p-ISSN: 2184-2205 e-ISSN: 2184-3414 ISBN: 978-989-35106-0-5 © 2023
https://doi.org/10.36315/2023inpact023

LIFE SATISFACTION AFTER TRAUMATIC SPINAL CORD INJURY: A COMPARISON OF LIFE SATISFACTION IN PEOPLE LIVING WITH PARAPLEGIA AND TETRAPLEGIA TO THE GENERAL CANADIAN POPULATION

Derek J. Gaudet[1], Lisa A. Best[2], & Najmedden Attabib[3]
[1]M.A., Department of Psychology, University of New Brunswick Saint John (Canada)
[2]Ph.D., Department of Psychology, University of New Brunswick Saint John (Canada)
[3]M.D., Department of Neurosurgery, Saint John Regional Hospital, Horizon Health Network (Canada)

Abstract

Traumatic spinal cord injury (tSCI) can be a life changing event that has the potential to impact many aspects of life including subjective well-being. One component of subjective well-being that is commonly measured following tSCI is Life Satisfaction (LS). Despite this, it is difficult to find research that has made direct comparison between the levels of LS reported by tSCI survivors and the general population. To better understand the impact that tSCI has on LS, the present study compared the LS of individuals without a tSCI, to a large sample of individuals who are currently living with tSCI that resulted in either paraplegia or tetraplegia. Our analyses showed that individuals with tSCI report lower levels of LS, when compared to individuals without a tSCI, and that people with tetraplegia report lower LS than individuals living with paraplegia. We also determined whether people without a tSCI can make accurate predictions about how their LS would change is they sustained a tSCI resulting in paraplegia or tetraplegia. When participants without tSCI were asked to estimate their life satisfaction in both situations, they overestimated the impact of tSCI. The degree to which LS in tSCI survivors differs from individuals without a tSCI , reasons for the overestimations made by individuals without tSCI and implications of the findings are discussed.

Keywords: *Traumatic spinal cord injury, subjective well-being, life satisfaction.*

1. Introduction

Spinal cord injuries (SCI) are defined as any damage to the spinal cord that changes its function either temporarily or permanently (Ahuja et al., 2017). SCIs have two main categories of causes: non-traumatic and traumatic. This study focuses on Traumatic spinal cord injuries (tSCI), which result from any physical trauma to the spinal cord (Noonan et al., 2012), with the most common causes being by motor vehicle accidents or falls (Hagen et al., 2012). There are two categories of tSCI, determined by the location of the injury on the spinal cord. Damage to the lumbar and thoracic spine results in paraplegia, which is associated with loss of sensory and/or motor function to the lower extremities. Paraplegia may also be associated issues in the trunk and pelvic organs, depending on the level of the injury, but the upper limbs are typically unaffected. An Injury to the cervical spine results in tetraplegia, which is associated with loss of sensory and/or motor function from the neck down. In general, the higher the injury location on the spinal cord, the more serious the consequences (Kirsblum, 2011).

To better understand the presentation and outcomes of a tSCI the injury needs to be identified as being complete or incomplete. A complete injury inhibits all signals from being sent from and received by the brain beyond the location of the injury, while incomplete injuries maintain some of the spinal cord's function, allowing some signals through (Ahuja, 2017). This means that some sensory and/or motor function is maintained in an incomplete tSCI. The American Spinal Injury Association (ASIA) developed a grading and classification system to help classify sensory and motor impairment following a tSCI. The ASIA impairment scale categorizes injuries as ASIA A, B, C, D, or E based on the results of an examination of key dermatomes and myotomes. ASIA A is the only classification that describes a complete tSCI, whereas B through D describe incomplete injuries in which some motor and sensory function is preserved. ASIA E describes an incomplete tSCI in which all motor and sensory function is normal (Kirsblum et al., 2011).

Research on the prevalence of tSCI in Canada indicates that there are more than 44, 000 people living with a tSCI, and there are an additional 1,389 new cases occurring every year (Noonan et al., 2012). The Rick Hansen Spinal Cord Injury Registry (RHSCIR), maintained by the Praxis Spinal Cord Institute (PSCI), was established in 2004 to better understand various aspects of tSCI. A recent report based on a sample of these participants (Praxis, 2019), describes several large impacts of tSCI on these individual's lives. The report estimates that 42% of tSCI survivors became unemployed following their injury, that many saw a decrease in annual household income, that more than 80% report a secondary health complication caused by their tSCI, and that more than half required a wheelchair when outdoors. In numerous areas of life less than half reported being satisfied or very satisfied with their current situation.

