Fear of Falling in People With Chronic Stroke

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MeSH TERMS

- accidental falls
- anxiety
- fear
- postural balance
- severity of illness index
- stroke

OBJECTIVE. We assessed the prevalence of fear of falling (FoF) in a sample of people with chronic stroke and compared multiple variables (balance, anxiety, depression, activity and participation, and stroke severity) in people with and without FoF.

METHOD. This study was a secondary analysis of data collected from a cross-sectional study of mobility after stroke in 77 participants with chronic stroke (>6 mo poststroke).

RESULTS. Of the 77 participants, 51 (66%) reported experiencing FoF. People with FoF had significantly decreased balance ($p < .001$) and activity and participation ($p = .006$) and significantly increased anxiety ($p = .007$). People with FoF also had significantly worse stroke severity ($p = .001$).

CONCLUSION. FoF is a prevalent concern in the chronic stroke population. The presence of FoF was associated with a variety of negative consequences. Occupational therapy practitioners should address FoF to help clients manage FoF and possibly improve recovery.

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Stroke is the fourth most common cause of death and the leading cause of adult disability in the United States (American Stroke Association, 2013). Each year, approximately 795,000 people experience a stroke (Go et al., 2014), which often has negative consequences. For example, balance impairment has been found to affect 83% of people with acute stroke (Tyson, Hanley, Chillala, Selley, & Tallis, 2006). Anxiety and depression are frequently observed in people with stroke (McGinnes, 2009), and depression has been found to be strongly associated with poor functional outcomes (Fure, Wyller, Engedal, & Thommessen, 2006; Hackett, Yapa, Parag, & Anderson, 2005; Pohjasvaara, Vataja, Leppävuori, Kaste, & Erkinjuntti, 2001; Schmid, Kroenke, et al., 2011). Activity and participation levels have also been found to be decreased after stroke (Hartman-Maeir, Soroker, Ring, Avni, & Katz, 2007; Mayo, Wood-Dauphinee, Côté, Durcan, & Carlton, 2002).

Falls are a common complication after a stroke (Batchelor, Mackintosh, Said, & Hill, 2012) and have been associated with

loss of function for people with acute stroke (Schmid et al., 2010). Approximately 73% of people returning to the community after stroke experience a fall during the first 6 mo (Forster & Young, 1995). This high incidence of poststroke falls might put people with stroke at a greater risk for developing fear of falling (FoF), just as a history of falls can lead to the development of FoF (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008).

FoF has been examined in people with acute stroke (Schmid & Rittman, 2007, 2009; Schmid, Van Puymbroeck, et al., 2011). Approximately half of people with acute stroke self-reported FoF at hospital discharge (Schmid et al., 2009; Schmid, Van Puymbroeck, et al., 2011). It is likely that poststroke balance and mobility impairments are associated with FoF. However, emotional factors may also play a role, and it has been suggested that people with anxiety and depression are more likely to develop FoF (Scheffer et al., 2008; Schmid et al., 2009). In addition, people with stroke may restrict their activity and participation to prevent

falls and manage FoF (Schmid & Rittman, 2007).

Although the relationship between FoF and these variables has been studied in people with *acute stroke*, the period <6 mo after a stroke, little research has explored the impact of FoF on people with *chronic stroke*, the poststroke phase generally considered to begin 6 mo after the stroke event. To the authors' knowledge, the existing literature does not address stroke severity and FoF. Therefore, the objectives of our study were to identify the prevalence of FoF in a sample of people with chronic stroke and to compare multiple variables (i.e., balance, anxiety, depression, activity and participation, and stroke severity) in people with and without FoF.

Method

Research Design

This study was a secondary analysis of data collected from a cross-sectional parent study. The primary objective of the parent study was to determine predictive variables for activity and participation in people with chronic stroke (Schmid et al., 2012).

Recruitment and Participants

In the parent study, we used a convenience sample of participants recruited from stroke support groups, stroke and spasticity clinics, and ongoing stroke studies from three states in the Midwest (Illinois, Indiana, and Ohio). Potential participants in the parent study were included if they had chronic stroke, had been referred to occupational or physical therapy for physical deficits resulting from a stroke, had completed all stroke-related rehabilitation programs, had residual functional disability, and scored ≥ 4 of 6 on the 6-item Mini-Mental State Examination (Paveza, Cohen, Blaser, & Hagopian, 1990). Potential participants were excluded from the parent study if their referral to therapy was not for physical deficits or if they had a history of psychiatric illness. All participants in the parent study were included in the analyses for this study. Approval was obtained from the institutional review board, and all participants provided written consent to participate.

Assessments

Demographic information and stroke characteristics self-reported by the participants included age, gender, race, education level, marital status, months since stroke, type of stroke, and side of hemiparesis. Participants also self-reported their falls history.

FoF was assessed using a modified dichotomous question (Arfken, Lach, Birge, & Miller, 1994); the original question was developed to assess FoF in older adults. The reliable and valid Berg Balance Scale (BBS) was used to measure balance (Berg, Wood-Dauphinee, & Williams, 1995; Mao, Hsueh, Tang, Sheu, & Hsieh, 2002). The BBS includes 14 items, and scores range from 0 to 56. Higher scores indicate better balance (Berg et al., 1995), and scores ≤ 46 indicate fall risk (O'Sullivan & Schmitz, 2001).

The Generalized Anxiety Disorder scale (GAD-7) is a reliable and valid measure used to assess anxiety (Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 includes seven items, and scores range from 0 to 21, with higher scores indicating a higher level of anxiety. We used the reliable and valid Patient Health Questionnaire (PHQ-9) to measure poststroke depression (Kroenke, Spitzer, & Williams, 2001; Williams et al., 2005). The PHQ-9 includes nine items, and scores range from 0 to 27, with higher scores indicating more severe depression.

We included the *International Classification of Functioning, Disability and Health (ICF)* (World Health Organization, 2001) Measure of Participation and Activities (IMPACT) as a measure of activity and participation (Post et al., 2008). This self-report measure contains 33 items in nine different scales assessing the domains of activity and participation as defined by the *ICF*. The IMPACT includes subscores for both activity and participation and a total score; lower scores indicate fewer limitations.

We included the Modified Rankin Scale (mRs) to assess stroke severity or disability. The mRs is a reliable and valid measure of disability after stroke (Banks & Marotta, 2007). We used the mRs as a dichotomous variable, with scores of 0–2 defined as slight to no disability or functional independence and scores of

3–5 as moderate to severe disability or dependence.

Statistical Analysis

We used IBM SPSS Statistics (Version 20; IBM Corporation, Armonk, NY) to analyze all data. Demographics and stroke characteristics were described with descriptive statistics. All data were normal (as indicated by a Shapiro–Wilk test), eliminating the need to use nonparametric analyses. We compared the continuous and categorical demographic, stroke characteristic, and falls history variables and outcomes of interest (i.e., balance, anxiety, depression, activity and participation, and stroke severity) in people with and without FoF. Independent *t* tests were used for continuous variables and χ^2 analyses for categorical or dichotomous variables. A Bonferroni correction was done to correct for multiple comparisons and was calculated by dividing .05 (α) by the number of outcomes of interest in the study (5). Thus, for the purpose of our study, the adjusted α was set at .01.

Results

A total of 77 participants with chronic stroke completed this study. The average age was 64.46 ± 9 yr, and average time since stroke was 53 ± 44.34 mo. Table 1 provides data on demographics, stroke characteristics, and outcomes of interest for the sample as a whole and for people with and without FoF. The FoF group had significantly more White participants (76%) than the group without FoF (46%; $p = .008$) and significantly fewer African Americans (22%) than the group without FoF (46%; $p = .026$). Three people in the study indicated “other” as their race.

In this sample, 51 participants (66%) reported experiencing FoF. People with FoF differed significantly from those without FoF in terms of balance, anxiety, and activity and participation (Bonferroni $\alpha < .01$; Table 1). For example, people with FoF had significantly decreased balance compared with people without FoF (mean BBS score = 42.16 ± 8.61 vs. 50.00 ± 3.54 , $p < .001$). People with FoF had higher anxiety scores than people without FoF (mean GAD-7 score = 4.71 ± 5.00 vs. 2.23 ± 2.85 , $p = .007$) and more limitations in activity and participation (mean IMPACT

Table 1. Differences Between Groups With and Without Fear of Falling in Demographics, Stroke Characteristics, Falls History, and Variables Associated With Fear of Falling

Variable	Total (<i>N</i> = 77) <i>n</i> (%) or <i>M</i> ± <i>SD</i>	Fear of Falling (<i>n</i> = 51) <i>n</i> (%) or <i>M</i> ± <i>SD</i>	No Fear of Falling (<i>n</i> = 26) <i>n</i> (%) or <i>M</i> ± <i>SD</i>	<i>p</i>
Demographics				
Age, yr	64.06 ± 8.78	64.88 ± 9.05	62.46 ± 8.14	.255
Gender, male	58 (75)	36 (71)	22 (85)	.264
Race				
African-American	23 (30)	11 (22)	12 (46)	.026
White	51 (66)	39 (76)	12 (46)	.008
Education, post-high school	46 (60)	31 (61)	15 (58)	.794
Marital status, married or partnered	44 (57)	32 (63)	12 (46)	.164
Stroke characteristics				
Time since stroke, mo	53.10 ± 44.34	55.73 ± 48.93	48.09 ± 34.34	.507
Type of stroke, ischemic	34 (44)	23 (45)	11 (42)	.729
Side of hemiparesis, right	44 (57)	28 (55)	16 (62)	.570
Falls history				
Fallen since stroke	56 (73)	38 (75)	18 (69)	.623
Repeated falls	33 (43)	24 (47)	9 (35)	.214
Variables associated with fear of falling				
Balance, BBS score	44.95 ± 8.12	42.16 ± 8.61	50.00 ± 3.54	<.001*
Anxiety, GAD-7 score	3.87 ± 4.52	4.71 ± 5.00	2.23 ± 2.85	.007*
Depression, PHQ-9 score	6.22 ± 5.91	7.36 ± 6.16	4.04 ± 4.78	.019
Activity and participation, total IMPACT score	53.62 ± 12.66	56.43 ± 12.28	48.12 ± 11.73	.006*
Stroke severity, mRs classification of dependent	32 (42)	28 (55)	4 (15)	.001*

Note. BBS = Berg Balance Scale; GAD-7 = Generalized Anxiety Disorder scale; IMPACT = *International Classification of Functioning, Disability and Health* Measure of Participation and Activities; mRs = Modified Rankin Scale; PHQ-9 = Patient Health Questionnaire.

