Published in final edited form as:

PM R. 2015 August ; 7(8): 836–844. doi:10.1016/j.pmrj.2015.02.004.

Determinants of Effective Caregiver Communication After Adolescent Traumatic Brain Injury

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Abstract

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Disclosure

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Disclosures related to this publication: grant, National Institute of Mental Health #MHR073764 (PI Wade) (money to institution)

S.W.

Disclosures related to this publication: grants, National Institute of Mental Health, Department of Education (money to institution)

Disclosures outside this publication: consultancy, Center for Brain Injury Research and Training; grants/grants pending, National Institute of Child Health and Human Development #R01HD042729, Patient-Centered Outcomes Research Institute (money to institution); payment for lectures including service on speakers bureaus, National Institutes of Health, International Neuropsychology Society

N.M.

Disclosures related to this publication: grant, National Institute of Mental Health (money to institution)

M.K.

Disclosures related to this publication: grant, Colorado Traumatic Brain Injury Trust Fund, and National Institutes of Health grant R01-MH073764 from the National Institute of Mental Health (money to institution)

T.S.

Disclosures related to this publication: grant, National Institute of Mental Health (money to institution)

Disclosures outside this publication: grants/grants pending, National Institute on Disability and Rehabilitation Research, Patient-Centered Outcomes Research Institute (money to institution)

H.G.T.

Disclosures related to this publication: grant, National Institutes of Health (money to institution)

Disclosures outside this publication: expert testimony, occasional forensic neuropsychological consultation; grants/grants pending, grants for National Institute on Disability and Rehabilitation Research #H133B090010 (PI Wade) and Patient-Centered Outcomes Research Institute on family treatments for traumatic brain injury (money to institution); book royalties from Guilford Press

Material in this article was presented at the AAPMR 2013 Annual Assembly as a poster entitled Parents' Coping Styles Influence Their Interactions With Children Who Have Sustained a Traumatic Brain Injury.

Peer reviewers and all others who control content have no relevant financial relationships to disclose.

Objective—To characterize the effects of caregiver mental health and coping strategies on interactions with an injured adolescent acutely after traumatic brain injury (TBI).

Design—Multi-site, cross-sectional study.

Setting—Outpatient setting of 3 tertiary pediatric hospitals and 2 tertiary general medical centers.

Participants—Adolescents (N = 125) aged 12–17 years, 1–6 months after being hospitalized with complicated mild to severe TBI.

Methods—Data were collected as part of a multi-site clinical trial of family problem-solving therapy after TBI. Multiple regression analyses were used to examine the relationship of caregiver and environmental characteristics to the dimensions of effective communication, warmth, and negativity during caregiver-adolescent problem-solving discussions.

Main Outcomes Measures—Adolescent and caregiver interactions, as measured by the Iowa Family Interaction Rating Scales.

Results—Caregivers who utilized problem-focused coping strategies were rated as having higher levels of effective communication ($P < .01$), as were those with higher socioeconomic status ($P < .01$). Problem-focused coping style and higher socioeconomic status were also associated lower levels of negative interactions ($P < .01$ and $P < .05$, respectively). Female gender of the adolescent and fewer children in the home were associated with increased parental warmth during the interaction ($P < .01$ and $P < .05$, respectively). Neither adolescent TBI severity nor caregiver depression significantly influenced caregiver-teen interactions.

Conclusions—Problem-focused coping strategies are associated with higher levels of effective communication and lower levels of caregiver negativity during the initial months after adolescent TBI, suggesting that effective caregiver coping may facilitate better caregiver-adolescent interactions after TBI.

Introduction

Pediatric traumatic brain injury (TBI) is a significant source of morbidity in the United States, resulting in an estimated 631,146 emergency department visits and 60,032 hospitalizations annually for children aged 19 years and younger [1,2]. Survivors may have persistent deficits associated with their injuries that have a significant impact on quality of life and overall functioning [3–5]. In particular, persons with moderate or severe injuries (classified by an initial Glasgow Coma Scale [GCS] score less than 13) are at increased risk for physical and psychological health problems, both of which can tax the material and emotional resources of the survivors and their families [6,7]. Evidence from several prospective studies documents an increased incidence of novel psychiatric illness within the initial months after pediatric TBI [8–10].

