

ORIGINAL ARTICLE

The Efficacy of Cognitive Behavior Therapy in the Treatment of Emotional Distress After Acquired Brain Injury

Cheryl L. Bradbury, PsyD, CPsych, Bruce K. Christensen, PhD, CPsych, Mark A. Lau, PhD, RPsych, Lesley A. Ruttan, PhD, CPsych, April L. Arundine, BA, MSc (Cand), Robin E. Green, PhD, CPsych

ABSTRACT. Bradbury CL, Christensen BK, Lau MA, Ruttan LA, Arundine AL, Green RE. The efficacy of cognitive behavior therapy in the treatment of emotional distress after acquired brain injury. *Arch Phys Med Rehabil* 2008;89(12 Suppl 2):S61-8.

Objective: To evaluate the efficacy of cognitive behavior therapy (CBT), adapted to meet the unique needs of individuals with acquired brain injury (ABI), and modified for both group and telephone delivery.

Design: Matched-controlled trial, with multiple measurements across participants, including pretreatment baseline assessment plus posttreatment and 1-month follow-up.

Setting: Outpatient community brain injury center.

Participants: Participants (N=20) with chronic ABI. Ten were assigned to the CBT treatment group and 10 to education control. All were experiencing significant emotional distress at the onset of the study.

Intervention: Eleven sessions of CBT (or education control), including 1 introductory individual session plus 10 further sessions administered in either group format or by telephone. The CBT was designed to decrease psychologic distress and improve coping. Specific adaptations were made to the CBT in order to better accommodate individuals with cognitive difficulties.

Main Outcome Measures: Primary outcome measures included the Symptom Checklist-90-Revised (SCL-90-R) and the Depression Anxiety Stress Scales (DASS-21). Secondary outcome measures included the Community Integration Questionnaire (CIQ) and the Ways of Coping Scale, Revised.

Results: Significant CBT treatment effects (in both group and telephone formats) were observed on the SCL-90-R and the DASS-21, whereas no significant effects were observed in the education control group. No significant effects of treatment were observed on the CIQ or Ways of Coping Scale, Revised.

Conclusions: Results suggest that adapted CBT—administered by telephone or in a face-to-face group setting—can significantly improve emotional well-being in chronic ABI.

Key Words: Anxiety; Brain injuries; Depression; Psychotherapy; Rehabilitation.

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PEOPLE WITH ABI are at increased risk for the development of psychiatric disturbance; many have extreme and protracted emotional disturbances in the months and years after injury.¹ However, the emotional consequences of ABI have historically received little attention. Although physical and cognitive symptoms are often the focus of inpatient rehabilitation programs, the emotional impact of ABI is frequently undertreated.^{2,3} For people in the chronic stages of ABI, outpatient treatment for psychiatric sequelae may be inaccessible because of geographic remoteness, financial barriers, or physical disability limiting travel to treatment facilities.⁴ Moreover, to date, there have been no validated treatments tailored to meet the specific needs of people with ABI.

The most common post-ABI psychiatric symptoms are depression^{5,6} and anxiety,⁵ with the prevalence of depression estimated to be upwards of 40%.⁷ Importantly, the presence of psychologic symptoms, particularly depression and anxiety, places individuals at increased risk for poorer outcomes after brain injury.⁸⁻¹¹ For example, during rehabilitation, the severity of depressive symptoms has been shown to be a robust determinant of poorer functional outcomes after TBI, even after controlling for demographic variables, cognitive deficits, and injury severity.⁹ Emotional distress has also been shown to have a similar direct and negative impact on life satisfaction.^{10,12} The consequences of prolonged, poor psychosocial adjustment after ABI can be profound, with suicide risk estimated to be 3 to 4 times greater than in healthy individuals.^{11,13} Importantly, if left untreated, clinically significant depressive symptoms do not appear to remit over time,^{8,10,11} suggesting that psychiatric symptoms represent a long-term consequence of ABI.

The persistence of emotional distress in ABI underscores the importance of both early identification and effective treatment interventions. However, traditional psychiatric treatments (pharmacologic and supportive) have been largely ineffective with clients with ABI.²

From the Toronto Rehabilitation Institute, Toronto, ON (Bradbury, Ruttan, Green, Arundine); Department of Psychiatry and Behavioural Neurosciences, McMaster University, St. Joseph's Health Centre, Hamilton, ON (Christensen); BC Mental Health and Addiction Services, Coquitlam, BC (Lau); Department of Psychiatry, Faculty of Medicine, University of British Columbia, Vancouver, BC (Lau); Graduate Department of Rehabilitation Sciences, University of Toronto, Toronto, ON (Arundine, Green), Canada; Peel Halton Acquired Brain Injury Services (Arundine).

Supported by the Ontario Neurotrauma Foundation (grant no. 2007-ABI-COP-538).

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

Reprint requests to Cheryl Bradbury, PsyD, Toronto Rehabilitation Institute, 520 Sutherland Dr, Toronto, ON, M4G 3V9, Canada, e-mail: bradbury.cheryl@torontorehab.on.ca.

