerns about falls using partial eta-squared. Effect sizes of 0.01 are considered small, 0.06 medium, and 0.14 large.²⁹ Only presented for significant differences between levels of concern about falls.

^eEstimate of the effect size of the entire model including covariates using adjusted coefficient of determination. Effect sizes of 0.02 are considered small, 0.13 medium, and 0.30 large.²⁹ Only presented for significant differences between levels of concern about falls.

^fHigher scores indicate worse functioning.

^gLower scores indicate worse functioning.

over 1 year,⁴ and another examined the difference only in physical function over 1 year.⁵ In contrast to the current study, both studies found that, over a year's time, worsening of physical function was greater in participants who reported higher levels of fall-related concerns than in those with lower levels. Furthermore, the first study⁴ determined that the change in (general) mental function was also significantly larger in persons indicating higher levels of fall-related concerns than in those with lower levels. Symptoms of depression and feelings of anxiety were not included in this study. It is likely that these differences in conclusions are related to the fact that neither study necessarily excluded people without fall-related concerns. Therefore, differences between people with and without fall-related concerns rather than different levels of fall-related concerns could explain the significant differences.

The conclusions derived from the current study lend support to earlier evidence of other cross-sectional studies^{3,6-8,10,11,13-18} that found associations between level of concern about falls and physical and social function. The

current study confirmed these conclusions not only by identifying initial differences in functioning, but also by finding that these differences persisted over time at least through 14 months of follow-up. A remarkable finding is that an earlier cross-sectional study highlighted substantial and significant differences in symptoms of depression and feelings of anxiety between persons with mild and severe fear of falling using baseline data derived from the same randomized controlled trial as the current study.¹⁴ There may be two explanations for these different findings. First, although the persons with high levels of concern about falls in the current study also clearly reported more symptoms of depression and feelings of anxiety than those with lower levels of concern, lack of significance in most differences in this study may be because of low power. More specifically, for feelings of anxiety, an average difference of 1.8 points across four measurement periods was found between participants with high and low levels of concern about falls; the other study reported a difference of 1.9 points.¹⁴ For symptoms of depression, these figures were

1.3 and 1.6 points, respectively. The previous study included the full baseline sample of 540 persons from the randomized controlled trial. Second, the different way in which the fall-related concerns groups were identified may explain the difference. The previous study¹⁴ used a single-item question to determine the degree of fear of falling, as opposed to the current study, which used the 14-item MFES. Another study¹⁵ supports this suggestion, concluding that outcomes tend to change when different measurements for concerns about falls are used in determining differences in daily function.

Limitations

This study has several limitations. First, it was not possible to compare older adults with high or low levels of concerns with those experiencing no concerns about falls at all because this latter group was excluded. Future research could determine the effects of fall-related concerns in more detail when at least a third reference group of older adults would be included who are not concerned about falls. Second, some studies^{8,15,18,21,30} have emphasized the role of the effects of activity avoidance due to concerns about falls as the determinant factor in differences in functional decline. In the current study, only older adults experiencing concerns about falls and activity avoidance due to this concern were included. Therefore, it was not possible to study differences in function between levels of concern about falls while controlling for the effects of activity avoidance. Future research could include people experiencing fall-related concerns with and without activity avoidance due to this concern to better isolate the effects of concerns about falls separately. Finally, the continuous score for concerns about falls was not used in the analyses; instead two groups were created to facilitate interpretation of outcomes particularly from a clinical point of view. Groups with higher and lower levels of concerns are somewhat easier to identify in daily practice. To avert ADL and social dysfunction, people with higher levels of fall-related concerns may be most appropriate for referral to prevention programs, but the dichotomy made in the current study between high and low levels of fall-related concerns is not based on a clinical criterion. Models with the MFES as a continuous score were also examined for differences in rate of change for each outcome measure (data not presented) without finding significant differences, lending support to the earlier conclusions.

Clinical Implications

Because a clear relationship was found between level of concern about falls and ADL dysfunction and social participation, with medium to large effects, these results may help to target groups who are particularly at risk of developing more-severe functional consequences. Such knowledge could direct and prioritize healthcare interventions more effectively.

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