Family Satisfaction Predicts Life Satisfaction Trajectories Over the First 5 Years After Traumatic Brain Injury

Caitlin L. Johnson, J. Aaron Resch, Timothy R. Elliott, Victor Villarreal, and Oi-Man Kwok
Texas A&M University

Andrea T. Underhill
University of Alabama at Birmingham

Objectives: Examined the influence of functional impairment, stable marital status, and family satisfaction on life satisfaction trajectories for 609 individuals (435 men, 174 women) over the first 5 years after traumatic brain injury (TBI). Measures: Participants completed the Family Satisfaction Scale (FSS), Functional Independence Measure (FIM), and the Life Satisfaction Index (LSI) at years 1, 2, 4, and 5 after sustaining a TBI. Results: Trajectory modeling revealed that higher family satisfaction was associated with increases in life satisfaction for individuals with less functional impairment. Stable marital status was not significantly associated with life satisfaction trajectories. Implications: Family satisfaction appears to have pronounced beneficial effects on life satisfaction for persons with less functional impairment after TBI regardless of marital status. In contrast, a stable marriage appears to have no apparent benefits to self-reported life satisfaction over the first 5 years post-TBI. Theoretical and clinical implications of these results are discussed.

Keywords: traumatic brain injury, family satisfaction, life satisfaction, modeling

Estimates of new incidences of traumatic brain injury (TBI) have grown to 1.5 million Americans each year (Thurman, Alversson, Dunn, Guerrero, & Sniezek, 1999). With incidence peaks occurring between the ages of 15 to 24 years and above 70 years, TBI impacts a great number of young people (Testa, Malec, Moessner, & Brown, 2005). Because of improvements in health care and rehabilitation services, individuals sustaining a TBI have life expectancies that approach that of the general population (Strauss, Shavelle, & Anderson, 1998). With the increased prevalence, high occurrence in young adults, and increased life expectancies, TBI is becoming a more prominent public health issue as the direct and indirect care costs after TBI burden the individual and their families, and their communities (Dikmen, Machamer, Powell, & Temkin, 2003; Stalnacke, 2007).

The study of long-term adjustment after TBI, then, is a critical priority in rehabilitation psychology research. Of particular importance is the study of patient-oriented outcomes (such as life satisfaction and subjective well-being) as these have considerable implications for improving health and public services to promote individual quality of life (Kaplan & Frosch, 2005). Although studies of life satisfaction after TBI have understandably proliferated over the past decade, there are few clear patterns in these data. Generally, it appears that life satisfaction steadily declines over time after TBI (Dijkers, 2004; Johnston & Miklos, 2002; although there is some evidence of stability, see Corrigan, Bogner, Mysiw, Clinchot, & Fugate, 2001). Functional impairment appears to be a better predictor of life satisfaction than demographic variables (Hicken, Putzke, Novack, Sherer, & Richards, 2002; Resch et al., 2009). In contrast, injury severity has not been reliably predictive of life satisfaction (Dijkers, 2004; Johnston & Miklos, 2002; Mailhan, Azouvi, & Dazord, 2005) and its limited predictive value wanes considerably over time (Wood, 2008).

But research remains mixed about the relative contributions of other clinically important variables. There is some evidence, for example, that women may report lower life satisfaction than men after TBI (Dijkers, 2004; Farace & Alves, 2000), yet this was not replicated in a recent prospective study of life satisfaction over the first 5 years postinjury (Resch et al., 2009). Marital status has also been significantly associated with higher life satisfaction in some research (Arango-Lasprilla et al., 2008; Hicken et al., 2002; Kreuter, Sullivan, Dahllof, & Siosteen, 1998; Warren, Wrigley, Yoels, & Fine, 1996), but the implications of these findings are attenuated by the documented strain that TBI exerts on marital and other intimate relationships (Perlesz, Kinsella & Crowe, 1999; Wood, 2008).
Contemporary theories of well-being and life satisfaction posit that psychological variables may have a stronger influence on life satisfaction than life circumstances and events among people in general (Diener, Lucas, & Scollon, 2006; Frederick & Loewenstein, 1999; Lucas, 2007a). According to these models, life events (e.g., the onset of disability, winning a lottery) may have brief effects on life satisfaction, but in due time people will habituate to their ongoing, “pre-set” level of life satisfaction that previously existed. Although these models have yet to receive rigorous empirical attention in the rehabilitation psychology literature (Dunn, Uswatte, & Elliott, 2009), prospective studies of life satisfaction before and after disability indicate that people experience significant decreases in life satisfaction that do not conform to set-point models of well-being (Lucas, 2007b). Individuals who incur a TBI seem to experience moderate to large decreases in life satisfaction in the first 5 years of the injury (Resch et al., 2009) and there is little evidence of improvement over this time period (Wood & Rutterford, 2006; Wood, 2008).