Ages 15 to 19 years represent one of the bimodal peaks in the incidence of TBI in childhood [11]. Although many adolescents who sustain TBI have good functional outcomes, those with more severe injuries often require long-term medical and supportive care [12–14]. At a time when teens normatively seek to assert more autonomy through activities including driving, courtship, and vocational pursuits [15,16], adolescents with TBI frequently need

increasing rather than decreasing levels of caregiver supervision and oversight [17]. Adolescence itself has been linked to increased parent-child conflict and parental distress, even among teens without neurologic injury [18,19]. Adolescents with a brain injury demonstrate deficits in problem solving and executive control [20], as well as post-TBI psychiatric sequelae, which may exacerbate developmentally typical parent-teen conflicts [8,16,17,21].

Caregivers of children with moderate to severe TBI have higher rates of global distress, depression, and anxiety compared with parents of children with mild TBI or orthopedic injuries or healthy control subjects [8,9,22,23]. More severely injured children require additional time and resources (social, economic, emotional, and otherwise), which represents a significant strain even in high-functioning families. Increased severity of TBI also correlates with increased family burden, even years after the injury [6]. Higher caregiver socioeconomic status (SES) can serve as a buffer in these circumstances [24]. Lower SES unfortunately exacerbates burdens, in that families with lower incomes have fewer necessary resources to access available assistance [25].

Caregiver psychological health alters interactions with typical developing, noninjured children, in turn influencing child mental health [26]. Reciprocity between parent and child functioning is also documented in families of children with TBI [27]. Higher levels of parental emotional distress after the injury predict later behavioral problems in children with TBI, regardless of prior behavioral problems [28]. Additionally, child behavioral problems contribute to higher levels of family stress, even when controlling for pre-TBI family functioning [27]. In teens with TBI, parental interaction influences teen quality of life [29]. New demands posed by the injured child may contribute to caregiver burden and distress, whereas caregiver functioning can buffer or exacerbate emerging child behavioral difficulties [27]. Caregiver SES may moderate the effects of injury severity, having an impact on adolescent academic performance, behavior, and adaptive ability, with lower SES contributing to less favorable outcomes across domains [27,30,31]. This factor becomes particularly important in adolescents with TBI, because they may rely on caregivers more for instrumental support at a time when their peers are increasingly autonomous [14].

Parents incorporate a variety of coping styles to manage the challenges of raising a child with TBI. Adaptive coping strategies (such as problem-focused coping) are associated with lower levels of parental distress, particularly among lower income groups [32]. Parental coping styles can have an impact on teen functioning as well, with maladaptive styles resulting in poorer functional outcomes. When caregivers utilize a passive coping style, child societal integration tends to be poor [33]. Although avoidant coping has not been found to be a beneficial long-term approach [34,35], parents may continue to use this method [36]. Numerous therapeutic strategies have been utilized to promote adaptive parenting within the pediatric population, including those with TBI and other populations of childhood disability [6,37].

Given the paucity of literature specifically examining changes in caregiver-teen interaction in the initial months after TBI, we sought to examine factors that may influence how the caregiver responds to his or her child after adolescent TBI. We hypothesized that adaptive

coping behaviors (problem- and emotion-focused coping) and lower levels of caregiver depression would be associated with higher ratings of positive parenting interactions, as characterized by warmth and effective communication. Conversely, we hypothesized that higher levels of caregiver depression and coping through denial would be associated with greater caregiver negativity. We also examined the relationship of SES and family composition (1- or 2-parent family) to parenting interactions, with the expectation that higher SES and the presence of 2 parents in the home would be associated with greater warmth and more effective communication. By identifying factors that place caregivers at risk for less positive interactions with adolescents during the initial months after TBI, we hope to be able to screen families at risk and provide appropriate interventions.

Methods

Data presented here were collected as part of a larger randomized clinical trial designed to explore the efficacy of an Internet-based family problem-solving intervention after TBI. The trial was registered with clinicaltrials.gov with the assigned identifier NCT00409448. The study was approved by the Institutional Review Board of each of the participating sites. Please see Peterson et al (2012) for additional information regarding this study [38]. This data subset consists of baseline assessments completed prior to study group assignment.

