Fear of Falling Among People Who Have Sustained a Stroke: A 6-Month Longitudinal Pilot Study

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KEY WORDS
- accidental falls
- anxiety
- depression
- fear
- quality of life
- stroke

OBJECTIVE. Fear of falling (FoF) after stroke is not well understood. We assessed change in FoF over the first 6 mo after a stroke and compared 6-mo anxiety, depression, balance, and quality of life (QoL) scores between people with and without baseline FoF (at the time of hospital discharge).

METHOD. Data for this longitudinal study were collected at baseline and 6 mo. Of the 28 people included at baseline, 18 remained in the study 6 mo later.

RESULTS. FoF significantly decreased over time (p = .015). Participants with baseline FoF had higher 6-mo anxiety and depression scores (s = .002 and .005, respectively) and lower QoL scores (p < .001) than did those without baseline FoF.

CONCLUSION. The results are suggestive of the need for occupational therapists and their colleagues to consider anxiety and depression variables in managing the needs of poststroke participants experiencing FoF.

Approximately 795,000 strokes occur in the United States each year, leaving more than 600,000 survivors disabled (Lloyd-Jones et al., 2010). Emotional and cognitive impairments are common after stroke; they are associated with poorer recovery outcomes and negatively influence activities of daily living (ADLs) and higher level skills, including mobility and participation in leisure and life activities (Duncan, Lai, & Keighley, 2000; Pohjasvaara, Leskelä, et al., 2002; Pohjasvaara, Vataja, Leppävuori, Kaste, & Erkinjuntti, 2002; Zinn et al., 2004). The high prevalence of stroke and its many negative sequelae make stroke the most common source of physical disability treated by occupational therapists (Pulaski, 2003).

Occupational and physical therapists frequently address falls and fall prevention during rehabilitation and poststroke recovery. Falls are a common medical complication after stroke and greatly affect rehabilitation potential and functional recovery (Hyndman, Ashburn, & Stack, 2002). The reported incidence of falls varies in the first 6 mo after stroke but is as high as 73% (Forster & Young, 1995), much more than the 35%–40% fall rate for the general older adult population (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001).

In addition to experiencing actual falls, some stroke survivors develop a fear of falling (FoF), which can be defined as lower or decreased perceived self-efficacy or confidence in avoiding falls while completing activities (Tinetti, Richman, & Powell, 1990). FoF may exist with or without a prior fall. In a review of FoF, Legters (2002) identified that 12%–65% of community-

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125

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dwellings older adults without stroke or a prior fall reported FoF and explained that this figure increases to >90% for people who sustain a fall.

FoF has been associated with many negative physical, functional, psychological, and social consequences, including decreased physical activity, social interaction, and quality of life (QoL) and increased activity avoidance, depression, and anxiety (van Haastregt, Zijlstra, van Rossum, van Eijk, & Kempen, 2008). FoF and its consequences may impair rehabilitation and recovery; it is associated with a loss of independence and identity because of avoidance of activities and a decrease in physical, emotional, and mental health status (Murphy, Williams, & Gill, 2002; Yardley & Smith, 2002).

Although many researchers have evaluated FoF in the general older adult population, little research has taken place among patients with stroke. We have found FoF to be an emergent issue after stroke (Schmid & Rittman, 2007, 2009). Therapists consider poststroke FoF to be a primary barrier to functional recovery (Schmid, Butterbaugh, Egolf, Richards, & Williams, 2008). In addition, researchers have found poststroke FoF to be associated with lower community reintegration satisfaction, decreased physical functioning, and minimized perceived health status (Andersson, Kamwendo, & Appelros, 2008; Pang, Eng, & Miller, 2007; Salbach et al., 2006). The prevalence, severity, and impact of FoF on anxiety, depression, QoL, and balance over time after a stroke, however, remain unknown. Thus, the objectives of this pilot study were to (1) assess change in FoF over the first 6 mo after a stroke and (2) compare 6-mo anxiety, depression, balance, and QoL scores between people with and without baseline FoF (at the time of hospital discharge).

