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

Hardeep Singh, Katherine Chan, Lovisa Cheung, Sander L. Hitzig, Kristin E. Musselman

1KITE, Toronto Rehab-University Health Network, Toronto, Canada, 2Rehabilitation Sciences Institute, Faculty of Medicine, University of Toronto, Toronto, Canada, 3Bridgepoint Collaboratory for Research & Innovation, Lunenfeld-Tanenbaum Research Institute, Sinai Health System, 4St. John's Rehab Research Program, Sunnybrook Research Institute, Sunnybrook Health Sciences Centre, Toronto, Canada, 5Department of Occupational Science and Occupational Therapy, Faculty of Medicine, University of Toronto, Toronto, Canada, 6Department of Physical Therapy, Faculty of Medicine, University of Toronto, Toronto, Canada

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
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 calculation used data from individuals with SCI on the Impact on Participation and Autonomy Questionnaire (IPA), α=0.05, β=0.10, and an estimated fall rate of 45%. 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 IPA and Life Satisfaction Questionnaire 9 (LiSAT-9) (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”) 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 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)          | χ² = 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)          | χ² = 1.05, p=0.30                             |
| Paraplegia, n (%)                           | 24 (36.92)            | 16 (42.11)      | 8 (29.63)           | χ² = 1.45, p=0.23                             |
| Motor complete (AIS A/B), n (%)             | 28 (43.08)            | 14 (36.84)      | 14 (51.85)          |                                               |
| 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)          | χ² = 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.

| IPA                                      | Fallers Baseline scores (n = 38) | Non-fallers Baseline scores (n = 27) | Test-statistic, p-value (fallers, non-fallers) |
|------------------------------------------|----------------------------------|--------------------------------------|-----------------------------------------------|
| Autonomy indoors Median (IQR)           | 11 (7)                           | 10.5 (6)                             | U=509.00, p=0.96                               |
| Autonomy outdoors Median (IQR)          | 12 (6)                           | 13 (7)                               | t=0.41, p=0.68                                |
| Family role Median (IQR)                | 16 (8)                           | 14 (7)                               | U=411.00, p=0.17                               |
| Social life & relationships Median (IQR)| 11.5 (7)                         | 11 (7)                               | U=497.00, p=0.83                               |
| LISAT-9                                   |                                   |                                      |                                               |
| Total life satisfaction** Mean, SD       | 3.83 ± 0.97                      | 4.25 ± 0.88                         | t=0.15, p=0.89                                 |
| Life as a whole Median (IQR)             | 5 (1)                            | 5 (1)                                | U=490.00, p=0.76                               |
| Vocational situation Median (IQR)        | 4 (2)                            | 5 (2)                                | U=504.00, p=0.90                               |
| Financial situation Median (IQR)         | 4.5 (2)                          | 5 (3)                                | U=447.00, p=0.36                               |
| Leisure situation Median (IQR)           | 4 (2)                            | 4 (2)                                | U=454.00, p=0.42                               |
| Contact with friends Median (IQR)        | 4.5 (2)                          | 5 (3)                                | U=469.00, p=0.55                               |
| Sexual life** Median (IQR)               | 3 (2)                            | 3 (3)                                | U=453.00, p=0.75                               |
| Self-care Median (IQR)                   | 5 (2)                            | 5 (1)                                | U=487.00, p=0.72                               |
| Family life Median (IQR)                 | 5 (2)                            | 5 (2)                                | U=423.50, p=0.22                               |
| Partner relationship** Median (IQR)      | 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 without 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
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 restriction\(^5\) and a lower quality of life, while others may not be affected by a fall.\(^5\) Our findings correspond with the geriatric

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

| IPA                      | Faller (n=31) | Non-faller (n=34) | Test-statistic, \(p\)-value |
|--------------------------|--------------|-------------------|-----------------------------|
| Autonomy outdoors        | Time: F = 1.11, \(p = 0.30\) | Group: F = 0.26, \(p = 0.61\) | Interaction: F = 0.07, \(p = 0.79\) |
| Autonomy indoors         | Time: F = 1.11, \(p = 0.30\) | Group: F = 0.26, \(p = 0.61\) | Interaction: F = 0.07, \(p = 0.79\) |
| 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.**

### 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, \(p\)-value |
|-----------------|--------------------------|-----------------------------|-----------------------------|
| Mean age (SD) \(\text{years}\) | 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) | \(U=517.00, p=0.90\) |
| Median (IQR) TSI \(\text{years}\) | 12.00 (26.00) | 17.50 (30.00) | \(\chi^2 = 2.05, p=0.82\) |
| Tetraplegia, n (%) | 20 (64.52) | 21 (61.76) | \(\chi^2 = 7.21, p=0.01*\) |
| Paraplegia, n (%) | 11 (35.48) | 13 (38.24) | \(\chi^2 = 2.21, p=0.33\) |
| Motor complete (AIS A or B), n (%) | 8 (25.81) | 20 (58.62) | |
| Motor incomplete (AIS C or D), n (%) | 23 (74.19) | 14 (41.18) | |
| Full-time Wheelchair user, n (%) | 10 (32.66) | 17 (50.00) | |
| Full-time Ambulator, n (%) | 17 (54.84) | 13 (38.24) | |
| Part-time Ambulator**, n (%) | 4 (12.90) | 4 (11.76) | |

TSl: time since injury; AIs: American Spinal Injury Association Impairment Scale
*statistically significant; **used a wheelchair and ambulated
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.