Deiner and colleagues (1999) define SWB as an overall evaluation of one's life that includes a consideration of affective and cognitive components. An evaluation of SWB involves both the consideration of emotional experiences as well as an evaluation of overall satisfaction with various situational and dispositional factors that occur in one's life. Given the findings of this 2019 report by PSCI, and the increasing number of people that sustain a tSCI, it is important to understand the impact of tSCI on subjective well-being (SWB). Evaluating SWB involves an evaluation of Life Satisfaction (LS). Measuring LS consist of measuring overall satisfaction with several domains that are considered important to life. Such domains include, but are not limited to employment, finances, leisure, social life, sexual life, independence, family life, romantic relationships, physical health, and psychological health (Diener, 1999). The community report released by PSCI (2019) showed that in each of these cases, except for family life (57%), less than half of their respondents reported be satisfied or very satisfied.

In a study by Gaudet, Best, & Attabib (2019), individuals without a tSCI were asked to estimate their levels of LS if they were to suddenly sustain a tSCI resulting in 1) paraplegia, and then 2) tetraplegia. The purpose of that study was to examine the perceptions people have about living with tSCI. Perhaps unsurprisingly, participants predicted that their LS would be lower with a tSCI, and that their LS would suffer more from a tSCI resulting in tetraplegia versus one resulting in paraplegia. This research suggested that the participants believed there is a link between the severity of the tSCI and LS. However, when we examined the literature, we were unable to identify research that has directly compared the LS of individuals with paraplegia versus tetraplegia to individuals unaffected by tSCI. Despite the existence of a national Canadian tSCI research database, there is also no research that has compared the LS of Canadian tSCI survivors to the LS of individuals without a tSCI. The present study was designed to examine differences in the levels of LS experienced by individuals living with paraplegia and tetraplegia, as well as to make comparisons of each type of tSCI to individuals who do not have a tSCI. Furthermore, we were also interested in assessing the accuracy of the predictions made by participants in Gaudet et al. (2019) regarding how their current LS would compare to scenarios in which they sustained a tSCI resulting in paraplegia or tetraplegia. Given what is known about affective forecasting (Wilson & Gilbert, 2003, 2005; van den Bosch et al., 2021) and research demonstrating the potential for some improvements in LS years after a tSCI (Van Leeuwen et al., 2011, 2012), we hypothesized that these predictions would be in the correct direction but overestimate the impact that tSCI has on LS. Finally, also examine differences in LS between each of the ASIA categories and also compared each ASIA classification to the LS of individuals unaffected by tSCI.

2. Method

2.1. Participants

Participants without tSCI. A total of 430 participants were recruited from undergraduate courses at the University of New Brunswick Saint John and through online social media platforms. The average age of these participants was 20.39 years (SD = 4.73 years). Three hundred and forty-five (80.2%) of the participants identified as female, with the remainder (19.8%) identifying as male.

tSCI survivors. The Rick Hansen Spinal Cord Injury Registry (RHSCIR) was used to obtain data from a sample of tSCI survivors. The final sample of tSCI survivors consisted of 1,016 individuals with a mean age of 45.44 years (SD = 18.03 years). Seven hundred and eighty-six (77.36%) identified as male with the remainder (22.64%) identifying as female. A total of 472 (46.45%) individuals could be categorized as having paraplegia (i.e., thoracic or lumbar injuries), and 526 (51.77%) were identified as having tetraplegia (i.e., injuries to the cervical region of the spinal cord). The remaining 18 individuals (1.8%) had insufficient information to be categorized as having paraplegia or tetraplegia.

2.2. Measures

Life Satisfaction Questionnaire – 11 (LiSAT-11). The LiSAT-11 measures an individual's satisfaction in 11 different domains, rated on a Likert-scale ranging from 1 (very dissatisfying) to 6 (very satisfying). Domain scores can be assessed independently or summed and averaged to assess overall Life

Satisfaction. Here the latter approach was used. Internal consistency of the LiSAT-11 has been found to be adequate (α = 0.75, Post et al., 2012), and was also found to have slightly better internal consistency in the present study (α = 0.80).

American Spinal Injury Association (ASIA) Impairment Scale. The ASIA impairment scale is a physical examination that results in an ASIA score ranging from ASIA A to ASIA E. The score describes the individual's functional impairment that resulted from their injury. These examinations have been shown to be reliable when conducted by trained individuals and interrater and interrater reliabilities are high (Marino et al. 2008). The ASIA assessment data was provided by RHSCIR for use in the present study.

