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Fall-related self-efficacy in adults poststroke: A cross-sectional study

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ABSTRACT

Aims: The overall aim was to describe and examine if there is a difference between men and women in fall-related self-efficacy (SE). Another aim was to examine the strength of associations between fall-related SE and physical function and health-related quality of life (QoL) in community-living individuals poststroke. Methods: A cross-sectional study was conducted within two weeks of admission to rehabilitation or first week follow-up after discharge from hospital. Used tests were fall-related self-efficacy (FES-S), Functional Ambulation Classification (FAC), 10 meter walking test (10 mWT), the functional independence measure (FIM), and health-related QoL (EQ5D). The analysis was based on 37 individuals with a mean age off 68.5 years. Results: The results showed that physical factors but not QoL had association with perceived confidence in task performing without falling. No gender difference was shown. Conclusion: In this study physical function was associated with fall-related SE.

Keywords: Fall-related self-efficacy, Gender, Physical function, Poststroke, Quality of life

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INTRODUCTION

In industrialized populations, stroke is a common cause of death and long-term disability [1]. In Sweden approximately 21,000 individuals suffer from a stroke each year. At the time of the stroke the mean age for men is 73 years and for women 78 years [2]. In the past decades there have been a strong decline in stroke mortality and long-term survival after stroke continues to improve. Due to the growing elderly population this results in an increased number of individuals in Sweden who previously have had a stroke. In Sweden approximately every sixth individual who suffered a stroke will have a long-term disability [2]. The symptoms after stroke are varied and depend on which part of the brain is injured and how severely it is affected [3]. Often the symptoms are on one side of the body and the most common symptoms are weakness or numbness, loss and/or disturbance of motor function, cerebral visual impairment, difficulty in communication, and reduced cognitive function [3]. Pound et al. [4] suggest that the most disabling consequence of stroke is the loss of independent ambulation as it affects almost every aspect of daily living [4]. In community-dwelling stroke survivors, walking is the most frequent activity leading to falls with a rate of 39–90% [5]. In community ambulation gait speed is important for individuals poststroke [6]. Self-selected gait speed <1 m/s can identify older people at risk for health-related outcomes [7] as it is one risk factor for falling [5]. Studies have shown that individuals poststroke have a risk of falling that is significantly higher than that of age- or gender-matched controls. The proportions of fallers range from 23% to 34% (3–4 month follow-up), 40% to 73% (6 month follow-up), and 43% to 70% (1 year follow-up) in community-dwelling stroke survivors

[5]. Stroke group characteristics can partly explain the difference in fall incidence rates [5]. Falls can lead to a variety of physical and psychosocial consequences. One severe physical consequence is hip fracture with an odds ratio of 2.1 (aged >80), 3 (70–80), and 3.8 (>70) for individuals poststroke [5]. Furthermore, surgically treated hip fractures have a doubled mortality rate in individuals poststroke. The psychosocial consequences of falls are equally important [5]. Many individuals develop fear of falling (FoF) [5, 8], defined as "persisting concern regarding falling" [9]. Studies have shown that FoF is associated with restriction in mobility/activity, reduced social interactions, and poor QoL [5]. Reduction in QoL is associated with further declines in physical, psychological, and mental functions [5].

Stroke rehabilitation is essential to minimize long-term loss of function and the rehabilitation is multifaceted [10]. Physical therapists working in stroke rehabilitation play an active role in motor skills learning or relearning voluntary control over the affected muscles [10]. Bandura's social cognitive learning theory (SCT) [11] is a well-developed theory that elucidates the underlying mechanisms involved in maximizing learning. Social cognitive learning theory points out the interaction between the individual, the environment, and the behavior [11]. Self-efficacy is a central concept in SCT and is defined as the degree of confidence a person has in his/her ability to perform specific behaviors successfully. Individuals with high SE approach the particular activity with confidence and individuals with low SE tend to avoid the activity [12]. Those SE beliefs are thought to be domain specific; they pertain to a specific behavior in a particular context and do not necessarily generalize to other behaviors or other contexts [11, 13]. Self-efficacy is a psychological construct which predicts both QoL [14, 15], mobility [15], and activities of daily living poststroke [15, 16], and several studies have found that SE is a strong predictor of real-world walking activity [16–18]. The use of SE can help the individual during the rehabilitation to gain more control of important aspects of their disease [15]. Therefore, it is of importance that physiotherapy takes into account the individuals SE toward the task during rehabilitation. Four main sources can develop SE: (1) mastery experience, successfully performing a task, (2) vicarious experience of a task (the individual is observing others performing the task), (3) verbal persuasion/encouragement, and (4) psychological state (anxiety and depression) [15]. There can however be a challenge measuring SE in individuals with cognitive and/or language impairment due to the difficulty in grasping the concept of rating confidence levels [18].