### 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       | 12 (8)                      | 9 (6.25)              | U = 457.00, p = 0.35 |
| Median (IQR)           |                             |                      |                      |
| Autonomy outdoors      | 14 (7)                      | 10.5 (7.25)          | t = 2.35, p = 0.02* |
| Median (IQR)           |                             |                      |                      |
| Family role            | 15 (9)                      | 13.5 (7)              | U = 444.00, p = 0.27 |
| Median (IQR)           |                             |                      |                      |
| Social life & relationships | 12 (8)                    | 10 (6.25)            | U = 418.50, p = 0.15 |
| Median (IQR)           |                             |                      |                      |
| **LISAT-9**            |                             |                      |                      |
| Total life satisfaction** | Mean, SD                 | 4.01 ± 0.94          | 4.51 ± 0.89         |
| Life as a whole        | 4 (2)                       | 5 (0.5)               | U = 305.00, p = 0.00* |
| Vocational situation   | 5 (3)                       | 5 (1.25)              | U = 471.00, p = 0.45 |
| Financial situation    | 4 (3)                       | 5 (2)                 | U = 422.50, p = 0.16 |
| Leisure situation      | 4 (2)                       | 5 (2)                 | U = 387.00, p = 0.06 |
| Contact with friends   | 5 (2.5)                     | 5 (2)                 | U = 387.00, p = 0.27 |
| Sexual life**          | 3 (3)                       | 3 (2.25)              | U = 444.50, p = 0.12 |
| Self-care              | 5 (2)                       | 5 (1)                 | U = 341.50, p = 0.01* |
| Family life            | 5 (1.5)                     | 5 (2)                 | U = 438.50, p = 0.22 |
| Partner relationship** | 5 (2)                       | 5 (2.25)              | U = 461.50, p = 0.65 |
| **Median, (IQR)**      |                             |                      |                      |

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

Disclaimer statements

Funding This work was supported by the Craig H. Neilsen Foundation, Psychosocial Research Grant 440070 to KEM; CIHR Fellowship and TRI Student Scholarship to HS.

ORCID

Hardeep Singh http://orcid.org/0000-0002-7429-5580
Sander L. Hitzig http://orcid.org/0000-0002-9139-9250
Kristin E. Musselman http://orcid.org/0000-0001-8336-8211