0003-9993/08/8912S-00206\$34.00/0

doi:10.1016/j.apmr.2008.08.210

List of Abbreviations

ABI	acquired brain injury
ANOVA	analysis of variance
CBT	cognitive behavioral therapy
CIQ	Community Integration Questionnaire
DASS-21	Depression Anxiety Stress Scales, short form
GSI	Global Severity Index
RBANS	Repeatable Battery of Adult Neuropsychological Status
SCL-90-R	Symptom Checklist-90-Revised
TBI	traumatic brain injury
WTAR	Wechsler Test of Adult Reading

To be effective, psychological treatments designed for ABI populations need to address the complex relationship between the various sequelae of ABI, including compromised self-awareness and coping. Poor coping (eg, emotion-focused coping) has been widely associated with adjustment problems, anxiety, and depression postinjury.^{14,15} Conversely, adaptive coping (ie, problem-focused coping) has been recognized as a precursor to better adjustment and overall well being,¹⁶ yet it may require intact executive function, often compromised after brain injury.¹⁷ Reduced self-awareness has been associated with adjustment difficulties post-ABI.¹⁸ Individuals with higher levels of self-awareness endorse greater levels of emotional distress and may also show greater motivation to change, translating into better outcomes.^{19,20} Yet, the opposite is true for patients with lower levels of self-awareness, often resulting in an underestimation of symptoms and difficulties articulating and recognizing their own impairments. One promising psychological treatment that may improve both effective coping and self-awareness is CBT.²¹

CBT is one of the most empirically validated short-term interventions aimed at decreasing psychological distress, improving coping, and enhancing psychological well being in a wide range of clinical populations²² with demonstrated efficacy in both the individual therapy modality and the group therapy modality, which is more cost-effective.²³ There is an emerging literature detailing the benefits of CBT in medical populations,²² where improved coping and overall quality of life have been observed in patients with breast cancer²⁴ and other chronic conditions.²⁵ CBT has also been shown to promote behavioral activation in patients with stroke²⁶ and to decrease depressive symptoms in an Alzheimer's population.²⁷

Despite the proven benefits of CBT for both the general and medical population, there is a paucity of treatment with demonstrated efficacy for ABI, and the few existing studies evaluating efficacy contain methodologic limitations.²⁸⁻³¹ Intuitively, CBT represents a promising intervention for individuals with ABI, given its efficacy among other populations with mood and anxiety symptoms. Nonetheless, there are strong suggestions that psychological interventions may need modifications to meet the unique needs of persons with ABI. Recently, Mateer and Sira³² also emphasized the importance of addressing the emotional sequelae in brain injury and developed several guidelines for tailoring CBT to a brain-injured population.

Until recently, though, there were only case study accounts of the effectiveness of CBT in the treatment of patients with ABI.²⁹ For example, Tiersky et al³⁰ evaluated the efficacy of an intensive neuropsychiatric rehabilitation program (cognitive remediation and CBT 3 times a week for 11 weeks) aimed at treating mild to moderate psychological symptoms and postconcussive symptoms in patients with TBI. The intervention was effective in reducing psychological distress in patients compared with wait list controls. The benefit of this evaluation was the inclusion of CBT as the primary treatment. Yet, methodologic limitations (eg, confounding of CBT with cognitive remediation, intensity and proximity of care) make it impossible to ascertain the underlying mechanism of improvement and likely precluded outpatients from rural communities or patients with mobility constraints from participating. Anson and Ponsford³¹ also found that group CBT improved coping strategies among patients with TBI, yet failed to impact mood or anxiety symptoms. Again, several methodologic limitations (no control group, small sample size, concurrent cognitive remediation) should be noted.³¹ Nevertheless, these preliminary positive findings are promising and support further investigations into the efficacy of CBT for the ABI population.

An additional major barrier to the delivery of postacute health care to people with ABI is accessibility.⁴ Financial circumstances, mobility issues, and geographic remoteness can impede access to services,⁴ which has led some (eg, Tam et al)³³ to advocate the development of telerehabilitation for ABI. Emerging research investigating the efficacy of telephone-administered psychotherapy have shown telephone therapy to be beneficial in the treatment of depression in patients with multiple sclerosis³⁴ and for terminally ill patients with cancer.³⁵ CBT has demonstrated efficacy for telephone delivery in medical populations, allowing for administration of therapy regardless of the patient's geographic location; however, the efficacy of telephone CBT in ABI has yet to be examined.

Finally, although CBT has been identified as the treatment of choice for the psychiatric sequelae of ABI, there is little research on its efficacy when adapted for patients with cognitive impairments.

The objective of this study was to evaluate the efficacy of a CBT protocol for reducing emotional distress and improving coping in a group of patients with chronic ABI that (1) has been adapted for people with ABI, (2) can be delivered in conventional group format or by telephone, and (3) is benchmarked against an education control group. We hypothesized, first, that CBT, administered by group or telephone modality, would improve the emotional wellness, coping skills, and community integration for individuals with chronic ABI. Second, we hypothesized that improvements in emotional wellness would be maintained at 1 month after cessation of treatment.

METHODS

Participants

The study protocol was approved by the research ethics board at the institution at which the study was conducted, and the procedures of the study were in accordance with the standards of the research ethics board.

A total of 20 patients were initially recruited from a community-based ABI treatment organization for patients with the chronic effects of ABI. Inclusion criteria were as follows: (1) age between 18 and 65 years, (2) greater than 1 year postinjury, (3) able to provide informed consent, (4) on stable dosage of psychoactive medication and being monitored by a physician or psychiatrist, and (5) scored at least 1 SD above the published mean on the SCL-90-R.³⁶ GSI.

Individuals were excluded from the study if they (1) were endorsing significant suicidal ideation at the time of evaluation, (2) were currently engaged in another CBT or other psychotherapeutic intervention (not including sporadic support from social work, psychiatry, case manager, or other counselor), (3) had a concurrent neurological or psychotic disorder, or (4) were diagnosed with a communication disorder that would preclude participation.

Twenty-nine patients were approached to participate in the study. Of these, 7 declined. Of the 22 who agreed to participate, 20 met the SCL-90-R cutoff. From these patients, 2 groups were created who were matched on SCL-90-R scores, age, sex, and years of education. All participants in the groups had sustained significant brain injuries. Patients with TBI had initial GCS scores in the moderate or severe range. All patients with nontraumatic injuries were currently operating in the moderate to severe range of cognitive impairment in at least 1 cognitive domain and/or had remained in inpatient treatment for more than double the provincial average length of stay (27 days).

Within each group, half of the participants were assigned to a conventional group format for their sessions, and half were

assigned to a telephone-administered format; this latter assignment was based on logistical considerations, with patients traveling the farthest distances or without reliable transportation to the treatment facility receiving the telephone administration. (After the study commenced, 1 participant in the telephone-administered CBT condition withdrew and was subsequently replaced by a new recruit.) Table 1 shows the demographic, medical, and injury variables of the 2 groups. The CBT and education control groups did not differ significantly across any of the following parameters: age, years of

education, time since injury, estimated premorbid intelligence quotient as measured by the WTAR,³⁷ or current cognitive functioning as measured by the RBANS.³⁸

There were 4 subgroups in total. The treatment group comprised a telephone-administered subgroup (telephone CBT; n=5) and a face-to-face, group format subgroup (group format CBT; n=5). The education control group was composed of a telephone-administered subgroup (telephone education control; n=5) and a group-administered subgroup (group education control; n=5).

Table 1: Demographic, Medical, and Injury Variables

	CBT Group (n=10)	Education Control (n=10)
Age, mean \pm SD (y)	39.8 \pm 10.44	42.50 \pm 13.01
Sex, n (%)		
Female	5 (50)	5 (50)
Male	5 (50)	5 (50)
Years postinjury, mean \pm SD	7.00 \pm 6.15	11.40 \pm 9.42
Injury type		
Trauma, n (%)	7 (70)	3 (30)
MVC	5	1
Pedestrian MVC	1	1
Fall	1	1
Nontrauma, n (%)	3 (30)	7 (70)
Aneurysm/AVM/stroke	2	3
Hypoxia/anoxia	1	1
Anaphylaxis	0	1
Tumor	0	2
Psychotropic medication, n (%)		
No medication	4 (40)	3 (30)
Antidepressant	5 (50)	6 (60)
Antipsychotic/mood stabilizer	3 (30)	6 (60)
Benzodiazepine	2 (20)	2 (20)
Stimulant	0 (0)	2 (20)
Marital status, n (%)		
Single	8 (80)	4 (40)
Married/common law	1 (10)	4 (40)
Divorced/separated	1 (10)	2 (20)
Years of education, mean \pm SD	13.10 \pm 1.66	14.00 \pm 1.89
Preinjury employment, n (%)		
Employed	8 (80)	6 (60)
Student	2 (20)	2 (20)
Unemployed	0 (0)	2 (20)
Postinjury employment, n (%)		
Employed	1 (10)	0 (0)
Student	0 (0)	1 (10)
Unemployed	9 (90)	9 (90)
Estimated premorbid IQ, mean \pm SD		
WTAR standard score	95.40 \pm 11.58	102.8 \pm 13.47
Cognitive functioning, mean \pm SD		
RBANS total index	66.10 \pm 16.37	73.20 \pm 15.62
Immediate memory	71.10 \pm 20.96	75.80 \pm 17.64
Attention	68.50 \pm 21.10	73.00 \pm 20.36
Language	79.50 \pm 13.06	83.00 \pm 16.55
Visuospatial	76.50 \pm 19.80	86.70 \pm 16.67
Delayed memory	64.30 \pm 25.29	75.40 \pm 20.38

Abbreviations: AVM, arteriovenous malformation; MVC, motor vehicle collision; IQ, intelligence quotient.

Materials

Prior to treatment, all participants were administered the following neuropsychological tests to confirm similar levels of premorbid intellectual functioning and current cognitive functioning, and to provide clinical information with which to tailor therapy: (1) the WTAR,³⁷ an estimate of premorbid intelligence; and (2) the RBANS,³⁸ a brief, valid, and reliable measure of neuropsychological functioning that evaluates performance across a range of cognitive domains, providing summary index scores for each.

Primary Outcome Measures

Symptom Checklist-90-Revised.³⁶ This is a 90-item self-report questionnaire that measures a broad range of psychological symptoms, including a global severity index of psychological distress, the GSI. The GSI captures overall levels of emotional distress by calculating an aggregate score across clinical scales, allowing the comparison of overall emotional well being of participants with differing diagnoses. The SCL-90-R has robust psychometric properties and has been normed for the ABI population.³⁹

Depression Anxiety Stress Scales.⁴⁰ The DASS-21 is a 21-item self-report measure, shown to be a valid and reliable measure of depression and anxiety.⁴¹ The DASS-21 consists of a total score that evaluates overall emotional distress from all 3 clinical scales, as well as subscale scores of depression, anxiety, and stress.

Secondary Outcome Measures

The Ways of Coping Scale, Revised.⁴² The Ways of Coping Scale, Revised is a 66 item self-report measure used to assess the cognitive and behavioral strategies that individuals implement in order to cope with a situation that they perceive to be stressful. Factor analysis of the Ways of Coping Scale, Revised has generated 8 dimensions of coping, and the current study focused on planful problem-focused coping (Ways of Coping Scale, Revised, Planful Problem Focused subscale; planning, strategizing, and perspective-taking considered more adaptive)⁴³ and escape/avoidance coping (Escape Avoidance subscale; emotional method of coping, considered less adaptive).⁴²

Community Integration Questionnaire.⁴⁴ The CIQ is a 15 question self-report measure aimed at evaluating an individual's level of community reintegration after brain injury. It is a widely used measure of community reintegration after brain injury and has been shown to be a valid and reliable measure for the ABI population.

Design and Procedures

The design was a pre/posttreatment, education controlled design, comparing the effects of CBT to education both within and between groups. The modalities were commensurate on pretreatment SCL-90-R means, with no significant differences, similar distributions, and minimal effect sizes. Prior to treat-

ment commencing, neuropsychological tests and baseline psychologic outcome measures were administered. Then, the first session for all participants took place in person, 1-on-1, with their therapist or educator. At this time, all procedures were explained and materials were distributed.

The subsequent 10 treatment/education sessions were conducted either over the telephone (1-on-1 format) or in the face-to-face, group format. The sessions took place on a weekly basis with some sessions occurring twice weekly because of time constraints and scheduling. All sessions were completed within a 9-week time frame, with sessions ranging from 45 to 75 minutes as required. All participants completed the DASS-21 at the beginning of each weekly session to monitor progress and suicide risk. After completion of the eleventh session, all participants completed the posttreatment outcome measures. Participants in both groups also received 1-month follow-up sessions, at which time only the primary outcome measures (SCL-90-R and DASS-21) were administered.

CBT protocol (telephone CBT and group format CBT). The CBT was tailored to meet the unique needs of the ABI population, while adhering to proven treatment protocols. To address cognitive difficulties, specific alterations were made to conventional CBT, including repetition of important materials and frequent breaks.³² To expand and refine the recommendations of Mateer and Sira,³² specific cognitive information about each patient was obtained from neuropsychological assessment results. Specifically, the presence and severity of current cognitive deficits were identified in the following areas: memory, attention, initiation/activation, language, and speed of processing. For each patient, (1) their ability to benefit from repetition, (2) their capacity to learn and retain information, and (3) speed of information processing were identified and provided the therapist with information that helped determine the rate and complexity of speech and amount of repetition and summarization that might be required to optimize retention of information for each patient. In groups, the cofacilitator (master's-level graduate student) played a key role in assisting patients with higher needs (eg, reminders to complete homework). The master's-level student also administered telephone CBT to 1 participant under the direct supervision of the supervising psychologist. The 2 CBT therapists were clinical psychologists who also specialized in clinical neuropsychology, with a minimum of 5 years of clinical experience in the administration of CBT.

Education control protocol (telephone education control and group education control). The education control was administered by a trained clinician educator (master's-level graduate student). The purpose of the education group was to control for general aspects of therapeutic contact. Participants in both the telephone education control and group education control subgroups were provided wide-ranging information regarding the normative functioning of the brain, brain injury, and ABI sequelae. The content of the sessions was entirely educational, and if patients solicited counseling directly or indirectly, the educator was trained to explain that she was there to provide general information, but not counseling. Subsequent to the completion of the study, all control participants who continued to endorse significant emotional symptoms at their 1-month follow-up were offered CBT.

Statistical Analyses

Hypothesis 1. Pretreatment outcomes were compared with posttreatment outcomes using 2 (group: CBT vs education control) by 2 (time: pretreatment vs posttreatment) repeated-measures ANOVAs for each of the primary and secondary outcome measures. Subgroup analyses were also conducted, using paired *t* tests

(with primary outcome measures only) in order to evaluate the efficacy of both the group format CBT and the telephone CBT.

Hypothesis 2. (1) To evaluate retention of treatment gains, a 2 (group: CBT vs education control) by 2 (time: pretreatment vs 1-month follow-up) repeated-measures ANOVA was conducted, with the SCL-90-R GSI and DASS-21 as the dependent variables. We also examined effect sizes (Cohen's *d*) to compare the magnitude of the effect in this analysis to the equivalent analysis from hypothesis 1, with the expectation that participants in the CBT group would demonstrate commensurate pretreatment/1-month follow-up changes, compared with pre/posttreatment changes. (2) Paired *t* tests (CBT group) from posttreatment to follow-up were also undertaken, including effect size calculations (with no significant differences and small effect sizes expected).

RESULTS

Hypothesis 1

A significant group by time interaction was observed for the SCL-90-R ($F_{1,18}=7.03$, $P<.05$), with planned comparisons showing no significant pretreatment differences ($t_{18}=-0.40$, $P=.69$, 1-tailed, Cohen's $d=-0.18$), but significant posttreatment differences ($t_{18}=-2.95$, $P<.01$, 1-tailed Cohen's $d=-1.32$). Further, the CBT group showed a significant reduction in distress ($t_9=4.11$, $P<.01$) with a large effect size (Cohen's $d=1.30$). Similarly, with the DASS-21 total score as a dependent variable, a significant group by time interaction was observed ($F_{1,18}=7.56$, $P<.05$), with nonsignificant pretreatment differences between the 2 groups ($t_{18}=-1.01$, $P=.33$, although a moderate effect size was observed, Cohen's $d=-0.48$), but significant posttreatment differences ($t_{18}=-0.93$, $P<.001$, with a very large effect size Cohen's $d=-1.76$). Significant improvement on the DASS-21 was also observed from pretreatment to posttreatment in the CBT group ($t_9=6.27$, $P<.001$, Cohen's $d=1.79$). Moreover, although the mean pretreatment DASS-21 scores indicated a moderate range of emotional disturbance, relative to normative data, posttreatment DASS-21 total scores for the CBT group fell within the normative range for emotional disturbance. See figure 1 for group differences on DASS-21 scores across all sessions.

Table 2 displays the descriptive statistics for the subgroups on the primary outcome measures. On the SCL-90-R GSI, the group format CBT patients showed significant improvement over time as predicted ($t_4=3.67$, $P<.01$, 1-tailed, with a large Cohen's *d* effect size: Cohen's $d=1.45$) as did the telephone CBT patients ($t_4=2.20$, $P<.05$, 1-tailed, with a large effect size: Cohen's $d=1.06$). On the DASS-21 total score, significant reductions in emotional distress with large effect sizes were observed for both the group format CBT subgroup ($t_4=5.03$, $P<.01$, 1-tailed, Cohen's $d=1.91$) and the telephone CBT subgroup ($t_4=3.07$, $P<.05$, 1-tailed Cohen's $d=1.46$). Further, there were no significant between-group differences at posttreatment, when the group format CBT and telephone CBT groups were compared on either the SCL-90-R ($t_8=0.19$, $P=.85$, Cohen's $d=0.12$) or the DASS-21 ($t_8=-0.78$, $P=.46$, Cohen's $d=-0.49$). Last, there were no significant improvements, or trends toward improvement, after treatment in either of the education control groups on either test.

Scores on the secondary outcome measures for community integration, emotion-focused coping, and problem-focused coping, all changed in the expected directions—that is, improvements were noted for the most part in the CBT group, but not the education control group. Most of these results were trends toward significance. On total CIQ score, results revealed a trend toward a group by time interaction ($F_{1,18}=4.34$,

Between Group Differences on DASS Total Score Over Time

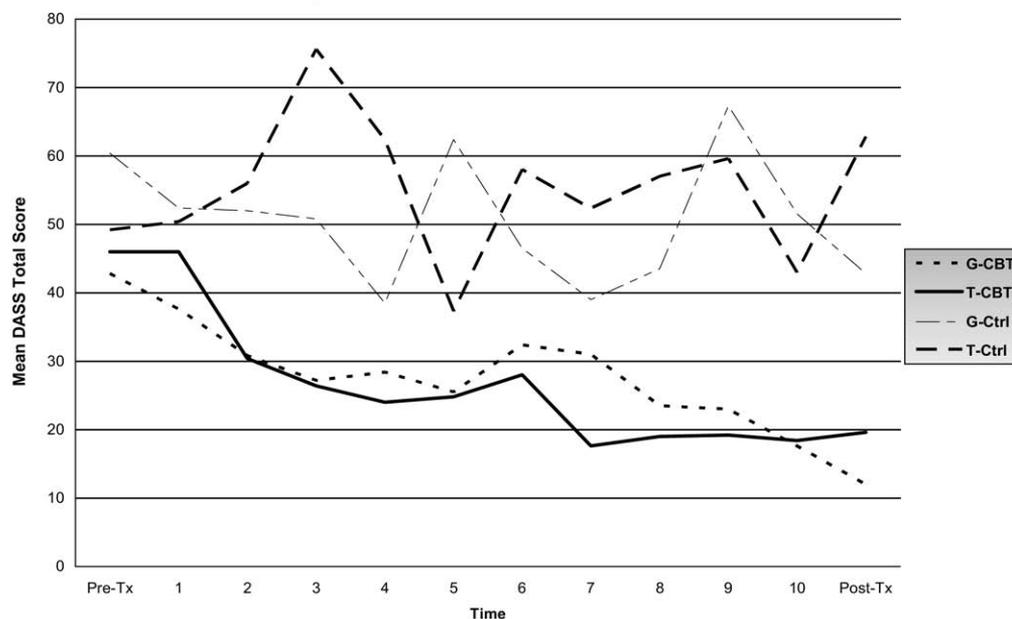


Fig 1. Group differences on DASS-21 total score over time. Performances in each of the 4 groups are presented across the 10 treatment/education sessions. A lower score represents less emotional distress. G-CBT, Group CBT; T-CBT, telephone CBT; G-Ctrl, group education control; T-Ctrl, telephone education control; Pre-TX, pretreatment; Post-TX, posttreatment.

$P=.052$), and similar results were revealed on the Ways of Coping Scale, Revised, Escape Avoidance subscale ($F_{1,18}=3.94, P=.063$). No group by time interaction effect was revealed on the Ways of Coping Scale, Revised, Planful Problem Focused subscale ($F_{1,18}=0.22, P=.65$), but a main effect of time was shown ($F_{1,18}=7.81, P<.05$). Therefore, both groups seemed to improve their problem-solving approach by being involved in CBT or learning about brain injury. However, only the CBT group showed trends toward declines in emotion-focused coping.

Hypothesis 2

As shown in figure 2, when pretreatment and 1-month follow-up outcomes on the SCL-90-R GSI were examined, a significant group by time interaction was observed ($F_{1,18}=18.60, P<.001$). As previously stated, the groups had commensurate pretreatment scores. However, significant differences were revealed at follow-up on a 1-tailed t test ($t_{18}=-3.38, P<.01$, Cohen's $d=-1.51$), with the treatment group showing significantly better functioning than the control group. As well, significant improvement within the CBT group from pretreatment to follow-up was observed ($t_9=5.17, P<.001$, 1-tailed, Cohen's $d=1.30$).

As shown in figure 3, similar results were revealed for the DASS-21, with a significant group by time interaction observed ($F_{1,18}=12.65, P<.01$). The CBT group demonstrated significant reductions in distress (DASS-21 total score) compared with the control group ($t_{18}=-4.65, P<.001$, Cohen's $d=-2.08$), and significant improvement within the CBT group from pretreatment to 1-month follow-up was also found ($t_9=7.01, P<.001$, 1-tailed, Cohen's $d=1.85$).

Table 2: Individual Group Analyses for Primary Outcome Measures

Outcome Measures	G-CBT (n=5) Mean ± SD	T-CBT (n=5) Mean ± SD	G-Ctrl (n=5) Mean ± SD	T-Ctrl (n=5) Mean ± SD
SCL-90-R, GSI				
Pre	71.00±7.84	68.40±8.26	72.40±9.15	69.80±6.98
Post	59.20±8.41	58.00±11.11	68.00±7.97	72.80±9.28
DASS-21				
Total score				
Pre	42.80±21.15	46.00±13.41	60.40±36.89	49.20±17.81
Post	12.00±8.60	19.60±19.97	42.80±25.00	62.80±24.68
Depression				
Pre	21.20±14.87	13.60±7.67	23.20±10.35	18.40±7.80
Post	6.80±6.57	5.20±5.76	16.00±11.31	22.80±10.26
Anxiety				
Pre	8.00±3.74	11.20±8.07	16.00±14.63	14.80±5.93
Post	2.00±3.46	3.60±3.58	7.60±6.69	16.80±8.44
Stress				
Pre	13.60±9.94	21.20±3.03	21.20±13.31	16.00±6.78
Post	3.20±3.35	10.80±11.28	19.20±11.19	23.20±8.44

Abbreviations: G-CBT, Group CBT; T-CBT, telephone CBT; G-Ctrl, group education control; T-Ctrl, telephone education control.

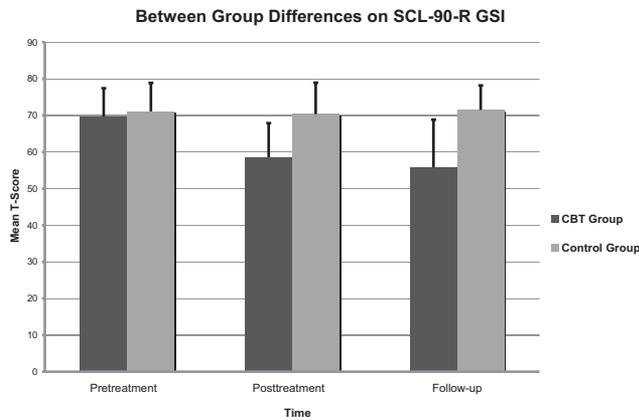


Fig 2. Differences on SCL-90-R GSI from pretreatment to follow-up across collapsed CBT groups and education control groups.

Importantly, no change was found between posttreatment and 1-month follow-up measures for the CBT group on either the SCL-90-R GSI ($t_9 = -0.89, P = .20$, Cohen's $d = 0.25$) or the DASS-21 total score ($t_9 = -0.06, P = .48$, Cohen's $d = -0.02$), demonstrating the stability of group effects over time. The stability of positive change was also upheld, on both outcome measures, for subgroup analyses. The group format CBT participants showed commensurate posttreatment and follow-up scores on the SCL-90-R GSI ($t_4 = 0.44, P = .34$, Cohen's $d = 0.19$), and the DASS-21 total score ($t_4 = -0.12, P = .45$, Cohen's $d = -0.05$). The telephone CBT participants showed similar results on the SCL-90-R GSI ($t_4 = 0.75, P = .25$, Cohen's $d = 0.27$) and DASS-21 ($t_4 = 0.00, P = .50$, Cohen's $d = 0.00$).

Importantly, there were no significant differences between the group format CBT and telephone CBT groups at follow-up on either the SCL-90-R GSI ($t_8 = .32, P = .76$, Cohen's $d = -0.20$), or the DASS-21 ($t_8 = -.82, P = .44$, Cohen's $d = -0.52$). See table 3 for individual change scores and clinical impact for individual participants.

DISCUSSION

As predicted, results of the current study revealed statistically significant improvements in emotional distress for the CBT group, compared with the control group, from pretreat-

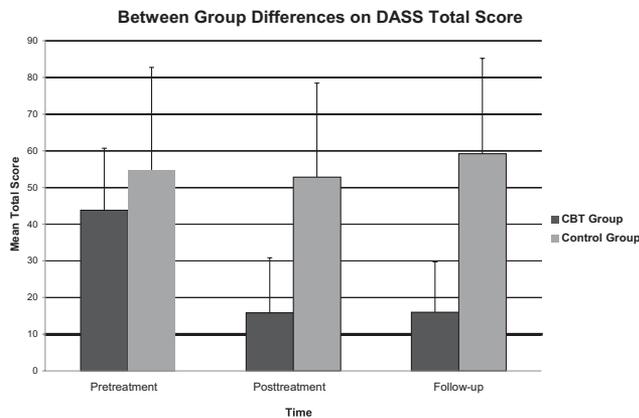


Fig 3. Differences on DASS-21 total score from pretreatment to follow-up across collapsed CBT groups and education control groups.

Table 3: Individual Scores on SCL-90-R GSI and DASS-21, Pretreatment Versus Posttreatment Versus 1-Month Follow-Up

Patient	GSI Pre	GSI Post	GSI Follow-Up	DASS-21 Pre, Total Score	DASS-21 Post, Total Score	DASS-21 Follow-Up
CBT treatment group						
1*	63	55	41	16	0	8
2*	81	58	71	62	22	14
3*	74	68	64	56	18	26
4*	63	48	50	24	8	4
5*	74	67	60	56	12	10
6	65	66	58	44	38	18
7	72	71	72	62	44	44
8	81	59	60	56	10	30
9	60	50	30	40	0	0
10	64	44	52	28	6	6
Education control group						
1*	65	60	58	54	20	12
2*	74	66	68	24	26	48
3*	81	81	81	88	82	90
4*	81	69	73	108	52	70
5*	61	64	67	28	34	50
6	72	61	71	58	82	76
7	65	65	74	38	32	32
8	64	81	72	24	40	44
9	67	76	70	68	78	86
10	81	81	81	58	82	84

*Group-administered subgroup patients for group cognitive behavior therapy and group education control.

ment to posttreatment and at a 1-month follow-up. Upwards of 60% of the CBT participants showed meaningful improvements in their pre-post treatment reports of emotional distress on the SCL-90-R GSI (ie, a t score < 1 SD above the mean), compared with 0% of control group participants. Similar benefits were observed on the DASS-21, with 80% of the CBT group reporting normative levels of emotional distress post-treatment, compared with only 20% of controls. Therefore, they may have been experiencing a greater number of symptoms, and this may have impacted the current findings.

Results also demonstrated the lasting benefits of CBT at 1 month postinjury, with 50% of CBT participants continuing to show meaningful positive change on the SCL-90-R GSI compared with only 10% of the control group. Similar findings were found on the DASS-21, with 80% of participants in the CBT group reporting normative levels of emotional distress at their 1-month follow-up, compared with only 10% of controls. Importantly, the efficacy of treatment cannot be attributed to higher estimated premorbid intelligence quotient or higher current cognitive functioning in the treatment group because there were no significant differences between the groups on the WTAR or the RBANS. This suggests that CBT adapted to meet the unique cognitive and emotional needs of ABI survivors can be successful at improving emotional well being, even in patients who are years postinjury.