Many personal, familial, and social characteristics can promote well-being despite the stress typically experienced in the wake of disability onset (Elliott, Kurylo, & Rivera, 2002; Elliott & Warren, 2007), generally, and they may be “largely responsible” for adjustment after TBI, specifically (Wood, 2008, p. 115). Indeed, recent findings confirm that self-reported personality traits (e.g., neuroticism; Rutterford & Wood, 2006) and social-cognitive beliefs (e.g., self-efficacy; Cicerone & Azulay, 2007) account for a significant degree of variance in life satisfaction above and beyond indicators of injury severity post-TBI.

To advance our theoretical and clinical understanding of life satisfaction after many life events such as TBI, we must “... clarify the individual level characteristics that promote or prevent adaptation” (Lucas, 2007a, p. 78). To further our understanding of life satisfaction after TBI, we propose that prospective designs incorporating potentially important clinical and psychologically relevant variables will be required. For example, marital status is considered a clinically important demographic variable and it is routinely examined in studies of adjustment. The relationship between marriage and life satisfaction is positive and rather robust, accounting for a small degree of variance in life satisfaction (Diener, Suh, Lucas, & Smith, 1999; Dunn & Brody, 2008; Lucas, Clark, Georgellis, & Diener, 2003). A stable marriage, then, could be significantly associated with life satisfaction in the first 5 years after the onset of TBI.

We already know, however, that other family members and significant partners can provide critical emotional, financial, and logistical support to persons with TBI (Rotondi, Sinkule, Balzer, Harris, & Moldovan, 2007). Marital status (as a discrete, demographic variable) does not convey this kind of supportive involvement from various family members, nor does it capture the changes in quality and cohesion that occur after TBI (Kosciulek, 1996; Kosciulek & Lustig, 1999). Emotional bonds between family members and the ability of family members to adapt to changes in roles, relationships, and rules in times of stress may have more influence on life satisfaction after TBI than marital status per se, and these characteristics may be assessed with appropriate instrumentation (Olson, Russell, & Spenkle, 1983).

We conducted the current study to examine the relative contributions of stable marriage and self-reported family satisfaction (with emotional bonds and adaptability; Olson et al., 1983; Olson & Wilson, 1982) on trajectories of life satisfaction over the first 5 years after TBI. In light of the conflicting evidence regarding gender differences, we also included gender in our models. To properly examine the “individual level characteristics” that may predict the trajectory of life satisfaction over time, we used multilevel modeling (MLM) techniques to study individual-level growth trends in life satisfaction within the context of functional impairment and co-varying family satisfaction over the first 5 years of TBI. The models were thus designed to take into account co-varying levels of these characteristics and the degree to which fluctuations in one could relate to fluctuations in the other. MLM techniques avoid common statistical obstructions in predicting individual trajectories in longitudinal studies such as attrition and unequal time intervals (Kwok et al., 2008). Additionally, MLM accounts for interdependencies within levels of data, accounting for more accurate standard error measurements where ANOVAs would underestimate (Kwok et al., 2008; Resch et al., 2009).

Based on prior research, we expected greater functional impairment to be associated with declines in life satisfaction over time. We also expected stable marriage and greater family satisfaction to be associated with less declines in life satisfaction trajectories.

