Marital Status, Marital Transitions, Well-Being and Spinal Cord Injury: An Examination of the Effects of Sex and Time

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Abstract

Objective—To examine the applicability of marital resource (marriage has substantial benefits for well being over not being married) or marital crisis models (marital dissolution leads to poorer well being) to the spinal cord injury (SCI) population by studying the effects of gender, marital status and marital transitions on well-being.

Design—Prospective cohort from the SCI Model Systems National Database.

Setting—Community.

Participants—4,864 men and 1,277 women who sustained traumatic SCI and completed a minimum of one follow-up interview beginning at one year through 15 years post-injury.

Interventions—None.

Main outcomes measures—Life satisfaction, depressive symptomatology, and self-perceived health status using linear mixed models for longitudinal data.

Results—In general, well being improved over time since injury. Hypothesis testing supported the marital crisis model as marital loss through being or becoming separated or divorced and being or becoming widowed had the most consistent and negative impact across well-being outcomes, while being or becoming married only had an advantage for lower depression symptomatology over time. However, marital dissolution or loss did not have a uniformly adverse impact on well-being outcomes and this effect was often moderated by gender such that widows had higher depressive symptomatology and poorer self-perceived health than widowers, but separated or

divorced women had higher life satisfaction and self-perceived health than men. Irrespective of gender, being separated or divorced vs. being single was associated with higher depression over time.

Conclusions—The results support the marital crisis model and that women and men can experience marital dissolution differently. Nor does all marital loss result in compromised well-being or marriage enhance well-being, highlighting complex dynamics worthy of further investigation in this population.

Keywords

Quality of life; Rehabilitation; Spinal cord injuries

The relationship of marital status with well-being has been extensively studied in the social sciences, though is still widely debated. Gove's theories on gender and marriage in the early 1970s[1,2] explain gender differences in mental health in terms of how gender roles differentially impact marriage, marital roles, and interpersonal connections. That is, married men appeared to have more positive mental health, while for women, mental health was higher among those who were single, divorced or widowed. Subsequent work, though, has not provided unequivocal support for these theories of marital status and well-being.[3,4] Early work has also been criticized for the lack of multivariate models[5] and relying too heavily on cross-sectional designs.[3,6]

Contemporary conceptual frameworks of marital status, marital transitions and well-being are particularly relevant in the context of disability. The "marital resource" model purports that marriage has a positive impact on health because of greater economic resources, social support, and increased regulation of health behavior.[6–8] In general, married people tend to fare better than unmarried people on various indices of well-being[9–11] and some research has shown a greater benefit of marriage for men, attributed to a healthy lifestyle, emotional support and physical comfort, although these conclusions have been criticized.[3,6,12,13] For example, when factors such as social support, emotional support and financial well-being are accounted for, the effect of marital status on well-being becomes non-significant.[14]

An alternative to the resource model is the "crisis" model which contends that marital status differences in health are consequence of marital dissolution which undermines well-being.[6,15,16] Marital loss through death or divorce may lead to diminished life satisfaction[17] and increased depression, though negative effects can attenuate over time.[6] Gender effects have been found with a greater negative effect of divorce and a longer adaptation among women compared to men.[3,18] The early years after widowhood have been associated with higher levels of depression compared to other marital transitions (e.g., divorcing or marrying) with adverse effects on health behaviors in women.[14,19]

For individuals with a disability, and specifically for those with an SCI, being married has been related to higher life satisfaction and adjustment, less self-reported handicap, better quality of life and longer life expectancy.[20–22] While these findings appear to lend support to the marital resource model, methodological weaknesses have been noted for many of these studies.[23] Other studies provide support for the crisis model, with findings suggesting that those who are divorced report lower physical and social functioning compared to those who are married.[24] Divorced women with SCI have been shown to have significantly greater odds of probable major depressive disorder than women who are not divorced.[25]

The purpose of this study was to evaluate the effects of marital status, marital transitions and gender on well-being of individuals with SCI in the years post-injury, examining the applicability of the marital resource and crisis models for this population. Specifically, we

hypothesized that: 1) men and women differ significantly on well-being outcomes, controlling for other demographic and injury characteristics; 2) marital status is significantly related to well-being, such that those who are single, separated or divorced or widowed have lower well-being than those who are married, and this relationship is not moderated by gender; 3) there is a significant relationship between marital transitions and well-being, such that (a) separating, divorcing and becoming widowed are associated with lower well-being, and (b) marrying is associated with higher levels of well-being, as compared with undergoing no marital transition, and these relationships are not moderated by gender; and 4) time since injury is significantly related to well-being and this relationship is moderated by marital status and marital transitions, but not gender.