References

1 Khan A, Pujol C, Taylor M, Unic N, Pakosh M, Dawe J, et al. Falls after spinal cord injury: a systematic review and meta-analysis of incidence proportion and contributing factors. Spinal Cord 2019;57(7):526–539.
2 Singh H, Scovil CY, Yoshida K, Oosman S, Kaiser A, Jaglal SB, et al. Capturing the psychosocial impacts of falls from the perspectives of wheelchair users with spinal cord injury through photo-elicitation. Disabil Rehabil 2020;1–10. doi:10.1080/09638288.2019.1709911
3 Musselman KE, Arnold C, Pujol C, Lynd K, Oosman S. Falls, mobility, and physical activity after spinal cord injury: an exploratory study using photo-elicitation interviewing. Spinal Cord Ser Cases 2018;4:39. Available from: https://pubmed.ncbi.nlm.nih.gov/29707239
4 Jørgensen V, Roaldsen KS. Negotiating identity and self-image: perceptions of falls in ambulatory individuals with spinal cord injury - a qualitative study. Clin Rehabil 2017;31(4):544–554.
5 Boswell-Ruys CL, Harvey LA, Delbaere K, Lord SR. A falls concern Scale for people with spinal cord injury (SCI-FCS). Spinal Cord 2010;48(9):704–709.
6 Sung J, Shen S, Peterson EW, Soosnoff JJ, Backus D, Rice LA. Fear of falling, community participation and quality of life among community-dwelling people who use wheelchairs full time. Arch Phys Med Rehabil 2020;102(6):1140–1146.
7 Singh H, Scovil CY, Bostick G, Kaiser A, Craven BC, Jaglal SB, et al. Perspectives of wheelchair users with spinal cord injury on fall circumstances and fall prevention: A mixed methods approach using photovoice. PloS one 2020;15(8):e0238116.
8 Singh H, Scovil CY, Yoshida K, Oosman S, Kaiser A, Craven BC, et al. Factors that influence the risk of falling after spinal cord injury: A qualitative photo-elicitation study with individuals that use a wheelchair as their primary means of mobility. BMJ Open 2020;10:e034279.
9 Singh H, Shibi Rosen A, Bostick G, Kaiser A, Musselman KE. Exploring the causes and impacts of falls among ambulators with spinal cord injury using photovoice: a mixed-methods study. BMJ Open 2020;10(8):e039763.
10 Steiner DL, Norman GR. Health measurement scales: A practical guide to their development and use. Toronto (ON): Oxford University Press; 2008.
11 Noonan VK, Kopec JA, Noreau L, Singer J, Mäše LC, Dvorak MF. Comparing the reliability of five participation instruments in persons with spinal conditions. J Rehabil Med 2010;42(8):735–743.
12 Wannapakhe J, Arrayawichanon P, Suengsuwan J, Amatachaya S. Medical complications and falls in patients with spinal cord injury during the immediate phase after completing a rehabilitation program. J Spinal Cord Med 2015;38(1):84–90.
13 Cardol M, de Haan RJ, van den Bos GA, de Jong BA, de Groot IJ. The development of a handicap assessment questionnaire: the impact on Participation and Autonomy (IPA). Clin Rehabil 1999;13(5):411–419.
14 Fugl-Meyer AR, Bränholm I-B, Fugl-Meyer KS. Happiness and domain-specific life satisfaction in adult northern Swedes. Clin Rehabil 1991;5(1):25–33.
15 WHO. (2018). Available from: https://www.who.int/news-room/fact-sheets/detail/falls#:~:text=A%20fall%20is%20defined%20as%20an\n20as%20floor%20or%20other%20lower%20level.
16 Tinetti ME, Powell L. Fear of falling and low self-efficacy: a case of dependence in elderly persons. J Gerontol 1993;48, Spec No:35-38.
17 Singh H, Flett H, Hitzig S, Kaiser A, Craven C, Jaglal S, Musselman KE. A comparison of falls between wheelchair users and ambulators with spinal cord injury. Arch Phys Med Rehabil 2019;100(10):E24.
18 Cardol M, de Haan RJ, de Jong BA, van den Bos GA, de Groot IJ. Psychometric properties of the impact on Participation and Autonomy questionnaire. Arch Phys Med Rehabil 2001;82(2):210–216.
19 Post MW, van Leeuwen CM, van Koppenhagen CF, de Groot S. Validity of the life satisfaction questions, the Life Satisfaction Questionnaire, and the satisfaction With life Scale in persons with spinal cord injury. Arch Phys Med Rehabil 2012;93(10):1832–1837.
20 Wilson JR, Hashimoto RE, Dettori JR, Fehlings MG. Spinal cord injury and quality of life: a systematic review of outcome measures. Evid Based Spine Care J 2011;2(1):37–44.
21 Kersten P. ‘Impact on Participation and Autonomy’ (IPA) Manual to the English version: IPA 2007. Available from: https://www.nivel.nl/sites/default/files/bestanden/INT-IPA-Manual.pdf.
22 Brotherton SS, Krause JS, Nietert PJ. Falls in individuals with incomplete spinal cord injury. Spinal Cord 2006;44(5):37–40.
23 Phonthee S, Saengsuwan J, Sirirataratw J, Amatachaya K. Incidence and Factors associated With falls in independent ambulatory individuals With spinal cord injury: A 6-month prospective study. Phys Ther 2013;93(8):1061–1072.
24 Srisim K, Saengsuwan J, Amatachaya S. Functional assessments perspectives of wheelchair users with spinal cord injury through photo-elicitation. Disabil Rehabil 2020;1–10. doi:10.1080/09638288.2019.1709911
25 Cardol M, de Haan RJ, de Jong BA, van den Bos GA, de Groot IJ. Fear of falling, community participation and quality of life among community-dwelling people who use wheelchairs full time. Arch Phys Med Rehabil 2020;102(6):1140–1146.
26 Fonad E, Ebbeskog B. Life satisfaction among home-dwelling normal data: Is ANOV A still a valid option? Psicothema 2017;29(4):552–554.
27 Cardol M, de Haan RJ, de Jong BA, van den Bos GA, de Groot IJ. Exploring the causes and impacts of falls among ambulators with spinal cord injury using photovoice: a mixed-methods study. BMJ Open 2020;10(8):e039763.
28 Prata MG, Scheicher ME. Relationship between fear of falling and quality of life in older women fallers fear of falling and quality of life in older. MOS Gerontol Ger 2017;15(8):128–131. doi:10.15406/mojgg.2017.01.00027
29 Jørgensen V, Butler Forslund E, Franzen E, Opheim A, Seiger A, Ståhle A, et al. Factors associated with recurrent falls in individuals with traumatic spinal cord injury: A multicenter study. Arch Phys Med Rehabil 2016;97(11):1908–1916.
30 Rosenman R, Tennekon V, Hill LG. Measuring bias in self-reported data. Int J Behav Health Res 2011;2(4):320–332.
31 Stenhagen M, Ekström H, Nordell E, Elmståhl S. Accidental falls, health-related quality of life and life satisfaction: a prospective study of the general elderly population. Arch Gerontol Geriatr 2014;58(1):95–100.
32 Iaboni A, Flint AJ. The complex interplay of depression and falls in older adults: a clinical review. Am J Geriatr Psychiatry 2013;21(5):484–492.