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Association of mindfulness to resilience, anxiety, and depressive symptoms after spinal cord injury—a correlational study

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Abstract

Study design Online survey of individuals with spinal cord injuries (SCI).
Objective This pilot study examined associations between mindfulness factors, resilience, and levels of depression and anxiety after SCI.
Setting Community-based; United States.
Methods A survey was posted online and shared with individuals with recent SCI (≤5 years).
Results Thirty-four individuals responded to the survey. The Five Facet Mindfulness Questionnaire (FFMQ) measures mindfulness with the following subscales: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity of inner experience. Nonjudgment of inner experience was significantly associated with depression ($\beta = -0.74$, $p = 0.007$) and anxiety ($\beta = -0.60$, $p = 0.01$). Nonreactivity to inner experience was significantly associated with anxiety ($\beta = -0.57$, $p = 0.007$) and resilience ($\beta = 0.55$, $p = 0.004$); and there was a trend with depression ($\beta = -0.45$, $p = 0.07$). Higher resilience was significantly associated with less anxiety ($r = -0.62$, $p = 0.04$) and less depression ($r = -0.75$, $p < 0.001$). Depression and anxiety were significantly correlated ($r = 0.84$, $p < 0.001$). When comparing those who are employed to those who are not, they differed significantly in terms of anxiety ($t(32) = 2.53$, $p = 0.02$).
Conclusions These findings suggest that factors of mindfulness, specifically the practice of acting nonjudgmentally and nonreactively to one's inner experience, may act as protective factors against depression and anxiety following SCI. These preliminary data support the literature that individuals with lower resilience are more susceptible to depression following SCI. Interventions aimed at maximizing mental well-being following SCI may benefit from incorporating these factors of mindfulness practice.

Introduction

In 2018 there were ~288,000 people with spinal cord injury (SCI) in the USA, with 17,700 new cases occurring that year [1]. Frequently, SCI rehabilitation requires substantial, long-term physical, psychological and occupational therapy, especially for those whose activities of daily living have been impacted. Traditionally, research in medicine and other health care fields has focused on identifying risk

factors associated with poor adjustment to SCI. Equally important is the study of potentially protective factors that facilitate positive adjustment. Although more recent studies have started to examine these protective factors, there is still a gap in the scientific literature, in particular regarding the relationship of mindfulness to resilience and aspects of psychopathology, including depressive and anxiety symptoms. Of particular interest to the researchers is how levels of resilience and mindfulness impact psychopathology, specifically levels of depressive and anxiety symptoms.

Resilience is the ability of human beings to persevere, rebound, and even flourish after experiencing traumatic events [2, 3]. Although there are biological/genetic bases of resilience, it is also considered a dynamic process comprised of learned behaviors, cognitions and interpersonal skills [4]. Resilient individuals tend to have optimistic attitudes, effectively balancing negative emotions with

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positive ones [5]. They also maintain consistent levels of emotional well-being when confronted with traumatic injury [6], natural disaster [7] or cancer diagnosis [8]. Resilience to physical trauma and loss has been shown to be separate from the process of psychological recovery. Recovery generally refers to the move from normal functioning after a traumatic event to threshold or subthreshold psychopathology that is apparent for several months and progressively returns to pre-trauma levels [2]. Symptoms of acute anxiety and depression are common following SCI [9]. There may never be a full recovery psychologically from trauma. Full or partial recovery can take years to accomplish.

Although there is a higher risk of distress and depression after trauma, the most common response is resilience [9]. SCI can dramatically alter an individual's life and lives of their family members. Individuals with SCI that score lower in resilience have been shown to be more susceptible to depression [3]. Interventions for trauma-related changes in mood are currently being researched [3].

The practice of mindfulness or having a moment-to-moment awareness of one's own personal experience, can be conceptualized using five factors, including: (1) observing, or deliberately paying attention to ones thoughts, bodily sensations, and emotions; (2) describing, or being able to define beliefs, opinions, feelings, and expectations into words; (3) acting with awareness, or the ability to remain focused, attentive, and present; (4) nonjudging of inner experience, the ability to not criticize, belittle, or disapprove of one's experience; and (5) nonreactivity to inner experience, or the ability to perceive, watch, step back, and not engage distressing experiences [10]. Mindfulness has been shown to be associated with increased well-being [11] and reduction in psychological distress [11, 12]. Mindfulness is not synonymous with the practice of meditation, tai chi, qigong. or yoga; however, most modern clinical research has evaluated mindfulness-based meditation interventions. Research findings have shown decreased stress [13], anxiety [14], depression [15], fatigue, anger and. stress-related cortisol [16] after exposure to various stress-reduction mindfulness-based training programs in comparison to a control group. Mindfulness researchers have also found a negative correlation with negative psychological symptoms and overall quality of life after mindfulness training [17].

To date, empirical research on mindfulness associated with SCI is limited, and factors contributing to the connection of resilience to mindfulness would provide valuable information for the development of clinical interventions for individuals with SCI. The aim of this pilot study is to examine resilience and mindfulness in a sample with individuals that have sustained an SCI within the last 5 years. The goals are to (1) describe levels of resilience and mindfulness in this population, and determine whether they differ by demographic factors, type of injury, or level of injury, and (2) evaluate the factors of mindfulness and how they relate to resilience, depression, and anxiety.

Methods

This pilot study used a cross-sectional survey design. Eligible individuals were required to be at least 18 years of age and have a self-reported definitive diagnosis of SCI within the last 5 years. Participants were primarily recruited via ResearchMatch (www.researchmatch.org), a national health volunteer registry that was created by several academic institutions and supported by the US National Institutes of Health as part of the Clinical Translational Science Award program. ResearchMatch has a large population of volunteers who have consented to be contacted by researchers about health studies for which they may be eligible. Participants were also recruited using approved fliers at participating Hospitals and Clinics. Informed consent was obtained from all participants in accordance with the IRB's guidelines and policies concerning human participant procedures. Interested individuals were emailed personalized links to the online survey.

Measures

Demographic information was collected including type and level of SCI, age, gender, work, education, and race/ethnicity.

Resilience was measured using the 10-item Connor–Davidson Resilience Scale (CDRISC) [18]. The CDRISC is a brief, unidimensional measure of resilience. Participants rated items such as "Can achieve goals despite obstacles", "Tend to bounce back after illness or hardship", and "Able to adapt to change", on a 5-point Likert scale from "Not true at all" to "True nearly all the time". Higher scores indicate greater resilience. This measure has sound psychometric properties and has been used with SCI populations [19–21].

Mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ) [10]. The FFMQ is a 39-item measure of five subscales of mindfulness as it is currently conceptualized, including: observing, describing, acting with awareness, nonjudging of inner experience and nonreactivity of inner experience. Participants rated items such as "I pay attention to sensations, such as the wind in my hair or sun on my face", "I can easily put my beliefs, opinions, and expectations into words", and reverse score items such as, "I criticize myself for having irrational or inappropriate emotions", on a 5-point Likert Scale "never or very rarely true" to "very often or always true". High scores

indicate high ratings of mindfulness. It is a reliable and valid comprehensive tool for assessing different aspects of mindfulness in community and student samples [10, 22]. Its validity has been demonstrated by measuring mindfulness in adults with clinically relevant symptoms of depression, anxiety, and other medical conditions [22–24].

Anxiety was measured using the Patient-Reported Outcome Measurement Information System Item Bank v1.0-Emotional Distress-Anxiety—Short Form (PRO-A-SF) [25], The PRO-A-SF uses a four-item measure of anxiety which participants rated the presence of anxiety symptoms over the past week on a on a 5-point Likert Scale "never" to "always". Participants rated items such as, "I found it hard to focus on anything other than my anxiety", and "my worries overwhelmed me". High scores indicate high ratings of anxiety. This measure has been shown to be clinically valid by measuring longitudinal changes in anxiety in medical populations [26].

Depression was measured using the Patient-Reported Outcomes Measurement Information System (PROMISE) Depression–Short Form 4a (PRO-D-SF) [27]. The PRO-D-SF uses a four-item measure of depression which participants rated presence of depressive symptoms over the past week on a 5-point Likert scale from "never" to "always". Participants rated items such as, "I felt depressed", and "I felt hopeless", with high scores indicate high ratings of depression. This measure has been shown to be clinically valid by measuring longitudinal changes in depression in medical populations [26].

Statistical analyses

Study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at the University of Utah. REDCap is a secure, web-based application designed to support data capture for research studies, providing an intuitive interface for validated data entry, manipulation, and export to common statistical packages [28]. Analyses were conducted using IBM SPSS Statistics 25.

All data were double checked, cleaned and, examined for outliers and normal distribution. Descriptive statistics and t-tests were used to describe participant characteristics, and examine differences in resilience, mindfulness, depression, and anxiety between those with traumatic and nontraumatic SCIs, higher and lower level injuries, men and women, and those who are working vs. not working. Finally, three separate multiple regression analyses were completed to examine which aspects of mindfulness were associated with resilience (model 1), depression (model 2), and anxiety (model 3). The significance level was set at $p < 0.05$; however, due to the exploratory nature of this pilot study, "trends" of up to $p = 0.1$ were also considered.

Table 1 Participant demographics.

	Participants ($n = 34$)
Participant characteristics	
Female (n, %)	23 (67)
Male (n, %)	11 (33)
Age, mean years (SD), range	45 (9.87), 22–62
Working	15 (44)
Not working	19 (56)
Years of education	
Graduate (n, %)	10 (28)
Bachelor's Degree (n, %)	6 (17)
Associate (n, %)	7 (19)
Some College (n, %)	7 (19)
High School Diploma (n, %)	4 (11)
Chose to not respond (n, %)	2 (6)
Ethnicity/Race	
White (n, %)	31 (91)
Black (n, %)	1 (3)
Asian (n, %)	1 (3)
Chose to not respond (n, %)	1 (3)
SCI characteristics	
Traumatic (n, %)	18 (52)
Nontraumatic (n, %)	16 (48)
Cervical (n, %)	17 (50)
Thoracic/lumbar (n, %)	15 (44)
Unsure (n, %)	2 (6)

Results

Participant characteristics

Participants were a small sample ($n = 34$); three began but did not fully complete the questionnaires. Participants were primarily middle-aged adults (Median = 47, SD = 9.87); however, ages ranged from 22 to 62 years. Participants were predominantly women (67%), Caucasian (91%) and well educated, with 87% of participants having some education beyond high school. Of the participants 52% reported a nontraumatic SCI, caused by a tumor, neurodegenerative disorder or other disease related; 48% reported a traumatic SCI, caused by a physical impact such as a fall or car accident; 56% reported that they are not currently working and 44% reported they are working. Participants reported level of SCI as primarily cervical (50%), followed by thoracic/lumbar (44%); two participants were unsure (6%) (Table 1).

Group differences and associations

Analyses show that depression and anxiety were significantly correlated ($r = 0.84$, $p < 0.001$). In addition,

Table 2 Overview of group differences.

	Traumatic vs. nontraumatic M (SD), M (SD)	Cervical vs. lumbar/thoracic M (SD), M (SD)	Men vs. women M (SD), M (SD)	Not working vs. working M (SD), M (SD)
Resilience	39.14 (6.37), 35.73 (9.25)	38.41 (8.70), 37.87 (6.79)	37.91 (6.09), 36.77 (9.38)	34.21 (8.13), 41.33, (6.85)[a]
Mindfulness	135.21 (28.34), 121.20 (20.36)[a]	136.76 (27.25), 122.27 (21.36)[a]	138.18 (22.96), 122.14 (28.03)[a]	126.68 (25.98), 128.20 (28.67)
Anxiety	9.43 (4.11), 11.40 (4.10)	11.00 (3.97), 8.8 (3.55)[a]	9.73 (3.77), 10.82 (4.73)	12.05 (4.15), 8.53 (3.85)[b]
Depression	20.79 (7.37), 22.07 (6.94)	21.35 (7.18), 20.87 (6.40)	18.82 (5.55), 23.09 (7.27)[a]	24.37 (5.54), 18.20 (6.97)[a]

[a]Trend.

[b]Significant, $p < 0.05$.

higher resilience was significantly associated with less anxiety ($r = -0.62$, $p = 0.04$) and less depression ($r = -0.75$, $p < 0.001$). Independent samples t-tests were completed comparing: traumatic and nontraumatic SCI, level of injury including cervical and thoracic/lumbar, men and women, and those working and not working, with all individual questionnaire totals. Please refer to Table 2 for an overview of group differences. When comparing those with a traumatic and nontraumatic SCI, there was a trend in mindfulness $t(27) = 1.54$, $p = 0.14$; those with traumatic injuries scored higher in mindfulness. There were also trends in the comparison of cervical SCI and thoracic/lumbar SCI with mindfulness ($t(30) = 1.66$, $p = 0.11$) and anxiety ($t(30) = 1.64$, $p = 0.11$). When comparing the male participants to female, there was a trend in mindfulness ($t(31) = 1.64$, $p = 0.11$), with men scoring higher. We also saw a trend for depression in women ($t(31) = -1.71$, $p = 0.10$). When comparing those who are employed to those who are not, they differed significantly in terms of anxiety ($t(32) = 2.53$, $p = 0.02$), a trend for depression ($t(32) = 2.88$, $p = 0.01$), and a trend for those working compared to not working in resilience ($t(32) = -2.72$, $p = 0.11$).

Regression

Three regression models were completed comparing the five subscales of the FFMQ with the CDRISC, the PRO-D-SF and PRO-A-SF and the questionnaires. The purpose of these models was to test for predictive variance for resilience, depression, and anxiety in the sample. Results suggest that variables in the regression model account for 63% of variance in resilience ($p < 0.001$). Of the five subscales trends existed in the describing category with resilience ($\beta = -0.40$, $p = 0.08$), acting with awareness as associated with resilience ($\beta = 0.38$, $p = 0.06$), nonjudging of inner experience was associated with resilience ($\beta = 0.36$, $p = 0.08$) and nonreactivity to inner experience was significantly associate with resilience ($\beta = 0.55$, $p = 0.004$). Variables in the regression model also account for 61% of variance in depression ($p < 0.001$). Trends existed in the observing category associated with depression ($\beta = 0.28$,

$p = 0.07$), acting with awareness associated with depression ($\beta = -0.27$, $p = 0.19$), nonjudging of inner experience associated with depression ($\beta = -0.36$, $p = 0.09$) and nonreactivity to inner experience associated with depression ($\beta = -0.24$, $p = 0.198$). Variables in the regression model account for 56% of variance in anxiety ($p < 0.001$). Of the five subscales, a trend was seen in the observing category in association with anxiety ($\beta = 0.23$, $p = 0.15$). Nonjudging of inner experience was significantly associated with anxiety ($\beta = -0.60$, $p = 0.01$) and nonreactivity to inner experience was significantly associated with anxiety ($\beta = -0.57$, $p = 0.007$); higher scores on both of these factors were associated with lower anxiety.

Discussion

This pilot study is one of the first studies to examine the association of mindfulness with resilience, anxiety, and depressive symptoms after diagnosis of SCI. To date, research linking mindfulness to resilience is limited. Our findings suggest that having traits of mindfulness, particularly the subscales: describing, acting with awareness, nonjudgment of inner experience, and nonreactivity to inner experience, are related to higher scores in resilience. Our findings support the literature that possessing traits of resilience protect against developing anxiety and depression [13]. Having these traits of mindfulness may aid in improving resilience and thereby act as protective factors for developing mental health disorders such as anxiety and depression after SCI. Our data suggest that having employment or being able to work, may be associated with better adjustment following SCI, as demonstrated by higher resilience, and less anxiety and depression. Our findings are consistent with the literature that individuals who are unemployed are more susceptible to developing anxiety and depression [29]. Those who reported having a traumatic SCI also scored higher on mindfulness compared to nontraumatic SCI. This may be due to the extensive rehabilitation therapy regimens associated with survival of traumatic SCI, which may include fostering self-awareness and reflection

[30]. Our data are also consistent with findings across the literature suggesting that women are more prone to depression than men [31]. The data also suggest that individuals with cervical SCI are more mindful and have lower anxiety than those with thoracic/lumbar level injuries. These findings may be associated with the nature of the injuries and/or therapies received. Individuals with cervical SCI typically have more complications, a longer hospital stay and substantial multidisciplinary treatments [30, 32]. Further research is necessary to better understand these observed differences.

Clinical Implications

Interventions aimed at maximizing mental well-being following SCI may benefit from incorporating certain factors of mindfulness practice to improve resilience. Interventions aimed at this population may be particularly beneficial post SCI. Trends for the describing category and resilience indicate that individuals who are better able to articulate their experiences score higher on resilience. Evidence for journaling as an effective therapy for chronic conditions exists in the literature [33]. Clinicians may wish to incorporate journaling to target the describing aspect of mindfulness, which may improve resilience. Trends for the observing scale suggest that there is an association with high scores in depression and anxiety. Observing focuses on being aware of ones' sensations and emotions. If an individual is already experiencing emotions/sensations of depression or anxiety this may exacerbate their symptoms. Based on our findings, it may be less beneficial for clinicians to include this aspect of mindfulness training.

Limitations and future directions

This pilot study is limited due to its small sample size, and generalizability is limited as our sample was predominantly white, and well educated. Further, the sample was non-representative of the target population as there were far more women than men who completed the survey. This study is considered exploratory and the cross-sectional design cannot make definitive statements concerning causality. Future research should include a larger, more representative sample. If data were supported, this information could be used to support development and/or implementation of mindfulness-based interventions for individuals with SCI. Although there are a number of limitations with this pilot study, it provides unique data on the association of mindfulness to resilience, depression, and anxiety that has not yet been explored. The future study and development of mindfulness-based interventions for resilience after SCI is promising.

Compliance with ethical standards

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