METHODS

Participants

The sample included women and men who sustained traumatic SCI and were enrolled in the National SCI Model Systems Database. For this study, selection criteria were age 18 years or older at time of injury and completion of at least the first year follow-up interview (follow-up interviews are conducted at one year and five years post-injury and at five year intervals thereafter) either by telephone or mailed survey. We excluded individuals who, at discharge from acute care, had minimal neurological deficits (i.e., no significant or incapacitating loss of function) or normal neurologic status (i.e., no demonstrable muscular weakness or impaired sensation) or were deceased by the year 1 follow-up, or for whom marital status at injury was missing. Because three of the four outcomes were first assessed in November 1995, individuals who were eligible for their year 1 follow-up before January 1996 were excluded to allow for a transition period. From a pool of 7,186 individuals who met inclusion criteria, 6,141 completed at least the year 1 follow-up interview (85.4%). A total of 11,369 records were available for analysis. For the Patient Health Questionnaire-9 outcome (a measure of depression symptomatology) introduced in October 2000, individuals completing their year 1 and subsequent follow-up interviews *after* December 2000 were included in the analysis (3,782 individuals and 6,115 interview records). We evaluated the representativeness of the sample by comparing demographic and injury characteristics of those who were eligible but did not complete year 1 follow-up interviews (N = 1,045).

Measures

Outcome Variables—The Satisfaction with Life Scale is a five-item measure of life satisfaction.[26] Items are rated on seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Total scores range from 5 to 35, with higher scores reflecting higher levels of life satisfaction.

The Patient Health Questionnaire-9 was developed as a depression screening tool for primary care and consists of items corresponding to the nine criteria from the Diagnostic and Statistical Manual for Mental Disorders, 4th Edition for diagnosis of major depression.[27] Items query respondents about frequency of symptoms of depression over the past two weeks rated on four-point Likert scales ranging from 0 (not at all) to 3 (nearly every day), summed to create a symptom severity score (ranging from 0 to 27).

The Self-Perceived Health Status is a single item from the Medical Outcomes Study 36-Item Short-Form Health Survey measuring general health perception.[28] This item asks: "In general, would you say your health is…", rated on five-point Likert scales ranging from poor (1) to excellent (5).

Predictors and Covariates—Marital Status refers to the individual's marital status at each follow-up. We combined legally separated and divorced classifications, creating four categories for marital status: (1) widowed, (2) divorced, (3) married and (4) single/never married (referent). Marital transition refers to a change in marital status during the time between follow-up interviews and obtained by self-report during each follow up interview. Marital transition had five categories: (1) became separated or divorced; (2) became married; (3) became widowed; (4) experienced multiple changes; and (5) experienced no change (referent). Marital status and marital transition were accounted for simultaneously in model testing to account for their potentially joint effects as two individuals may have the same current marital status, but different marital transitions occurring in the interim period between interviews. For example, both may be divorced at the time of follow up, but one was divorced during the interim period and the other had no change in marital status.

Time since injury was quantified by year of follow-up interview and treated as a continuous variable.

Level of neurological impairment was based grossly classified as incomplete paraplegia, complete paraplegia, incomplete tetraplegia, and complete tetraplegia. Occupational status was classified as employed, unemployed and other (e.g., student, homemaker, retired and other).

Education was classified as less than high school, high school or GED, college (associate and bachelor degrees) and graduate degree. Race/ethnicity was classified as: White, non-Hispanic; White, Hispanic; African American; Other, Hispanic; and Other, non-Hispanic.

Statistical Analysis

We used a combination of univariate and multivariate analyses to analyze cross-sectional and longitudinal (repeated follow-up interviews) data. Tabulations combined with independent samples t-test or Pearson Chi-square analysis were used to describe demographic and injury characteristics and test for differences. For Pearson Chi-square analyses, an SR value (a z-score) 2.0 was used to identify a statistically significant difference between expected and observed cases; negative SR values indicate under-representation and positive SR values indicate over-representation in a sub-sample. Each outcome was tested in a step-wise fashion using three models: 1) model 1 include only main effects; 2) model 2 included main effects plus two-way interactions; and 3) model 3 included main effects, two-way and three-way interactions. Linear mixed models with random intercepts and slopes were used to analyze repeated measures data. For statistically significant or marginally significant two-way interactions (<0.06), estimated marginal means were used for *post hoc* testing with Bonferroni correction. For statistically significant three-way interactions, *post hoc* testing compared slopes of women and men within each marital status or marital transition category using a t-test. Line graphs of predicted values were used to examine the pattern of differences across time for significant interactions. SPSS® 17.0 was used to conduct all analyses.

RESULTS

Representativeness of the Study Sample

We compared the study sample to individuals who did not complete their year 1 follow-up (N = 1,045; 838 men and 207 women). Those without year 1 data had significantly more acute care days (22.2 vs. 19.0; $t = 3.26$, $p = 0.001$) and fewer rehabilitation days (53.8 vs. 57.4; $t = -2.57$, $p = 0.01$) days. However the effect sizes of these differences were small to negligible ($\delta = 0.15$ and 0.09, respectively). There were significant differences in

distributions of marital status classifications ($X^2 = 29.26$, p 0.001, $df = 3$) with singles over-represented (SR = 2.5) and married persons under-represented (SR = −4.0) in the group without year 1 data. Persons with less than high school education were over-represented (SR = 3.5, $X^2 = 20.82$, p 0.001, $df = 3$). There were no group differences with respect to injury level or gender.