2.3. Procedure

This study was reviewed and approved by the University of New Brunswick Research Ethics Board. Data pertaining to each of our samples (i.e., those with a tSCI and those without) was obtained using different procedures. All data from participants who did not have a tSCI was obtained from a previous study (Gaudet et al., 2019). These participants completed an online study that asked them to provide basic demographics and complete the LiSAT-11 under three different conditions. In the first condition, they completed the LiSAT-11 normally, as to reflect their actual levels of LS. They were then asked to imagine a scenario in which they had sustained a tSCI resulting in paraplegia, and to fill out the LiSAT-11 to reflect how they think their LS would be in that situation. Finally, they were asked to fill out the LiSAT-11 while imagining a scenario in which they had sustained a tSCI resulting in tetraplegia. The measure of their actual LS always came first, but the order of the injury scenarios was counterbalanced.

Basic demographics, ASIA assessments, and LiSAT-11 data pertaining to tSCI survivors was obtained through the RHSCIR, in collaboration with the local RHSCIR site managed by the Department of Neurosurgery at the Saint John Regional Hospital. This registry is maintained by the PSCI, but that group was not involved in any other part of this study. Demographics and ASIA examinations are typically completed shortly after the participant's admission to hospital, following a tSCI. LiSAT-11 data is first collected one year following the initial tSCI. One-year LiSAT-11 data, the ASIA data, and some basic demographic data was used in the present study.

As the RHSCIR registry does not provide a paraplegia and tetraplegia classification, tSCI survivors had to be placed into each category using the available data. Both the location of the tSCI on the spinal cord and the American Spinal Injury Association (ASIA) Impairment Scale Scores, both obtained from the ASIA assessment, were used to assign a classification of paraplegia or tetraplegia. To sort our tSCI survivors into paraplegia and tetraplegia group, we identified the level of injury in the spinal column. We also excluded anyone without an ASIA score, or anyone who had an ASIA score of "E" (normal function), from the following analyses. Those with injuries to the cervical levels were classified as tetraplegia, and those with injuries to the thoracic and lumbar levels were classified as paraplegia.

3. Results

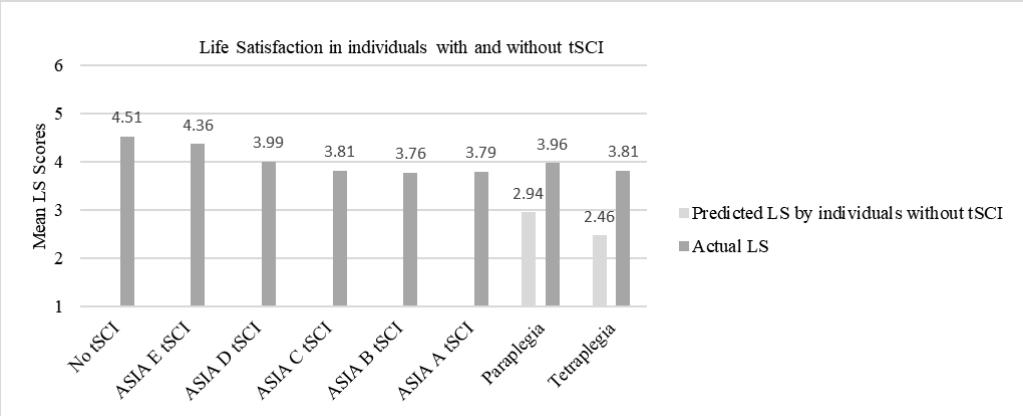
LS of individuals with tSCI compared no tSCI. To estimate the impact that tSCI resulting in paraplegia or tetraplegia has on LS, we compared the LS levels of participants from Gaudet et al. (2019) to the individuals who had sustained each type of tSCI. A 3(injury classification: no injury vs. paraplegia vs. tetraplegia) x 2 (male vs. female) factorial ANOVA, using LiSAT-11 total score as the dependent variable, was conducted. A statistically significant main effect of injury classification on LiSAT-11 scores, $F(2, 1422) = 59.42$, $p < .001$, $\eta 2 = .077$ was found. Neither the main effect of gender nor the interaction effect was statistically significant ($p > .05$). Post hoc analyses showed that both tSCI groups had lower life satisfaction than the no injury group ($p < .001$), with the tetraplegia group reporting lower LS than the paraplegia group ($p = .011$; results shown in Figure 1).

