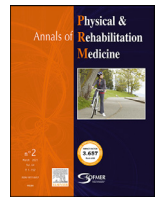




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Original article

Testing the stability of a family resilience model at 2 and 5 years after traumatic brain injury or spinal cord injury: A longitudinal study



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ABSTRACT

Background: Recent studies have tested models of resilience and caregiver adjustment in individuals with traumatic brain injury (TBI) or spinal cord injury (SCI). Few studies have examined the role of adaptive variables over time.

Objective: Conduct a longitudinal study to test a model of caregiver resilience with caregiver outcomes at 2- and 5-years post-injury.

Method: Caregivers of relatives with TBI or SCI were surveyed at 2 years (Time 1) and 5 years (Time 2) post-injury. Stability of the resilience model across the 2 time-points was tested using structural equation modeling with multi-group analysis. Measures included resilience related variables (Connor-Davidson Resilience Scale, General Self-Efficacy Scale, Herth Hope Scale, Social Support Survey) and outcome variables (Caregiver Burden Scale, General Health Questionnaire-28, Medical Outcome Study Short Form -36 [SF-36] and Positive and Negative Affect Scale).

Results: In total, 100 caregivers were surveyed at both 2 and 5 years (TBI =77, SCI =23). Scores for resilience (Time 1, 75.9 SD 10.6; Time 2, 71.5 SD 12.6) and self-efficacy (Time 1, 32.51 SD 3.85; Time 2, 31.66 SD 4.28) showed significant minor declines, with other variables remaining stable. The resilience model for the pooled responses (Time 1 + Time 2) demonstrated a good fit (Goodness of Fit Index [GFI] = 0.971; Incremental Fit Index [IFI] = 0.986; Tucker-Lewis Index [TLI] = 0.971; Comparative Fit Index [CFI] = 0.985 and Root Mean Square Error of Approximation [RMSEA] = 0.051). Multi-group analysis then compared Time 1 to Time 2 responses and found that a variant (compared to invariant) model best fitted the data, with social support having stronger associations with mental health and positive affect at Time 2 than Time 1. Hope reduced from Time 1 to Time 2.

Conclusions: The model suggests that resilience-related variables can play an important role in positive caregiver adjustment over time.

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Abbreviations: CBS, Caregiver Burden Scale; CD-RISC, Connor-Davidson Resilience Scale; CFI, Comparative Fit Index; GFI, Goodness of Fit Index; GHQ-28, General Health Questionnaire-28; GSES, General Self-Efficacy Scale; HHI, Herth Hope Index; MOS SSS, Medical Outcome Study Social Support Survey; PANAS, Positive and Negative Affect Scale; PTA, Post traumatic amnesia; RMSEA, Root Mean Square of Approximation; SCI, Spinal cord injury; SF-36, Medical Outcome Study Survey Short Form - 36; TBI, Traumatic brain injury; TLI, Tucker-Lewis Index

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Introduction

Traumatic brain injury (TBI) and spinal cord injury (SCI) are both recognised as critical health issues globally [1,2]. Both TBI and SCI are catastrophic injuries that result in significant long-term disabilities. In TBI, the impact spans physical (e.g., poor balance, gait), cognitive (e.g., challenges in memory, executive function) and emotional/behavioural impairments (e.g., lability, aggression) [3,4]. Severe spinal cord injury impacts physical functioning including mobility, continence, respiration, sexual and reproductive health and causes neuropathic pain [5]. These impairments considerably impact on family caregivers and represent a burden to health care systems and

economies through lost productivity and increased demands on health services with the associated rise in health care costs [3,6].

The family serves as the primary informal support system for individuals with TBI or SCI, and interpersonal relationships are an essential factor influencing all aspects of the rehabilitation process [7]. Given the central role that the family plays in the rehabilitation of people with disabilities, considerable attention has been given to understanding caregiver adjustment and adaptation to supporting individuals with these pathologies [8–10].

Historically, research has principally focused on the adverse outcomes for caregivers, including disrupted family functioning, caregiver burden, and psychological distress such as depression and anxiety [10–15]. Recently, the scope of research has been widening to include variables associated with the positive adaptation by family caregivers in the face of adversity after either TBI or SCI, embodying a paradigm shift from risk-based to strengths-based frameworks [16,17]. Resilience, self-efficacy, hope and social support are variables associated with positive adaptation among family caregivers across a range of clinical conditions such as dementia and trauma [18,19]. These variables have now been shown to have direct or indirect links with reduced levels of burden and psychological distress, as well as enhanced positive emotions and psychological well-being in family caregivers of individuals with TBI or SCI [20].

In TBI, cross-sectional studies have found that resilience among caregivers was associated with higher levels of health-related quality of life and other positive aspects of caregiving [21,22]. In SCI, Elliott et al. [23] examined the role of resilience among families at 4 time points within the first year post-SCI, finding that a large percentage of families displayed resilience within the first year and this was associated with enduring levels of positive affect and supportive social networks. The current study extends these findings by examining the role of adaptive variables in the chronic phase (2 to 5 years) post-injury.

Despite the differences in the injury profile between TBI and SCI, the 2 groups share several similarities. Both groups have a sex bias (2:1 or 3:1, male to female), come from at-risk populations, sustain a life-threatening trauma to the central nervous system, undergo extensive hospitalization and face lifelong disabilities [16]. Previous cross-sectional studies have found that family caregivers of individuals with TBI or SCI share similar profiles in terms of their adaptive capability [20,24]. However, little is known about the longer-term stability of this adaptation. This longitudinal study involved a 3-year follow-up of family members of individuals with TBI or SCI, originally surveyed at 2 years post-injury [20], to generate a theoretically based understanding of the stability in caregiver resilience over time. Employing structural equation modeling (SEM), we hypothesised that: (i) the explanatory variable resilience would have direct and indirect (as mediated by self-efficacy, hope, and social support) associations with caregiver outcomes; (ii) the caregivers of the individuals with TBI or SCI will share the same path coefficients (invariant model) rather than different path coefficients (variant model) at the 2-year and 5-year time-points.

Methods

Sample and setting

STROBE – cohort guidelines were followed for the presentation of this investigation.

Family caregivers were recruited from the inpatient and community rehabilitation services of 6 state rehabilitation centres across New South Wales and Queensland, Australia. The multidisciplinary teams at these centres provide specialized inpatient and/or community-based rehabilitation services to people with TBI or SCI and their families. Ethical approval was granted from the relevant New South Wales Health and Queensland Health Human Research Ethics Committees.

Inclusion for family members were age 18 years or older; primary responsibility to support their relative with TBI or SCI; no history of a severe psychiatric disorder, a potential confounding variable; and able to speak English fluently to complete the survey forms; relative of a person with a severe TBI (post-traumatic amnesia [PTA] greater than 24 h) or an SCI (documented neurological injury to the spinal cord). After providing informed consent, family members first completed the battery of scales at an average of 2 years post-injury (Time 1; 2013 to 2016) and then at the 5-year follow-up between 2016 and 2019 (Time 2). Individuals with TBI/SCI provided informed consent at Time 1 for access to their demographic, injury, and functional details from the medical files. For individuals with severe cognitive impairment, the guardian provided consent.

