Social problem-solving abilities, relationship satisfaction and depression among family caregivers of stroke survivors

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(Received 27 August 2008; revised 26 November 2008; accepted 30 November 2008)

Abstract
Primary objective: To examine the prospective relation of caregiver problem-solving abilities and relationship satisfaction to caregiver depression 1 month following care recipient discharge from an inpatient stroke rehabilitation facility.
Research design: Correlational, prospective design.
Methods and procedures: Participants included 39 women (average age = 51.47, SD = 20.59) and four men (average age = 42.50, SD = 5.57) assuming caregiver roles for persons discharged from stroke rehabilitation.
Main outcome measure: The Beck Depression Inventory was the outcome measure at discharge and 1 month later.
Results: Caregivers experienced a significant decrease in depression scores between the discharge and 1-month assessments. Lower relationship satisfaction and dysfunctional problem-solving abilities were independently and significantly predictive of depression scores at discharge. Dysfunctional problem-solving abilities were indirectly predictive of depression 1 month later.
Conclusions: Dysfunctional problem-solving abilities and low relationship satisfaction are associated with caregiver depression, but dysfunctional problem-solving abilities maintain an indirect association with depression over 1 month. Implications of these findings for developing problem-solving training programmes for caregivers post-discharge are discussed.

Keywords: Stroke, caregivers, problem solving, relationship satisfaction, depression

Introduction
Strokes are the leading cause of adult disability in the US. Since many survivors are left with mental and physical difficulties after a stroke, these individuals often require assistance with daily needs and functioning. The National Center on Caregiving Responsibilities [1] reports that family caregivers provide ~75% of care to stroke survivors above and beyond any assistance that may be provided by a formal agency. Indeed, family caregivers probably constitute the ‘...largest group of health providers’ in the US [2] and the market value of their work exceeds that spent on formal health and nursing home care [3]. Nevertheless, family caregivers experience considerable difficulties with their emotional and physical health [4] and these problems may be pronounced among caregivers of persons with neurological diseases such as stroke [5]. Despite the essential role family caregivers assume in the health and well-being of stroke survivors, effective support programmes for community-residing caregivers that address their unique and dynamic concerns [8]. Although several interventions have been studied among caregivers of...
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stroke survivors, this research has been limited by a lack of theory-driven models that take into consideration caregiver characteristics that may influence adjustment and examine testable propositions that can advance available knowledge [9].

There is considerable evidence that some caregivers are at greater risk for distress over time and many of their characteristics may be apparent early in the caregiver career. For example, individuals who report a dissatisfying relationship with the care recipient prior to the disability are more likely to experience greater burden, distress and resentment than caregivers who report a greater satisfaction with their relationship [10–12]. Caregivers of persons with stroke may be at risk for unintentional injuries—such as falls, cuts, scrapes, bruises—that range from minor to potentially serious [13]. There may be emotional consequences for care recipients as well. Some research indicates that the nature of spousal interactions is directly correlated with the functional abilities in stroke survivors [14].

Although these data provide important insights into the interpersonal dynamics of the caregiver experience, they offer little direction for developing theory-based interventions and services for family caregivers, generally. Studies of caregiver adjustment that are guided by the theoretical model of social problem-solving abilities have been particularly encouraging, because the model posits clear directives for cognitive-behavioural interventions that have effectively lowered distress among caregivers of persons with stroke [15], traumatic brain injury [16, 17], spinal cord injuries [18, 19] and among mothers of children with cancer [20]. Caregivers who have ineffective problem-solving styles are at risk for clinical levels of depression [21, 22] and their care recipients are at risk for preventable secondary complications [23].

Effective problem-solvers report greater benefits from social relationships [24] and display more interpersonal skills [25, 26] critical to community integration [27] than ineffective problem-solvers. Preliminary evidence suggests that effective problem-solving abilities may be associated with better family functioning and fewer family conflicts through its beneficial associations with empathy [28]. Unfortunately, one has yet to study caregiver problem-solving abilities and the level of satisfaction with their relationship with a care recipient as these factors pertain to caregiver adjustment over time.