**Method**

**Participants**

Participants of this study are a subset of a longitudinal study of adjustment after disability conducted by the Injury Control Research Center (ICRC) at the University of Alabama at Birmingham. The project studied individuals who had incurred one or more of four disabling injuries (spinal cord injury, TBI, severe burns, or intra-articular fractures of the lower extremity) and who were discharged from a sample of eight hospitals in north-central Alabama. Individuals were eligible if they (1) had an acute-care length of stay of 3 or more days; (2) resided and injured in Alabama; (3) were discharged alive from an acute-care hospital between October 1, 1989, and September 30, 1992; (4) were more than 17 years old when injured; and (5) agreed to participate in regularly scheduled telephone follow-up interviews conducted by ICRC personnel. Prospective participants were identified from acute-care medical records and were contacted at 12 months postdischarge.

Letters were sent to individuals eligible for the project that explained the study. A prepaid postcard containing a consent form was included. Individuals were contacted by ICRC personnel if they did not return the form and the study was explained in greater detail. Informed consent was then obtained over the telephone. A trained interviewer collected data from those who consented. If an individual was unavailable or could not answer questions over the phone, the person’s caretaker, spouse, or close relative were interviewed.

Of the 1,026 persons eligible for the study, 609 individuals (435 men, 174 women) with TBI consented to participate. Data on the etiology and severity of the injury, clinical characteristics, acute-care treatment, source of payment, demographic characteristics, and discharge disposition were obtained from participants’ acute-care medical records. Participant average age at time of TBI was 38.31 years (SD = 18.00 years) and men were on average significantly younger than women (35, 44, respectively). Participants...
were primarily White (n = 436; 71.6%) and 27.6% were African American (n = 168).

Reasons why the 425 additional potential participants did not participate were not recorded. Ten percent (n = 102) of eligible individuals died before the first data collection period at 1 year postdischarge. As reported in Resch et al. (2009), individuals who agreed to participate were significantly more likely to have private medical insurance and less likely to have no insurance compared to nonparticipants. The groups did not differ in terms of Medicare coverage.

Severity of TBI was assessed with the Abbreviated Injury Scale (AIS; Committee on Injury Scaling, 1985). AIS scores for each of the six body regions, including the head, were calculated through the use of ICDMAP, a computerized table that converts ICD-9-CM coded discharge diagnoses to AIS scores (MacKenzie, Steinwachs, & Shankar, 1989). The AIS is a measure of injury severity based on anatomic descriptors of the injury with ordinal values ranging from 1 (minor injury) to 6 (maximum injury, virtually unsurvivable; Committee on Injury Scaling, 1985). The majority of the current sample had injury ratings of moderate (32.7%; injury rating of 2) and serious severity (39.10% rated as 3). A minority of the sample (22.8%) had ratings indicative of a severe injury (a rating of 4).

Procedure

A trained interviewer collected the data via telephone. These interviews typically were conducted around the 12 month time period after the patient was discharged from the acute care setting. Interview data were subsequently collected at 24, 48, and 60 months postacute care discharge. Data were collected on social and demographic characteristics, rehabilitation services, other medical services, secondary complications because of the injury, overall health status, physical and psychological adjustment to disability, and rehabilitation outcomes. For purposes of this study, only information collected using the Life Satisfaction Inventory (LSI), the Functional Independence Measure (FIM), and the Family Satisfaction Scale (FSS) measures were analyzed.

Measures

Life satisfaction. The Life Satisfaction Index–A (LSI–A; Neugarten, Havighurt, & Tobin, 1961) is a 20-item instrument designed to measure psychological well-being. The LSI assesses passion for life, mood, and congruence between desired and achieved goals. Sample items include, “The things I do are as interesting to me as they ever were,” “As I look back on my life, I am fairly well satisfied,” “I am just as happy as when I was younger,” and “My life could be happier than it is now.” Each item is scored 0 or 1 with the possible total score ranging from 0 to 20. Higher scores indicate greater perceived life satisfaction while lower scores indicate dissatisfaction with life.

Lobello, Underhill, and Fine (2004) assessed the reliability and validity of the LSI–A using this same sample of 609 individuals with TBI. Reliability was assessed by examining internal consistency (coefficient α’s ranged from .85 to .92) and through the test–retest method (Pearson’s r ranged from .62 to .77). Validity was established through statistically significant positive correlations with numerous other measures that are known to assess quality of life, health status, independence, and activity level. Several other studies (e.g., Adams, 1969; Rao & Rao, 1981; Wallace & Wheeler, 2002) indicate the LSI–A is a reliable and valid instrument to measure life satisfaction.

