




Research Article

The impact of falls and fear of falling on participation, autonomy, and life satisfaction among individuals with spinal cord injury: A brief report

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Context: Qualitative research suggests that falls can have a negative psychosocial impact on the lives of individuals with spinal cord injury (SCI). However, it is unclear whether these qualitative findings are supported by quantitative psychosocial metrics. This paper examines whether falling and/or having a fear of falling impacts participation, autonomy, and life satisfaction among individuals with SCI.

Methods: Falls and fear of falling were tracked over six months using a survey and phone check-ins conducted approximately every three to four weeks. The Life Satisfaction 9 and Impact on Participation and Autonomy Questionnaires were administered at baseline and after six months. Responses on the questionnaires were statistically compared between fallers and non-fallers as well as participants with and without a fear of falling during the tracking period.

Findings: Of the 65 community-dwelling adults with chronic SCI, 38 were categorized as fallers (aged 54.29 ± 13.73 , 19.55 ± 14.20 years post-SCI, AIS A-D) and 27 were non-fallers (aged 57.78 ± 12.21 , 17.93 ± 17.24 years post-SCI, AIS A-D). Our results revealed no significant differences between fallers and non-fallers in their perceived participation, autonomy, or life satisfaction at baseline or after six months. At the last check-in, 34 participants denied a fear of falling, while 31 had a fear of falling. Perceived autonomy outdoors ($P=0.02$), total life satisfaction ($P=0.04$), satisfaction with life as a whole ($P=0.00$) and self-care ($P=0.01$) differed between participants with and without a fear of falling after six months.

Conclusion: Fear of falling, rather than falls, may impact participation, autonomy, and life satisfaction in the SCI population.

Keywords: Spinal cord injury, Falls, Quality of life, Participation, Autonomy, Fear of falling

Introduction

Falls are common among individuals with spinal cord injury (SCI).¹ Although literature on this topic has been growing, falls among individuals with SCI are relatively understudied when compared to other neurological

populations.¹ Qualitative literature suggests that falls and the risk of falls can negatively impact the psychosocial functioning of a person with SCI and lead to a fear of falling (FOF).²⁻⁴ However, it is unclear whether these qualitative findings²⁻⁴ are supported by quantitative psychosocial metrics.⁵ A comprehensive understanding of the psychosocial consequences of falls can improve our understanding of the impact of falls in this population as well as inform

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the development of targeted fall prevention efforts to minimize negative psychosocial impacts.^{2,6}

This study examined whether falls or a FOF impacted participation, autonomy, and life satisfaction of individuals with SCI over a six-month period. We hypothesized that fallers as well as those with a FOF would experience lower levels of participation, autonomy, and life satisfaction compared to non-fallers or those without a FOF.

Materials and methods

This is a sub-study of a larger project.^{2,7-9} Ethical approval was received from the Research Ethics Boards of the University Health Network and University of Toronto.

Participants: Inclusion criteria were: (1) adult (aged ≥ 18 years), (2) traumatic, chronic (≥ 1 year) SCI between C1 and L1 (American Spinal Injury Association Impairment Scale grades A–D), (3) community-dwelling (≥ 1 month), and (4) have no other significant co-morbid condition affecting mobility or physical activity. The targeted sample size was ≥ 64 participants. The sample size calculation¹⁰ used data from individuals with SCI on the Impact on Participation and Autonomy Questionnaire (IPA),¹¹ $\alpha=0.05$, $\beta=0.10$, and an estimated fall rate of 45%.¹² For the five IPA domains, the number of participants/groups required varied from 18–29. Thus, we estimated requiring ≥ 29 fallers and 35 non-fallers (given a 45% fall rate).¹²

Data collection

During a baseline interview, we collected demographic and injury characteristics from participants, and administered the IPA¹³ and Life Satisfaction Questionnaire 9 (LiSAT-9)¹⁴ (i.e. baseline scores). After completion of the baseline interview, participants prospectively tracked falls (i.e. “an event which results in a person coming to rest inadvertently on the ground or floor or other lower level”)¹⁵ for six months using online or paper-based surveys. We conducted phone check-ins with participants every three to four weeks during the six-month period.^{7,9} During the phone check-ins, we inquired whether participants had: (i) experienced a fall, FOF or any changes in their physical activity, health or medication, and (ii) completed a fall survey. FOF was assessed by asking whether participants had a lasting concern about falling causing them to avoid activities that they felt capable of doing.¹⁶ During the final interview, after the tracking period ended, we re-administered the IPA and LiSAT-9 (i.e. final scores). Details of the circumstances and consequences of falls

during this tracking period were reported elsewhere.^{7,9,17} In short, most falls occurred within the home environment, and nearly two-fifths of falls resulted in an injury; most injuries were minor (e.g. bruises, pain).¹⁷