Demographic and Injury Characteristics of the Sample

Men and women differed on several demographic and injury characteristics, summarized in table 1. The majority of the sample was in early adulthood through early midlife when injured, with from one fifth to one third in each of the neurological impairment groups. They were mostly non-Hispanic Whites with high school educations and slightly more than half were employed at the time of injury. Men and women were over and under-represented in various categories as indicated by the SR values in table 1.

Hypothesis Testing

Hypothesis 1: Men and women differ significantly on well-being outcomes, controlling for demographic and injury characteristics (model 1)—There were no main effects for gender for any of the outcomes when controlling for other demographic and injury characteristics, except for depressive symptomatology where men had significantly lower symptom severity than women; however gender differences disappeared when marital status/transitions and time were entered into models 2 and 3 (see table 4). Hence hypothesis 1 was only partially supported.

Hypothesis 2: Marital status is significantly related to well-being, such that those who are single, separated or divorced or widowed have lower well-being than those who are married, and this relationship is not moderated by gender (model 2)—Only being a widow/widower had a significant association with life satisfaction, with slightly higher life satisfaction compared to those who are single. Being separated or divorced approached statistical significance for life satisfaction and depression ($p = 0.06$, respectively). There also were no significant two-way or three-way interactions involving gender, indicating that the lack of a relationship of marital status to well-being was similar for men and women. Thus there was only partial support for hypothesis 2.

Hypothesis 3: There is a significant relationship between marital transitions and well-being, such that (a) separating, divorcing and becoming widowed are associated with lower well-being, and (b) marriage is associated with higher levels of well-being, as compared with experiencing no marital transition, and these relationships are not moderated by gender (model 2)—The relationship of becoming widowed and depression almost reached statistical significance. Testing a marginally non-significant interaction, recently widowed women had slightly higher rates of depressive symptoms than widowed men ($F_{(1, 4198)} = 5.189$, $p = 0.023$, 95% CI: 0.11, 1.41). Becoming widowed was not associated with any other well-being outcome, nor was any other marital transition related to well-being. In addition, there was no other significant interaction between gender and a marital transition, thus hypotheses 3 was only partially supported.

Hypothesis 4: Time since injury is significantly related to well-being, and this relationship is moderated by marital status and marital transitions, but not gender(models 1, 2 and 3)—There were significant main effects for time since injury and life satisfaction and depression, but not for perceived health (model 1); that is, individuals generally showed improved levels of well-being over time. These effects remained significant when marital status and marital status transitions were introduced, as

well as the two-way interactions of time since injury with marital status, marital transitions and gender (model 2). In particular, there were no significant two-way interactions between time and gender on any well-being outcome, indicating that the absence of effect of time was similar for men and women. However, the main effect of time was no longer significant with the addition of three-way interactions in model 3.

With respect to marital status, time since injury was moderated by marital status such that those who were separated or divorced or married experienced an improvement in depressive symptomatology over time while those who were single had relatively stable symptomatology (est. = 0.030, SE = 0.012, df = 1826; t = −80.30, p 0.001; 95% CI: −0.99, −0.94 and est. = 0.023, SE = 0.009, df = 1903; t = −210.68, p 0.001; 95% CI: −1.99, −1.95, respectively). For those who were separated or divorced, life satisfaction increased over time, but did so to a greater degree for women than for men (est. = 0.024, SE = 0.016, df = 1797; t = −61.058, p 0.001; 95% CI: −1.00, −0.944). There were no significant three-way interactions of time, gender and marital status for depression or self-perceived health.

With respect to marital transitions and time since injury, among those who got separated or divorced, men reported a decline in self-perceived health while women reported an increase (est. = 0.097, SE = 0.047, df = 3619; t = −18.83, p 0.001; 95% CI: −1.00, −0.81). Among those who got married, men had a sharp decline in self-perceived health while women had a sharp increase (est. = −0.301, SE = 0.093, df = 3113; t = −2.68, p 0.001; 95% CI: −2.49, −2.11). Women who became a widow had a sharp decline in self-perceived health status while men who became a widower had a modest increase (est. = −0.195, SE = 0.89, df = 3277; t = −31.31, p 0.001; 95% CI: −2.98, −2.63). Overall, there was partial support for hypothesis 4.

DISCUSSION

The effect of time since injury, gender, marital status and marital transitions on the well being of adults with SCI was studied to examine the applicability of the marital resource or marital crisis models to the SCI population. Overall, our results provided far more support for the marital crisis model than marital resource model and indicate a greater number of gender differences than expected. Most notably, marital loss through separation/divorce or widowhood had the most consistent impact across well-being outcomes. In addition, marriage conferred little to no additional benefit for well being over and above being single or experiencing no change in marital status. Specifically, being married was only significantly associated with a decline in depressive symptomatology over time, irrespective of gender and similar to those who were separated or divorced compared to those who were single.