Method

Design

This study was a prospective longitudinal pilot study developed to explore and better understand FoF after stroke and to examine the relationship between poststroke FoF and functional and rehabilitation outcomes.

Recruitment and Participants

Participants were recruited for 6 mo as a convenience sample from an inner-city university-affiliated urban hospital in Indianapolis, Indiana. Potential participants were patients hospitalized for an acute stroke; they were identified and referred to the study research assistant through the attending neurologist.

Inclusion criteria for the study required participants to be hospitalized for an acute stroke (ischemic or hemorrhagic) at the time of enrollment; have no history of prior stroke; be referred to occupational or physical therapy for physical deficits; obtain a score of ≥3 on the six-item Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975), which covers six items, including orientation and recall of named objects (Paveza, Cohen, Blaser, & Hagopian, 1990); and live within a 60-mi radius of Indianapolis. Potential participants were excluded if they did not have a telephone or address because future contact was necessary; were unable to verbally communicate; or if their therapy referral was for sensory, cognitive, or speech deficits only (because they would be considered a different population from people with poststroke physical and cognitive impairment). Human subjects approval was obtained from the local institutional review board, and all participants gave written informed consent to participate.

Assessments

Baseline demographic data and stroke-related variables were collected through self-report and chart review. These variables included age, sex, race, education level, number of medications, type of stroke, laterality of stroke, and fall history. Study participants completed a series of questionnaires and assessments before discharge from the hospital (baseline assessment) and at a 6-mo follow-up visit. Baseline interviews were completed at bedside or in the research area, as appropriate. Six-month follow-up visits were completed in person at the same hospital (research area) or in the home, as needed. We provided money for parking or for transportation by a cab. All baseline and 6-mo data were collected by a trained research assistant (Carrie Spangler-Morris).

Stroke-Related Disability. Stroke-related disability was assessed at baseline using the Modified Rankin Scale (mRs; Wilson et al., 2005), a validated measure of the degree of disability and dependence for stroke survivors in the acute stroke period (Lindley et al., 1994; Rankin, 1957). The mRs has six categories of disability: 0 = no symptoms; 1 = no significant disability; 2 = slight disability; 3 = moderate disability; 4 = moderately severe disability; 5 = severe disability; and 6 = dead. Others have defined a poor outcome (dependence) as an mRs score > 2; therefore, for this analysis, we specified the mRs as a dichotomous variable, with scores of 0–2 indicating functional independence and 3–5 representing dependence after stroke (Sulter, Steen, & De Keyser, 1999).

Fear of Falling. We used two separate variables to measure FoF: (1) the Modified Falls Efficacy Scale (MFES; Hellström, Lindmark, & Fugl-Meyer, 2002) as a continuous variable and (2) a single-item dichotomous question.
Tinetti and colleagues (1990) previously demonstrated measures of falls efficacy (i.e., confidence in abilities to complete a task without falling) as valid and reliable measures of FoF. They found that people who avoided activities because of a FoF had lower falls efficacy or falls confidence. We therefore used a modified, validated version of the original Falls Efficacy Scale (FES; Hellström et al., 2002) to measure FoF. The original 10-item FES scale measures self-perceived FoF during the performance of 10 common activities (Tinetti et al., 1990). The modified FES (MFES) is a 14-item questionnaire based on the FES and modified for people with chronic stroke (5 mo–7 yr after stroke; Hellström et al., 2002). It includes the 10 items from the FES plus another 4 items pertaining to activities considered complex for people with stroke. Each item is rated as 1 (not confident), 2 (fairly confident), or 3 (completely confident). Scoring ranges from 14–42, with higher scores indicating less FoF and more falls efficacy or confidence.

Hill, Schwarz, Kalogeropoulos, and Gibson (1996) found that the MFES had high retest reliability (intraclass correlation coefficients [ICCs] = .93) and high internal consistency (Cronbach’s α = .95; Hill, Schwarz, Kalogeropoulos, & Gibson, 1996). Hellström et al. (2002) found that the Swedish modification of the FES had high test–retest reliability when used with people with stroke.