Measures

Family caregivers completed a battery of 8 valid self-report questionnaires employed to operationalize the explanatory, mediating and outcome variables. In addition, family members provided demographic and psychosocial information.

Explanatory measure

The Connor Davidson Resilience Scale (CD-RISC) [25] was used to measure a person's ability to cope and adapt to stressful situations. This 25-item scale is a well-recognised measure of resilience using a 5-point Likert scale. Total scores range from 0 to 100, with higher scores indicating greater resilience. The scale has good psychometric properties with strong internal consistency ($\alpha=0.93$) [25].

Mediating measures

The General Self-Efficacy Scale (GSES) [26] assessed perceived self-efficacy. The measure was composed of 10 items that the caregivers rated on a 4-point Likert scale (1, not true at all to 4, exactly true), with high scores indicating that the caregiver's self-efficacy was higher. The total score was used (range = 10–40). The internal consistency for the measure is acceptable, averaging 0.90 [26].

Hope was measured using the Herth Hope Index (HHI) [27]. The HHI consists of 12 items measuring levels of hope related to cognitive and affective factors and interconnectedness with self and others. Item scores range from 1 (strongly disagree) to 4 (strongly agree), and the total score ranges from 12 to 48. A high score indicates a higher level of hope. The HHI has shown high internal consistency ($\alpha=0.97$) and high test-retest reliability ($r = 0.91$) [27].

The Medical Outcome Study Social Support Survey (MOS SSS) [28] was administered to assess social support. The MOS is a 19-item survey that measures 4 social support dimensions: emotional/informal, tangible, affectionate, and positive social interaction. Responses are rated on a 5-point Likert scale from 1 (none of the time) to 5 (all of the time) with the total score (range 19–95) used. The reliability and construct validity of the MOS Social Support Survey have been established [28].

Outcome measures

The Caregiver Burden Scale (CBS) [29] was used to assess caregiver burden. The scale consists of 22 items about the effects of caregiving on caregivers' social and emotional lives. Responses are rated on a 4-point scale ranging from 1 (not at all) to 4 (often). A total score was calculated by summing all 22 items ranging from 22 to 88, with higher scores indicating the burden experienced is high. The test-retest reliability of the scale is good [29].

The 28-item General Health Questionnaire-28 (GHQ-28) [30] was completed to measure psychological distress. This self-report measure comprises 4 subscales (7 items per domain, score range 0–21

per domain). These are somatic symptoms, anxiety/insomnia, social dysfunction, and severe depression and a total score (range 0–84), with higher scores indicating higher overall distress. The instrument shows high test-retest reliability [30].

The Medical Outcomes Survey Short Form-36 (SF-36) [31] is a self-administered instrument measuring 8 quality of life domains, producing a total score and 2-overarching component scores. The Physical component score comprises physical functioning, role-physical, bodily pain, and general health subscales. The Mental component score includes vitality, social functioning, role-emotional, and mental health subscales. The domain and component scales have strong internal consistency ($\alpha = 0.83$ to 0.95), concurrent and convergent/divergent validity [31]. An analysis in our previous study²⁰ found the mental health subscale to be the best fitting variable in the SEM analysis; therefore, this subscale was adopted rather than the Mental Component or Physical Component scores.

The Positive and Negative Affect Scale (PANAS) [32] measured caregiver positive and negative emotional well-being. The scale contains 20 adjectives (10 for the positive affect subscale, 10 for the negative affect subscale), and caregivers were asked to report how often they experienced these feelings in the past week on a 5-point Likert scale ranging from 1 (very slightly/not at all) to 5 (extremely), with higher subscale scores indicating higher positive or negative affect respectively. Subscale reliabilities are substantial, ranging from 0.86 to 0.90 for positive affect and from 0.84 to 0.87 for negative affect [33].

Procedures

Data collection

All participants were volunteers with Time 1 data collected between October 2013 and May 2016. Inpatient participants were recruited from a consecutive series of individuals. For outpatients, all active clients in the service caseload of participating units were reviewed to find family members who met the inclusion criteria. Family members who provided informed consent then undertook the survey battery, administered by the study project officer (face-to-face, by phone, or online). Additional details for Time 1 data collection are provided in a previous report [20].

At Time 2 (5 years post-injury), letters were mailed or e-mailed to all family respondents to invite them to complete the second round of surveys. Prospective participants nominated the preferred method of completion (on-line 77%, hard copy 5%, by phone 9%, face to face 9%). Data from online-surveys were directly entered into REDCap; data from other sources were manually entered into REDCap. The progress of the families in completing the data was monitored by research staff and prompts were provided as needed.

Data analysis

Data were imported from REDCap into IBM SPSS version 26 and AMOS 26 computer software for analysis. Between-groups analyses (TBI vs SCI) of demographic, injury and psychosocial variables were performed with the chi squared test, Student t-test, or Mann Whitney U test. Inspection of the measured variables found they were normally distributed and therefore between-groups (TBI vs SCI) and within-groups (Time 1 vs Time 2) analyses were conducted using independent t-tests and paired t-tests respectively. Bonferroni corrections were applied to the significance level ($p < 0.05$) to control for type 1 error due to multiple testing.

Structural equation modeling (SEM) was used for the data analysis. SEM has the advantage over regression analysis of being able to simultaneously examine the strength and direction of multiple relationships between variables [34]. In this study, we used the SEM to examine the association between resilience and the mediating

variables self-efficacy, hope, social support, and the outcome variables burden, mental health, positive affect, negative affect and psychological distress in family caregivers at 2 time-points post-injury. An optimal model was derived by testing the theoretical model against the empirical data and systematically trimming non-significant path coefficients until only significant (at 0.05) and theoretical relevant paths made up the model [34].

Maximum likelihood estimates (MLE) for the model parameters using covariance matrices were calculated for the pooled responses (Time 1 + Time 2, $n = 200$), which meets the suggested minimum requirement of 100 or more [35]. The overall fit of the model to the research data was tested by means of several fit statistics namely, the chi square (χ^2) goodness of fit statistic, with a non-significant value indicating a good fit; the root mean squared error of approximation (RMSEA), with values < 0.08 indicating a close fit; Goodness of Fit Index (GFI), Incremental Fit Index (IFI), Tucker–Lewis Index (TLI) and Comparative Fit Index (CFI), with values > 0.90 indicating a good fit. As sample size strongly influences the decision to accept or reject a model based on statistical findings, these fit indices were chosen over other indices because they are known to be least affected by sample size, model misspecification and parameter estimates [36].

Next a multi-group analysis was performed by setting up invariant and variant models to determine whether the pattern of structural relationships in the hypothesised path model follows the same dynamics for caregivers of individuals with TBI or SCI at Time 1 and Time 2. The invariant model hypothesized that caregivers of people with TBI or SCI shared the same path coefficients at Time 1 and Time 2, whereas the variant model hypothesized that the caregivers of people with TBI or SCI had different path coefficients. The fit of the competing invariant and variant models was compared using the Akaike Information Criterion (AIC) measure, which indicates the goodness of fit between a model and the data, with lower values indicating a superior model fit.³⁴ Finally, the critical ratio (CR) was used to test for caregiver differences ($CR \geq 1.96$, $p = 0.05$) in the path coefficients across time.