The IPA was used to assess a participant’s participation and autonomy in five domains: autonomy indoors, autonomy outdoors, family role, social life/relationships, and work/education.^{13,18} Responses on the IPA ranged from 1 (very good) to 5 (very poor); a higher score indicated a higher negative impact on participation and autonomy.¹³ The IPA has excellent psychometric properties (i.e. test-retest reliability in the SCI population and content validity).^{11,13,18}

The LiSAT-9 was used to measure satisfaction in life as a whole, and in eight additional domains: vocational situation, financial situation, leisure situation, contact with friends, sexual life, self-care, family life, and partner relationship.¹⁹ Responses on the LiSAT-9 ranged from 1 (very dissatisfying) to 6 (very satisfying); a higher score indicated higher life satisfaction.¹⁴ The LiSAT-9 has validity and responsiveness in the SCI population.²⁰

Data analysis

Group characteristics (fallers versus non-fallers, FOF versus no FOF) were descriptively reported. IPA domains were calculated by summing IPA item scores that corresponded with the subscales.²¹ The work/education domain was excluded as it was not relevant to all participants. A total life satisfaction score (i.e. mean of all items) and LiSAT-9 domains (i.e. item scores) were examined.¹⁴ A Shapiro-Wilks test was used to determine normality of continuous data (i.e. total LiSAT-9 scores, IPA domain scores, age, time since injury). Microsoft Excel (Microsoft Corporation) and SPSS 27 (IBM, Armonk, New York) were used for data management and analysis, respectively. Alpha was set to 0.05.

To assess the impact of falls on participation, autonomy, and life satisfaction, participants were grouped into fallers (≥ 1 fall during tracking period) and non-fallers (no falls during tracking period), as is consistent with previous studies.^{22–24} To compare demographic and injury characteristics between fallers and non-fallers, independent t-tests, Mann–Whitney U tests or chi-square tests were used, as appropriate. The relationship between FOF and fall status was examined using a Spearman’s correlation. Independent t-tests or Mann–Whitney U tests were used to determine whether baseline scores on the LiSAT-9 and IPA of fallers and non-fallers were similar. A 2×2 mixed ANOVA was used to compare IPA domain scores and LiSAT-9

Table 1 Characteristics of fallers versus non-fallers.

Characteristics	Entire sample (n=65)	Fallers (n=38)	Non-fallers (n=27)	Test-statistic, p-value (fallers, non-fallers)
Mean age (SD) (years)	55.74 ± 13.13	54.29 ± 13.73	57.78 ± 12.21	t=1.06, p=0.30
Male, n (%)	40 (61.54)	24 (63.16)	16 (59.26)	χ ² = 0.10, p=0.75
Female, n (%)	25 (38.46)	14 (36.84)	11(40.74)	
Mean (SD) TSI (years)	18.89 ± 15.43	19.55 ± 14.20	17.93 ± 17.24	t= -0.42, p=0.68
Tetraplegia, n (%)	41 (63.08)	22 (57.89)	19 (70.37)	χ ² = 1.05, p=0.30
Paraplegia, n (%)	24 (36.92)	16 (42.11)	8 (29.63)	
Motor complete (AIS A/B), n (%)	28 (43.08)	14 (36.84)	14 (51.85)	χ ² = 1.45, p=0.23
Motor incomplete (AIS C/D) n (%)	37 (56.92)	24 (63.16)	13 (48.15)	
Full-time Wheelchair user, n (%)	27 (41.54)	13 (34.21)	14 (51.85)	χ ² = 3.99, p=0.14
Ambulator, n (%)	30 (46.15)	18 (47.37)	12 (44.44)	
Part-time Ambulator**, n (%)	8 (12.31)	7 (18.42)	1 (3.70)	

TSI: time since injury; AIS: American Spinal Injury Association Impairment Scale;

**used a wheelchair and ambulated

Table 2 Baseline scores for fallers versus non-fallers on the IPA and LiSAT-9.

	Fallers Baseline scores (n=38)	Non-fallers Baseline scores (n=27)	Test-statistic, p-value
IPA			
Autonomy indoors <i>Median (IQR)</i>	11 (7)	10.5 (6)	U=509.00, p=0.96
Autonomy outdoors <i>Median (IQR)</i>	12 (6)	13 (7)	t=0.41, p=0.68
Family role <i>Median (IQR)</i>	16 (8)	14 (7)	U=411.00, p=0.17
Social life & relationships <i>Median (IQR)</i>	11.5 (7)	11 (7)	U=497.00, p=0.83
LiSAT-9			
Total life satisfaction** <i>Mean, SD</i>	3.83 ± 0.97	4.25 ± 0.88	t=0.15, p=0.89
Life as a whole <i>Median (IQR)</i>	5 (1)	5 (1)	U=490.00, p=0.76
Vocational situation <i>Median (IQR)</i>	4 (2)	5 (2)	U=504.00, p=0.90
Financial situation <i>Median (IQR)</i>	4.5 (2)	5 (3)	U=447.00, p=0.36
Leisure situation <i>Median (IQR)</i>	4 (2)	4 (2)	U=454.00, p=0.42
Contact with friends <i>Median (IQR)</i>	4.5 (2)	5 (3)	U=469.00, p=0.55
Sexual life** <i>Median (IQR)</i>	3 (2)	3 (3)	U=453.00, p=0.75
Self-care <i>Median (IQR)</i>	5 (2)	5 (1)	U=487.00, p=0.72
Family life <i>Median (IQR)</i>	5 (2)	5 (2)	U=423.50, p=0.22
Partner relationship** <i>Median (IQR)</i>	5 (3)	5 (2)	U=471.50, p=0.96

**Responses from two participants were excluded due to missing values.

scores (total and domain) among fallers and non-fallers, even if the assumption of normality was violated, as ANOVA calculations remain robust under these circumstances.²⁵

To assess the impact of FOF on participation, autonomy, and life satisfaction, participants were grouped based on their responses during their last check-in: FOF or no FOF. FOF at the last check-in was selected for analysis since this time point aligned closely with the final interview. To compare demographic and injury characteristics between participants with and with a FOF, independent t-tests, Mann–Whitney U tests or chi-square tests were used, as appropriate. Group differences on the IPA domain scores and LiSAT-9 scores (total and domain) from the final interview were examined using independent t-tests or Mann–Whitney U tests.

Results

Sixty-five community-dwelling adults with chronic traumatic SCI participated in this study. The 38 fallers and 27 non-fallers did not differ in demographic or injury characteristics (see Table 1). At baseline, fallers and non-fallers did not differ with respect to scores on the IPA domains, total life satisfaction score and LiSAT-9 domain scores (see Table 2). There were no significant differences between fallers and non-fallers in their perceived participation and autonomy or life satisfaction after six months (see Table 3).

Most (i.e. 97%) of the last check-ins preceded the final interview by ≤6 weeks. In two cases, the last check-in was conducted >2 months prior to the final interview because the participants were difficult to reach. Thirty-four participants reported no FOF and 31 reported a FOF at the last check-in; participants

Table 3 Statistical results for ANOVAs comparing fallers and non-fallers at baseline and six months post-baseline.

	Comparison Faller versus Non-faller over study period (Test-statistic, <i>p</i> -value)
IPA	
Autonomy indoors	Time: $F=1.33, p=0.25$ Group: $F=0.11, p=0.74$ Interaction: $F=0.40, p=0.53$
Autonomy outdoors	Time: $F=1.11, p=0.30$ Group: $F=0.26, p=0.61$ Interaction: $F=0.07, p=0.79$
Family role	Time: $F=0.98, p=0.35$ Group: $F=0.50, p=0.49$ Interaction: $F=2.28, p=0.14$
Social life & relationships	Time: $F=0.16, p=0.69$ Group: $F=0.51, p=0.48$ Interaction: $F=0.22, p=0.64$
LISAT-9	
Total life satisfaction**	Time: $F=2.65, p=0.11$ Group: $F=0.00, p=0.97$ Interaction: $F=0.25, p=0.62$
Life as a whole	Time: $F=2.61, p=0.11$ Group: $F=0.00, p=0.96$ Interaction: $F=0.91, p=0.35$
Vocational situation	Time: $F=0.23, p=0.63$ Group: $F=0.00, p=0.98$ Interaction: $F=0.05, p=0.82$
Financial situation	Time: $F=1.74, p=0.19$ Group: $F=0.52, p=0.47$ Interaction: $F=0.14, p=0.71$
Leisure situation	Time: $F=0.02, p=0.89$ Group: $F=0.06, p=0.81$ Interaction: $F=1.93, p=0.17$
Contact with friends	Time: $F=0.19, p=0.66$ Group: $F=1.18, p=0.28$ Interaction: $F=0.84, p=0.36$
Sexual life**	Time: $F=0.91, p=0.34$ Group: $F=0.25, p=0.62$ Interaction: $F=0.04, p=0.84$
Self-care	Time: $F=4.13, p=0.05$ Group: $F=0.01, p=0.92$ Interaction: $F=0.17, p=0.68$
Family life	Time: $F=0.24, p=0.62$ Group: $F=1.28, p=0.26$ Interaction: $F=0.43, p=0.51$
Partner relationship**	Time: $F=0.46, p=0.50$ Group: $F=0.00, p=0.96$ Interaction: $F=0.30, p=0.59$

**Responses from two participants were excluded due to missing values.

with a FOF had a significantly greater proportion of people with motor incomplete injury (see Table 4). No relationship was found between FOF at last check-in and fall status ($P=0.66$). It must be noted that FOF fluctuated (i.e. responses to having a FOF during the check-ins changed) among 36 (55.38%) participants during the tracking period. Among those with a fluctuating FOF, 77.69% of the time their FOF was not associated with a report of a fall. At the final interview, statistically significant differences were found among participants with and without a FOF in autonomy outdoors ($P=0.02$), total life satisfaction ($P=0.04$), as well as satisfaction with life as a whole ($P=0.00$) and self-care ($P=0.01$) (see Table 5), with those without a FOF showing greater participation, autonomy and life satisfaction.

Discussion

We found group differences in perceived participation, autonomy, and life satisfaction among participants with and without a FOF, but no differences were found among fallers and non-fallers with chronic, traumatic SCI during the six-month period.

Our findings were surprising as the experiences of falls described by individuals with SCI in previous qualitative studies suggested that falls and the risk of falls impacted people's participation in daily activities, impacted their family role, instilled negative emotions, and interfered with their enjoyment/participation in meaningful activities.²⁻⁴ Our findings suggest that a FOF rather than the occurrence of a fall may lead to negative psychosocial impacts. One explanation for this finding could be that individuals with SCI may have different reactions to a fall. Previous studies have found that following a fall, some develop a FOF which may lead to activity restriction⁴ and a lower quality of life, while others may not be affected by a fall.² Our findings correspond with the geriatric

Table 4 Characteristics of participants with versus without a fear of falling.

Characteristics	Fear of falling (n=31)	No fear of falling (n=34)	Test-statistic, <i>p</i> -value
Mean age (SD) (years)	58.32 ± 12.95	53.38 ± 13.04	$t=1.53, p=0.13$
Male, n (%)	19 (61.29)	21 (61.76)	$\chi^2 = 0.00, p=0.97$
Female, n (%)	12 (38.71)	13 (38.24)	
Median (IQR) TSI (years)	12.00 (26.00)	17.50 (30.00)	$U=517.00, p=0.90$
Tetraplegia, n (%)	20 (64.52)	21 (61.76)	$\chi^2 = 0.05, p=0.82$
Paraplegia, n (%)	11 (35.48)	13 (38.24)	
Motor complete (AIS A or B), n (%)	8 (25.81)	20 (58.82)	$\chi^2 = 7.21, p=0.01^*$
Motor incomplete (AIS C or D), n (%)	23 (74.19)	14 (41.18)	
Full-time Wheelchair user, n (%)	10 (32.26)	17 (50.00)	$\chi^2 = 2.21, p=0.33$
Full-time Ambulator, n (%)	17 (54.84)	13 (38.24)	
Part-time Ambulator**, n (%)	4 (12.90)	4 (11.76)	

TSI: time since injury; AIS: American Spinal Injury Association Impairment Scale

*statistically significant; **used a wheelchair and ambulated

Table 5 Final scores of participants with versus without a fear of falling on the IPA and LiSAT-9.