Marital dissolution or loss did not have a uniformly negative impact on well being outcomes; loss through spousal death appeared to have a greater adverse effect for women in terms of depression and self-perceived health, suggesting that the marital crisis model may have particular relevance for widows with SCI. Women who became widowed experienced greater depressive symptoms than did men, irrespective of time, and had a decline of self-perceived health across time while for widowers, self-perceived health remained relatively stable. The decline of health across time for widowed women is consistent with other research suggesting that the effect of widowhood on women's health is accounted for by a decrease in health regulation reminders that are high in marriage; the loss of a spouse results in loss of reminders, leading to poorer health.[19] It is not clear why men did not have the same decline in perceived health after the loss of a spouse as women are more likely than men to control others' health, particularly in marriage.[29] In contrast to widows, women who were separated or divorced or got separated or divorced by follow up reported an increase in

self-perceived health and life satisfaction compared to men who experienced a decline. It is possible that the specific circumstances leading to these marital transitions account for such differences. Also noteworthy is that marital transitions, but not marital status at follow up, were related to self-perceived health. This finding suggests that marital loss may have a greater association (positive or negative) with well-being than any current marital state, lending support for the marital crisis model.

Given literature supporting the advantage of marriage in health and well-being in general and for those with SCI in particular, it is most striking that our results did not provide more support of the marital resources model. In fact, most surprisingly, men who got married experienced a sharp decline in self-perceived health over time while women's rose. It is unclear whether this change after marriage is related to a shift in social roles and expectations. The work of Ross has suggested that social engagement has important implications for understanding the relationship of marital status and transitions on well-being.[14] Unfortunately, the data used for this study do not include information on social engagement, shifts in social roles or the quality of relationships. Given the impact of disability on social integration and social roles, future studies should account for such factors in addition to marital status and transitions to understand their combined effects on well being.

Unexpectedly, multiple marital transitions also were not related to any of the well-being outcomes. The lack of effect may be because this category combined sequences that may have opposite effects, such as marriage followed by divorce may have a completely different impact than divorce followed by remarriage. Future studies should use a more refined approach to multiple transitions, such as loss and then gain or gain and then loss, to examine their effects on well-being. The number of cases in any sample that undergoes these multiple transitions may limit opportunities to analyze such diverse effects, however. Finally, across all models, demographic and injury characteristics (i.e., injury level, education, employment and age at injury) remained significant contributors to well being outcomes, indicating that, above and beyond any effects of marital status and marital transitions, these characteristics are important for well being outcomes over time in this population, which has been shown in other work.[30]

Study Limitations

Perhaps the most important caveat to our findings is that the estimates of predictors were small, most below 0.5 standard deviations (all outcomes were transformed to z-scores) and many much smaller. Interpretation should be tempered by this fact; the relatively large sample size made it possible to find statistical significance for relatively minor differences. In addition, participants are not fully representative of the population of persons with SCI. Loss of contact with participants resulted in missing data which also affects the generalizability of the results. The extent to which other concurrent life changes may affect results are unknown, and there is evidence for the important role of the life course in considering the relationship of marital status, transitions and well-being.[6] Moreover, many factors that impact well being and interact with marital status and marital transitions[14] or other committed relationships and cohabitation,[31] relationship happiness, and relationship quality[14] are not included in these data.

CONCLUSIONS

The results provide support for the marital crisis model rather than the marital resource model for understanding how marital status and marital transitions are related to well being in persons with SCI. Although the results should be viewed with caution, the findings suggest that women and men can experience the effects of marital dissolution or marital gain

differently. Not all marital losses result in compromised well-being, nor does marriage necessarily enhance well-being, highlighting complex dynamics worthy of further investigation in this population.

Acknowledgments

List of Abbreviations

SCI   spinal cord injury

SR   standardized residual

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Table 1

Demographic and injury characteristics at time of injury

Characteristics	Men (n = 4,864)	Women (n = 1,277)	Test, p value; df; [95% C.I.]
Age at injury, M (SD)	37.3 (15.2)	40.7 (16.7)	$t = -3.38$, p 0.001; $df = 6139$; C.I.: −4.39, −2.37
Level/completeness of injury at inpatient discharge, n (%), SR			
Paraplegia, incomplete	898 (18.5), −1.2	283 (22.2), *2.4*	$X^2 = 27.42$, p 0.001; $df = 3$
Paraplegia, complete	1,413 (29.1), 1.7	293 (22.9), *−3.3*	
Tetraplegia, incomplete	1,627 (33.4), −1.0	480 (37.6), *2.0*	
Tetraplegia, complete	926 (19.0), 0.6	221 (17.3), −1.1	
Marital status, n (%), SR			
Single	2,393 (49.2), *2.6*	472 (37.0), *−5.1*	$X^2 = 222.83$, p 0.001; $df = 3$
Married	1,837 (37.8), −0.1	490 (38.4), 0.03	
Divorced/separated	571 (11.7), −2.0	212 (16.6), *3.9*	
Widowed	63 (1.3), *−6.0*	103 (8.1), *11.7*	
Ethnicity, n (%), SR			
Caucasian, non-Hispanic	2,934 (60.3), −1.4	869 (68.1), *2.8*	$X^2 = 44.75$, p 0.001; $df = 4$
Caucasian and Hispanic	248 (5.1), 0.2	61 (4.8), −0.4	
African American	1,285 (26.4), *2.4*	233 (18.2), *−4.7*	
Other, Hispanic	270 (5.6), 0.3	64 (5.0), −0.7	
Other, non-Hispanic	114 (2.3), −1.2	47 (3.7), *2.3*	
Education, n (%), SR			
Less than High school	1,146 (25.2), *2.3*	202 (17.2), *−4.5*	$X^2 = 41.70$, p 0.001; $df = 3$
High school	2,689 (59.1), −0.5	731 (62.1), 1.0	
Some college/College	568 (12.5), −1.6	198 (16.8), *3.2*	
Graduate degree	144 (3.2), −0.6	46 (3.9), 1.1	
Employment, n (%), SR			
Employed	3,222 (67.1), 1.8	711 (56.7), *−3.6*	$X^2 = 93.36$, p 0.001; $df = 2$
Unemployed	793 (16.5), 0.6	187 (14.9), −1.1	
Other	789 (16.4), −3.9	356 (28.4), 7.7	