Results

At Time 2, more than half (55%; 100/181) of the original Time 1 respondents completed the battery of measures. The reasons for non-participation were that participants could not be contacted ($n = 14$); declined to participate ($n = 28$); were no longer eligible because of relationship breakdown ($n = 6$); the person with TBI/SCI deceased ($n = 6$); the family respondent deceased ($n = 1$); the family respondent sustained a TBI ($n = 1$); or they did not complete/return surveys after 3 prompts ($n = 25$). Between-groups analysis found no differences between those who did ($n = 100$) or did not complete the assessments at Time 2 ($n = 81$) in terms of sex, age, marital status, employment status, education level, relationship to the person with injury, living with relative at time of injury, and living with relative at the time of the survey (Chi squared test, Student t-test, and Mann-Whitney U test).

Demographic and psychosocial data for family caregivers who had completed the scales at Time 1 and Time 2 are displayed in Table 1. Between-groups analysis found no differences between the caregivers of individuals with TBI versus SCI on any demographic or psychosocial variables (Table 1).

Demographic, injury, and psychosocial data for the individuals with traumatic injury are displayed in Table 2. Between-groups analyses found that individuals with traumatic injury with a participating family member at Time 2 ($n = 100$) did not differ significantly to those with a non-participating family member ($n = 81$) in sex, age, marital status, employment status, education level, living situation, injury severity, or time post injury variables (Chi squared test, Student t-test, and Mann-Whitney U test; Bonferroni adjusted alpha set at 0.006. Between-groups analyses found no differences between

Table 1
Demographic and psychosocial variables of family members supporting individuals with traumatic brain injury (TBI) or spinal cord injury (SCI).

Variables	TBI (n = 77)	SCI (n = 23)	Total (N = 100)
Sex (n, %)			
Male	19 (25%)	5 (22%)	24 (24%)
Female	58 (75%)	18 (78%)	76 (76%)
Age, years; mean (SD)	58.1 (10.0)	52.9 (13.5)	56.9 (11.0)
Education level (n, %)			
Year 10 or less	19 (25%)	5 (22%)	24 (24%)
Year 12 Certificate	4 (5%)	1 (4%)	5 (5%)
College Technical and Further Education	31 (40%)	8 (35%)	39 (39%)
University	23 (35%)	9 (39%)	32 (32%)
Marital status (n, %)			
Married/De facto	64 (83%)	18 (78%)	82 (82%)
Single	6 (8%)	4 (17%)	10 (10%)
Separated/divorced/widowed	7 (9%)	1 (4%)	8 (8%)
Relationship to person with injury (n, %)			
Parent	38 (49%)	5 (22%)	43 (43%)
Spouse	33 (43%)	15 (65%)	48 (48%)
Other ¹	6 (8%)	3 (13%)	9 (9%)
Current employment status (n, %)			
Employed full time	23 (30%)	8 (35%)	31 (31%)
Employed part time	22 (29%)	5 (22%)	27 (27%)
Not employed	32 (42%)	10 (44%)	42 (42%)
Living with person with injury at time of injury (n, %)			
Yes	63 (82%)	18 (78%)	81 (81%)
No	14 (18%)	5 (22%)	19 (19%)
Living with person with injury now			
Yes	58 (75%)	18 (78%)	76 (76%)
No	18 (25%)	5 (22%)	24 (24%)

¹ Other includes grandparent, sibling, adult child, best friend; Bonferroni adjusted alpha was set at 0.006 (0.05/8 = 0.006) for the between group tests.

individuals with TBI versus SCI on any of the demographic or psychosocial variables (Table 2). Functional Independence Measure (FIM) scores were significantly different. Individuals with TBI had significantly higher Motor FIM scores, but significantly lower Cognitive FIM scores compared to individuals with SCI (Table 2).

Within-groups analyses found significant decreases in family caregiver scores for resilience and hope, but a significant increase in SF-36 Mental Health scores from Time 1 to Time 2 (Table 3). Overall, there were no between-group differences among caregivers (TBI vs. SCI) in the measured variables at 2 years post-injury except for the General Self-Efficacy Questionnaire (GSEQ) Self-efficacy score (Table 4). There were no between-group differences in the measured variables at 5 years post-injury (Table 4).

Model of resilience: total group

Preliminary correlation analyses among variables were carried out to determine the most relevant variables to be included in the model for testing. The model was then subjected to SEM analysis, which was theory-driven and empirically validated [34]. An optimal model was derived using this approach by an iterative inspection process between the statistical significance of the path coefficients and the theoretical relevance of the constructs in the model. The model's weakest coefficients (not statistically significant at $p > 0.05$) were systematically trimmed until only significant paths and covariances were left in the model. Fig. 1 presents the trimmed path model for the pooled (Time 2 + Time 5) responses ($n = 200$) with significant standardised path coefficients.

Overall, the model accounted for 50% of the variance in psychological distress as well as moderate to strong proportions of variance in positive affect (36%), negative affect (35%) and burden (22%), followed by mental health, which accounted for a small proportion (9%)

of the variance in the model. The overall fit for the model was very good, as indicated by the goodness of fit indices (GFI = 0.971; IFI = 0.986; TLI = 0.971; CFI = 0.985; RMSEA = 0.051). These statistics suggest there is strong evidence to support the structure of the hypothesised theoretical model from the pooled responses of the family caregivers at Time 1 and Time 2.

Parameters reaching statistical significance included direct links between the explanatory variable resilience and the mediating variables social support ($\beta = 0.43$), self-efficacy ($\beta = 0.65$) and hope ($\beta = 0.36$). Social support, in turn, was significantly associated with hope, burden, mental health, and positive affect, which had selected links with outcome variables in the model. Resilience also had direct links with positive affect and negative affect, which significantly influenced psychological distress.

Multigroup analysis

Multi-group analysis was used to compare the fit of the variant and invariant group models assessing the differences between Time 1 and Time 2 in the strength of the paths among the explanatory, mediating and outcome variables. Both variant and invariant models fitted the data very well, as indicated by the goodness of fit indices (Variant: GFI= 0.950; IFI=0.983; TLI=0.964; CFI=0.982; Invariant: GFI=0.918; IFI=0.955; TLI=0.938;CFI=0.953) which were greater than 0.90, and RMSEA values were < 0.08 (0.041 and 0.054 respectively) for both models, which showed that the model fit of the two models was excellent.

The models were then compared using the AIC measure, which considers both model parsimony and model fit. The score for the variant group model (155.84) was lower than that of the invariant-group model (156.67), indicating the former was more parsimonious and better fitting than the latter model. Subsequently, the variant-group model estimates were used rather than the invariant-group model estimates. Based on this outcome, the variant-group model, which indicated that caregivers of individuals with TBI or SCI at Time 1 and Time 2 had one or more different path coefficients, was adopted for the analysis.