	Fear of falling (n=31)	No fear of falling (n=34)	Comparison Fear of falling versus No fear of falling (test statistic, p-value)
IPA			
Autonomy indoors <i>Median (IQR)</i>	12 (8)	9 (6.25)	U=457.00, p=0.35
Autonomy outdoors <i>Median (IQR)</i>	14 (7)	10.5 (7.25)	t=2.35, p=0.02*
Family role <i>Median (IQR)</i>	15 (9)	13.5 (7)	U=444.00, p=0.27
Social life & relationships <i>Median (IQR)</i>	12 (8)	10 (6.25)	U=418.50, p=0.15
LiSAT-9			
Total life satisfaction** <i>Mean, SD</i>	4.01 ± 0.94	4.51 ± 0.89	t=2.16, p=0.04*
Life as a whole <i>Median (IQR)</i>	4 (2)	5 (0.5)	U=305.00, p=0.00*
Vocational situation <i>Median, (IQR)</i>	5 (3)	5 (1.25)	U=471.00, p=0.45
Financial situation <i>Median, (IQR)</i>	4 (3)	5 (2)	U=422.50, p=0.16
Leisure situation <i>Median, (IQR)</i>	4 (2)	5 (2)	U=387.00, p=0.06
Contact with friends <i>Median, (IQR)</i>	5 (2.5)	5 (2)	U=387.00, p=0.27
Sexual life** <i>Median, (IQR)</i>	3 (3)	3 (2.25)	U=444.50, p=0.12
Self-care <i>Median, (IQR)</i>	5 (2)	5 (1)	U=341.50, p=0.01*
Family life <i>Median, (IQR)</i>	5 (1.5)	5 (2)	U=438.50, p=0.22
Partner relationship** <i>Median, (IQR)</i>	5 (2)	5 (2.25)	U=461.50, p=0.65

*Statistically significant.

**Responses from two participants were excluded due to missing values.

literature, where good life satisfaction was reported by older adults who had experienced falls, but those with a higher FOF reported lower life satisfaction.²⁶⁻²⁸

Sung and colleagues⁶ found lower levels of life satisfaction and community participation among wheelchair users who had a FOF. Among participants with SCI, we found that having a FOF may decrease life satisfaction and participation more than whether someone experiences a fall. This may be because individuals with a FOF will limit their activities and participation.¹⁶ Interestingly, we found that the group with a FOF consisted of more participants with motor incomplete injuries and ambulators in comparison to the group without a FOF. Individuals with SCI who ambulate are known to have a greater risk of falling than wheelchair users,^{1,29} which may explain this finding. Based on our findings, we contend that fall prevention/management interventions that minimize the psychosocial impacts associated with a FOF are needed to support individuals who have a FOF, especially those with motor incomplete injuries.

Our study had limitations that must be considered. First, participants self-reported falls, and there is a chance of errors in the numbers of falls experienced versus reported.³⁰ Second, the tracking period could

have impacted the findings. It is possible that a longer period is needed to identify the longer-term psychosocial consequences of falls.³¹ Alternatively, administering the questionnaires soon after a participant fell may have enabled us to capture the immediate effect of falls. Third, the sample consisted of a mix of full-time wheelchair users and those who ambulate part-time or full-time. It is possible that the impact of falls may differ among mobility groups,¹⁷ and further research is needed to investigate sub-group differences. Fourth, we examined differences in perceived participation, autonomy, and life satisfaction among fallers and non-fallers over a six-month period, but the associations between participants' baseline psychological functioning (e.g. depression, anxiety) and FOF and falls were not explored. Among older adults, depression is closely associated with having an excessive FOF and frequently associated with falls.³² Similar associations may exist in the SCI population and should be explored within future research. Finally, we categorized participants into those with and without a FOF based on whether they had a FOF at the last check-in. However, it is important to acknowledge that FOF fluctuated among some participants at earlier check-ins.

In conclusion, a FOF may have a larger impact on an individual's life satisfaction, participation, and autonomy than the occurrence of a fall. To minimize the psychosocial impacts of falls, fall prevention/management efforts should target those with a FOF.

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