The present study examined the prospective associations between caregiver problem-solving abilities, relationship satisfaction with the care recipient and caregiver depression as a family member received services in an inpatient stroke rehabilitation programme and returned for outpatient services 1 month later. This 1-month window following stroke rehabilitation is considered one of the most stressful times for caregivers as they adjust to new roles and routines and as the limitations of the stroke survivor become obvious in the home environment [29]. To control for the probable associations among the predictor variables with the two indicators of caregiver depression, this study relied on statistical procedures that would take into account the contextual relations among these variables [30]. Specifically, this study tested the theoretical assumption that effective problem-solving abilities would be prospectively associated with lower depression, regardless of the quality of relationship satisfaction and the extent of care recipient disability.

Method

Participants

Participants included 39 women (average age = 51.47, SD = 20.59) and four men (average age = 42.50, SD = 5.57) who were caregivers of stroke survivors and recruited from a rehabilitation hospital in Philadelphia, PA and another in Institute, WV. Caregivers of individuals diagnosed with CVAs and other neurological illnesses that result in similar, progressive, cognitive and motor deficits were also approached to participate. Individuals were invited to participate if (a) they were new to the caregiving role and (b) were family members who provided services for the care recipient in their home. Of those individuals that were approached to participate, three individuals declined.

The sample included 37 Caucasians and six African-Americans. Participants averaged 12.35 years of formal education (SD = 2.76): 79.4% had a high school diploma, 5.9% had bachelor’s degrees, 5.9% had master’s degrees and 8.8% had more than two graduate degrees. Twenty caregivers were spouses of the care recipient (mean age = 64.79, SD = 10.44), 15 were adult children (mean age = 29.20, SD = 6.25), one was a parent (age = 67) and seven were classified as being in ‘other relationships’ (e.g. siblings, cousins (mean age = 55.71, SD = 20.06)). Most caregivers were married (58.1%), 23.3% were single, 7.0% were widowed and 11.6% had other situations (e.g. divorced). Participants averaged 9.44 daily caregiving hours (SD = 7.18) post-discharge.

All participation was voluntary and participants were informed that all of their responses would be held in strict confidence. Informed consent was explained to all participants and appropriately obtained before data collection began. Participants were informed of the sensitive nature of some of the questions (e.g. emotional status) prior to giving consent.
Measures

Social problem-solving abilities. The Social Problem-Solving Inventory-Revised (SPSI-R) [31] is a 52-item self-report measure of social problem-solving abilities. Respondents rate questions on a 5-point Likert-type scale ranging from not very true of me (0) to extremely true of me (4). Higher scores represent more effective problem-solving abilities. The SPSI-R is based on a five-dimensional model of problem-solving and includes five scales [31]. Two of the SPSI-R scales measure problem orientation dimensions: Positive Problem Orientation and Negative Problem Orientation. The remaining three scales are considered problem-solving skills scales: Rational Problem-Solving, Impulsive/Careless Style and Avoidant Style.

Scales on the SPSI–R have shown high reliability (ranging from 0.69–0.93) and they have been moderately correlated in theoretically consistent directions with other external measures of psychological distress and well-being [31]. Criterion-referenced validity has been found in significant correlations with relevant scales on the Problem-Solving Inventory [32] and with other theoretically related constructs as stress, somatic symptoms, anxiety, depression, hopelessness and suicidality [31]. The SPSI–R scales have been predictably associated with self-esteem, life satisfaction, extraversion, social adjustment and social skills [33].

Consonant with contemporary notions of social problem-solving measurement, this study examined separate constructs of constructive and dysfunctional problem-solving styles [34]. The two positive measures (positive orientation, rational problem-solving skills) were summed to obtain an index of a constructive problem-solving style (CPS) and the three negative measures (negative orientation, impulsive/carelessness, avoidant style) were summed to form an index of a dysfunctional problem-solving style (DPS). Confirmatory, exploratory and principal component factor analyses with different samples have supported this conceptualization [35–37]. Higher scores on these two variables (CPS, DPS) indicate greater propensity for each dimension.

Relationship satisfaction. Relationship satisfaction was assessed with a 5-point Likert-type scale that was not relationship-specific to accommodate the responses of parents and adult children who might assume the caregiver role. Caregivers were asked to rate the level of satisfaction that most accurately describes their relationship with the care recipient, ranging from 1 (very dissatisfied) to 6 (very satisfied). This item was developed for use in the current study with caregivers who would vary considerably in formal relationship status (married, adult child, etc.) with a care recipient; therefore, no psychometric data were previously available.

Functional disability. Care recipient functional disability of stroke survivors is associated with caregiver distress [38]. The Functional Independence Measure (FIM) [39] was used to assess care recipient disability. Items on this instrument assess self-care (i.e. eating, grooming, bathing, dressing-upper, dressing-lower and toileting), sphincter control (bladder, bowel), transfers (bed/chair/wheelchair, toilet, tub/shower), locomotion (walk/wheelchair), communication (i.e. comprehension, expression) and social cognition (social interaction, problem-solving, memory). These items are individually rated on a 7-point Likert type scale and are referred to as FIM Levels. The rating scale is as follows: 1 = total assistance or not testable, 2 = maximal assistance, 3 = moderate assistance, 4 = minimal assistance, 5 = supervision, 6 = maximal assistance, 7 = complete independence. These ratings were collected collaboratively by the care recipient’s multidisciplinary treatment team immediately prior to discharge. No other stroke survivor data were collected.

Caregiver depression. The Beck Depression Inventory (BDI) [40] was used to assess caregiver depression. The BDI is a 21-item questionnaire measuring cognitive, somatic and behavioural symptoms of depressive behaviour. Each item is rated on a 4-point scale, with higher scores indicating a more intense display. The BDI has demonstrated adequate internal consistency ($\alpha = 0.86$) and adequate construct validity with inpatient psychiatric populations [41]. Substantive data indicate that the BDI has an adequate internal consistency (0.84) and its correlations with other depression measures range from 0.54–0.68 [42].

Procedure

Caregivers were recruited prior to discharge. At the end of the care recipient’s inpatient stay, caregivers were scheduled to attend all therapies with the patient for the purpose of education and training for their new role. The present study recruited caregivers to fill out the SPSI-R and the BDI within a week of their attendance in an inpatient rehabilitation programme. The Functional Impairment Measure (FIM) was completed by the medical team during this time. Care recipients returned to an outpatient clinic within the same facility for a medical follow-up 1 month after discharge. While waiting for the appointment, participating caregivers...
completed the BDI. Individuals who did not attend this appointment were contacted by telephone and completed the measures while speaking with a research assistant.

Data analysis

Pearson r correlation coefficients and t-tests were calculated to examine relationships between the self-report variables and demographic characteristics. Paired t-tests were conducted to examine possible changes in the BDI scores from discharge to the 1-month follow-up.

A path model was created and tested with AMOS 7.0 to examine the direct influence of constructive problem-solving, dysfunctional problem-solving, relationship satisfaction and functional impairment of the stroke survivor on caregiver depression at discharge and at the 1-month follow-up assessment. A path model was utilized because it is a confirmatory (i.e. hypothesis testing) analysis that examines direct and indirect influences of measured variables on other measured variables [43, 44] and it was best suited for analysing hypothesized relationships between the variables under investigation. The theoretically-derived a priori model, displayed in Figure 1, was first analysed by treating all variables as observed (measured) variables. This model theoretically assumed that social problem-solving abilities—represented by the constructive and dysfunctional constructs—would be predictably associated with relationship satisfaction and significant paths would flow from each of the predictor variables to depression measured at discharge. This model included the functional impairment of the stroke survivor to test the relative contributions of the psychological constructs to caregiver depression in the context of disability severity. Recommended statistics were used to determine the fit of the path model for the data, including the root-mean square error of approximation (RMSEA) and the comparative fit index (CFI) [45].

To further examine possible mediation effects between variables a macro for SPSS 15.0 by Preacher and Hayes [46] was utilized. The macro computed bootstrap confidence intervals with 10 000 iterations through multiple regression analysis. Bootstrap confidence intervals were used to determine significance of mediated effects over normal theory with p-values because they lack the power to detect a true mediation effect [47]. The Bootstrap analysis was also used because it is appropriate for testing models with smaller sample sizes [48, 49]. Bootstrapping, also referred to as resampling, removes individual scores in a random fashion, conducts a reanalysis of the remaining dataset and this is repeated in subsequent iterations. Each individual score has an equal possibility of being drawn for the bootstrap sample at each iteration and it is possible for an individual’s score to be drawn multiple times or not at all throughout the process [44, 50]. The bootstrap is used to create confidence intervals around the mean of the variable being resampled [50]. Bootstrapping is a computer intensive procedure because it is logistically difficult to conduct without specialized computer software [51]. Without the benefit of collecting a new

![Figure 1. A priori model of caregiver problem-solving abilities, relationship satisfaction and depression.](image-url)
data set, bootstrapping may be the closest approximation to external replicability when limited to one data set [44].

**Results**

Caregiver age was not significantly correlated with either dysfunctional or constructive problem-solving style, nor did it significantly correlate with caregiver depression scores at discharge or at the follow-up visit. There were no significant differences in BDI scores (at discharge and follow-up), relationship satisfaction or the problem-solving scores as a function of caregiver gender. Years of formal education among caregivers was significantly correlated with depression at discharge (0.33; \( p < 0.05 \)) but not with depression at the follow-up visit. Relationship status was unrelated to depression at discharge and at the follow-up visit. Caregiver depression scores decreased significantly from discharge to the 1-month follow-up assessment, \( r(42) = 5.08, \ p < 0.05 \). Table I presents the means, standard deviations and correlations for all variables used in subsequent analyses.

Fit statistics for the theoretically-derived model indicate a poor fit for the data, \( \chi^2(8) = 55.43, \ p < 0.01 \) (RMSEA = 0.38, CFI = 0.44). Consequently, the paths of the initial model were refitted to develop and test an empirically-derived model.

The corrected model (see Table II) excluded path coefficients between the exogenous variables that were not statistically significant. The corrected model—depicted in Figure 2—was constructed with six observed variables including four exogenous variables (dysfunctional problem-solving, constructive problem-solving, functional impairment, relationship satisfaction) and two endogenous variables of depression (discharge, 1-month follow-up). This empirically-derived model provided a good fit to the data, \( \chi^2(9) = 3.96, \ p = 0.91 \) (RMSEA = 0.0, CFI = 1.0). Dysfunctional problem-solving and greater functional impairment were significantly predictive of greater depression at discharge (\( p < 0.01 \)). Additionally, lower relationship satisfaction was significantly predictive of higher caregiver depression at discharge (\( p < 0.01 \)).

Although dysfunctional problem-solving and constructive problem-solving were significantly related as expected (\( –0.84, \ p < 0.01 \)), constructive problem-solving was not significantly associated with relationship satisfaction. Therefore, the path between constructive problem-solving and relationship was eliminated from the final model. Finally, caregiver depression at discharge was significantly associated with depression scores at the 1-month follow-up assessment, as initially expected (0.51, \( p < 0.01 \)).

All possible indirect effects on depression 1 month later were tested with a bias-corrected bootstrap method with 10 000 iterations on SPSS 15.0 with a macro program developed by Preacher and Hayes [46]. Procedures for evaluating mediational effects were observed [52]. Bootstrapping results computed a bias-corrected 95% confidence interval (CI) to indicate a statistically significant indirect effect between dysfunctional problem-solving on follow-up depression, mediated by depression at discharge, \( F(9, 42) = 0.42, \ CI(0.020, 0.265) \). Consequently, a dysfunctional problem-solving style was indirectly predictive of caregiver depression at the 1-month follow-up assessment. Higher dysfunctional

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CPS</td>
<td>–</td>
<td>–0.84*</td>
<td>–0.33*</td>
<td>–0.29</td>
<td>–0.23</td>
<td>0.10</td>
<td>60.07</td>
<td>16.29</td>
</tr>
<tr>
<td>2. DFS</td>
<td>–</td>
<td>0.49*</td>
<td>–0.34*</td>
<td>0.28</td>
<td>–0.17</td>
<td>31.14</td>
<td>15.55</td>
<td></td>
</tr>
<tr>
<td>3. Depression discharge</td>
<td>–</td>
<td>0.04</td>
<td>0.47*</td>
<td>0.34*</td>
<td>8.51</td>
<td>3.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Relation satisfaction</td>
<td>–</td>
<td>0.09</td>
<td>–0.06</td>
<td>5.72</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Depression follow-up</td>
<td>–</td>
<td>0.11</td>
<td>5.02</td>
<td>4.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. FIM</td>
<td>–</td>
<td>82.19</td>
<td>19.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

\* \( n = 43 \). CPS = Constructive problem-solving style (observed range 28–90), DPS = Dysfunctional problem-solving style (observed range 8–71). Depression Discharge = Beck Depression Inventory at Discharge (observed range 0–19), Relation Satisfaction = Relationship Satisfaction (observed range 4–6), Depression Follow-up = Beck Depression Inventory at Follow-up visit (observed range 0–14), FIM = Functional Independence Measure (observed range 46–111).

Table II. Maximum likelihood estimates of corrected model.

<table>
<thead>
<tr>
<th>Path</th>
<th>Unstandardized estimate</th>
<th>Standardized estimate</th>
<th>SE</th>
<th>Critical ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIM → BDI1***</td>
<td>0.10</td>
<td>0.44</td>
<td>0.023</td>
<td>4.30</td>
</tr>
<tr>
<td>DPS → BDI1***</td>
<td>0.17</td>
<td>0.63</td>
<td>0.030</td>
<td>5.74</td>
</tr>
<tr>
<td>RELSAT → BDI1***</td>
<td>2.30</td>
<td>0.28</td>
<td>0.019</td>
<td>2.51</td>
</tr>
<tr>
<td>BDI1 → BDI2***</td>
<td>0.56</td>
<td>0.49</td>
<td>0.152</td>
<td>3.68</td>
</tr>
</tbody>
</table>

DPS = Dysfunctional problem solving; FIM = Functional impairment; RELSAT = Relationship Satisfaction; BDI1 = Depression at discharge; BDI2 = Depression at follow-up.

\* \( p < 0.05 \), ** \( p < 0.01 \), *** \( p < 0.001 \).
Problem-solving styles were associated with higher depression scores at discharge and they were significantly associated with higher depression scores at the follow-up assessment through its association with depression at discharge. The model fit statistics provide a good estimation of effect sizes [53].

**Post-hoc analyses**

The significant decrease in scores on the Beck Depression Inventory from the discharge to 1-month follow-up assessment raised some concerns about the rates of clinical levels of depression in this sample. Following recommendations for determining clinical significance for determining depression severity from the BDI [54], persons with scores 10 and higher were classified as having a greater likelihood of mild-to-severe depression. Using this scheme, 44% of the sample at discharge could be classified as having symptoms associated with mild-to-severe symptoms of depression (19 out of 43). However, only 16% of the sample at the 1-month assessment met operational criteria for determining clinically significant levels of depression (seven out of 43).

**Discussion**

These results are generally consistent with other prospective studies of family caregivers of persons with spinal cord injury [55] and of stroke survivors [56]. A dysfunction problem-solving style was directly associated with caregiver depression at the time the care recipient was discharged from inpatient rehabilitation and it maintained a significant association with depression scores 1 month after their return to the community. Unique to the current study is the additional insight into the contributions of these associations in the context of the caregiver-care-recipient relationship. Problem-solving abilities were not meaningfully associated with relationship satisfaction and dysfunctional problem-solving styles remained independently predictive of caregiver depression. Although lower relationship satisfaction was significantly predictive of higher caregiver depression at discharge, there were no apparent indirect effects from relationship satisfaction to caregiver depression 1 month later. The predictive associations of dysfunctional problem-solving styles and relationship satisfaction to caregiver depression were independent of the degree of stroke survivor functional impairment.

Social problem-solving abilities may be associated with a variety of interpersonal and relationship skills (e.g. empathy, assertiveness), but they remain important predictors of caregiver adjustment over time regardless of the quality of the caregiver-care-recipient relationship. It should be noted that the current caregiver sample reported a significant

![Figure 2. Empirically-derived model of caregiver problem-solving abilities, relationship satisfaction and depression.](#)
decline in depression in the month following discharge of the care recipient from the inpatient rehabilitation programme. This decline imposed a more conservative test for the \textit{a priori} model, in contrast to the observed experiences of other caregivers in other disability scenarios (e.g. spinal cord injury) [55]. The restricted range in the BDI scores from discharge to the 1-month assessment may have attenuated the predictive potential of the relationship satisfaction variable.

The functional disability scores for the stroke survivors in the current sample were in the mild impairment range. Many were cognitively intact and experienced few physical limitations. Therefore, it is likely that the resulting caregiver depression may not be as overwhelming compared to those living with someone requiring more continuous care and monitoring. This may account in part for the low sub-clinical rates of depression among caregivers 1 month following discharge. At discharge, the rate of depression in the current sample of stroke caregivers was comparable with that observed in other studies of family members assuming care for a stroke survivor (44% in the present study compared to 37% and 38%) [21, 57].

Interestingly, dysfunctional problem-solving styles were particularly important in the prediction of depression, as measured by the BDI. Constructive problem-solving styles—deemed essential in problem-solving training [33] and theoretically pivotal as a motivational factor in effective problem-solving [34]—did not significantly contribute to either model. Dysfunctional styles are consistently associated with self-report measures of adjustment and constructive styles have emerged as significant predictors in studies involving larger samples and in studies using observational measures of criterion variables [58]. The exact implications of these patterns are uncertain, but collectively they suggest that we have yet to fully appreciate how problem-solving styles influence optimal outcomes [58].

There are several limitations to the present study that temper the implications of the results. The sample size was rather small and the majority of participants were Caucasian. Generalizations from the results to other samples, generally, and to people from ethnic and minority backgrounds, specifically, are limited. A brief, one-item measure of relationship satisfaction was used in this study. Future work should examine the problem-solving and relationship satisfaction association with established, psychometrically-sound instruments of relationship satisfaction. The Beck Depression Inventory is sensitive to mood state and distress in general, so it is imprudent to equate elevated Beck scores with clinical depressive syndromes.

Despite these limitations, results of the present study are consistent with prior research of social problem-solving abilities among family caregivers. The first month following discharge from stroke rehabilitation is a time of considerable stress for families [29]. There is little evidence that basic educational programmes for caregivers are effective [6], but these may be supplemented by problem-solving principles. Home-based problem-solving interventions have been effective in lower distress among caregivers of children with brain injuries [17, 59] and to adults with brain injuries [16]. Problem-solving training programmes can be successfully provided to family caregivers of stroke survivors in the first month following rehabilitation [15]. However, the present study indicates that caregivers of stroke survivors may experience considerable distress prior to discharge from inpatient rehabilitation. Therefore, caregiver preparation programmes that provide training in problem-solving strategies might benefit caregivers during the inpatient stay. Follow-up sessions may then be provided to caregivers via telephone following their return to the community. Developing a partnership with the caregiver prior to discharge from inpatient rehabilitation has been a feature of randomized clinical trials that have supported the use of problem-solving training [15, 18]. In this model, preparation programmes may help alleviate caregiver concerns during this time of transition and equip them with useful cognitive-behavioural skills that may generalize to a variety of everyday problems.

\textbf{Declaration of interest:} The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

\textbf{References}


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