We also included the following single-item question: “Are you very fearful, somewhat fearful, or not fearful that you may fall?” (Arfken, Lach, Birge, & Miller, 1994). Participants for this study were considered to have FoF if they answered “very” or “somewhat” fearful to this question. We used this single-item question as the criterion for presence of FoF because the MFES has not previously been validated in an acute stroke population and does not have a valid cutoff score and because we hypothesized that the single question may be easier to complete by people with potential cognitive impairment, which is common after stroke.

Balance. We used the Berg Balance Scale (BBS; Berg, Wood-Dauphinee, & Williams, 1995; Berg, Wood-Dauphinee, Williams, & Maki, 1992) to assess balance. The BBS is a physical assessment with 14 items that challenge both static and dynamic balance. Scoring ranges from 0 to 56, with higher scores indicating better balance. The intrarater reliability and test–retest reliability are high (ICCs = .97 and .98, respectively; Berg et al., 1995; Liston & Brouwer, 1996). In older adults without stroke, a score <36 indicates fall risk (Shumway-Cook, Baldwin, Polissar, & Gruber, 1997). Mao, Hsueh, Tang, Sheu, and Hsieh (2002) analyzed the psychometric properties of the BBS for people with stroke and found it to be valid and reliable.

Anxiety. We used the Generalized Anxiety Disorder–7 (GAD–7) to measure anxiety (Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD–7 is a brief but reliable measure that has been validated as a screening measure for generalized anxiety disorder in general medical patient populations. The seven items include questions based on the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000) criteria for anxiety disorder.

In a population of primary care patients ranging in age from 18 to 95 years, this seven-item scale was found to have excellent internal consistency (Cronbach’s α = .92), good test–retest reliability (ICC = .83), and good procedural validity as determined by comparing self-report scales with scales administered by mental health professionals (ICC = .83; Spitzer et al., 2006). In addition, the GAD–7 was found to have good convergent validity, correlating well with the Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988; Fydrich, Dowdall, & Chambless, 1992; r = .72) and the anxiety subscale of the Symptom Checklist–90 (r = .74; Spitzer et al., 2006). Higher scores indicate worse anxiety.

Depression. We included the Patient Health Questionnaire (PHQ–9) as a measure of poststroke depression; it has been validated as a screening measure for major depressive disorder in several clinical populations and among people who have sustained a stroke (Kroenke, Spitzer, & Williams, 2001; Williams et al., 2005). Nine items based on the DSM–IV–TR are included; higher scores indicate worse depression. The PHQ–9 scoring ranges from 0 (no depressive symptoms) to 27 (all symptoms occurring daily); a score of ≥10 was found to have 89% specificity and 91% sensitivity for major depression (Williams et al., 2005).

Quality of Life. We assessed QoL with the Stroke Specific Quality of Life Scale (SSQoL; Williams, Weinberger, Harris, Clark, & Biller, 1999). The SSQoL includes items in the following 12 domains: self-care, vision, language, mobility, work, upper-extremity function, thinking, personality, mood, family, social, and energy. Each of the 49 items is measured with a 1–4 or 1–5 scale, with higher scores indicating better QoL. Participants are asked to think about the past week and to rate their ability to complete certain tasks; their agreement with statements about fatigue, socialization, and so forth; and whether some items, such as speech, walking, thinking, and the like, are worse since their stroke. Williams et al. (1999) demonstrated that all domains have excellent internal reliability (Cronbach’s α values for each domain are ≥.73) and that scores are associated with patients’ self-reported health-related QoL (p < .001).
Statistical Analysis

Participants who provided follow-up data at 6 mo were included in the analyses. We did not impute missing data. To describe the data, we used frequencies (and proportions) and means (and standard deviations), as appropriate. We used histograms with fit lines and $p$-plots to assess distribution and found the continuous variable (MFES, BBS, GAD, PHQ-9, and SSQoL) to be normally distributed. We therefore used parametric statistics for all analyses. We completed all data analyses with SPSS Version 17.0 (SPSS, Inc., Chicago).

To address Objective 1 and assess the change in FoF (MFES scores) over 6 mo, we used paired $t$-tests. We again used paired $t$ tests to assess change in balance (BBS score) over time. To complete Objective 2 and compare 6-mo anxiety, depression, QoL, and balance scores between people with and without baseline FoF (dichotomous question), we completed independent $t$-tests or Pearson’s $\chi^2$ analyses (or Fisher’s Exact Test if the cell count was $<5$), as appropriate. To control for multiple $t$ tests, we completed a Bonferroni correction ($0.05$ divided by the number of comparisons). We included four comparisons (using the four variables anxiety, depression, balance, and QoL); statistical significance was thus defined as $0.0125$. As a post hoc exploratory analysis, we completed a $t$ test to compare 6-mo MFES scores by the baseline dichotomous FoF question.

Results

Sixty-seven people were screened for the study: Twelve did not have a referral to occupational therapy or physical therapy; 4 were nonresponsive; 2 were homeless and thus did not have a phone number or address; 1 left the hospital against medical advice; 8 did not meet the minimum cognitive criterion of MMSE score of $\geq 3$ for inclusion in this pilot study; 2 transferred to other hospitals; and 2 did not speak English. Of the 36 people who met the inclusion criteria and were invited to participate in the study, 28 (78%) participated at baseline. At 6 mo, 18 participants (64%) completed follow-up assessments. Ten participants were lost to follow-up at 6 mo despite multiple attempts to reach them by means of phone calls and letters. No statistical differences were found in any baseline demographics or stroke-related disability between participants who did and did not complete the study (Table 1).

Demographics and stroke characteristics for stroke participants at baseline and 6 mo are found in Table 1. Most of the baseline participants were men (64%), 59 years old (slightly younger than the average age for stroke, which is $>65$); 46% were White; and 54% had at least a high school education.

We found that FoF, as measured with the MFES, decreased (i.e., falls efficacy increased; $p = .015$) and balance increased ($p = .001$) significantly over the 6 mo after stroke (Table 2). Using the dichotomous FoF variable, the prevalence of FoF was 54% at baseline and 39% at 6 mo. We found 7 people with FoF at 6 mo: 5 people who had baseline FoF and 2 people without baseline FoF. Three people with baseline FoF did not have fear at 6 mo.

Participants with baseline FoF (dichotomous question) did not have significantly more stroke-related baseline

| Table 1. Demographics and Stroke Characteristics for Study Participants |
|-----------------|-------------------|-------------------|-------------------|-------------------|
| Variables       | Baseline (N = 28) | 6 Mo (n = 18)     | Lost to Follow-Up (n = 10) | $p^a$  |
| Age, M (SD)     | 59 (10.04)        | 60 (10.20)        | 58 (10.23)         | .75    |
| Gender, male, n (%) | 18 (64)       | 11 (61)           | 7 (70)             | .70$^b$ |
| Race, n (%)     |                  |                  |                   |       |
| African-American| 15 (54)           | 9 (50)            | 6 (60)             | .71$^b$ |
| White           | 13 (46)           | 9 (50)            | 4 (40)             |       |
| Education level, ≥ high school graduate, n (%) | 15 (54) | 12 (67) | 3 (30) | .11$^b$ |
| Stroke type, n (%) |                  |                  |                   |       |
| Ischemic        | 14 (50)           | 9 (50)            | 5 (50)             | .18$^b$ |
| Hemorrhagic     | 7 (25)            | 2 (11)            | 5 (50)             |       |
| Brainstem       | 7 (25)            | 7 (39)            | 0 (0)              |       |
| Side of stroke, right-sided lesion, n (%) | 20 (71) | 12 (67) | 8 (80) | .67$^b$ |
| Baseline stroke-related disability, Rankin, dependent, n (%) | 23 (82) | 13 (72) | 10 (100) | .13$^b$ |
| 6-mo stroke-related disability, Rankin, dependent, n (%) | 12 (67) |       |       |       |
| Baseline FoF, yes, n (%) | 15 (54) | 8 (44) | 7 (70) | .25$^b$ |
| 6-mo FoF, yes, n (%) |       | 7 (39) |       |       |

Note. FoF = fear of falling; $M =$ mean; SD = standard deviation.