Assessment of stroke impacts on daily living should include physical, psychological, and social consequences [19] because individuals poststroke can be confronted with limitations in all three aspects [15]. Therefore, it is of importance to develop better understanding of the relationship between SE and physical function and QoL as it can have an impact on how training poststroke is planned, particularly within the field of physiotherapy.

Aim

This study had four purposes:

(1) To describe fall-related SE, (2) and to examine if there was a difference between men and women with stroke in fall-related SE.

To investigate the strength of association between (3) fall-related SE and physical function and (4) fall-related SE and health-related QoL.

MATERIALS AND METHODS

Participants

During a period of approximately two years 37 participants, 18 men and 19 women, were consecutively included in the study. Table 1 provides data on demographics and stroke characteristics.

In order to achieve a breadth of the study, the recruitment was done from all six daycare rehabilitation centers within the area of Gävle Hospital and from Gävle Hospital "home follow up team." To be included in the study, the individual had to be an adult and have limitations in physical functioning requiring rehabilitation due to stroke. A few did not want to participate and a number of individuals were not asked due to exclusion criteria (could not understand FES-S or EQ5D and/or already participated in rehab during last six months). Unfortunately there is no record of how many individuals who were excluded or did not want to participate.

Assessment instruments

Demographics data and stroke characteristics included: sex, age, respectively, stroke type, affected side, weeks since stroke, fall history (self-reported fall to the ground), previous rehab, and where recorded by questionnaire.

The Falls Efficacy Scale-Swedish version (FES-S) is a visual analog scale measuring fall-related SE in 13 items common in everyday life [20]. It is divided into two subscales: Personal activities of daily living (PADL) and instrumental activities of daily living (IADL), and an in-between item (walking up and down stairs). The score range from 0 (not confident) to 10 (completely confident) gives a total score of 130. Falls Efficacy Scale-Swedish version has an acceptable test–retest reliability (K = 0.97) and validity in individuals with stroke [20, 21].

Functional Ambulation Classification (FAC) scale distinguishes six levels of walking ability based on the amount of physical support required, score range from 0

Table 1: Demographics and stroke characteristics of the participants in the study, missing data are noted

	All participants n = 37	Men n = 18	Women n = 19
Age, mean year [range]	68.5 [45–89]	72 [53–85]	65 [45–89]
Affected side, n (%)			
Right	12 (32.4)	5 (27.8)	7 (36.8)
Left	22 (59.5)	12 (66.7)	10 (52.6)
Both	3 (8.1)	1 (5.6)	2 (10.5)
Stroke type, n (%)			
Ischemic	27 (73)	13 (72.2)	14 (73.7)
Hemorrhagic	7 (18.9)	4 (22.2)	3 (15.8)
Both	1 (2.7)	0 (0)	1 (5.3)
Missing data	2 (5.4)	1 (5.6)	1 (5.3)
Weeks since stroke*	12 (6.5–16) [2–182]	12 (6–24) [3–182]	10 (6.25–13) [2–130]
Missing data, n (%)	4 (10.8)	3 (16.7)	1 (5.3)
Fall history, n (%)			
Fallers	13 (35.1)	6 (33.3)	7 (36.8)
Nonfallers	21 (56.8)	11 (61.1)	10 (52.6)
Missing data	3 (8.1)	1 (5.6)	2 (10.5)
Previous rehab, n (%)			
Yes**	13 (35.1)	9 (50)	4 (21.1)
No	24 (64.9)	9 (50)	15 (78.9)

*Median summed scores (interquartile range) and [range] for all participants and for men and women.