Recruitment Criteria

Participants were recruited from 5 major trauma centers in the Midwest and Rocky Mountain regions of the United States, including 3 large tertiary children's hospitals and 2 general hospitals with level I trauma designation and pediatric commitment. Adolescents aged 12–17 years with a complicated mild to severe TBI requiring overnight hospitalization within the past 1–7 months were screened for eligibility. Requirements for enrollment included a history of altered neurologic functioning as measured by a GCS score of less than 13 or evidence of brain injury seen on advanced cranial imaging (computed tomography or magnetic resonance imaging). Additional requirements included English as the primary language spoken in the home, availability of the teen to participate in the intervention, and family residence within 3 hours of study site. Exclusion criteria included (1) insufficient recovery of the child 6 months after the injury to participate in the intervention (ie, in a persistent minimally conscious state); (2) a history of child or parent psychiatric hospitalization in the 12 months preceding the injury; (3) residence of the family in an area without access to high-speed Internet; (4) residence of the child outside the home (eg, in a detention facility); (5) premorbid intellectual disability of the child (ie, $IQ < 65$); (6) nonblunt head trauma (eg, a gunshot wound); or (7) a history of child abuse (either documented in the medical record or by parent report). Several of the exclusion criteria relate to the larger study, which involved Internet-based family problem solving requiring home visits and high-speed Internet connectivity.

Participants

Of the 308 screened participants, 52 declined to participate, and another 52 were excluded because of one or more exclusionary criteria. The most common reason for exclusion was language other than English spoken as primary language within the home (14 participants).

An additional 72 participants were ineligible because they could not be contacted within the first 6 months after injury. Nonparticipants did not differ from participants in age of injury, gender, or race. The remaining 132 participants and their primary caregivers provided informed consent and completed baseline assessment. Because of the expense associated with the collection of video-recorded interactions, data were collected for only self-identified primary caregiver–adolescent dyads. Of these dyads, 7 did not have usable video data for the caregiver-adolescent interaction task because of technical problems, resulting in a sample size of 125 for factor analyses of the ratings of caregiver-adolescent interactions. An additional 6 dyads did not complete self-report measures, resulting in a sample size of 119 for the regression analyses. Participants included in the regression analyses did not differ from those excluded from analysis for unusable video data ($n = 7$) or incomplete self-report measures ($n = 6$) with respect to injury severity, race, or SES. However, the adolescents in excluded dyads were significantly older (14.44 years for those included and 15.44 for those excluded, $P < .05$).

Participants were between 12 and 17 years of age ($M = 14.78$, $SD = 1.72$), and 66% were male (see Table 1). GCS scores at the time of injury were available for 117 participants, and injury severity was classified based on these scores. Consistent with previous studies, mild injuries were defined as a lowest recorded GCS score of 13–15. We chose to examine subjects with complicated mild injuries (GCS of 13–15 with evidence of neurologic insult on advanced imaging such as magnetic resonance imaging or computed tomography). Recent studies support stratification of mild TBI based on the presence or absence of abnormality on imaging, given that long-term outcomes may differ between the 2 groups despite the same GCS score [39]. Moderate injuries were defined as a GCS score of 9–12. Moderate and complicated mild groups were combined for data analysis, consistent with prior research supporting their comparability [40]. Severe injuries were defined as a GCS score of 3–8. Initial GCS scores included 8 unclassified, 50 complicated mild, 20 moderate, and 47 severe TBI. The 8 unclassified were assigned to an appropriate TBI group after review of the medical record by a neuropsychologist; 2 were severe and 6 were moderate. After combining and scoring groups as described, 49 subjects (39%) had severe TBI and 76 (61%) had mild/moderate TBI.

Procedure

Data were collected at the baseline assessment in the family's home an average of 109 days after the injury (range, 10–226; $SD = 54$). Families received self-report questionnaires assessing family characteristics, including caregiver educational status and family composition, as well as self-report measures of coping, caregiver self-efficacy, and depression as discussed in further detail in the following sections. During the home visit, study personnel interviewed the caregiver, completed cognitive testing with the adolescent, and administered the caregiver-adolescent dyad assessment (discussed in further detail later). This visit typically required about 75–90 minutes.

Measures

Dyadic Assessment—The Iowa Family Interaction Rating Scale (IFIRS) was used to assess caregiver-adolescent interactions during a problem-solving discussion around a

conflictual situation [41]. This tool rates video-recorded 10-minute problem-solving interactions between family members. Consistent with IFIRS standard protocol, participants (the self-identified primary caregiver and adolescent) independently completed a questionnaire rating how often they disagreed or were upset by 28 issues that are common areas of conflict between parents and adolescents (eg, money, alcohol, curfew, breaking rules, and discipline) [42,43]. They were directed by study personnel to discuss an upcoming holiday for 10 minutes to acclimate participants to being videotaped. This first conversation was not scored. The study personnel then selected 3 topics that both the caregiver and adolescent rated as areas of high conflict. The participants were then instructed to talk through a solution to these issues. Study personnel left the room while this 10-minute conversation was recorded. This video recording was submitted to the Interaction Rating Laboratory at Iowa State University, where the interaction was scored by trained coders naïve to condition. Participants were scored as individuals and as a dyad in both positive (eg, warmth) and negative (eg, hostility) domains. Coders rated both the quality of the interaction and behavioral characteristics of the participating caregiver and adolescent. Participant mood, behavior, and tone of interaction were scored on multiple dimensions, such as positive mood, endearment, and coercion. Twenty-nine scales (7 individual scales and 22 dyadic scales) were scored on a 9-point scale based on the frequency and intensity of a specified behavior, with a score of 1 indicating low frequency and intensity and 9 indicating high frequency and intensity [41]. We chose to examine caregiver interaction scores.

Although the IFIRS had been used to examine parent-teen interactions in a range of pediatric populations, including cancer, cystic fibrosis, and asthma [44–46], it had not previously been used with pediatric TBI. We used common factor analysis with an oblique rotation to reduce the number of variables and provide a more cohesive picture of caregiver-teen interaction. This analysis resulted in a 3-factor solution reflecting “effective communication,” “warmth,” and “negativity” (see Raj et al for more details) [47]. Effective communication consisted of communication, assertiveness, and listener responsiveness (Cronbach’s α of 0.90). Warmth consisted of the following codes: escalate warmth, warmth/support, positive mood, and endearment (Cronbach’s α of 0.81). The negativity scale included hostility, antisocial, escalate hostile, angry coercion, and contempt (Cronbach’s α of 0.86). Examination of the distribution of scores for “warmth” and “negativity” scales indicated significant skewness. We used a log transformation to normalize the scores for these 2 scales.

Caregiver Coping Styles—Caregiver coping styles in response to the child’s injury were measured using the COPE Inventory [48], an assessment that characterizes 15 distinct coping scales. These scales were divided into 3 broad approaches, 2 adaptive and 1 maladaptive: problem-focused coping, emotion-focused coping, and denial. Groupings were based on previously demonstrated classifications of coping styles, as well as factor analysis [49]. Problem-focused coping involves active efforts to address the problem through planning, actively seeking a solution to the problem at hand, seeking instrumental (contrasted with emotional) support, and suppression of competing activities. Emotion-focused coping is characterized by seeking emotional social support, positive reinterpretation of the situation, and acceptance. We specifically examined the subset *adaptive* emotion-focused coping, rather than including maladaptive strategies such as

venting. We used previously validated coping style classifications to distinguish maladaptive and adaptive emotional coping [49]. We chose to examine denial as an index of maladaptive coping based on previous research suggesting that this strategy is associated with greater distress and poorer outcomes [32].

Caregiver Depression—Caregiver depression was assessed using the Center for Epidemiological Studies Depression Scale (CES-D) [50]. The CES-D is a self-report measure of caregiver depression. Scores range from 0 to 60, with higher scores indicating higher levels of depression. Scores of 16 or higher are considered to be indicative of clinically meaningful depressive symptomatology.

Caregiver Self-Efficacy—We measured parenting confidence and efficacy using the Caregiver Self-Efficacy Scale (CSES), a 25-item caregiver report scale. The CSES has documented high internal consistency for the assessment of caregiving efficacy [51]. Scores range from 25–100, with higher scores indicating greater perceived caregiving self-efficacy. Criteria have not been established for determining the clinical significance of specific scores for this measure.

Injury Severity—Data concerning injury severity were collected from participants' medical records. GCS scores and imaging findings were used to classify severity as previously described.

Background Questionnaire—Sociodemographic information including primary caregiver educational attainment, employment status, marital status, age, and race was provided by the primary caregiver. The majority of primary caregivers were mothers or stepmothers ($n = 108$; 86%), with fathers ($n = 13$; 10%) and grandmothers ($n = 4$; 3%) constituting the remainder of the caregivers. SES was estimated by averaging sample z scores for caregiver education in years and median income for the neighborhood of residence (based on 2008 U.S. Census data).

Analyses

The student t -test was used to compare the 2 injury severity groups (mild/moderate and severe TBI, as previously described). Demographic variables, caregiver self-assessments, and IFIRS scores were examined (see Tables 1 and 2).

Hierarchical regression analyses were used to examine the associations of adolescent and caregiver characteristics, caregiver psychological functioning, and caregiver coping style with IFIRS measures of caregiver interactions. Three separate models were run with effective communication, warmth, and negativity as the dependent variables. Predictor variables were entered in the regression model stepwise fashion. Background child and caregiver characteristics were entered in step 1, including adolescent age, gender, race, TBI severity, time elapsed since injury, caregiver marital status, neighborhood income, caregiver education, and number of children in the household. For the purposes of analysis, neighborhood income and caregiver education were combined into one variable due to high collinearity. Step 2 variables assessed effects of caregiver psychological characteristics, including depression and self-efficacy as measured by CES-D and CSES scores,

respectively. Step 3 variables assessed the effects of the caregiver coping styles, problem-focused, emotion-focused, and denial. Step 1 controlled for background factors potentially confounded with the caregiver characteristics of interest, and step 2 permitted assessment of caregiver coping independent of caregiver psychological status. Significance was set at $P < .05$.

Results

With the exception of GCS score and time since injury, the mild/moderate and severe TBI groups were similar in terms of demographics and caregiver self-efficacy. Caregivers of adolescents with severe TBI reported significantly higher levels of depressive symptoms than did the mild-moderate TBI group ($P < .05$), with average score of 15.10 in the severe group versus 11.01 in the mild/moderate group. Ratings of coping style and caregiver-adolescent interaction on IFIRS did not vary as a function of injury severity. Table 2 lists means of self-report and observational measures by injury severity.

As summarized in Table 3, regression analysis revealed that greater caregiver use of problem-focused coping strategies was associated with higher ratings for Effective Communication ($\beta = 0.69$, $P < .01$) and lower Negativity ($\beta = -0.10$, $P < .01$). Higher levels of caregiver SES (income and education) were also associated with higher ratings for Effective Communication ($\beta = 0.49$, $P < .01$) and lower Negativity ($\beta = -0.04$, $P < .05$). Warmth was higher when the adolescent was female ($\beta = 0.11$, $P < .01$) and slightly lower in families with a greater number of children in the household ($\beta = -0.03$, $P < .05$). Collectively, the predictor variables accounted for modest variance in the 3 models with adjusted R^2 as follows: 0.25 Effective Communication, 0.10 Warmth, and 0.16 Negativity. Warmth and Negativity models required transformation because of substantial skewness, resulting in smaller β values. Given that Emotion-Focused Coping was not retained in the stepwise models because of high co-linearity with Problem-Focused Coping, we conducted exploratory analyses to examine its association to parent-teen interactions without Problem-Focused Coping in the model. In these exploratory models, Emotion-Focused Coping was marginally inversely related to Negativity ($\beta = -0.06$, $P < .05$) but was not significantly related to Warmth or Effective Communication.

Primary caregiver interactions with adolescents were not influenced by caregiver depression, perceived self-efficacy, or marital status. Injury severity, adolescent race, and time since injury were not significantly associated with IFIRS ratings of Effective Communication, Warmth, or Negativity. To examine whether depressive symptoms moderated the efficacy of Problem-Focused Coping, we performed a series of exploratory regression analyses examining the interaction between CES-D scores and Problem-Focused Coping. These analyses revealed a significant interaction between depressive symptom levels and Problem-Focused Coping in predicting Negativity. As depicted in Figure 1, higher levels of Problem-Focused Coping were only associated with lower levels of Negativity at low levels of depressive symptoms, suggesting that coping is less effective among caregivers with greater levels of depressive symptoms.

Discussion

Pediatric TBI influences family functioning, caregiver mental health, adolescent mental health, and functional outcomes [27]. This study sought to examine factors that predicted the quality of caregiver interactions with the injured adolescent in the initial months after TBI. SES and family composition influenced adolescent-caregiver interactions; however, Problem-Focused Coping proved to be the most potent modifiable factor. Problem-focused coping strategies were associated with lower levels of negativity and higher levels of effective communication in these interactions. These findings suggest that use of problem-focused strategies or active coping (planning and problem solving) may support more positive caregiver-adolescent interactions after injury.

Past studies found that active problem-focused coping after TBI contributed to more caregiver psychological symptoms across the initial 12 months after injury [22,32] and that emotion-focused coping tended to be more effective in buffering against stress and family burden [52]. These earlier studies did not examine interactions of the caregivers and adolescents, as we did with the IFIRS, instead focusing more on levels of caregiver distress. Earlier work examined the effects of coping over a longer time frame as well. Further research is warranted to more fully understand the relationship of caregiver coping to caregiver-adolescent interactions over time.

No correlation was found between caregiver depression or denial and the quality of the caregiver's interactions with the adolescent, despite higher levels of depressive symptoms in the severe TBI group. Several factors may have contributed to this finding. These assessments took place an average of 3 months after adolescent injury, and the acute stress of the injury may have dissipated by that point, influencing both depression and denial. Caregivers may have had differing levels of depression more acutely that were not reflected in baseline data collection. Had we selected a sample with a greater range of depressive symptomatology, we may have found a stronger association between depression and parenting interactions. Consistent with the current findings, other studies exploring the impact of caregiver depression on caregiver-adolescent interaction, as rated by IFIRS, failed to demonstrate a relationship between caregiver depression and caregiver interactions [53]. We examined the interaction of coping and depression to better understand how depression may influence caregiver-adolescent interactions. These analyses, depicted in Figure 1, suggest that depression moderates the efficacy of problem-focused coping in reducing negativity in interactions. Specifically, Problem-Focused Coping was only associated with less Negativity among caregivers with fewer depressive symptoms, supporting the possibility that depressed caregivers engage in less effective coping. Thus, interventions to reduce depression may also enhance the effectiveness of caregivers' efforts to cope.

TBI severity was also unrelated to ratings of parenting interactions. One possible explanation for this finding is that the adolescents included in this sample were required to be able to verbally interact and participate in study procedures, which limited the sample to persons with less severe functional impairments. Interactions with adolescents with limited verbal ability may be influenced more strongly by caregiver factors, but this possibility could not be examined via a strongly verbally based outcome measure such as the IFIRS.

Several limitations of the current study should be noted. Although the IFIRS has the advantage of being conducted by naïve raters not influenced by diagnosis or treatment group, the coding system was developed on the basis of interactions with typically developing, non injured adolescents and has not previously been standardized for use with adolescents with brain injury. Though IFIRS standards were based on a population of noninjured adolescents, a control group of adolescents without TBI was not included as part of the study. These analyses were based on cross-sectional data from a larger treatment study. Because this group was part of a larger treatment study, the selection of participants may have been biased toward families desiring additional treatment. Because the larger study required access to high-speed Internet and English-speaking dyads, these participants were excluded, which may limit applicability to rural and non-English-speaking populations. Initial assessments took place on average approximately 3 months after injury and may not be representative of the period directly after injury. There was a large range in data collection dates, in large part because of the need for more severely injured patients to recover sufficiently to participate in this very verbally biased outcomes measure. Future work should explore the trajectory of dyadic interactions over time. Nonetheless, this study represents one of the largest studies of adolescents with TBI to date and one of only a handful to examine caregiver-adolescent interactions after TBI. Moreover, it has the strength of incorporating multiple methods and raters (naïve coders and caregivers).

Conclusion

This study demonstrated that caregiver coping styles influence the quality of interactions with their adolescent children with TBI as measured using the IFIRS. Active problem-focused coping may be a helpful strategy for caregivers, potentially facilitating more effective communication and reducing negative interactions. Neither TBI severity nor caregiver depression was significantly related to IFIRS ratings of these interactions. Caregiver coping style is a modifiable behavior that can be reinforced by professionals who provide care for families of adolescents with TBI. Future research is needed to determine the effects of interventions that promote problem-focused coping on this population, as well as how these effects may change as time from injury increases.

Acknowledgments

We acknowledge the contributions of Kendra McMullen, Robert Blaha, Elizabeth Hagesfeld, Michelle Jacobs, Daniel Maier, and Nina Fox in data collection and entry, Amy Cassidy in data management, and John Stullenberger in Web site support. We also acknowledge the contributions of therapists JoAnne Carey, PsyD, Britt Nielsen, PsyD, and Brad Jackson, PhD, as well as the contributions of Dr Janet Melby and the staff of the coding laboratory at the Iowa State University who coded the parent-child interaction data.

This work was supported in part by (1) National Institutes of Health grant R01-MH073764 from the National Institute of Mental Health; (2) a grant from the Colorado Traumatic Brain Injury Trust Fund Research Program, Colorado Department of Human Services, Division of Vocational Rehabilitation, Traumatic Brain Injury Program; and (3) grant H133B090010 to Dr Shari Wade from the National Institute on Disability and Rehabilitation Research, Department of Education.

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Figure 1.

Problem-focused coping decreased negativity in nondepressed individuals. Higher values on the y-axis indicate higher Iowa Family Interaction negativity scores. CES-D = Center for Epidemiologic Studies–Depression; COPE = COPE Inventory.

Table 1

Summary of characteristics by injury severity group

Characteristic	Complicated Mild/Moderate TBI (n = 76)	Severe TBI (n = 49)
Adolescent age at injury, y, mean (SD)	14.33 (1.74)	14.65 (1.70)
Adolescent gender, % female (n)	32.9 (25)	36.7 (18)
Adolescent race, % white (n)	73.7 (56)	87.8 (43)
GCS score ^{**} (n = 117), mean (SD)	13.36 (1.88)	4.94 (1.94)
Time from injury to baseline assessment, d, [*] mean (SD)	110.84 (54.63)	121.76 (51.84)
Caregiver, % married (n)	56.6 (43)	69.4 (34)
Caregiver, % with high school diploma or higher (n)	94.7 (72)	91.8 (45)
Caregiver, % employed full or part time (n)	75 (57)	69.4 (34)
Census tract family income, mean (SD)	\$66,116 (\$30,134)	\$74,090 (\$24,897)
No. of children in household, mean (SD)	3.34 (1.71)	2.86 (1.02)

Other than GCS and time since injury, there were no statistically significant differences between the groups. Note that the number differs for GCS because of the absence of formal scoring in medical records for some participants.

TBI = traumatic brain injury; SD = standard deviation; GCS = Glasgow Coma Scale.

^{*} $P < .05$.

^{**} $P < .01$.

Table 2

Means and standard deviations of study variables by injury severity

Characteristic	Complicated Mild/Moderate TBI (n = 76)	Severe TBI (n = 49)	<i>t</i> (df)
CES-D ^{*,†}	11.01 (8.65)	15.10 (10.40)	−2.34 (118)
CSES [‡]	88.84 (9.27)	89.04 (9.83)	−0.12 (122)
Problem-focused coping (COPE) [§]	2.68 (0.64)	2.71 (0.53)	−0.21 (118)
Emotion-focused coping (COPE) [§]	3.03 (0.64)	3.01 (0.48)	0.24 (118)
Denial (COPE) [§]	1.27 (0.44)	1.32 (0.50)	−0.58 (118)
IFIRS: effective communication [¶]	4.77 (1.50)	4.95 (1.35)	−0.67 (123)
IFIRS: warmth [¶]	2.06 (1.17)	2.17 (0.99)	−0.56 (123)
IFIRS: negativity [¶]	2.63 (1.24)	2.80 (1.10)	−0.82 (123)

Scores are means for each group; standard deviations are indicated in parentheses.

TBI = traumatic brain injury; CES-D = Center for Epidemiologic Studies–Depression; CSES = Caregiver Self-Efficacy Scale; COPE = COPE Inventory; IFIRS = Iowa Family Interaction Rating Scale.

* $P < .05$.

† CES-D: Measure of caregiver depression with scores ranging from 0–60, with scores of 16 indicating depressive symptomatology. Scores were higher in caregivers of adolescents with severe TBI.

‡ CSES: Measure of perceived caregiver efficacy with scores ranging from 0–100, with higher scores indicating greater perceived self-efficacy.

§ COPE: A measure of caregiver coping style with scores ranging from 1–4, with higher numbers indicating more usage of a particular strategy. Because the COPE subscales did not have a uniform number of possible responses, these numbers represent an average. The denial subscale is a mean of 4 items; problem-focused, a mean of 16 items; and emotion-focused, a mean of 12 items.

¶ IFIRS: A measure of interaction between caregiver and adolescent. IFIRS is scored on a scale of 1–9, with 1 indicating “not at all characteristic” and 9 “mainly characteristic.” These specific data pertain only to the caregiver, not the dyad or the adolescent. Effective communication and warmth indicate the degree to which the caregiver exhibits these qualities. Negativity is a combined score of caregiver qualities that are not favorable (eg, hostile or coercive).

Table 3

Regression models predicting Iowa Family Interaction Rating Scale ratings (effective communication, warmth, negativity)

Characteristic	Effective Communication β (standard error) t (standardized β)	Warmth β (standard error) t (standardized β)	Negativity β (standard error) t (standardized β)
Adolescent age	-0.05 (0.07)	0.00 (0.01)	-0.01 (0.01)
	-0.69 (-0.06)	-0.06 (-0.01)	-0.84 (-0.08)
Female child	0.31 (0.26)	0.11 (0.04)//	0.02 (0.03)
	1.22 (0.10)	2.75 (0.25)	0.44 (0.04)
Race (white)	0.50 (0.35)	0.07 (0.05)	0.02 (0.05)
	1.41 (0.13)	1.23 (0.13)	0.52 (0.05)
TBI severity (by GCS)	-0.03 (0.26)	0.01 (0.04)	0.07 (0.03)
	-0.13 (-0.01)	0.35 (0.03)	1.98 (0.19)
Time elapsed since injury	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	-0.30 (-0.03)	-0.51 (-0.05)	-0.83 (-0.07)
Caregiver married	0.20 (0.29)	0.03 (0.04)	-0.05 (0.04)
	0.68 (0.07)	0.59 (0.06)	-1.41 (-0.14)
Caregiver SES *	0.49 (0.14)//	0.01 (0.02)	-0.04 (0.02)¶
	3.63 (0.34)	0.27 (0.03)	-2.33 (-0.23)
No. of children in household	-0.11 (0.08)	-0.03 (0.01)¶	0.01 (0.01)
	-1.27 (-0.11)	-2.06 (-0.20)	0.90 (0.08)
Step 1 adjusted R ² †	0.20	0.10	0.06
CES-D total ‡	0.00 (0.02)	0.00 (0.00)	0.00 (0.00)
	0.20 (0.02)	0.90 (0.10)	-0.43 (-0.05)
Caregiver self-efficacy	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)
	0.40 (0.04)	0.58 (0.06)	-0.11 (-0.01)
Step 2 adjusted R ² †	0.19	0.09	0.06
Problem-focused (COPE) §	0.69 (0.21)//	0.01 (0.03)	-0.10 (0.03)//
	3.28 (0.28)	0.36 (0.03)	-3.73 (-0.34)
Denial (COPE) §	-0.01 (0.27)	-0.06 (0.04)	0.05 (0.04)
	-0.02 (0.00)	-1.54 (-0.15)	1.33 (0.12)
Step 3 adjusted R ² †	0.25	0.10	0.16

TBI = traumatic brain injury; GCS = Glasgow Coma Scale; SES = socioeconomic status; CES-D = Center for Epidemiologic Studies–Depression; COPE = COPE Inventory.

* SES is a combined variable including caregiver education level and census tract income.

† R² denotes the total variance explained by the model.

‡ CES-D: A measure of caregiver depression.

§ COPE: A measure of caregiver coping style (only Problem-Focused and Denial scales are listed in this table). Means of COPE scores were studied.

¶ $P < .05$.

// $P < .01$.

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