The LS of tSCI survivors compared with predicted LS made by healthy controls. To examine the accuracy of predictions made by healthy controls about the impact that tSCI might have on LS, we conducted two independent sample t-tests. The first analysis compared the levels of LS in the paraplegia group with the predicted levels of LS healthy controls believed they would have if they were living with paraplegia. The difference in LS between the groups was statistically significant, t (912) = 17.56, $p < .001$, $d = 1.87$. Individuals living with paraplegia reported higher levels of LS than what was predicted by participants with no injury ($M = 3.99$, SD = 0.78 vs. $M = 2.94$, SD = 0.98, respectively). The second analysis accomplished the same comparison for the tetraplegia group. Individuals living with tetraplegia reported higher levels of LS than what was predicted by individuals without an injury, t (966) = 22.862, $p < .001$, $d = 1.47$ ($M = 2.46$, $SD = 0.83$ vs $M = 3.81$, SD = 0.84; see Figure 1).

ASIA scale scores and LS. To examine differences in LS between the various ASIA classifications and individuals with no tSCI, we conducted a 6 (ASIA category, including no injury) x 2

(male vs. female) factorial ANOVA. There was a significant main effect of ASIA classification, F (5, 1434) = 24.48, p < .001, η 2 = .079, but neither the main effect of gender nor the interaction effect were statistically significant (p > .05). The Bonferroni test revealed that all ASIA categories except ASIA E reported lower LS than participants who did not have a tSCI. Additionally, when comparing ASIA E to all other ASIA categories, only ASIA A and ASIA B groups reported lower LS than the ASIA E group (Means for ASIA groups are shown in figure 1).

Figure 1. LS scores of individuals without a tSCI, with a tSCI but no impairment, with paraplegia, with tetraplegia, and estimates of LS for paraplegia and tetraplegia made by individuals without a tSCI.



4. Discussion

This study found that individuals with tSCI report lower levels of LS when compared to individuals without tSCI. We also found that individuals with more severe injuries report lower levels of LS. This was found both when we compared tetraplegia to paraplegia groups, as well as when we compared the ASIA impairment scale categories. These results are perhaps not that surprising, given that tSCI impacts several areas of life associated with LS. What is interesting, is how little, on average, LS appears to be affected by tSCI. In the case of both paraplegia and tetraplegia, there is less than a single point difference when compared to individuals without tSCI. A similar pattern is noted when we compare ASIA categories associated with the most and least severe forms of tSCI. ASIA A (complete injuries with no motor or sensory function) report LS levels that are less than a single point lower than the ASIA E category (incomplete injury with no effect on motor or sensory function) as well as to the group of individuals with no injury. This suggests that while physical health is a component of LS, tSCI does not always have a large impact on LS.

Using data from Gaudet et al. (2019), we also compared the levels of LS predicted for paraplegia and tetraplegia, by individuals with no tSCI, to groups of tSCI survivors. While participants accurately predicted that tSCI would be associated with lower LS, they overestimated the impact for both paraplegia and tetraplegia groups. The affective forecasting research helps to understand how our participants correctly predicted the direction, but not the degree of impact that tSCI has on LS. When people are asked to make predictions about both the valence and the specific emotions that they will feel in each situation, they tend to be accurate. When asked to predict both the duration and intensity of those emotions, however, people are less accurate (Wilson and Gilbert 2003, 2005). Participants without a tSCI perhaps considered how badly they would feel if they sustained a tSCI and reported their life satisfaction based on those hypothetical emotions. Overestimations of how happy people think they will feel in positive and negative situations are common and occur for many reasons. One such reason is immune neglect, which refers to the tendency for individuals to ignore the ability to adapt to and cope, psychologically, with negative events (Gilbert 1998). Our tSCI participants had been living with tSCI for at least one year, during this time they may have begun to adapt and cope with their circumstances. While it is possible that the estimates made by individuals without tSCI would accurately describe predictions about LS made in the initial days of sustaining a tSCI, they do not reflect the LS of tSCI survivors one year post injury. There is no way for us to test this possibility, as RHSCIR only collects LS data one year post injury. Our lower LS predictions, therefore, are likely the result of immune neglect, whereby our participants without a tSCI fail to recognize that they would adapt and learn to cope better with a tSCI over time.

As with all research, the present study has limitations. While the group of individuals without a tSCI were disproportionately female, the group of individuals with tSCI were disproportionally male. Studies in academic settings are often overrepresented by female participants (Dickson et al., 2012), while

tSCI is far more common in young adult males (Noonan et al., 2012). Although we tried to balance the design, some of the demographics of the two populations differ slightly. Secondly, because the number of individuals falling into each of the ASIA categories was extremely unbalanced, we chose not to include it as a factor in any of our comparisons of tetraplegia and paraplegia. Given that each of these categories is associated with differing degrees of impairment, a more balanced design might reveal and interaction effect between ASIA classification, paraplegia, and tetraplegia on LS. Given that injuries to the cervical spine can have a greater impact on motor and sensory function, assessing these interactions would be of value.