Significant SR values are italicized

48.5% completed only one interview; 31.3% completed two interviews; 9.2% completed three interviews;

9.2% completed four interviews and another 1.8% completed five or more interview

Table 2

Life satisfaction

Parameter	Model 1 (Hypothesis 1)			95%CI		Model 2 (Hypothesis 2 and 3)			95% CI		Model 3 (Hypothesis 4)			95% CI	
	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Intercept	0.18	0.08	0.02	0.03	0.33	0.27	0.13	0.04	0.01	0.53	0.25	0.15	0.09	−0.04	0.55
Men[1]	−0.04	0.03	0.16	−0.10	0.02	−0.09	0.13	0.50	−0.34	0.17	−0.11	0.13	0.39	−0.38	0.15
Paraplegia, incomplete[2]	0.18	0.04	0.00	0.10	0.26	0.18	0.04	0.00	0.10	0.26	0.18	0.04	0.00	0.10	0.26
Paraplegia, complete[2]	0.06	0.04	0.09	−0.01	0.13	0.06	0.04	0.11	−0.01	0.13	0.06	0.04	0.11	−0.01	0.13
Tetraplegia, incomplete[2]	0.15	0.04	0.00	0.08	0.22	0.15	0.04	0.00	0.08	0.22	0.15	0.04	0.00	0.08	0.22
White, Hispanic[3]	−0.13	0.03	0.00	−0.19	−0.07	−0.12	0.03	0.00	−0.18	−0.06	−0.12	0.03	0.00	−0.18	−0.06
African American[3]	0.01	0.06	0.89	−0.11	0.12	0.01	0.06	0.90	−0.11	0.12	0.01	0.06	0.88	−0.11	0.12
Other, Hispanic[3]	0.03	0.06	0.56	−0.08	0.15	0.02	0.06	0.72	−0.09	0.13	0.02	0.06	0.72	−0.09	0.13
Other, non-Hispanic[3]	0.09	0.08	0.27	−0.07	0.24	0.07	0.08	0.36	−0.08	0.23	0.07	0.08	0.37	−0.08	0.22
<High school[4]	−0.15	0.06	0.01	−0.27	−0.03	−0.15	0.06	0.01	−0.27	−0.03	−0.15	0.06	0.01	−0.27	−0.03
High school[4]	−0.10	0.06	0.06	−0.21	0.01	−0.09	0.06	0.09	−0.20	0.01	−0.10	0.06	0.08	−0.20	0.01
College[4]	−0.04	0.06	0.50	−0.15	0.07	−0.03	0.06	0.58	−0.14	0.08	−0.03	0.06	0.58	−0.14	0.08
Employed[5]	0.37	0.03	0.00	0.31	0.43	0.36	0.03	0.00	0.30	0.42	0.36	0.03	0.00	0.30	0.42
Unemployed[5]	−0.17	0.02	0.00	−0.22	−0.13	−0.17	0.02	0.00	−0.21	−0.12	−0.17	0.02	0.00	−0.21	−0.13
Age at injury	−0.01	0.00	0.00	−0.01	0.00	−0.01	0.00	0.00	−0.01	−0.01	−0.01	0.00	0.00	−0.01	−0.01
Time since injury	0.03	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.03	0.04	0.02	0.02	0.25	−0.02	0.07
Widowed[6]						0.23	0.11	0.03	0.02	0.45	0.21	0.13	0.10	−0.04	0.46
Separated/divorced[6]						−0.14	0.07	0.06	−0.28	0.01	−0.26	0.09	0.00	−0.44	−0.09
Married[6]						0.07	0.06	0.30	−0.06	0.19	0.03	0.08	0.70	−0.12	0.18
Got divorced[7]						0.11	0.16	0.49	−0.20	0.42	0.20	0.18	0.26	−0.15	0.56
Got married[7]						−0.26	0.24	0.27	−0.74	0.21	−0.27	0.30	0.36	−0.85	0.31
Was widowed[7]						−0.08	0.21	0.73	−0.50	0.35	0.10	0.25	0.68	−0.38	0.59
Multiple transitions[7]						−0.05	0.10	0.60	−0.26	0.15	0.03	0.12	0.83	−0.21	0.27
Gender * Widowed						−0.15	0.15	0.33	−0.45	0.15	−0.06	0.19	0.76	−0.43	0.31

Parameter	Model 1 (Hypothesis 1)			95%CI		Model 2 (Hypothesis 2 and 3)			95% CI		Model 3 (Hypothesis 4)			95% CI	
	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Gender * Separated/div.						0.09	0.08	0.27	-0.07	0.25	*0.21*	*0.10*	*0.04*	*0.01*	*0.41*
Gender * Married						0.05	0.07	0.50	-0.09	0.18	0.06	0.08	0.50	-0.11	0.22
Gender * Got divorced						-0.11	0.18	0.55	-0.46	0.24	-0.14	0.18	0.44	-0.49	0.21
Gender * Got married						0.28	0.32	0.38	-0.35	0.91	0.25	0.32	0.44	-0.38	0.88
Gender * Was widowed						-0.07	0.25	0.78	-0.56	0.42	-0.12	0.25	0.63	-0.62	0.37
Gender * Multiple trans.						0.02	0.12	0.87	-0.21	0.25	0.00	0.12	1.00	-0.23	0.23
Gender * Time											0.02	0.01	0.13	-0.01	0.05
Widowed * Time											0.01	0.03	0.71	-0.04	0.07
Sep/div * Time											*0.05*	*0.02*	*0.01*	*0.01*	*0.08*
Married * Time											0.02	0.02	0.25	-0.01	0.05
Got divorced * Time											-0.02	0.02	0.41	-0.07	0.03
Was widowed * Time											0.01	0.05	0.79	-0.09	0.11
Got married * Time											-0.04	0.04	0.37	-0.12	0.04
Multiple transitions * time											-0.02	0.02	0.33	-0.05	0.02
Gender * Widowed * time											-0.03	0.04	0.42	-0.11	0.05
Gender * Sep/divorced * time											*-0.04*	*0.02*	*0.03*	*-0.09*	*0.00*
Gender * Married * Time											-0.01	0.02	0.72	-0.04	0.03

9,102 records were used for this analysis (7,125 male records/1,977 female records)

Note: The 3-way interaction for gender by marital transition by time was non-significant and excluded from summary table

Statistically significant estimates are in bold/italics; for interactions with p-values <0.06, post hoc testing was performed

Referents: 1= women; 2 = tetraplegia, complete; 3 = White, non-Hispanic; 4 = Graduate degree; 5 = other employment; 6 = Single and 7 = No change in marital status

Table 3

Depression

Parameter	Model 1 (Hypothesis 1)			95%CI		Model 2 (Hypothesis 2 and 3)			95% CI		Model 3 (Hypothesis 4)			95% CI	
	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Intercept	−0.03	0.09	0.72	−0.21	0.14	−0.06	0.16	0.70	−0.38	0.26	−0.17	0.19	0.38	−0.54	0.21
Men[1]	−0.18	0.03	0.00	−0.24	−0.11	−0.17	0.16	0.29	−0.49	0.14	−0.11	0.17	0.49	−0.44	0.21
Paraplegia, incomplete[2]	0.15	0.05	0.00	0.06	0.24	0.15	0.05	0.00	0.06	0.25	0.16	0.05	0.00	0.07	0.25
Paraplegia, complete[2]	0.11	0.04	0.01	0.03	0.19	0.11	0.04	0.01	0.03	0.19	0.11	0.04	0.01	0.03	0.20
Tetraplegia, incomplete[2]	0.11	0.04	0.01	0.02	0.19	0.11	0.04	0.01	0.02	0.19	0.11	0.04	0.01	0.03	0.19
White plus hispanic[3]	−0.14	0.04	0.00	−0.21	−0.07	−0.13	0.04	0.00	−0.20	−0.06	−0.13	0.04	0.00	−0.20	−0.06
African American[3]	0.02	0.06	0.73	−0.11	0.15	0.02	0.06	0.79	−0.11	0.14	0.01	0.06	0.83	−0.11	0.14
Other plus hispanic[3]	−0.12	0.07	0.10	−0.26	0.02	−0.12	0.07	0.10	−0.26	0.02	−0.11	0.07	0.11	−0.25	0.03
Other, non-hispanic[3]	0.16	0.09	0.08	−0.02	0.34	0.16	0.09	0.08	−0.02	0.34	0.17	0.09	0.07	−0.01	0.34
<High school[4]	0.29	0.07	0.00	0.15	0.42	0.27	0.07	0.00	0.13	0.41	0.27	0.07	0.00	0.14	0.41
High school[4]	0.12	0.06	0.04	0.00	0.24	0.11	0.06	0.08	−0.01	0.23	0.11	0.06	0.08	−0.01	0.23
College[4]	0.01	0.06	0.86	−0.11	0.14	0.00	0.06	0.99	−0.12	0.13	0.00	0.06	0.98	−0.13	0.12
Employed[5]	−0.25	0.04	0.00	−0.33	−0.17	−0.26	0.04	0.00	−0.34	−0.19	−0.27	0.04	0.00	−0.34	−0.19
Unemployed[5]	0.12	0.03	0.00	0.06	0.18	0.11	0.03	0.00	0.05	0.17	0.11	0.03	0.00	0.05	0.17
Age at injury	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.46	0.00	0.00
Time since injury	−0.01	0.00	0.02	−0.02	0.00	−0.01	0.00	0.01	−0.02	0.00	0.02	0.02	0.41	−0.03	0.07
Widowed[6]						−0.10	0.13	0.44	−0.36	0.16	−0.10	0.16	0.56	−0.42	0.23
Separated/divorced[6]						0.17	0.09	0.06	−0.01	0.34	0.27	0.10	0.01	0.08	0.47
Married[6]						0.06	0.08	0.44	−0.09	0.21	0.14	0.08	0.10	−0.03	0.30
Got divorced[7]						0.22	0.20	0.27	−0.17	0.60	0.17	0.24	0.48	−0.30	0.63
Got married[7]						0.12	0.29	0.67	−0.45	0.70	0.21	0.37	0.56	−0.50	0.93
Was widowed[7]						0.57	0.31	0.06	−0.03	1.18	0.44	0.38	0.25	−0.31	1.18
Multiple transitions[7]						0.05	0.13	0.70	−0.21	0.31	0.07	0.16	0.68	−0.25	0.38
Gender * Widowed						0.32	0.19	0.09	−0.05	0.69	0.32	0.19	0.09	−0.05	0.69

Parameter	Model 1 (Hypothesis 1)		95%CI		Model 2 (Hypothesis 2 and 3)			95% CI		Model 3 (Hypothesis 4)			95% CI	
	Est.	SE	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Gender * Sep/divorced					0.00	0.10	0.96	−0.19	0.20	0.01	0.10	0.89	−0.18	0.21
Gender * Married					0.02	0.08	0.81	−0.14	0.18	0.02	0.08	0.80	−0.14	0.18
Gender * Got divorced					−0.26	0.23	0.25	−0.70	0.18	−0.25	0.23	0.27	−0.69	0.20
Gender * Got married					−0.42	0.39	0.29	−1.19	0.35	−0.40	0.39	0.31	−1.18	0.37
Gender * Was widowed					*−0.67*	*0.35*	*0.06*	*−1.37*	*0.02*	*−0.68*	*0.35*	*0.06*	*−1.37*	*0.02*
Gender * Multiple trans.					0.00	0.15	0.97	−0.30	0.29	−0.01	0.15	0.96	−0.30	0.29
Gender * Time										−0.02	0.01	0.09	−0.04	0.00
Widow * Time										0.00	0.03	0.94	−0.06	0.05
Sep/div * Time										*−0.03*	*0.01*	*0.01*	*−0.05*	*−0.01*
Married * Time										*−0.02*	*0.01*	*0.01*	*−0.04*	*0.00*
Got divorced * Time										0.01	0.03	0.73	−0.05	0.07
Was widowed * Time										−0.02	0.06	0.68	−0.14	0.09
Got married * Time										0.03	0.05	0.53	−0.07	0.14
Multiple transitions * Time										0.00	0.02	0.89	−0.04	0.04

5,776 records were used for this analysis (4,491 male records/1,205 female records)

Note: Both 3-way interactions are non-significant and dropped from the analysis

Statistically significant estimates are in bold/italics; for interactions with p-values <0.06, post hoc testing was performed

Referents: 1= women; 2 = tetraplegia, complete; 3 = White, non-Hispanic; 4 = Graduate degree; 5 = other employment; 6 = Single and 7 = No change in marital status

Table 4

Self-Perceived Health

Parameter	Model 1 (Hypothesis 1)					Model 2 (Hypothesis 2 and 3)					Model 3 (Hypothesis 4)				
				95%CI					95% CI					95% CI	
	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Intercept	−0.77	0.07	0.00	−0.92	−0.63	−0.69	0.14	0.00	−0.95	−0.42	−0.43	0.19	0.02	−0.81	−0.06
Men[1]	−0.01	0.03	0.69	−0.07	0.04	−0.06	0.14	0.63	−0.33	0.20	−0.34	0.20	0.09	−0.73	0.06
Paraplegia, incomplete[2]	0.07	0.04	0.05	0.00	0.15	0.07	0.04	0.05	0.00	0.15	0.08	0.04	0.05	0.00	0.15
Paraplegia, complete[2]	0.05	0.03	0.18	−0.02	0.11	0.05	0.03	0.16	−0.02	0.12	0.05	0.03	0.13	−0.02	0.12
Tetraplegia, incomplete[2]	0.07	0.03	0.04	0.00	0.14	0.07	0.03	0.05	0.00	0.14	0.07	0.03	0.04	0.00	0.14
White, Hispanic[3]	0.21	0.03	0.00	0.16	0.27	0.21	0.03	0.00	0.15	0.27	0.20	0.03	0.00	0.15	0.26
African American[3]	0.10	0.06	0.07	−0.01	0.21	0.11	0.06	0.06	0.00	0.22	0.10	0.06	0.08	−0.01	0.21
Other, Hispanic[3]	0.07	0.06	0.18	−0.04	0.18	0.08	0.06	0.16	−0.03	0.19	0.08	0.06	0.15	−0.03	0.19
Other, non-Hispanic[3]	0.21	0.08	0.01	0.06	0.35	0.21	0.08	0.01	0.06	0.36	0.21	0.08	0.01	0.06	0.35
<High school[4]	0.42	0.06	0.00	0.31	0.54	0.42	0.06	0.00	0.30	0.54	0.42	0.06	0.00	0.30	0.54
High school[4]	0.21	0.05	0.00	0.10	0.32	0.21	0.05	0.00	0.10	0.31	0.21	0.05	0.00	0.10	0.32
College[4]	0.04	0.06	0.43	−0.07	0.15	0.04	0.06	0.46	−0.07	0.15	0.04	0.06	0.47	−0.07	0.15
Employed[5]	−0.22	0.03	0.00	−0.29	−0.16	−0.22	0.03	0.00	−0.28	−0.16	−0.23	0.03	0.00	−0.29	−0.16
Unemployed[5]	0.09	0.02	0.00	0.04	0.14	0.09	0.02	0.00	0.04	0.13	0.09	0.02	0.00	0.04	0.13
Age at injury	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.02
Time since injury	0.00	0.00	0.29	0.00	0.01	0.00	0.00	0.34	0.00	0.01	−0.06	0.04	0.10	−0.13	0.01
Widowed[6]						−0.14	0.11	0.19	−0.35	0.07	−0.08	0.12	0.54	−0.31	0.16
Separated/divorced[6]						−0.01	0.07	0.91	−0.15	0.13	0.05	0.08	0.52	−0.10	0.20
Married[6]						−0.10	0.06	0.10	−0.22	0.02	−0.06	0.07	0.37	−0.19	0.07
Got divorced[7]						0.04	0.17	0.79	−0.28	0.37	−0.61	0.26	0.02	−1.13	−0.09
Got married[7]						0.15	0.26	0.57	−0.36	0.65	0.46	0.39	0.23	−0.30	1.22
Was widowed[7]						0.11	0.22	0.61	−0.33	0.55	−0.77	0.35	0.03	−1.46	−0.09
Multiple transitions[7]						−0.07	0.11	0.55	−0.28	0.15	−0.35	0.18	0.05	−0.70	−0.01
Gender * Widow						0.19	0.15	0.21	−0.11	0.48	0.18	0.15	0.22	−0.11	0.48

Parameter	Model 1 (Hypothesis 1)			95%CI		Model 2 (Hypothesis 2 and 3)			95% CI		Model 3 (Hypothesis 4)			95% CI	
	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB	Est.	SE	Sig.	LB	UB
Gender * Separated/div.						0.04	0.08	0.63	-0.12	0.20	0.04	0.08	0.66	-0.12	0.20
Gender * Married						0.06	0.07	0.36	-0.07	0.19	0.08	0.07	0.24	-0.05	0.21
Gender * Got divorced						-0.08	0.19	0.68	-0.45	0.29	0.53	0.30	0.08	-0.05	1.11
Gender * Got married						-0.18	0.33	0.59	-0.83	0.47	*-1.00*	*0.50*	*0.04*	*-1.97*	*-0.03*
Gender * Was widowed						-0.34	0.26	0.20	-0.86	0.18	0.54	0.42	0.19	-0.27	1.35
Gender * Multiple trans.						0.02	0.13	0.85	-0.23	0.27	0.29	0.20	0.14	-0.09	0.68
Gender * Time											0.07	0.04	0.07	-0.01	0.15
Widow * Time											-0.03	0.02	0.29	-0.07	0.02
Sep/div * Time											*-0.02*	*0.01*	*0.05*	*-0.04*	*0.00*
Married * Time											*-0.02*	*0.01*	*0.00*	*-0.04*	*-0.01*
Got divorced * Time											*0.19*	*0.06*	*0.00*	*0.07*	*0.30*
Was widowed * Time											-0.11	0.09	0.22	-0.28	0.07
Got married * Time											*0.27*	*0.08*	*0.00*	*0.11*	*0.43*
Multiple transitions * Time											*0.08*	*0.04*	*0.03*	*0.01*	*0.15*
Gender * Got divorced * time											**-0.17**	**0.06**	**0.01**	**-0.29**	**-0.05**
Gender * Got married * time											**0.23**	**0.10**	**0.02**	**0.03**	**0.43**
Gender * Was widowed * time											**-0.27**	**0.10**	**0.01**	**-0.46**	**-0.08**
Gender * multiple trans. * time											-0.07	0.04	0.07	-0.15	0.01

9,434 records were used for this analysis (7,395 male records/2,039 female records)

Note: The 3-way interaction for gender by marital status by time was dropped and excluded from summary table

Statistically significant estimates are in bold/italics; for interactions with p-values <0.06, post hoc testing was performed

Referents: 1= women; 2 = tetraplegia, complete; 3 = White, non-Hispanic; 4 = Graduate degree; 5 = other employment; 6 = Single and 7 = No change in marital status