Fig. 2 presents the variant-group model with standardized parameter estimates for family members of individuals with TBI or SCI at Time 1 and 2, respectively. Resilience in caregivers at Time 1 and 2 had a direct effect on self-efficacy (Time 1: $\beta = 0.71$; Time 2: $\beta = 0.59$). Resilience also had significant links with positive affect (Time 1: $\beta = 0.41$; Time 2: $\beta = 0.22$) and negative affect (Time 1: $\beta = -0.19$; Time 2: $\beta = -0.16$) over the longer-term. Resilience had a direct effect on hope, which had a significant effect on positive affect. Social support was significantly associated with hope at Time 1 and significantly linked with positive affect at Time 2. Self-efficacy had a significant association with hope at Time 2 ($\beta = 0.24$) in family caregivers. Increasing resilience scores were associated with decreasing burden, as mediated through social support over the longer term. Furthermore, burden was significantly associated with psychological distress (Time 1: $\beta = 0.41$; Time 2: $\beta = 0.24$) in caregivers over time. Mental health was significantly associated with negative affect (Time 1: $\beta = -0.41$; Time 2: $\beta = 0.54$), burden (Time 1: $\beta = -0.41$; Time 2: $\beta = -0.36$) and psychological distress (Time 1: $\beta = -0.31$) respectively. Positive affect (Time 1: $\beta = -0.17$; Time 2: $\beta = -0.34$) and negative affect (Time 1: $\beta = 0.17$; Time 2: $\beta = 0.44$) were significantly linked to psychological distress in family caregivers over time.

Time 1 versus Time 2

The critical ratios for differences test (CR) was applied to the model to determine the differences between path coefficients for Time 1 and Time 2. The path coefficients between social support and hope (CR = -2.109) were significantly different between groups, with the β values for Time 1 being much larger than for Time 2 in family

Table 2
Injury characteristics & participation in people with traumatic brain injury (TBI) and spinal cord injury (SCI) at Time 2.

Variables	TBI (n = 77)	SCI (n = 23)	Total (N = 100)
Sex (n, %)			
Male	55 (71%)	17 (74%)	72 (72%)
Female	22 (29%)	6 (26%)	28 (28%)
Age, years; mean (SD)	43.5 (15.1)	50.8 (16.1)	45.2 (15.6)
Time since injury, months; (median, Q1; Q3)	61.8 (49.2–85.9)	54.7 (47.8–64.8)	59.0 (49.1–76.8)
Education level (n, %)			
Year 10 or less	20 (26%)	6 (26%)	26 (26%)
Year 12 Certificate	12 (16%)	4 (17%)	16 (16%)
College Technical and Further Education	31 (40%)	7 (30%)	38 (38%)
University	14 (18%)	6 (26%)	20 (20%)
Marital status (n, %)			
Married/De facto	37 (48%)	15 (65%)	52 (52%)
Single	36 (46%)	4 (17%)	40 (40%)
Separated/divorced	4 (5%)	4 (17%)	8 (8%)
Current employment status (n, %)			
Employed full time	15 (20%)	5 (22%)	20 (20%)
Employed part time	11 (14%)	8 (35%)	19 (19%)
Not employed	51 (66%)	10 (44%)	61 (61%)
Current living situation (n, %)			
Own home	45 (58%)	15 (65%)	60 (60%)
Parents home	16 (21%)	2 (9%)	18 (18%)
Rent	7 (9%)	2 (9%)	9 (9%)
Other ¹	9 (12%)	4 (17%)	13 (13%)
Injury Circumstance (n, %)			
Road related	37 (48%)	4 (17%)	41 (41%)
Pushbike	7 (9%)	1 (4%)	8 (8%)
Fall	22 (29%)	9 (39%)	31 (31%)
Struck by object	9 (12%)	1 (4%)	10 (10%)
Water-related injuries	-	3 (13%)	3 (3%)
Other ²	2 (3%)	5 (22%)	7 (7%)
SCI Level (n, %)			
Paraplegia	-	9 (39%)	-
Quadriplegia	-	14 (61%)	-
SCI Lesion (n, %)			
Complete	-	5 (22%)	-
Incomplete	-	18 (78%)	-
Posttraumatic amnesia (n=75)			
Severe	3 (4%)	-	-
Very severe	24 (32%)	-	-
Extremely severe	48 (64%)	-	-
Functional Independence Measure; mean (SD)			
Cognitive (n = 85) ³	22.1 (12.9)	33.0 (4.4)	-
Motor (n = 85) ³	64.7 (32.6)	45.9 (26.9)	-

¹ Other: nursing/disability home, inpatient rehabilitation, family other than parents, separate dwelling on parent's property, housing commission, work supplied house.

² Other includes skydiving and paragliding; non-traumatic causes for SCI arising from surgeries or infections.

³ Between-groups Student t-test $p < 0.0001$; Bonferroni adjusted alpha was set at 0.006 (0.05/8 = 0.006) for tested variables. Injury circumstances and injury severity variables not tested. SCI: Spinal cord injury.

caregivers. The path coefficients between social support and positive affect were significantly different ($CR = 2.080$), with β values for Time 2 being much greater than for Time 1 in family caregivers. The influence of mental health ($CR = 1.960$), on psychological distress was significantly different between groups, with β values for Time 1 being much larger than for Time 2 in family caregivers. The influence of negative affect ($CR = 2.723$) and positive affect ($CR = -2.193$) on psychological distress were significantly different between groups, with the β values for Time 2 being much higher than for Time 1 in family caregivers.

Discussion

To the best of our knowledge, this is the first longitudinal study of a model of resilience in family caregivers of individuals with TBI or SCI. Further support was found at five years for key paths identified at two years post-injury. This included the direct relationship between resilience and positive affect, and the indirect role of

resilience on caregiver outcomes influenced by the mediating variables of social support, self-efficacy, and hope.

The stability of the model over time extends the findings of adaptive family caregiver responses during the first 2 years post-injury [20] out to 5 years post-TBI or SCI. This suggests that there may be an alternative trajectory to caregiver-burnout for at least a proportion of family caregivers after neurotrauma. The lack of difference between the 2 family groups for the measured variables is of interest given the different injury profiles of the 2 groups, as reflected by the FIM scores. Few studies have compared families supporting people with TBI and SCI, however the early studies did find higher levels of caregiver stress among families supporting people with TBI [37,38]. However more recent studies have been more equivocal, with fewer differences found between the 2 caregiver groups [20,39]. One explanation could be that the constructs of interest may tap into the resources that families bring to the challenge of caregiving, rather than their vulnerabilities.

The study confirmed empirically the hypothesised associations between resilience and key internal and external attributes that have

Table 3
Within groups comparison of the whole sample of family caregivers of people with traumatic brain injury or spinal cord injury between Time 1 (2 years) and Time 2 (5 years) post injury.

Variables	Total group of family members (n = 200) Mean (SD)	Family members Time 1 (n = 100) Mean (SD)	Family members Time 2 (n = 100) Mean (SD)	t statistic
<i>Explanatory variable</i>				
CD-RISC Resilience	73.71 (11.82)	75.89 (10.60)	71.53 (12.61)	3.49*
<i>Mediating variables</i>				
GSEQ Self-efficacy	32.08 (4.08)	32.51(3.85)	31.66 (4.28)	1.91
HHI Hope	37.89 (4.63)	39.63 (4.74)	36.16 (3.82)	7.38*
MOS SSS Social support	74.44 (18.24)	76.18 (17.29)	72.70 (19.07)	2.10
<i>Outcome variables</i>				
CBS Caregiver burden	46.16 (14.72)	45.81 (13.62)	46.51(15.81)	-0.58
SF-36 Mental health	47.44 (9.58)	45.45 (9.02)	49.43 (9.75)	-4.47*
PANAS Positive affect	33.95 (7.22)	34.36 (7.20)	33.55 (7.26)	1.03
PANAS Negative affect	17.20 (6.50)	17.72 (6.43)	16.69 (6.64)	1.56
GHQ-28 Psychological distress	20.12 (9.50)	20.80 (8.45)	19.44 (10.45)	1.50

CBS: Caregiver Burden Scale, CD-RISC: Connor-Davidson Resilience Scale, GHQ-28: General Health Questionnaire-28, GSEQ: General Self-Efficacy Questionnaire, HHI: Health Hope Index, MOS SSS: Medical Outcome Survey Social Support Survey, PANAS: Positive and Negative Affect Schedule, SF-36: Medical Outcomes Survey Short Form-36. * Significant at Bonferroni adjusted alpha set at 0.005 (0.05/9) for multiple tests.

been found in the general population and other clinical groups, including self-efficacy [20,40] hope [19,41] and social support [42]. The levels of resilience reported by the family caregivers at both time-points were similar to those found in the general population [25]. This contrasts with the mixed findings among people with TBI themselves, in which some studies have found similar robust levels [43] while others have reported decreased resilience, with levels up to 30% lower than the general population [44]. Among the family respondents in this study, small but significant reductions were found in both resilience and hope from 2 to 5 years, however, the latter scores were still at the high end of the 2 scales [25,27], suggesting the decrease may be of modest clinical significance.

Positive emotion plays an important role in subjective well-being within the general population [45], as well as among family caregivers in TBI and SCI [24]. The models highlighted the important role of positive affect in contributing both to an overall sense of well-

being as well as acting to buffer against psychological distress. While the buffering effect of social support on psychological distress among caregivers has been extensively documented [46,47], the role of positive affect (as supported by resilience, hope and social support) as a buffer has not been as clearly delineated. The study also provided further evidence of an association between negative affect and lower levels of resilience. One possible reason for this inverse association could be the lower levels of problem-solving skills (an important component of resilience) associated with caregivers reporting higher negative affect, alongside a higher use of escape-avoidance styles of coping [24].

Social support is an important environmental component of resilience, highlighting that resilience is not simply about an individual coping on their own [17,23-48]. People with high levels of resilience can quickly adapt to the changing environment [49] by mobilizing higher levels of social support including instrumental resources.

Table 4
Between-groups comparison at Time 1 (2 years) and Time 2 (5 years) of the family caregivers of people with traumatic brain injury (TBI) and spinal cord injury (SCI).

Variables	Year 2 (Time 1) Family member of person with TBI (n = 77) mean (SD)	Family member of person with SCI (n = 23) mean (SD)	t-stat	Year 5 (Time 2) Family member of person with TBI (n = 77) mean (SD)	Family member of person with SCI (n = 23) mean (SD)	t-statistic
<i>Explanatory variable</i>						
CD-RISC Resilience	76.64(10.89)	73.34(9.31)	1.31	72.41(12.13)	68.56(14.00)	1.29
<i>Mediating variables</i>						
GSEQ Self- efficacy	33.64(3.89)	30.65(3.12)	2.72*	31.79(4.25)	31.21(4.43)	0.56
HHI Hope	40.00(4.76)	38.39(4.55)	1.44	36.16(3.76)	36.17(4.11)	-0.06
MOS SSS Social support	76.31(17.60)	75.73(16.61)	0.14	73.03(19.85)	71.56(16.54)	0.29
<i>Outcome variables</i>						
CBS Caregiver burden	46.14(13.88)	44.69(12.94)	0.45	47.05(16.52)	44.69(13.34)	0.63
SF-36 Mental health score	45.57(8.86)	45.02(9.71)	0.26	49.67(9.23)	48.66(11.51)	0.43
PANAS Positive affect	34.40(6.95)	34.21(8.12)	0.11	33.31(6.94)	34.34(8.36)	-0.60
PANAS Negative affect	17.15(6.32)	19.60(6.55)	-1.61	16.58(6.88)	17.04(5.85)	-0.31
GHQ-28 Psychological distress	20.68(8.69)	21.17(7.76)	-0.24	19.32(10.64)	19.82(10.00)	-0.11

CBS: Caregiver Burden Scale, CD-RISC: Connor-Davidson Resilience Scale, GHQ-28: General Health Questionnaire-28, GSEQ: General Self-Efficacy Questionnaire, HHI: Health Hope Index, MOS SSS: Medical Outcome Survey Social Support Survey, PANAS: Positive and Negative Affect Schedule, SF-36 Medical Outcomes Survey Short Form-36. * Significant at Bonferroni adjusted alpha set at 0.005 (0.05/9) for multiple tests.

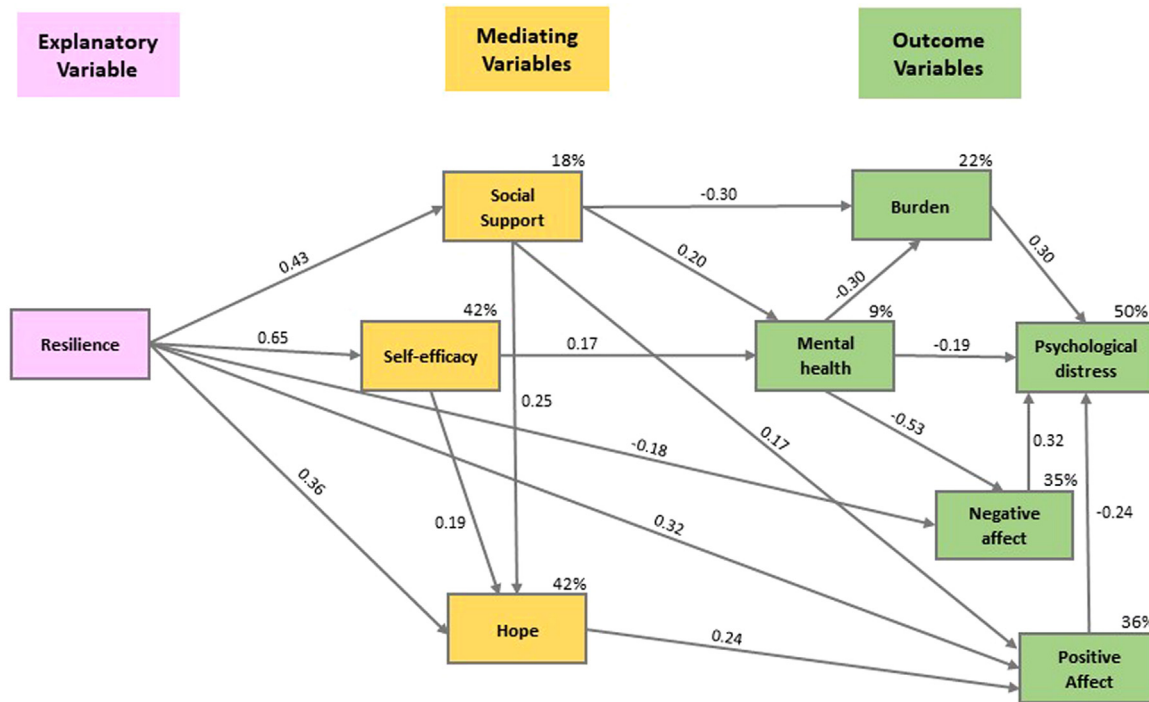


Fig. 1. Model of resilience in family caregivers of individuals with TBI or SCI with pooled results (year 2 + year 5). All significant paths with their coefficients are e. % indicates the proportion of variance.

Reflecting this, the multi-group analysis found that social support played a dynamic and expanded role in the model at the 5-year time-point. This contrasted with the initial model at the 2-year time-point, in which the sole path between social support and caregiver outcome was in buffering against caregiver burden [24]. Paths from social support to positive affect and to mental health emerged at the 5-year time-point, highlighting the potential contribution of ongoing social

support to the long-term sustainability of caregiving. It certainly acts as a counter to the increased social isolation reported by some family caregivers [46]. The path from social support to hope was no longer significant at five years, with the percentage variance of hope contributing to the model at 5 years also reducing. Although this might be seen as the start of caregivers giving up hope as the time post-injury increased, an alternative explanation might be that the results

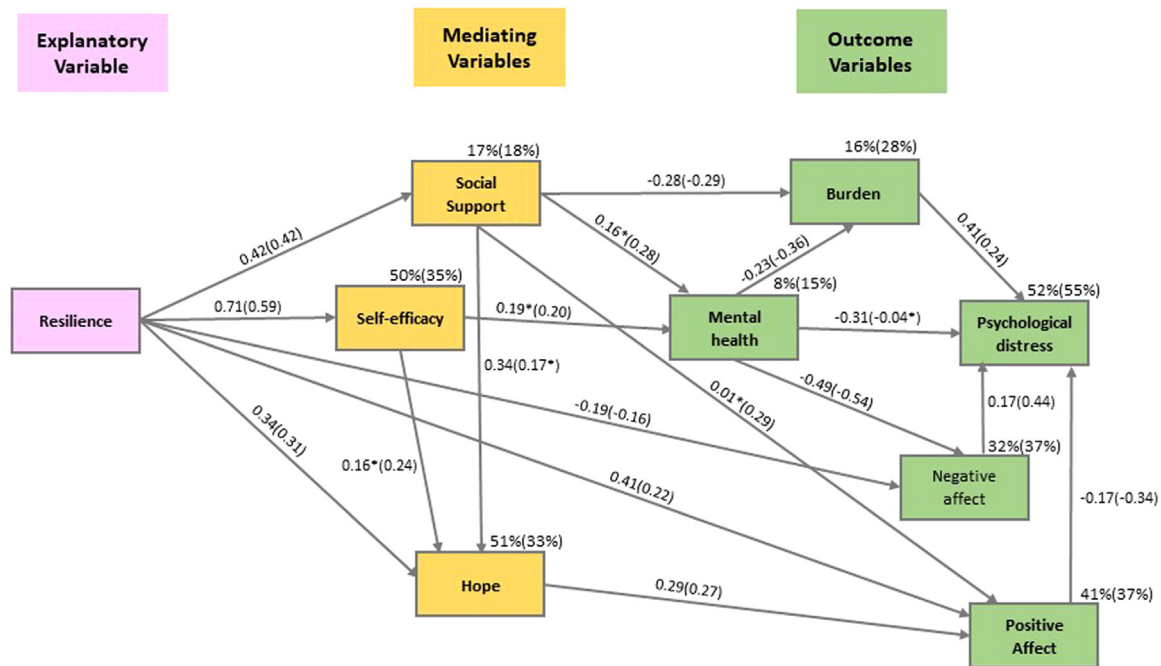


Fig. 2. Model of resilience in family caregivers of individuals with TBI or SCI for Time 1 (Time 2): Multigroup analysis. *: non-significant path. % indicates the proportion of variance.

represent a modulation of the level of hope over time as part of the process of adjustment to the 'new normal' of life post-TBI or SCI.

This study has several limitations. Despite the lack of differences between the participants who took part at year 5 versus those who did not, the study may have oversampled adaptive families, leading to an overstatement of the level of positive outcomes. Although the modest size of the research sample is of concern, the model fit indices were good, which suggested the modeling was acceptable. Furthermore, as a rule, models with robust parameter estimates and variables with high reliability may require smaller samples [50]. Nevertheless, caution is required in the generalization of these findings, with further investigation needed with larger samples.

Given the growing research base highlighting the importance of resilience in the adjustment and well-being of family caregivers, introducing resilience questionnaires into broader family assessment protocols could be considered, with a growing number of questionnaires becoming available [17]. Intervention programs that aim to build family resilience are starting to appear, and may become part of longer-term standard care provided to family caregivers [17]. Findings from the current study suggest that families supporting relatives with differing clinical conditions share similar aspects of their psychological profiles, meaning that interventions to build resilience may have applicability across multiple groups, leading to efficiency in clinical resources and time. The research also suggests that rehabilitation and disability services pay particular attention to the social networks and resources available to family members and seek to identify means of preserving or enhancing those networks over time.

Future research could be expanded to examine the links between resilience and spirituality [24], with initial studies already finding a strong correlation between the two. It would be useful to better understand the role of positive emotion as a cornerstone of caregiver psychological well-being and in particular, the relationship between positive emotion and other commonly used quality of life measures such as such as satisfaction with life. Further research could help tease out which elements of social support are most important, for example, the provision of emotional support versus instrumental support. Finally, further research up to 10 years post-injury would be required to establish whether the decline in resilience identified in this study was part of a longer-term trend, or a fluctuation of scores around the mean. In line with the recommendation of Neils-Strunjas et al., [17] such research would assist to build the evidence base to better guide rehabilitation professionals in their understanding of the role of resilience in the adaptation of family caregivers to a relative with a catastrophic injury such as TBI or SCI.

Declaration of Competing Interest

None.

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Supplementary materials

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References

- [1] Maas AI, Menon DK, Adelson PD, Andelic N, Bell MJ, Belli A, et al. Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. *Lancet Neurol* 2017;16:987–1048. doi: [10.1016/S1474-4422\(17\)30371-X](https://doi.org/10.1016/S1474-4422(17)30371-X).
- [2] Jazaveri SB, Beygi S, Shokranf F, Hagen EM, Rahimi-Movaghar V. Incidence of traumatic spinal cord injury worldwide: a systematic review. *Eur Spine J* 2015;24:905–18. doi: [10.1007/s00586-014-3424-6](https://doi.org/10.1007/s00586-014-3424-6).
- [3] Jourdan C, Bayen E, Pradat-Diehl P, Ghout I, Darnoux E, Azerad S, et al. A comprehensive picture of 4-year outcome of severe brain injuries. Results from the Paris-TBI study. *Ann Phys Rehabil Med* 2016;59:100–6. doi: [10.1016/j.rehab.2015.10.009](https://doi.org/10.1016/j.rehab.2015.10.009).
- [4] Ponsford JL, Downing MG, Olver J, Ponsford M, Acher R, Carty M, Spitz G. Longitudinal follow-up of patients with traumatic brain injury: outcome at two, five, and ten years post-injury. *J Neurotrauma* 2014;31:64–77. doi: [10.1089/neu.2013.2997](https://doi.org/10.1089/neu.2013.2997).
- [5] Kirshblum S, Benevento B. Understanding spinal cord injury and advances in recovery. In: Druin E, Sliwinski MM, editors. *Spinal cord injuries: management and rehabilitation*. Saint Louis: Mosby; 2009. p. 1–17.
- [6] Te Ao B, Brown P, Tobias M, Ameratunga S, Barker-Collo S, Theadom A, McPherson K, et al. Cost of traumatic brain injury in New Zealand: evidence from a population-based study. *Neurol* 2014;83:1645–52. doi: [10.1212/WNL.0000000000000933](https://doi.org/10.1212/WNL.0000000000000933).
- [7] Bannon SM, Greenberg J, Goldson J, O'Leary D, Vranceanu AM. A social blow: the role of interpersonal relationships in mild traumatic brain injury. *Psychosomatics* 2020;61:518–26. doi: [10.1016/j.psych.2020.04.003](https://doi.org/10.1016/j.psych.2020.04.003).
- [8] Kreutzer JS, Rapport LJ, Marwitz JH, Harrison-Felix C, Hart T, Glenn M, Hammond F. Caregivers' well-being after traumatic brain injury: a multicenter prospective investigation. *Arch Phys Med Rehabil* 2009;90:939–46. doi: [10.1016/j.apmr.2009.01.010](https://doi.org/10.1016/j.apmr.2009.01.010).
- [9] Doser K, Norup A. Caregiver burden in Danish family members of patients with severe brain injury: the chronic phase. *Brain Inj* 2016;30:334–42. doi: [10.3109/02699052.2015.1114143](https://doi.org/10.3109/02699052.2015.1114143).
- [10] Manskow US, Friborg O, Røe C, Braine M, Damsgard E, Anke A. Patterns of change and stability in caregiver burden and life satisfaction from 1 to 2 years after severe traumatic brain injury: a Norwegian longitudinal study. *NeuroRehabilitation* 2017;40:211–22. doi: [10.3233/NRE-161406](https://doi.org/10.3233/NRE-161406).
- [11] Anderson MI, Simpson GK, Morey P. The impact of neurobehavioural impairment on family functioning and the psychological wellbeing of male versus female caregivers of relatives with severe traumatic brain injury: multi-group analysis. *J Head Trauma Rehabil* 2013;28:453–63. doi: [10.1097/HTR.0b013e31825d6087](https://doi.org/10.1097/HTR.0b013e31825d6087).
- [12] Charlifue SB, Botticello A, Kolakowsky-Hayner SA, Richards JS, Tulskey DS. Family caregivers of individuals with spinal cord injury: exploring the stresses and benefits. *Spinal Cord* 2016;54:732–6. doi: [10.1038/sc.2016.25](https://doi.org/10.1038/sc.2016.25).
- [13] Sander AM, Maestas KL, Clark AN, Havins WN. Predictors of emotional distress in family caregivers of persons with traumatic brain injury: a systematic review. *Brain Impair* 2013;14:113–29. doi: [10.1038/sc.2016.25](https://doi.org/10.1038/sc.2016.25).
- [14] Juengst SB, Perrin PB, Glyce DW, O'Neil-Pirozzi TM, Herrera S, Wright B, et al. Caregiver characteristics of adults with acute traumatic brain injury in the United States and Latin America. *Int J Environ Res Public Health* 2022;19:5717. doi: [10.3390/ijerph19095717](https://doi.org/10.3390/ijerph19095717).
- [15] Perrin PB, Stevens LF, Sutter M, Hubbard R, Sosa DMD, Jove IGE, et al. Exploring the connections between traumatic brain injury caregiver mental health and family dynamics in Mexico City. *Mexico PM&R* 2013;5:39–849. doi: [10.1016/j.pmrj](https://doi.org/10.1016/j.pmrj).
- [16] Baker A, Barker S, Sampson A, Martin C. Caregiver outcomes and interventions: a systematic scoping review of the traumatic brain injury and spinal cord injury literature. *Clin Rehabil* 2017;31:45–60. doi: [10.1177/0269215516639357](https://doi.org/10.1177/0269215516639357).
- [17] Neils-Strunjas J, Paul D, Clark AN, Mudar R, Duff MC, Waldron-Perrine B, et al. Role of resilience in the rehabilitation of adults with acquired brain injury. *Brain Inj* 2017;31:131–9. doi: [10.1080/02699052.2016.1229032](https://doi.org/10.1080/02699052.2016.1229032).
- [18] Nogales-González C, Romero-Moreno R, Losada A, Marquez-Gonzalez M, Zarit SH. Moderating effect of self-efficacy on the relation between behavior problems in persons with dementia and the distress they cause in caregivers. *Ageing Ment Health* 2015;19:1022–30. doi: [10.1080/13607863.2014.995593](https://doi.org/10.1080/13607863.2014.995593).
- [19] Wu H-C. The protective effects of resilience and hope on quality of life of the families coping with the criminal traumatization of one of its members. *J Clin Nurs* 2011;20:1906–15. doi: [10.1080/13607863.2014.995593](https://doi.org/10.1080/13607863.2014.995593).
- [20] Simpson GK, Anderson MI, Daher M, Jones KF, Morey P. Testing a model of resilience in family members of relatives with traumatic brain injury vs spinal cord injury: multigroup analysis. *Arch Phys Med Rehabil* 2021;102:2325–34. doi: [10.1016/j.apmr](https://doi.org/10.1016/j.apmr).
- [21] Brickell TA, Wright MM, Lippa S, Sullivan JK, Bailie JM, French LM, Lange RT. Resilience is associated with health-related quality of life in caregivers of service members and veterans following traumatic brain injury. *Qual Life Res* 2020;29:2781–92. doi: [10.1007/s11136-020-02529-y](https://doi.org/10.1007/s11136-020-02529-y).
- [22] Bermejo-Toro L, Sánchez-Izquierdo M, Calvete E, Roldán MA. Quality of life, psychological well-being, and resilience in caregivers of people with acquired brain injury (ABI). *Brain Inj* 2020;34:480–8. doi: [10.1080/02699052.2020.1725127](https://doi.org/10.1080/02699052.2020.1725127).
- [23] Elliott TR, Berry JW, Richards J, Shewchuk RM. Resilience in the initial year of caregiving for a family member with a traumatic spinal cord injury. *J Consult Clin Psychol* 2014;82:1072–86. doi: [10.1037/a0037593](https://doi.org/10.1037/a0037593).
- [24] Simpson GK, Anderson MI, Jones KF, Genders M, Gopinath B. Do spirituality, resilience and hope mediate outcomes among family caregivers after traumatic brain injury or spinal cord injury? A structural equation modelling approach. *Neuropsychol Rehabil* 2020;46:3–15. PMID: 32039872. doi: [10.3233/NRE-192945](https://doi.org/10.3233/NRE-192945).
- [25] Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety* 2003;18:76–82. doi: [10.1002/da.101](https://doi.org/10.1002/da.101).
- [26] Schwarzer R, Jerusalem M. Generalised self-efficacy scale. In: Weinman J, Wright S, Johnson M, editors. *Measures in health psychology: a user's portfolio*. Windsor, UK: NFER-Nelson; 1995. PMID: 12964174. doi: [10.1002/da.10113](https://doi.org/10.1002/da.10113).