The present study also has implications for the care of individuals with tSCI. Estimates of LS made by people who did not have a tSCI were considerably lower than what is found in the tSCI population. Given that a tSCI can happen to anyone, it is reasonable to assume that individuals who have just sustained a tSCI believe that their lives will be less satisfying. This research shows that although there are differences in reported LS between people with and without tSCI, those differences are not as large as people assume. It should be emphasized to tSCI patients, that many people still go on to lead satisfying lives following a tSCI and that they shouldn't give up hope. There is research that has identified factors related to higher LS in tSCI survivors, and healthcare professionals could draw on that literature to ensure that they are doing everything possible to maximize LS in tSCI patients.

References

Ahuja, C. S., Wilson, J. R., Nori, S., Kotter, M., Druschel, C., Curt, A., & Fehlings, M. G. (2017). Traumatic spinal cord injury. *Nature reviews Disease primers*, *3*(1), 1-21.

Dickinson, E. R., Adelson, J. L., & Owen, J. (2012). Gender balance, representativeness, and statistical power in sexuality research using undergraduate student samples. *Archives of Sexual Behavior*, *41*, 325-327.

Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological bulletin*, *125*(2), 276.

Gaudet, D., Best, L., & Attabib, N. (2019, May). The Thought of Living with Spinal Cord Injury: How an Imagined Disability Affects Life Satisfaction. In Pracana, C. & Wang, M. *International Psychological Applications Conference and Trends Proceedings 2019*. 54-58. Lisbon, Portugal. ISSN: 2184-2205 ISBN: 978-989-54312-2-9 © 2019

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. P. (1998). Immune neglect: a source of durability bias in affective forecasting. *Journal of personality and social psychology*, *75*(3), 617.

Hagen, E. M., Rekand, T., Gilhus, N. E., & Grønning, M. (2012). Traumatic spinal cord injuries–incidence, mechanisms and course. *Tidsskrift for Den norske lægeforening*, *132*, 831-837.

Kirshblum, S. C., Burns, S. P., Biering-Sorensen, F., Donovan, W., Graves, D. E., Jha, A., ... & Waring, W. (2011). International standards for neurological classification of spinal cord injury (revised 2011). *The journal of spinal cord medicine*, *34*(6), 535-546.

Marino, R. J., Jones, L., Kirshblum, S., Tal, J., & Dasgupta, A. (2008). Reliability and repeatability of the motor and sensory examination of the international standards for neurological classification of spinal cord injury. *The journal of spinal cord medicine*, *31*(2), 166-170.

Noonan, V. K., Fingas, M., Farry, A., Baxter, D., Singh, A., Fehlings, M. G., & Dvorak, M. F. (2012). Incidence and prevalence of spinal cord injury in Canada: a national perspective. *Neuroepidemiology*, *38*(4), 219-226.

Praxis Spinal Cord Institute. Rick Hansen Spinal Cord Injury Registry - A look at spinal cord injury in Canada in 2020. Vancouver, BC: Praxis Spinal Cord Institute 2022.

Post, M. W., Van Leeuwen, C. M., Van Koppenhagen, C. F., & De Groot, S. (2012). Validity of the life satisfaction questions, the life satisfaction questionnaire, and the satisfaction with life scale in persons with spinal cord injury. *Archives of physical medicine and rehabilitation*, *93*(10), 1832-1837.

van den Bosch, G. J., Roos, R. A. N., Otten, R., Bockting, C., & Smulders, Y. M. (2021). Are patients accurate forecasters of their emotional response to medical conditions? A scoping review on affective forecasting. *BMJ open*, *11*(12), e053370.

Van Leeuwen, C. M., Post, M. W., Van Asbeck, F. W., Bongers-Janssen, H. M., Van Der Woude, L. H., De Groot, S., & Lindeman, E. (2012). Life satisfaction in people with spinal cord injury during the first five years after discharge from inpatient rehabilitation. *Disability and rehabilitation*,*34*(1), 76-83.

van Leeuwen, C. M., Post, M. W., Hoekstra, T., van der Woude, L. H., de Groot, S., Snoek, G. J., ... & Lindeman, E. (2011). Trajectories in the course of life satisfaction after spinal cord injury: identification and predictors. *Archives of Physical Medicine and Rehabilitation*, *92*(2), 207-213.

Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting.