

Brief Report: Description of Feasibility and Satisfaction Findings from an Innovative Online Family Problem-solving Intervention for Adolescents following Traumatic Brain Injury

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Objective To describe feasibility and satisfaction findings from an innovative online family problem-solving intervention for adolescents with traumatic brain injury (TBI). **Methods** Nine adolescents who sustained a moderate to severe TBI in the previous 24 months and their families participated in a novel, online, manualized treatment program (Teen Online Problem Solving, TOPS) consisting of 10 web-based sessions providing information and interactive exercises on cognitive, social, and behavioral skills typically affected by TBI. Web-based sessions were followed by synchronous video conferences with a therapist to review target skills and apply the problem-solving process to family goals. **Results** All teens and consenting parents completed at least 10 sessions. The website and videoconferences received moderate to high ratings on helpfulness and ease of use. Parents and teens reported increased knowledge regarding targeted knowledge and skills.

Conclusions Findings support the acceptability of TOPS for adolescent TBI.

Key words acquired brain injury; adolescent; telehealth.

Traumatic brain injury (TBI) is the most common cause of acquired disability in children and adolescents. The highest peak in incidence of TBI is during the adolescent and young adult years (Langlois, 2006). Long-term follow-up suggests that behavioral changes represent the most persistent sequelae of pediatric TBI (Bloom et al., 2001). The social and emotional sequelae of brain injury may be particularly salient for teens given the adolescent developmental challenges of increasing autonomy and responsibility. Deficits in executive function skills (EF), problem solving, and social communication following TBI may limit the teen's ability to negotiate important social tasks and developmental transitions (Janusz et al., 2002) and intensify the effects of life stress on adjustment (Goodman, Gravit, & Kaslow, 1995). These deficits may have a lifelong impact on the teen's academic and vocational pursuits and lead to social isolation and emotional difficulties.

Little effort has been made to design interventions to enhance functional outcomes following pediatric TBI (Laatsch et al., 2007). However, problem-solving interventions have been used successfully to reduce depressive

symptoms and behavior problems in children and adolescents with other problems (Spence, Sheffield, & Donovan, 2003). Collaborative parent-teen problem solving may provide necessary scaffolding, thereby enabling adolescents to function more effectively. Converging evidence suggests that a problem-solving approach emphasizing EF and social competence may provide functional skills necessary to facilitate the injured adolescent's transition into adult independence and have the potential to enhance behavioral and social outcomes of adolescents following TBI.

Treatment for TBI often occurs at urban trauma centers with discharge to home communities, where access to psychosocial follow-up is limited. Complex contemporary lifestyles make weekly in-office therapy sessions burdensome. Increasingly, the internet is being used to meet the mental health needs of individuals who have difficulty accessing traditional care (Norman, 2006). Given these time and access constraints, the web may provide an invaluable tool for linking families with state-of-the-art psychosocial care by reducing potential physical and

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psychological barriers. Given that 94% of typically developing teens spend time online, a web-based mode of treatment delivery may be particularly feasible and beneficial for them (Pew Internet and American Life Survey, 2007).

This project built upon a previous online family problem-solving (OFPS) intervention for children with TBI and their families addressing cognitive appraisals, problem solving, and family communication (Wade, Carey, & Wolfe, 2006a, 2006b). To our knowledge, OFPS represents one of only a handful of web-based interventions designed to be used by members of a family together, requiring responses from both individual family members and the family as a group (Ritterband et al., 2003). OFPS successfully reduced parent-reported child behavior problems and self-reported parental burden and distress in a sample of 5- to 16-year-olds with TBI, with adolescents exhibiting greater improvements than younger children (Wade et al., 2006b). However, the content was not designed to address the specific needs of adolescents. Session content emphasized positive behavioral supports to facilitate child functioning rather than self-monitoring and management. Qualitative feedback revealed a desire for more developmentally appropriate materials, as opposed to the multimedia examples and session content that featured younger school-aged children.

We adapted OFPS for adolescents (Teen Online Problem Solving, TOPS) by making three major changes. First, we added two sessions (7 and 8) to address the social challenges of adolescents and the social skills deficits that often accompany moderate to severe TBI. Second, we updated all the homework, session content, interactive skill-building exercises, animations, and video examples so that they were specific to and relevant for adolescents. Finally, we revised the sessions to reflect the emerging independence and self-monitoring skills of adolescence. This report describes TOPS and provides preliminary feasibility and satisfaction data based on a pilot sample of nine adolescents with TBI and their families. Our primary research question was whether teens and parents would find the program easy to use and helpful.

Method

Participants

Eligible adolescents were between the ages of 11 and 18 years and sustained a moderate to severe TBI in the previous 24 months. Severe brain injury was defined as a lowest Glasgow Coma Scale (GCS) score of ≤ 8 . Moderate TBI was defined as a GCS score of 9–12 or a higher GCS score with accompanying evidence of brain abnormalities on imaging studies (Teasdale & Jennett, 1974).

Thirty-four adolescents were assessed for eligibility, 12 of whom had already declined participating in another intervention study. Of the 24 remaining adolescents, we contacted 17 of whom 9 agreed to participate and 8 said no. The most common reasons families gave for declining were lack of adolescent and family problems post-injury and lack of time. This reflects a recruitment rate of 53% (9/17), which is similar to previous intervention studies with comparable recruitment criteria. The seven males and one female who did not participate were an average of 13.92 years of age (range: 12:0–15:6) and were injured an average of 4.3 months prior to recruitment (range: 2–9 months). Two had severe TBI and seven had moderate TBI. One was African American and one was bi-racial.

The four females and five males who did participate were an average of 15.04 years of age (range: 11:8–18:2) and were injured an average of 9.7 months prior to recruitment (range: 3–21 months). Two of the adolescents were classified as having severe TBI (1 with GCS of 3 and 1 with GCS of 6, both with positive imaging findings) and 7 had moderate TBI (3 with GCS scores of 11, 1 with positive imaging findings; 2 with GCS of 13, and 2 with GCS of 15, all with positive imaging findings). One adolescent was African American and one was bi-racial. In four families, the parents were married and residing together. SES and education level varied substantially: two parents had high school degrees, two had 2-year degrees, and five completed college. Only one family did not own a home computer prior to the intervention; two families reported not using the computer regularly.

Procedure

Institutional Review Board approval was obtained and participants were recruited from the trauma registry of an urban children's hospital based upon injury. All families with a teen meeting the injury criteria were contacted by letter and then by phone regarding participation. Once consent was obtained, a computer and web camera were installed in the family's home and baseline assessments were completed by the adolescent and his or her parents. At treatment inception, the therapist met once with each family in the family's home to conduct a structured interview regarding the effects of the injury and to assess current concerns and goals. Parents, the injured teen, and school-aged siblings were invited to participate, with participation mandated of the primary parent and teen. Three licensed psychologists delivered the intervention and treatment fidelity was maintained through weekly supervision sessions and end of session checklists indicating the time spent on specific topics. Synchronized videoconferences

with the therapist were scheduled for every 1–2 weeks after each family completed the web-based self-guided materials. Ten “core” sessions were delivered to all families (Table I). Families received up to four supplemental sessions based on a brief self-assessment of skills, therapist recommendations, and participant interest. The five possible sessions addressed content related to the stressors and burdens applicable to some individual families or family members. They were: (a) parent stress management and marital communication, (b) working with the school, (c) planning for after high school, (d) pain management, and (e) talking with your teen.

Measures

The measures were completed by seven mothers, five fathers, and nine teens at a postintervention follow-up visit to the family’s home by the research coordinator (who was not involved in the intervention) an average of 11 days after the final session was completed (range 0–27 days).

Website Evaluation Questionnaire

The Website Evaluation Questionnaire (WEQ; Rotondi, Sinkule, & Spring, 2005) contains 23 questions regarding the ease of use and helpfulness of the videoconferences and the components of the website rated on a 5-point Likert scale (1 = not at all; 2 = a little; 3 = moderately; 4 = very; 5 = extremely). Five questions pertained to

website ease of use (e.g., logging on, navigating). Six questions addressed the helpfulness of specific website content. Six additional questions addressed the ease of use and helpfulness of the videoconferences. Previous analyses of the WEQ indicated that the items pertaining to website and videoconference ease of use and helpfulness possessed high-internal consistency (Cronbach’s α ’s ranging from 0.87 to 0.92; Carey, Wade, & Wolfe, 2008).

Online Satisfaction Survey

The Online Satisfaction Survey (OSS, parent and teen versions; Wade et al., 2006a) was adapted to assess participants’ perceptions of skills they had acquired and behavioral changes they had made as a result of TOPS. The parent and teen versions consisted of 19 questions answered using a 4-point scale (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree). These items asked about the extent to which parents (or teens) perceived that they had acquired specific skills as a result of the program (i.e., skills to handle problems with attention and memory) as well as more global changes in their understanding of TBI, their teen, and the quality of their relationships (i.e., getting along better). The OSS also asked whether they would prefer to meet with the coach/therapist in person, whether the program was too long or too short, and whether they would recommend it to others. The OSS contained eight additional statements pertaining to the therapist, video clips, website content, and program as

Table I. Outline of Core Sessions

Session and title	Topics
Program introduction and identification of goals	Overview of program. Goal/problem identification and explanation of goal setting.
The importance of staying positive	Recognizing negative affect and managing it through cognitive reframing and relaxation/stress management. Monitoring problem behaviors and situations to identify triggers, as well as factors that exacerbate or prolong the problem.
Steps of problem solving	5-step problem solving heuristic [Aim, Brainstorm, Choose, Do it, Evaluate (ABCDE)]. Using problem solving process to achieve goals identified by the teen or parents.
Strategies for improving cognitive and organizational skills	Information on cognitive and EF changes following TBI. Compensatory strategies for addressing problems with working memory, planning, and organization.
Strategies for coping with behavioral changes	Information on changes in emotion regulation and control following TBI. Train parent to provide positive behavioral supports and encourage self-monitoring and self-regulation.
Communication skills	Listening skills, I-messages, anger management [Stop, think, accept, reframe, relax, and solve (STARRS)].
Social skills and communication	Nonverbal communication and basic social skills.
Social information processing	Using social problem solving framework to translate the problem solving process specifically to social situations.
Crisis management	Responding to crisis situations, skill review, assess needs.
Planning for the future	Skills review, future planning (e.g., transitions to/after high school).

a whole in which participants rated on a 10-point scale where 1 = not at all and 10 = completely/extremely.

Results

All nine families completed the 10 core sessions. Seven families completed one or more supplemental sessions as follows: parent stress management and marital communication: 4/7; working with the school: 2/7; planning for after high school: 3/7; pain management: 1/7; talking with your teen: 2/7. Both parents participated in one or more sessions in the two-parent families, with two of these fathers participating consistently. Nine siblings from six families participated in at least some of the sessions (ages 8, 10, 10, 12, 13, 13, 15, 15, and 20 years). Families spent an average of 40 min completing each of the core self-guided web sessions (range averaged across the nine families: 19–62 min/session). Families took an average of 6.2 months to complete all the sessions (range 4.8–9.3 months). The families who participated in the intervention lived an average of 26.3 miles from the

hospital (range 1.1–108 miles). Due to the brief report format of this article, OSS and WEQ results are presented in Table II for a sampling of the questions rated on the 4- and 5-point Likert scales. For the questions rated on a 10-point scale, mean ratings for seven mothers, four fathers, and nine teens were as follows: “The program was what I expected” (Mom: 7.86, *SD*: 2.79; Dad: 8.5, *SD*: 1.91; Teen: 6.22, *SD*: 2.73); “The program was helpful” (Mom: 8.14, *SD*: 2.27; Dad: 8.75, *SD*: 1.50; Teen: 8.55, *SD*: 1.74); “The therapist was caring and understanding” (Mom: 9.14, *SD*: 1.46; Dad: 9.5, *SD*: 1.0; Teen: 9.0, *SD*: 2.0); “The web materials were clear and easy to understand” (Mom: 9.14, *SD*: 0.90; Dad: 8.0, *SD*: 2.16; Teen: 8.44, *SD*: 1.67); “The information was helpful to me” (Mom: 8.0, *SD*: 2.31; Dad: 9.0, *SD*: 1.41; Teen: 7.78, *SD*: 2.73); “The problem solving process was easy to use” (Mom: 9.0, *SD*: 1.41; Dad: 8.75, *SD*: 1.5; Teen: 8.22, *SD*: 1.64); “The video examples were helpful” (Mom: 7.86, *SD*: 2.91; Dad: 8.75, *SD*: 0.96; Teen: 6.78, *SD*: 3.35); “I enjoyed the program” (Mom: 8.43, *SD*: 2.079; Dad: 9.5, *SD*: 0.58; Teen: 7.56, *SD*: 2.70).

Table II. Percentage of Participants Rated Scores of 4 (Very) or 5 (Extremely) on Items of the WEQ^a or Rated Scores of 3 (Agree) or 4 (Strongly Agree) on items of the OSS^b

Item	Mothers		Fathers		Teens	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Overall ease of use of website ^a	7/7	100	2/4	50	6/8	75
Overall ease of use of videoconferences ^a	4/7	57	4/5	80	5/8	63
Overall helpfulness of videoconferences ^a	5/7	71	3/5	60	7/8	88
Helpfulness of videoconference vs. to face-to-face ^a	3/7	73	3/5	60	5/8	63
Helpfulness of information on brain injury ^a	6/7	86	4/5	80	7/8	88
Helpfulness of training in problem solving ^a	7/7	100	4/5	80	6/8	75
Helpfulness of training in behavior management ^a	6/7	86	5/5	100	7/8	88
Helpfulness of training in communication skills ^a	6/7	86	5/5	100	7/8	88
Helpfulness of training in anger management ^a	6/6	100	4/4	100	6/8	75
Helpfulness of materials on friendship ^a	5/6	83	4/4	100	5/8	63
Acceptance ^a	6/7	86	4/5	80	5/8	63
Motivation ^a	4/7	57	3/5	60	5/8	63
Stress ^a	0/7	0	0/5	0	1/8	13
Support ^a	5/7	71	4/5	80	7/8	88
Reached goals I had when I began program ^b	5/7	71	4/4	100	9/9	100
Plan for handling future problems ^b	6/7	86	3/4	75	9/9	100
Understand injury better ^b	7/7	100	4/4	100	8/9	89
Know ways to improve attention and memory ^b	7/7	100	4/4	100	7/9	78
Feel less stressed ^b	4/7	57	4/4	100	8/9	89
Will use problem solving process in the future ^b	5/7	71	4/4	100	7/9	78
Will use communication skills in the future ^b	5/6	83	4/4	100	8/9	89
Would recommend the program to others ^b	5/7	71	4/4	100	9/9	100
Would rather meet with the coach in person ^b	2/7	29	0/4	0	4/9	44
Questions about injury have been answered ^b	7/7	100	4/4	100	7/9	78

^aWEQ = Website Evaluation Questionnaire.

^bOSS = Online Satisfaction Survey.

Discussion

As noted in a recent review article (Laatsch et al., 2007), there is a paucity of evidence-based treatment programs to address the cognitive, behavioral, and social consequences of pediatric TBI. Thus, our primary objective was to examine the acceptability of a new program to improve teen and family functioning following brain injury in adolescence. TOPS' emphasis on self-monitoring, self-regulation, and social problem-solving skills represents a substantial modification of prior interventions for pediatric TBI to address the developmental transitions of adolescence. Our findings suggest that the program length and structure is feasible for families. Barriers to care such as time and distance are reduced by delivering the intervention in the families' homes through the use of web materials and videoconferences. These factors may be particularly important when trying to negotiate the schedules of adolescents and their parents. Our impression is that the flexibility in scheduling and ease in communicating with families via e-mail and text messaging regarding missed sessions contributed to the 100% completion rate.

Despite the demands of technology, our findings support ease of use and suggest that the mode of delivery was acceptable. In fact, the fathers' satisfaction with the website content, the format, and the program as a whole, suggests that a web-based approach may be a means to increase father engagement in treatment. Although adolescents are technologically sophisticated on the whole, four teens and two mothers indicated that they would prefer to meet face-to-face. Although the reasons for this preference are unclear; one might infer that they were uncomfortable with some aspect of the format. Feedback from parents and teens also provided support for the acceptability and helpfulness of the program. Teen endorsement of helpfulness and satisfaction with the program suggests engagement in the treatment program and process. We feel this is particularly noteworthy given that apathy and lack of initiation can be common behavioral consequences of TBI and that teenagers can be particularly difficult to engage in family counseling. Parent and teen reports provide tentative evidence that TOPS contributes to increased knowledge about brain injury and broader cognitive-behavioral skills such as problem-solving and effective communication strategies. Participants also felt empowered to use these skills and strategies in the future.

A few limitations of the current study should be noted. The sample was small and not necessarily representative of teenagers with TBI more generally. Only two adolescents in the current sample had severe injuries, thus, we may have had different and perhaps stronger effects with a more

severely injured sample. Additionally, because all families received TOPS, the results fail to shed light on the utility of TOPS relative to alternative treatments or face-to-face delivery of the content. Given the nature of the assessment, social desirability biases may have caused participants to rate the program and its benefits more favorably. A randomized clinical trial of TOPS is necessary to establish its efficacy in improving adolescent targeted skills following TBI. However, we are encouraged by these preliminary findings of feasibility, satisfaction, and helpfulness.

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