**Longer than six months ago (rehab last six months = exclusion criteria).

(nonfunctional ambulator) to 5 (ambulator independent) [22]. The reliability of FAC is described in studies with different results. The most recent study from Mehrholz et al. [23] shows that FAC has high test–retest reliability (K = 0.95) and interrater reliability (K = 0.905) in individuals with stroke.

Ten meter walking test (10 mWT) measures self-selected gait speed m/s over 10 m with a stop watch. The test is done in a straight line and without a cognitive task. Slow walking speed <1.0 m/s. Individuals who experienced a stroke the test has acceptable psychometric properties [24].

The functional independence measure (FIM) scale is an 18-item instrument measuring activities of daily living and it is divided into two subscales: motor function and cognitive function. The score range from 1 (complete dependence) to 7 (independence) gives a total score of 126. The FIM scale has well-established reliability and validity [25, 26].

EuroQol five dimension questionnaire (EQ5D) and visual analogue scale (EQ-VAS). Measuring health-related QoL (EQ5D) by assessing five items: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each with a three level rating scale: Level 1 indicates no problem, level 2 indicates some problems, and level 3 indicates extreme problems. EuroQol-visual analogue scale starts from 0 (lowest QoL) to 100 (highest QoL). The test is valid and reliable in individuals who have experienced a stroke [27, 28].

Procedure

The study was cross-sectional and completed in accordance with the Swedish law of Ethical Review [29]. No ethical application was made due to the fact that there was no intervention in the study. The individuals were asked to participate in the study by their treating physiotherapist or occupational therapist. Oral and written information about the study was given and the individuals were informed that they could withdraw their approval at any time. Written informed consent was provided by all participants and all material was coded.

The therapists had written and oral information about the assessment instruments. The tests were not done in a certain order. All participants were assessed within two weeks of admission to daycare rehabilitation center or first week follow-up after discharge from Gävle hospital ("home follow up team"). They were mainly assessed by their treating physiotherapists, and some participants were also assessed by their treating occupational therapist. If the patient had aphasia a speech therapist helped with the questionnaires (FES-S and EQ5D).

Statistical analysis

To describe fall-related SE a power computation of the null hypothesis was done with Fisher's Z approximation before the start of the study. The criterion for significance (alpha) was set at 0.05, with a power of 90%. Thirty-four participants were needed. To investigate the association

between fall-related SE and physical function, and fall-related SE and QoL, a precision computation was done. Based on the same parameters and assumptions the study will report the value with a precision (95% confidence level) of approximately ±0.3 points.

Demographics, stroke characteristics, and study parameters were calculated and described with descriptive statistics. To evaluate the relations between FES-S and physical function and perceived health status Spearman's correlation (rho) was used and Cohen's conventions for small (0.1), medium (0.3), or large (0.5) effect size. The Mann–Whitney U test was used to identify group difference between men and women. Statistical significance at $p < 0.05$ was assumed throughout. All analyses were performed using statistical Package for Social Services (SPSS) computer program.

RESULTS

Fall-related self-efficacy

Overall rating of FES-S (total score) was high with a median score of 112.5 for men and 120 for women. The FES-S (total score and subscales) did not show any difference between men and women ($p > 0.05$) in fall-related SE. The median score, interquartile range, and range for the FES-S (total score and subscales) and the p value to identify possible group difference are presented in Table 2.

Physical function

The FIM scale, FAC scale, and 10 mWT had statically strong significant association with the FES-S ($p < 0.05$) (Table 3). Median scores, interquartile range and range for the FIM scale, FAC scale, and 10 mWT are presented in Table 4.

Quality of life

The EQ5D VAS was not associated with the FES-S ($p > 0.05$) (Table 3). Median score, interquartile range, and range of the EQ5D VAS are presented in Table 5. The scoring in the dimensions is also presented in Table 5.

DISCUSSION

The overall rating of FES-S was high with a median score of 120 for women and 112.5 for men. The individuals

Table 2: Fall-related self-efficacy

	All participants n = 37	Men n = 18	Women n = 19	p value**
FES-S*	116 (89–127) [22–130]	112.5 (89–121.5) [22–130]	120 (86–128) [48–130]	0.254
PADL	55 (43–60) [20–60]	54.5 (39–58.5) [20–60]	58 (51–60) [33–60]	0.201
IADL	51 (41–59) [2–60]	49 (41–58.5) [2–60]	56 (37–60) [11–60]	0.463
Item 7	8 (6–9.50) [0–10]	8.5 (5.5–9.25) [0–10]	8 (6–10) [0–10]	0.939

FES-S: The Falls Efficacy Scale-Swedish version (score range 0–130).
PADL: Personal activities of daily living (score range 0–60).
IADL: Instrumental activities of daily living (score range 0–60).
Item 7: Walking up and down stairs (score range 0–10).
*Median scores (interquartile range) and [range].
**Mann–Whitney U test to identify group difference between men and women.

Table 3: Association between fall-related self-efficacy and physical function and between fall-related self-efficacy and health-related quality of life.

		FIM	FAC	10 mWT	EQ-VAS
FES-S (total)	Correlation coefficient	0.629	0.593	0.562	0.181
	sig. (2-tailed)*	<0.001	<0.001	<0.001	0.29

FES-S: The Falls Efficacy Scale-Swedish version.
FIM: The functional independence measure.
FAC: Functional ambulation classification.
10 mWT: 10 meter walking test.

Table 4: Physical function

	All participants n = 37	Men n = 18	Women n = 19	p value**
FIM*	122 (114.5–125) [75–126]	119.5 (112.75–125) [75–126]	124 (115–125) [99–126]	0.358
Motor function	88 (81–90) [50–91]	86.5 (81–91) [50–91]	90 (84–90) [66–91]	0.199
Cognitive function	35 (33–35) [25–35]	35 (33–35) [25–35]	35 (33–35) [30–35]	0.916
FAC*	5 (4–5) [1–5]	4.5 (4–5) [1–5]	5 (4–5) [1–5]	0.499
10 mWT*	0.9 (0.6–1.12) [0–2]	0.9 (0.6–1.11) [0–2]	0.9 (0.59–1.17) [0–1]	0.964

FIM: The functional independence measure (score range 1–126).
Motor function (score range 1–91).
Cognitive function (score range 1–35).
FAC: Functional Ambulation Classification (score range 0–5).
10 mWT: 10 meter walking test (m/s).
*Median scores (interquartile range) and [range].
**Mann–Whitney U test to identify group difference between men and women.

Table 5: Quality of life, missing data are noted

	All participants n = 37	Men n = 18	Women n = 19	p value**
EQ-VAS*	60 (50–80) [20–100]	65 (50–80) [29–100]	50 (40–80) [20–85]	0.315
Missing data, n (%)	1 (0)	1 (0)	0 (0)	
EQ5D, n (%)				
Mobility				0.663
Level 1	14 (37.8)	6 (33.3)	8 (42.1)	
Level 2	23 (62.2)	12 (66.7)	11 (57.9)	
Level 3	0 (0)	0 (0)	0 (0)	
Self-care				0.343
Level 1	28 (75.7)	12 (66.7)	16 (84.2)	
Level 2	8 (21.6)	5 (27.8)	3 (15.8)	
Level 3	1 (2.7)	1 (5.6)	0 (0)	
Usual activity				0.799
Level 1	14 (37.8)	6 (33.3)	8 (42.1)	
Level 2	22 (59.5)	12 (66.7)	10 (52.6)	
Level 3	1 (2.7)	0 (0)	1 (5.3)	
Pain/discomfort				0.753
Level 1	11 (29.7)	6 (33.3)	5 (26.3)	
Level 2	24 (64.9)	11 (61.1)	13 (68.4)	
Level 3	2 (5.4)	1 (5.6)	1 (5.3)	
Anxiety/depression				0.424
Level 1	19 (51.4)	11 (61.1)	8 (42.1)	
Level 2	15 (40.5)	6 (33.3)	9 (47.4)	
Level 3	2 (5.4)	1 (5.6)	1 (5.3)	
Missing data	1 (2.7)	0 (0)	1 (5.3)	

EQ-VAS: EuroQol-visual analogue scale.
EQ5D: EuroQol five dimensions questionnaire.
*Median score (interquartile range) and [range].
**Mann–Whitney U test to identify group difference between men and women.

reported on the EQ5D dimensions mobility and usual activity level 2 (indicating some problems) whereas in self-care level 1 (indicating no problems) showed the highest response rate. That in combination with the high-test scores in FAC and FIM (total and subscales) indicates high functioning individuals in this study.

In comparison with other studies in the stroke population [8, 16, 30], the present study showed that physical function was associated with fall-related SE. As suggested by the SE theory, the relationship between efficacy and function may be reciprocal. Efficacy may influence function, while at the same time function may influence efficacy [12]. This is confirmed by existing literature with studies showing that SE is a significant predictor of physical function [16, 18] including balance [30, 31], gait capability [30], level of physical activity [32], and fall history [31, 32]. The study by Andersson et al. [8] showed a significant association between low fall-related SE and impaired physical function in individuals poststroke who had fallen and in those who had not.

Furthermore, there was a low rate of falling (Table 1); 33.3% for men and 36.8% for women, compared with other studies [5]. The high level of functional independence may have contributed to this. In a high functioning population with stroke a fall rate of 40% is still occurring [31]. The high risk of falling is a considerable health concern [5]. One risk for falling is slow walking speed [5, 33]. Persson et al. [33] showed that self-selected gait speed at ≤1.2 m/s on the 10 mWT tested one week after stroke increased the risk for falling during the first year and those individuals who were unable to perform the test had the highest risk. In healthy adults the mean self-selected gait speed is 1.33 m/s for men and 1.27 m/s for women [34]. The present study showed a mean self-selected gait speed of 0.9 m/s in both men and women. Previous studies have reported similar results with slower self-selected gait speed in a population with stroke [5, 32, 35] with velocities ranging from 0.66 to 1.2 m/s [6]. In community ambulation a gait speed at more than 1.2 m/s is needed to cross a street safely [36].

Different approaches to assess FoF have been developed over the years [37] and the Fall Efficacy Scale was one of them [13]. While some authors may suggest that fall-related SE and FoF are the same, but we do not agree. While related, fall-related SE and FoF are distinct constructs [37]. Fall-related SE is defined as "perceived confidence in task performing without falling" [21] and FoF is defined "persisting concern regarding falling" [9]. Nevertheless, several studies have used the SE theory to evaluate FoF [18, 19, 38]. Kim et al. [38] found an association, similar to ours, between FAC and FoF measured with the Korean version of falls efficacy-scale in subacute stroke patients. Fall-related SE and FoF have however been found to be correlated given the relationship between fear and beliefs [37]. Low fall-related SE and FoF can restrict performance of daily living [13] but on the other hand some level of FoF can promote effective coping skills for prevention of falls [19].

In the literature there has been some discussion of the influence of sex on SE. Some author's hypothesis is that men rate higher SE due to a higher educational level, occupational status, monthly income, or social influence. Other authors suggested that men rate higher SE in stroke rehabilitation to offer an image of strength and control [18]. This study did not show a significant difference between men and women in fall-related SE. Some studies showed the same results [21], yet others suggested that men rate a higher SE than women [18]. In our results, although not a significant difference, the women rated a higher SE than the men. The women did however also a slightly higher median score in FIM and FAC test have.

The participants in this study had a high median score of the FIM subscale that includes aspects of cognitive function. There has been some discussion of the influence of cognitive and/or perceptual impairments on SE. Bandura [12] suggests that individuals with cognitive impairments have limited ability to process information drawn from positive experiences that should enhance SE [12]. The study by Hellström and Lindmark [21] did not show any significant difference in FES-S scores in any of the 13 items between individuals poststroke with or without cognitive and perceptual impairments [21]. Previous studies have shown that when motor function, cognition, and psychosocial capacity are reasonable intact, poststroke performance-based mobility may be significantly limited due too poor SE [17, 32].