- [27] Herth K. Abbreviated instrument to measure hope: development and psychometric evaluation. *J Adv Nurs* 1992;17(5):1251–9. PMID: 1430629. doi: [10.1111/j.1365-2648.1992.tb01843.x](https://doi.org/10.1111/j.1365-2648.1992.tb01843.x).
- [28] Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32(6):705–14. doi: [10.1016/0277-9536\(91\)90150-b](https://doi.org/10.1016/0277-9536(91)90150-b).
- [29] Elmstahl S, Malmberg B, Annerstedt L. Caregiver's burden of patients 3 years after stroke assessed by a novel caregiver burden scale. *Arch Phys Med Rehabil* 1996;77:177–82. PMID: 8607743. doi: [10.1016/s0003-9993\(96\)90164-1](https://doi.org/10.1016/s0003-9993(96)90164-1).
- [30] Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. *Psychol Med* 1979;9(1):139–45. PMID: 424481. doi: [10.1017/s0033291700021644](https://doi.org/10.1017/s0033291700021644).
- [31] Ware Jr JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Med Care* 1992;473–83. PMID: 1593914.
- [32] Watson D, Clark L. *The PANAS-X. Manual for the positive and negative affect schedule - expanded form*. Iowa City: University of Iowa; 1994.
- [33] Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect; the PANAS scales. *J Pers Soc Psychol* 1988;54:1063–70. PMID: 3397865. doi: [10.1037//0022-3514.54.6.1063](https://doi.org/10.1037//0022-3514.54.6.1063).
- [34] Ho R. *Handbook of univariate and multivariate data analysis with IBM SPSS*. 2nd ed. Boca Raton, FL: Chapman & Hall/CRC Press; 2014.
- [35] Kline RB. *Principles and practice of structural equation modelling*. 2nd ed. NY: Guilford Press; 2005.
- [36] Hooper D., Coughlan J., Mullen M.R. Evaluating model fit: a synthesis of structural equation modelling literature. Presented at the 7th European conference of research methodology for business and management studies, Regents College, London, United Kingdom; 2008.
- [37] Alfano DP, Neilson PM, Fink MP. Sources of stress in family members following head or spinal cord injury. *App Neuropsychol* 1994;1:57–62. PMID: 16318562. doi: [10.1080/09084282.1994.9645331](https://doi.org/10.1080/09084282.1994.9645331).
- [38] Pelletier PM, Alfano DP, Fink MP. Social support, locus of control and psychological health in family members following head or spinal cord injury. *App Neuropsychol* 1994;1:38–44. PMID: 16318560. doi: [10.1080/09084282.1994.9645329](https://doi.org/10.1080/09084282.1994.9645329).
- [39] Kolakowsky-Hayner SA, Kishore R. Caregiver functioning after traumatic injury. *NeuroRehabilitation* 1999;13:27–33.
- [40] Earnovilino-Ramirez ME. Resilience: a concept analysis. *Nurs Forum* 2007;42:73–82. PMID: 17474940. doi: [10.1111/j.1744-6198.2007.00070.x](https://doi.org/10.1111/j.1744-6198.2007.00070.x).
- [41] Peterson C. The future of optimism. *American Psychologist* 2000;55:44–5. PMID: 11392864. doi: [10.1037//0003-066x.55.1.44](https://doi.org/10.1037//0003-066x.55.1.44).
- [42] Ruiz-Robledillo N, De Andrés – García J, Pérez-Blasco E, González-Bono E, Moya-Albiol L. Highly resilient coping entails better perceived health, high social support and low morning cortisol levels in parents of children with autism spectrum disorder. *Res Dev Disabil* 2014;35:686–95. doi: [10.1016/j.ridd.2013.12.007](https://doi.org/10.1016/j.ridd.2013.12.007).
- [43] Paasila J.M., Smith E., Daher M., Simpson G.K. Are psychological protective factors and reasons for living associated with lower psychological distress and suicide ideation following severe traumatic brain injury? A cross-sectional study. *Neuropsychol Rehabil* 2022; 32:2125–2146.
- [44] Kreutzer JS, Marwitz JH, Sima AP, Bergquist TF, Johnson-Greene D, Felix ER, et al. Resilience following traumatic brain injury: a traumatic brain injury model systems study. *Arch Phys Med Rehabil* 2016;97:708–16. doi: [10.1016/j.apmr.2015.12.003](https://doi.org/10.1016/j.apmr.2015.12.003).
- [45] Lyubomirsky S, King L, Diener E. The benefits of frequent positive affect: does happiness lead to success? *Psychol Bull* 2005;131:803–55. PMID: 16351326. doi: [10.1037/0033-2909.131.6.803](https://doi.org/10.1037/0033-2909.131.6.803).
- [46] Rodakowski J, Skidmore E, Rogers J, Schulz R. Does social support impact depression in caregivers of adults ageing with spinal cord injuries? *Clin Rehabil* 2013;27:565–75. doi: [10.1177/0269215512464503](https://doi.org/10.1177/0269215512464503).
- [47] Chronister J, Johnson ET, Chan F, Tu WM, Chung YC, Lee GK. Positive person-environment factors as mediators of the relationship between perceived burden and quality of life of caregivers of individuals with traumatic brain injuries. *Rehabil Nurs Bull* 2016;59:235–46. doi: [10.1177/0034355215601072](https://doi.org/10.1177/0034355215601072).
- [48] Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. *Child Dev* 2000;71:543–62. PMID: 10953923. doi: [10.1111/1467-8624.00164](https://doi.org/10.1111/1467-8624.00164).
- [49] Frydenburg E. Coping competencies: what to teach and when. *Theory Pract* 2004;43:14–22. <http://www.jstor.org/stable/3701560>.
- [50] Kyriazos TA. Applied psychometrics: sample size and sample power considerations pin factor analysis and SEM in general. *Psychol* 2018;9:2027–30. doi: [10.4236/psych.2018.98126](https://doi.org/10.4236/psych.2018.98126).