$a$Comparison of baseline variables between the 10 people lost to follow-up and the 18 who continued in the study. Brain stem not included in stroke type analysis because of 0% change.

$^b$Fisher’s Exact Test was used because the expected cell count was $<5$. 

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Table 2. Change of Fear of Falling and Balance at Baseline and 6-Mo Follow-Up (N = 18)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>6 Mo</th>
<th>p²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Falls Efficacy Scale, M (SD)</td>
<td>29.17 (10.34)</td>
<td>36.56 (6.95)</td>
<td>.015</td>
</tr>
<tr>
<td>Berg Balance, M (SD)</td>
<td>19.75 (23.88)</td>
<td>38.25 (16.74)</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note. M = mean; SD = standard deviation.

aPaired t tests.

(mRs, p = .15) or 6-mo disability (mRs, p = .637) than those without baseline FoF. According to the single-item dichotomous FoF question, study participants with baseline FoF had significantly higher 6-mo anxiety (p = .002) and depression scores (p = .005) and lower 6-mo QoL scores (p < .001) than those who did not have baseline FoF (Table 3). These items remained statistically significant after the Bonferroni correction (p < .0125). No significant difference appeared in 6-mo balance scores for people with and without baseline FoF (p = .141).

Results of the post hoc exploratory analysis indicate that participants who were fearful (dichotomous question) at baseline were significantly more likely to have lower MFES scores (indicating increased FoF and decreased falls efficacy) at 6 mo (p < .001).

Discussion

Among the group of participants with stroke included in this study, FoF significantly decreased and falls efficacy increased during the first 6 mo after stroke. Although earlier studies described FoF as an important aspect of poststroke recovery, this study is unique in the longitudinal examination of the fear over time. Six-month anxiety, depression, and QoL, but not balance, were significantly different between people with and without baseline FoF.

Watanabe (2005) studied FoF after people with stroke sustained a fall following discharge from inpatient rehabilitation. In that cross-sectional study of 49 participants, 29% of stroke survivors had FoF between 8 and 27 mo after stroke. By contrast, we found FoF in 54% of our study sample immediately after stroke and in 39% 6 mo later. The differences in our findings may be related to the timing of assessments. It is possible that FoF would continue to decrease in our study population over the course of recovery because of accommodation to poststroke disabilities over time or general improvement in poststroke disability.

Anxiety and depression are common complications described after stroke (Bruggimann et al., 2006; Fure, Wyller, Engedal, & Thommessen, 2006). We found 6-mo anxiety and depression scores to be higher for participants with baseline FoF. Other researchers have found FoF to be related to depression and anxiety in nonstroke older adult samples (Murphy et al., 2002; van Haastregt et al., 2008). Results from these studies encourage us to consider that an intervention to reduce or prevent FoF may be beneficial to decrease anxiety and depression and, similarly, that attention to treatment of anxiety and other mood symptoms may be important in reducing FoF after stroke.

FoF has also been related to decreased QoL (Legters, 2002). We found that people with baseline FoF had lower 6-mo SSQoL scores. It is possible that over time, stroke survivors are more aware of their poststroke deficits, that people with FoF are more cautious and are restricting more activities after stroke, or that the increased anxiety and depression symptoms in those with FoF are all factors contributing to lower QoL scores among people with FoF.

Balance increased significantly over time for the entire sample; however, 6-mo balance scores were not significantly different between participants with and without baseline FoF. This finding indicates that balance may be less important in poststroke FoF than would normally be assumed. In a nonstroke population, Friedman, Munoz, West, Rubin, and Fried (2002) discussed the relationship

Table 3. Anxiety, Depression, Balance, and Quality of Life at Baseline and 6-Mo Follow-Up for People With and Without Baseline FoF

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline FoF* (n = 8)</th>
<th>No Baseline FoF* (n = 10)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mo (n = 28), stroke-related disability, Rankin, dependent, n (%)</td>
<td>14 (93)</td>
<td>9 (69)</td>
<td>.150</td>
</tr>
<tr>
<td>6 mo baseline stroke-related disability, Rankin, dependent, n (%)</td>
<td>5 (63)</td>
<td>4 (40)</td>
<td>.637*</td>
</tr>
<tr>
<td>Modified Falls Efficacy Scale, M (SD)</td>
<td>35.13 ± 6.26</td>
<td>40.54 ± 6.37</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Anxiety, Generalized Anxiety Disorder score, M (SD)</td>
<td>9.25 ± 5.65</td>
<td>2.38 ± 2.35</td>
<td>.002</td>
</tr>
<tr>
<td>Depression, Patient Health Questionnaire–9, M (SD)</td>
<td>10.50 ± 4.99</td>
<td>3.40 ± 4.27</td>
<td>.005</td>
</tr>
<tr>
<td>Balance, Berg Balance Scale, M (SD)</td>
<td>32.50 ± 17.69</td>
<td>41.40 ± 16.85</td>
<td>.140</td>
</tr>
<tr>
<td>Quality of life, Stroke-Specific Quality of Life, M (SD)</td>
<td>3.32 ± 0.39</td>
<td>4.40 ± 0.52</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. Bonferroni adjustment sets significance level at .0125. FoF = fear of falling; M = mean; SD = standard deviation.

*Determined by a single question: “Are you very fearful, somewhat fearful, or not fearful that you may fall?”

°Fisher’s Exact Test.
Among falls, FoF, and the negative changes in strength and function that may lead to further falls and escalated FoF. Balance and falls history are often considered important variables to help manage FoF (Legters, 2002), but perhaps in the poststroke population, it is more important to address anxiety and depression.

Although further research is needed, it may be possible to assess FoF with the simple item “Are you very fearful, somewhat fearful, or not fearful that you may fall?” We found that stroke survivors who indicated fear (very or somewhat) when answering the simple question at baseline had significantly more fear (i.e., less confidence) at 6 mo, as measured by the MFES.

Because stroke sequelae include emotional, cognitive, and physical deficits, FoF is likely a complicated poststroke consequence that influences and is influenced by symptoms of these sequelae. Perhaps antianxiety or antidepressant medications, cognitive–behavioral therapy, self-management, psychological counseling, stress-relieving exercises, or other anxiety-reduction interventions should be tested in future FoF management interventions for people who have sustained a stroke. Given the complex interactions of symptoms in individual patients, self-management interventions that target specific fears of the population and assist people with addressing their fears to increase their self-efficacy in managing their health (Damush et al., 2003) may be a potentially powerful intervention to decrease FoF and increase QoL and participation after stroke.

Limitations

This study has several limitations. First, the results of this pilot study may not be generalizable to the poststroke population because of the small size and our recruitment from a single, university-based, urban teaching hospital through one attending neurologist. Because of the relatively small sample size in this pilot study, we would be powered to see only large differences in scores, and multiple comparisons in a small sample can lead to chance associations. Of additional note, we did not see statistically significant differences between participants with and without baseline FoF in regard to stroke-related disability, but this finding may be related to sample size. In addition, we did not identify whether study participants were on medications for depression or anxiety; this factor may have affected our results and will need to be controlled for in future studies. This study, however, does provide valuable new information about FoF in the early poststroke period and suggests associations among functional, cognitive, and emotional symptoms after stroke that deserve further investigation. These preliminary data can also be used to identify key elements of interventions to decrease FoF and increase participation after stroke.

Clinical Implications

Surveys of occupational therapists and physical therapists have indicated that FoF and depression are the two most important variables related to decreased physical and social functioning after stroke (Schmid et al., 2008). Thus, prevention and treatment of poststroke FoF is an important clinical issue. Because FoF may be related to both anxiety and depression after stroke, occupational therapists should assess and address FoF, anxiety, and depression during stroke rehabilitation efforts. Occupational therapists should be taught or reminded to screen for both anxiety and depression with standardized screening tools and to work with providers to prompt treatment of these symptoms when appropriate. Therapists should incorporate appropriate mental health occupational therapy interventions, as needed. Therapists should be aware of the relationships among FoF, anxiety, and depression and their potential effect on stroke recovery. It is important for occupational therapists to address FoF, anxiety, and depression in poststroke interventions to allow for the best stroke recovery possible. ▲

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