**p* < .01.

score = 56.43 ± 12.28 vs. 48.12 ± 11.73, *p* = .006). mRs scores indicated that 55% of participants with FoF were categorized as dependent compared with only 15% of participants without FoF (*p* = .001).

Discussion

In this sample of people with chronic stroke, falling was a prevalent concern; two-thirds of the participants reported experiencing FoF. The study demonstrated a relationship between FoF and decreased balance, decreased activity and participation, and increased anxiety. We also found a relationship between FoF and stroke severity; more participants with FoF had greater stroke severity.

Balance is commonly impaired after stroke (Corriveau, Hébert, Raïche, & Prince, 2004; Tyson et al., 2006). We found that people with FoF had significantly decreased balance compared with people without FoF (*p* < .001). Interestingly, results from studies in people with acute stroke appear to differ. For example, some studies reported no significant difference in BBS scores between people with acute stroke who did and did not experience FoF, measured in the hospital

setting and at 6 mo after the stroke event (Schmid et al., 2009; Schmid, Van Puymbroeck, et al., 2011).

Anxiety and depression are common in people with stroke (Fure et al., 2006; Hackett et al., 2005; Pohjasvaara et al., 2001; Schmid, Kroenke, et al., 2011). In our study, we found a significant difference in anxiety scores between participants. In acute stroke, Schmid, Van Puymbroeck, et al. (2011) found that GAD-7 scores were significantly different between people with and without FoF, and in fact, anxiety seemed to be a more important contributor to FoF than balance or a prior fall. Our current findings suggest that the relationship between FoF and anxiety extends from the acute phase into the chronic phase of stroke.

In contrast, although in the current study we found no significant difference between groups in depression, Schmid, Van Puymbroeck, et al. (2011) did find a difference in depression between groups with and without FoF in acute stroke (*p* = .005). This difference in findings may indicate that the relationship between depression and FoF may decrease over time in the stroke population. Further longitudi-

nal studies are needed to examine the association between changes in depression over time and to ascertain whether treatment of depression may reduce FoF in the stroke population.

People with FoF in our sample had significantly decreased activity and participation compared with people without FoF (*p* = .006). Schmid, Butterbaugh, Egolf, Richards, and Williams (2008) found that 82% of occupational and physical therapists identified FoF to be the most common reason for activity and participation restriction after stroke. These findings support the cycle of FoF—in which FoF, balance, falls, and restricted activities are all interrelated—as described by Delbaere, Crombez, Vanderstraeten, Willems, and Cambier (2004) and Friedman, Munoz, West, Rubin, and Fried (2002)—and it is possible that the cycle of FoF is also relevant for people with chronic stroke.

Limitations of the current study include the use of a convenience sample of volunteers, a relatively small sample size (*N* = 77), and a limited geographic source of participants. Participants were relatively high functioning, as indicated by their BBS and mRs scores, and therefore they do not

represent all people with chronic stroke. Although higher functioning, however, these participants still had FoF and related impairments. Higher functioning people with stroke may require different interventions than those with greater physical impairments. The relatively lower stroke severity and limitations in activity and participation in our sample may be related to our inclusion criterion that all participants had received therapy for a physical limitation, which may have confounded the results.

We did not measure participants' initial stroke severity and are unaware how initial stroke severity may affect FoF in the chronic phase of stroke. The current study was a secondary analysis of data from a study developed to address different objectives. Because this study was cross-sectional, it is impossible to infer cause and effect, and we could identify only relationships between FoF and the specific variables we measured.

Implications for Occupational Therapy Practice

Although at this time it is unknown how best to manage or improve FoF in people with stroke, it is important for occupational therapy practitioners to appreciate the impact of FoF on their clients' function and recovery. The results of the current study enhance the understanding of FoF and can guide occupational therapy practice in the following ways:

- FoF is likely to limit or slow overall recovery trajectories and the ability to function in many clients with stroke receiving occupational therapy services. Therefore, intervention planning should incorporate strategies to address FoF.
- By addressing FoF, occupational therapy practitioners may have a positive effect on other client variables, such as balance, anxiety, and activity and participation.
- For clients with chronic stroke, a well-rounded, client-centered intervention program addresses both traditional areas of occupational therapy (e.g., occupation-based interventions, activities of daily living retraining, and functional mobility) and FoF. ▲

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