In contrast to some previous studies, ours did not show any association between fall-related SE [38] and QoL. Furthermore, earlier studies have suggested that there is a difference between men and women, where women more frequently rate lower on QoL and depression [39]. While this study, like the one from Andersson et al. [8], did not show any significant difference, it could however indicate a difference between men and women regarding QoL and depression. EuroQol-visual analogue scale mean was at 65 for men and 50 for women, and the highest percentage in dimension anxiety/depression was level 1 for men at 61.1% and level 2 for women at 47.4%.

The results in this study support the concept of using SE within the field of physical therapy in stroke rehabilitation to help the individual to gain better function in activities of daily living post stroke.

Limitations

There were several methodological limitations to the study. It was a cross-sectional study, so predictive relationships cannot be drawn. Among the participants in this study, there are both individuals who have fallen and not fallen, those who have received rehabilitation before due to a previous stroke and those who have not received it. It can affect the test result as the group is not homogeneous. That does however form a group of individuals with which many rehabilitation staff will be

familiar with. Furthermore, the women of the study had a lower mean age at 65 years compared with 78 years overall in Sweden. Also the study sample was likely representative of highly functioning individuals. It should be emphasized that the study sample was quite small.

CONCLUSION

In this study different measures of physical function stood out as the most important variable associated with the fall-related SE. Consequently, the hypothesis that QoL is associated with fall-related SE that is not supported by the present study. Furthermore, no difference between men and women in fall-related SE is shown.

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Author Contributions
Jessica Söderborg – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Karin Hellström – Conception of the work, Design of the work, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.

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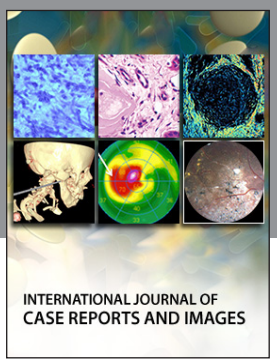

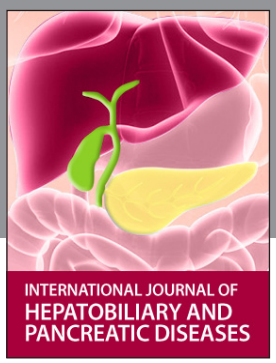

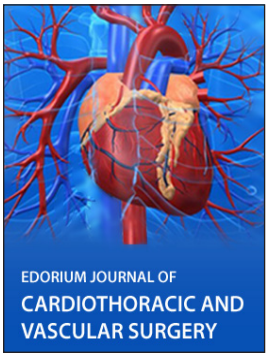

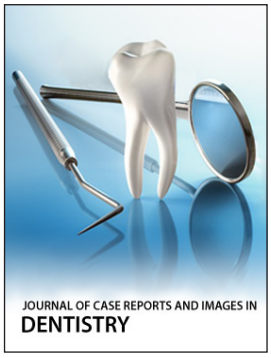

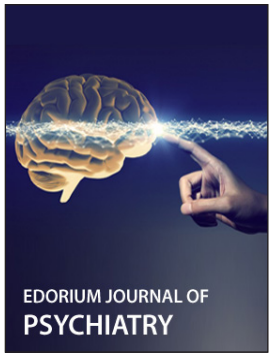

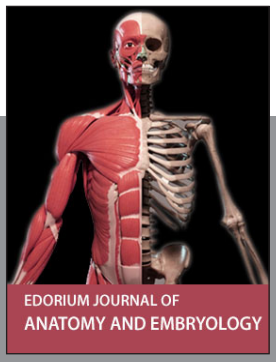

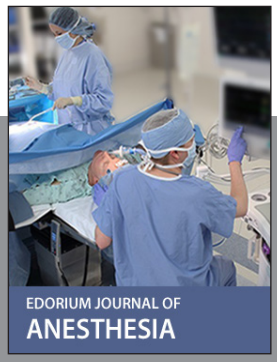

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