Family satisfaction. The original Family Satisfaction Scale (FSS) was developed by Olson and colleagues (Olson & Wilson, 1982). The FSS consists of 14 items designed to measure family cohesion and adaptability, and it has been proven useful in injury outcome research (Perlesz, Kinsella & Crowe, 2000; Warren, Wrigley, Yoels, & Fine, 1996; Webb, Wrigley, Yoels, & Fine, 1995). Sample items include “how satisfied are you with your ability to say what you want in your family,” “. . . with your family’s ability to try new things,” “. . . how often you make decisions as a family, rather than individually,” and “. . . how clear it is what your family expects of you.” The 14 items are based on a Likert scale-scoring format (1 = dissatisfied, 2 = somewhat dissatisfied, 3 = generally satisfied, 4 = very satisfied, 5 = extremely satisfied) with total scores ranging from 14 to 70.

The original reliability and validity studies done by Olson and Wilson (1982) yielded an overall alpha coefficient of .92. The cohesion (α = .85) and adaptability (α = .84) coefficients were also high. The total score is recommended for research purposes (Olson & Wilson, 1982). The FSS total score has been associated in theoretically consistent directions with measures of depression (Cumsille & Epstein, 1994) and of stress, meaning of life, and coping (Lightsey & Sweeney, 2008).

For this particular longitudinal study with survivors of TBI, the FSS was modified (Underhill, Lobello, & Fine, 2004). This modification was because of two items (4 and 5) specifically reflecting satisfaction a dependent child has with parental actions. These two items were rewritten to eliminate this focus (see Underhill et al., 2004, for a complete description of the modification to these items). Despite these changes to items 4 and 5, the standardized item-to-total score correlation coefficients were .78 at 12 months and .76 at 60 months for item 4, and .69 at 12 months and .82 at 60 months for item 5 (Underhill et al., 2004). Underhill et al. found the internal consistency of the FSS to be .94 at 12 months and .95 at 60 months (Underhill et al., 2004). Further analyses indicated the FSS total score was positively associated with marital status (at 12 and 60 months), number of contacts made with non-immediate family (60 months), and the LSI–A (at 60 months). Married or widowed participants had higher FSS scores than those who were divorced or single, and participants with more contacts with non-immediate family members had higher FSS scores and the LSI–A was positively correlated with the FSS (Underhill et al., 2004).

Functional impairment. The project used the telephone version of Functional Independence Measure (FIM) (Keith, Granger, Hamilton, & Sherwin, 1987). The FIM is a self-report questionnaire used to assess the need (or lack thereof) for assistance across various functional domains. The FIM has 18 questions and implements a Likert-type rating scale. Additionally, the FIM can be broken down into two subscales that specifically address motor functioning (13 items) and cognitive functioning (5 items). All 18 items are combined to form a FIM total score with higher scores signifying functional independence and lower scores indicating impairment. The FIM scale scores ranges from 1 to 7. A score ranging from 1 to 5 means there is a need for total assistance, an inability to complete the activity despite assistance, or the need for supervision of a second person. A score of 6 means that an activity
requires an assistive device, takes an excessive amount of time to complete, or requires safety considerations. A score of 7 denotes complete independence (meaning the activity is performed safely, reasonably quick, without aids and without modifications). Reliability of the FIM for the present sample was established by measuring internal consistency (coefficient α’s ranged from .97 to .98; Resch et al., 2009).

Fischer (1976) determined that the strong ceiling effects (such as those demonstrated by the FIM scores in the present sample) could be potentially problematic in the study of rate of change occurring over time. To overcome this limitation, the FIM scores were linearized using Rasch scaling procedures (Bond & Fox, 2001; Linacre, 2003). This allowed the researchers to ensure item quality, item reliability and item stability as well as the presence of any possible item gender bias. For a more thorough description of the Rasch procedure for this particular sample see Resch et al. (2009).

Statistical Analysis

Using hierarchical linear modeling, we examined the linear growth trends of life satisfaction after TBI. Specifically, we sought to determine the influence of family satisfaction and functional independence on life satisfaction trajectories 5 years after TBI. The sample for this study is uniquely appropriate for this type of multi-level model analysis because multiple observations were collected over a 5-year period and these observations are nested within each individual participant. MLM examines the growth trajectories of each individual by examining the nested information (Raudenbush & Bryk, 2002). The multi-level linear growth modeling program in SPSS was used to analyze this data (see Kwock et al., 2008, for a more detailed explanation). All time variables were coded as 1, 2, 4, or 5 respective of year.

Analyses were conducted to estimate the growth trajectories of life satisfaction over a 5-year period using time-varying FIM and FSS scores and controlling for time-invariant covariates gender and stable marital status. This allowed us to assess the effects of family satisfaction on life satisfaction trajectories after TBI in terms of stable marital status and gender differences. We conducted a two-level model using the FIM scores, FSS scores, time, gender, and marital status to predict life satisfaction trajectories over the 5-year period. FIM and FSS scores were treated as time-variant covariates in that they are nested within an individual over multiple time measures and change over those measurement points. Gender and stable marital status (coded as 1 = remained married to the same partner across all measurement occasions, 0 = all others) were treated as time-invariant covariates because of their stable status over time, and were controlled for in the model. Thus, life satisfaction, functional independence, and family satisfaction repeated data represent level-one units presented as:

\[ LSI_t = \pi_{0i} + \pi_{1i} * Time_t + \pi_{2i} * FIM_{it} + \pi_{3i} * FSS_{it} + \pi_{4i} * FIM_{it} * Time_t + \pi_{5i} * FSS_{it} * Time_t + \pi_{6i} * FIM_{it} + \pi_{7i} * FSS_{it} + e_{iti} \]

The second level of the equation is presented as:

\[ \pi_{0i} = \beta_{00} + \beta_{0i} * Gender + \beta_{02} * Stable Married + U_{0i} \]

\[ \pi_{1i} = \beta_{10} + U_{1i} \]

\[ \pi_{2i} = \beta_{20} + U_{2i} \]

\[ \pi_{3i} = \beta_{30} + U_{3i} \]

\[ \pi_{4i} = \beta_{40} + U_{4i} \]

\[ \pi_{5i} = \beta_{50} + U_{5i} \]

\[ \pi_{6i} = \beta_{60} + U_{6i} \]

\[ \pi_{7i} = \beta_{70} + U_{7i} \]

The level-one and level-two equations combine to form:

\[ LSI_t = \beta_{00} + \beta_{0i} * Gender + \beta_{02} * Stable Married + U_{0i} + \beta_{10} * Time_t + \beta_{20} * FIM_{it} + \beta_{30} * FSS_{it} + \beta_{40} * FIM_{it} * Time_t + \beta_{50} * FSS_{it} * Time_t + \beta_{60} * FIM_{it} + \beta_{70} * FSS_{it} + \beta_{80} * FIM_{it} * FSS_{it} + \beta_{90} * FIM_{it} * FSS_{it} * Time_t + \beta_{100} * FIM_{it} * FSS_{it} * Time_t + \beta_{110} * FIM_{it} + \beta_{120} * FSS_{it} + \beta_{130} * FIM_{it} * FSS_{it} + \beta_{140} * FIM_{it} * FSS_{it} * Time_t + \beta_{150} * FIM_{it} * FSS_{it} * Time_t + e_{iti} \]

As depicted in the above equation, life satisfaction is the outcome measure (LSI) while i represents a particular participant with t representing a specific time point. Meanwhile, \( \pi_{0i} \) and \( \pi_{1i} \) and \( \pi_{3i} \) represent slope parameters that signify the rates of change over time of their respective variables and \( \pi_{00} \) represents an initial status parameter (e.g., an intercept). All significance levels for statistical analyses were set at \( p < .05 \).

Results

Table 1 depicts the marital status of respondents at each assessment occasion (by gender). For the total sample, 38 individuals who were initially married at the first assessment were known to be divorced by the final assessment. Throughout the study, 107 persons were married and 76 persons were unmarried (single). Additional marital statuses included individuals who were initially married but changed marital status (or data were missing for status) after the first assessment (109), and individuals who were initially single but changed in status.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>184</td>
<td>158</td>
<td>103</td>
</tr>
<tr>
<td>Married</td>
<td>158</td>
<td>158</td>
<td>131</td>
</tr>
<tr>
<td>Divorced</td>
<td>50</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Separated</td>
<td>18</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Widowed</td>
<td>9</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Unknown</td>
<td>16</td>
<td>81</td>
<td>146</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>39</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Married</td>
<td>58</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>Divorced</td>
<td>31</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Separated</td>
<td>10</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Widowed</td>
<td>27</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Unknown</td>
<td>9</td>
<td>37</td>
<td>59</td>
</tr>
</tbody>
</table>
Functional Impairment, Family Satisfaction, and Life Satisfaction

Modeling total FIM scores and FSS scores across all participants with the rates of change in life satisfaction, family satisfaction significantly predicted life satisfaction individually (est = .207, SE = .025, p = .000), over time (est = −.021, SE = .008, p = .011), and as an interaction with functional independence both individually (est = −.023, SE = .008, p = .050) and across time (est = .007, SE = .003, p = .005; see Table 4). In addition, scores on the measure of functional independence significantly predicted life satisfaction individually (est = 1.71, SE = .443, p = .000) and across time (est = −.273, SE = .138, p = .050). Both gender (est = .109, SE = .316, p = .729) and stable married status (est = .592, SE = .349, p = .074) were not significantly predictive of life satisfaction. There were significant interaction effects for functional independence and family satisfaction as a two-way interaction with each other (est = −.023, SE = .008, p = .004), and a three-way interaction including time (est = .007, SE = .003, p = .005).

To best demonstrate result patterns, the significant effects are depicted graphically in Figure 1. This figure presents hypothetical models representing and individual with “high” scores that are 1 SD above the mean score for the sample and “low” scores that are 1 SD below the mean score for the sample on all measures in the equation composing the figure.

Higher family satisfaction is associated with higher life satisfaction overall, holding all other variables constant. However, the significant interaction between time and family satisfaction reveals that the effect of family satisfaction on life satisfaction is moderated by time, as life satisfaction decreases over time for most people in the sample. Furthermore, the significant family satisfaction X functional impairment interaction (and the significant three-way interaction with time) indicates that the relationship of family satisfaction to life satisfaction is moderated by the functional impairment of the individual. As displayed in Figure 1, persons with less functional impairment and high family satisfaction experienced significant gains in life satisfaction over time. Life satisfaction trajectories for individuals with less functional impairment and low family satisfaction remained relatively constant over the 5-year period. In contrast, individuals with high functional impairment decreased in life satisfaction over time, independent of family satisfaction. Interestingly, the decrease in the life satisfaction trajectory was steepest for individuals who had greater functional impairment and who reported higher family satisfaction.

Discussion

In contrast to previous prospective examinations of life satisfaction and TBI (e.g., Resch et al., 2009), the results of the present study indicate that certain individuals may experience positive gains in life satisfaction after TBI onset, and these gains may be apparent in the first few years of living with TBI. Family satisfaction may be related to increases in life satisfaction in the first few years after acquired brain injury, although this relationship may be confined to certain conditions: specifically, to individuals who report few functional impairments (as measured by the FIM) and who report high levels of family satisfaction. Moreover, this interaction was observed in the context of gender and stable marital status, indicating that the effect of

Table 3
Means and SDs for Self-Report Outcome Measures by Time

<table>
<thead>
<tr>
<th>Measurement time</th>
<th>FIMTot (Rasch)</th>
<th>FIMTot (raw)</th>
<th>LSI</th>
<th>FSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.80</td>
<td>114.17</td>
<td>11.71</td>
<td>53.49</td>
</tr>
<tr>
<td>2</td>
<td>2.24</td>
<td>25.27</td>
<td>4.67</td>
<td>12.31</td>
</tr>
<tr>
<td>3</td>
<td>2.84</td>
<td>114.50</td>
<td>11.50</td>
<td>59.73</td>
</tr>
<tr>
<td>4</td>
<td>2.17</td>
<td>22.83</td>
<td>5.39</td>
<td>13.20</td>
</tr>
<tr>
<td>5</td>
<td>2.99</td>
<td>115.00</td>
<td>11.77</td>
<td>59.08</td>
</tr>
<tr>
<td>Overall*</td>
<td>2.94</td>
<td>114.79</td>
<td>11.62</td>
<td>53.67</td>
</tr>
<tr>
<td></td>
<td>2.12</td>
<td>22.23</td>
<td>5.07</td>
<td>12.59</td>
</tr>
</tbody>
</table>

* Overall indicates total observations across all measurement points. FIMTot = FIM total score; LSI = Life Satisfaction Index total score.

Table 4
Estimates of Fixed Effects for FIM, Family Satisfaction, and Time on Life Satisfaction (N = 609)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>SEM</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>−8.15426</td>
<td>1.356413</td>
<td>.548</td>
</tr>
<tr>
<td>Time</td>
<td>−8.15426</td>
<td>.443673</td>
<td>.074</td>
</tr>
<tr>
<td>FIM</td>
<td>1.710333</td>
<td>.443418</td>
<td>.000</td>
</tr>
<tr>
<td>Female</td>
<td>.109313</td>
<td>.315585</td>
<td>.729</td>
</tr>
<tr>
<td>Stable marriage (over time)</td>
<td>.592173</td>
<td>.349478</td>
<td>.091</td>
</tr>
<tr>
<td>Family</td>
<td>.207731</td>
<td>.025306</td>
<td>.000</td>
</tr>
<tr>
<td>FIM * Time</td>
<td>−.272999</td>
<td>.138864</td>
<td>.050</td>
</tr>
<tr>
<td>Family * Time</td>
<td>−.021288</td>
<td>.008392</td>
<td>.011</td>
</tr>
<tr>
<td>Family * FIM</td>
<td>−.022829</td>
<td>.007986</td>
<td>.004</td>
</tr>
<tr>
<td>Family * FIM * Time</td>
<td>.007167</td>
<td>.002573</td>
<td>.005</td>
</tr>
</tbody>
</table>

Note. FIM = Functional Independence Measure total score; Family = Family Satisfaction Scale score.

Number of Observations for Measures

<table>
<thead>
<tr>
<th>Measurement occasion</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIM</td>
<td>LSI</td>
</tr>
<tr>
<td>Time 1</td>
<td>580*</td>
</tr>
<tr>
<td>Time 2</td>
<td>492</td>
</tr>
<tr>
<td>Time 3</td>
<td>403</td>
</tr>
<tr>
<td>Time 4</td>
<td>328</td>
</tr>
</tbody>
</table>

* Although the total number of participants was 609, not all of the participants completed a measure at Time 1. However, because of the properties of MLM all participants completing measures on at least 1 time period are included in the analyses.
family satisfaction on life satisfaction trajectories may occur independent of marital status and regardless of participant gender.

These results are consistent with dynamic models of adjustment after disability (e.g., Elliott & Warren, 2007), providing evidence that positive elements of a person’s social and environmental sphere (such as family satisfaction) can exert a beneficial influence on personal well-being after disability. These findings are among the first to demonstrate conditions under which gains in life satisfaction after TBI may occur in the first 5 years after the onset of injury.

The present study implies that marital status has very little explanatory power in understanding life satisfaction after TBI. Although marriage has been moderately associated with well-being among people in general (Lyubomirsky, Sheldon, & Schkade, 2005) and presumably it has similar associations among people with disabilities (Dunn et al., 2009), these beneficial effects may be tempered by an individual’s “chronic level of happiness” (Diener et al., 2006; Lyubomirsky et al., 2005) and by certain stressful life events (Lucas, 2007b). Subjective evaluations of family satisfaction, as measured by the FSS and as described by the circumplex model (Olson et al., 1983), seem to have greater currency than marital status in predicting life satisfaction post-TBI for men and women. Reasoning from the circumplex model, it appears that families that remain cohesive and flexible may facilitate a greater sense of life satisfaction among individuals with less functional impairment (as measured by the FIM) in the years after the onset of TBI.

Functional impairment, in contrast, appears to be a rather stable and significant predictor of life satisfaction trajectories after TBI (Resch et al., 2009). In their review of factors predictive of sustainable change in well-being among people in general, Lyubomirsky et al. (2005) noted that “circumstantial” factors account for a relatively small amount of variance in well-being (roughly 8 to 15%; p. 117), and they construed marital status as an example of a circumstantial factor. Furthermore, Lyubomirsky et al. argue that intentional activities (ones that behavioral, volitional, and cognitive) account for a greater degree of variance in chronic levels of happiness and well-being (as much as 40%). Dunn et al. (2009) assert that rehabilitation psychology may have its greatest impact on well-being after disability in the realm of behavioral, volitional, and cognitive activities, and ideally, the rehabilitation enterprise has this effect.

Collectively, the results of the present study and the previous one from this database (Resch et al., 2009) indicate that functional abilities have considerable and detrimental effects on life satisfaction among community-residing persons with TBI. Other evidence also indicates that restrictions in participation can account for 17% of the variance in life satisfaction reported by persons with TBI (Pierce & Hanks, 2006). Consequently, community and home-based efforts to offset the negative effects of functional impairments (and to increase behavioral, volitional and cognitive activities, generally) may be required to promote the well-being and life satisfaction of persons living with TBI.

These data, then, may lend support for programs designed specifically for individuals with TBI and their families in the community. Individuals who live with greater functional impairment after TBI and their families may require ongoing surveillance and support that can
be responsive to the immediate and pressing needs they experience in the home and in the community to maintain optimal levels of adjustment.

The current sample includes participants who were not treated at a Model Systems site. The average age of the sample was slightly higher (38.31) than the average age reported in the TBI Model Systems database (35.6; Corrigan et al., 2007); the percentage of women in the present sample (28.6%) is very similar to that observed in the Model Systems project (27.8%; Corrigan et al., 2007). Injury severity ratings obtained by the AIS indicate that the percentage of severe injuries in the present study (moderate injury, 32.7%; serious, 39.10%; severe, 22.8%) was less than that observed in the Model Systems database (moderate, 20.2%; serious, 16.4%; severe, 51.3%; Corrigan et al., 2007). Unlike the assessment procedure in the Model Systems project, the first assessment in the current study was conducted 1 year after injury onset, not during or immediately after discharge from an inpatient rehabilitation facility. The present sample may differ on several other dimensions from samples often employed in studies from the Model Systems database; therefore, the degree of generalizability of our results may be limited. Other prospective research using modeling techniques is warranted to understand the nature of family satisfaction to positive adjustment after TBI.

The study is also limited by a reliance on self-report measures and a lack of detailed neuropsychological data concerning the extent of injuries experienced by each participant. Other variables germane to life satisfaction after TBI were not investigated, and the impact of these and other unmeasured characteristics may have greater influence on life satisfaction than the measure of family satisfaction used in the project. For example, substance abuse has been significantly associated with lower life satisfaction after TBI (Corrigan et al., 2001). Our reliance on self-report in this study is consonant with a positive psychology perspective that emphasizes subjective states and individual processes (Dunn et al., 2009; p. 652) and respects how an individual may “... appraise, explain and draw meaning for their experiences” (p. 655). It is also congruent with the premium rehabilitation psychology research traditionally places on the subjective experience of individuals who live with disability (e.g., the “insider” perspective; Dunn et al., 2009). Nevertheless, we do not know the degree cognitive problems may have influenced participant responses to the self-report measures. This is an ongoing conundrum in the study of personal adjustment after TBI, generally (Dijkers, 2004), but to our knowledge, there remains little to “... no evidence that assessments of function and [quality of life], based on surveys of persons with TBI in the community are significantly less valid or reliable than reports from other individuals” (Johnston & Miklos, 2002; p. S33). This remains an issue for future empirical study.

Finally, our reliance on the FSS as a unifactorial indicator of family satisfaction may provide a convenient oversimplification of the circumplex model of family systems for research purposes (Olson & Wilson, 1982). Other evidence indicates that family systems can experience considerable changes in interpersonal dynamics, roles, and functions in response to TBI, and the circumplex model offers insights into strategic interventions for working with these families (Kosciulek & Lustig, 1999; Kosciulek, 1996). Our data complement this conceptualization and present additional information about the influence of family satisfaction (and adaptability and cohesion) on outcomes after TBI.

References