Importantly, individual subgroup analyses showed commensurate improvements on the SCL-90-R GSI and on the DASS-21 total score for both the group format CBT and the telephone CBT subgroups. Given the small sample size, it is difficult to interpret preliminary findings regarding treatment modality with confidence. Nonetheless, these results support

the notion that adapted CBT for ABI could have equivalent efficacy when administered in either traditional group or adapted telephone modalities. This important finding, if replicated in a larger, randomized controlled trial, would allow for greater accessibility to individuals with ABI who, because of either mobility or geographic restrictions, would have otherwise been precluded from participation in treatment. However, the current findings should still be considered preliminary, given the small sample size, and the fact that the study was a case matched design and not a more rigorous design, such as a randomized controlled trial.

Secondary outcomes including coping and community integration still require further investigation. Both the CBT and the control group showed significant improvements (pretreatment to posttreatment) in their implementation of problem-focused (adaptive) coping, but only the CBT group showed concurrent declines (trend) in their emotion-focused (maladaptive) coping. Findings suggest that providing structure, organization, and learning opportunities may have a global positive impact on planning and problem-solving in ABI, but that to elicit positive emotional change, the problem-solving must be related to psychologic/psychosocial issues. Community integration results were inconclusive, with both groups showing some changes over time and no significant effects revealed, despite trends in the direction of improved integration. Additional research into the secondary benefits of CBT for ABI is required. The current findings are nevertheless compelling, suggesting that individuals with ABI have the potential to improve their emotional well being, which in turn may have a widespread and positive impact on other aspects of functioning.

The emotional sequelae of ABI are not under debate. Emotional distress has unequivocally been identified as a significant contributing factor to poorer community functioning and decreased quality of life after brain injury.⁹⁻¹¹ That emotional distress does not receive more attention in traditional rehabilitation programs is a concern. Although significant rehabilitation efforts are devoted to the cognitive and motor sequelae of ABI, the emotional sequelae often receive limited attention, particularly during acute rehabilitation. Yet, psychologic services are often expensive and inaccessible for people in the subacute and chronic stages of brain injury. Moreover, few psychologic interventions are tailored to the specific cognitive needs and content issues of brain-injured patients. Of the previous findings, improvements in emotional well being³⁰ and coping strategies³¹ had been suggested, but the current study, to our knowledge, is the first of its kind that documents the efficacy of adapted CBT for individuals with ABI, and also investigates CBT efficacy for both group and telephone treatment modalities. Moreover, the current findings delineate the specific mechanisms underlying change, showing that education and socialization are insufficient to evoke change and that the necessary component is an adapted psychotherapeutic intervention that individuals with ABI can learn and retain over time.

Study Limitations

There are obvious limitations to the current study. First, the current study was an education-matched study, not a randomized controlled trial; therefore, caution should be applied in the extrapolation and generalization of the findings outside the context of the current study. Another very pertinent limitation was the small sample size, again making it difficult to interpret the current findings confidently. Results were nevertheless compelling, and given the current strength of the findings, additional investigations are warranted.

An additional limitation of this study was the representativeness of the sample. All individuals who participated in the current project were connected to a community ABI program and lived in urban areas with access to high-quality health care. Therefore, the sample tested is not representative of all individuals with ABI. Finally, sample bias is a potential limitation. Individuals who chose to participate in the current study may have been more psychologically minded or at a stage in their recovery at which they were more receptive to psychologic intervention. Results suggest that for individuals motivated to participate, the intervention has the potential to be efficacious and that the results can be lasting.

Clinical Implications

Overall, these findings are very promising. Efficacy of the adapted CBT protocol for people with ABI was observed on the primary outcome measures even with very small numbers. Although there was diminution of emotional dysfunction in the CBT subgroups and the CBT collapsed group, there was no significant change to symptoms in the education control group. These preliminary results strongly support the value of a larger randomized controlled trial, especially given that the current protocol is unique in that it is universally applicable to all patients with ABI regardless of accessibility restrictions that may be present. Moreover, research has shown that patients with ABI do not necessarily respond as well to traditional therapeutic interventions when their unique cognitive and rehabilitative needs are not formally recognized and addressed.² The current approach adheres to proven CBT treatment protocols aimed at reducing emotional distress and improving adjustment and coping, but critically, it has been adapted to address the specific needs of the ABI population. An additional potential benefit of this research is that CBT has the potential to promote cognitive and physical functioning, either by enhancing mood (which when significantly disrupted can reduce cognitive functioning) or by promoting greater motivation for and engagement in rehabilitation. This in turn may further enhance coping and adjustment after ABI. The current line of research has the potential to influence standard rehabilitation practices positively by demonstrating the benefits of allocating appropriate resources to emotional recovery after ABI.

CONCLUSIONS

Emotional distress in ABI is a pertinent concern for patients, families, and health care professionals. To our knowledge, the current project is the first matched controlled study demonstrating both the potential feasibility and efficacy of CBT in the treatment of emotional dysfunction after ABI. The results of our study showed significant treatment effects when a modified CBT for the treatment of emotional distress in ABI was compared with an education control group. Specifically, the CBT group reported significantly lower levels of emotional distress posttreatment compared with their pretreatment scores. No changes were observed in the education control group's reports of emotional distress over time. Importantly, the current results identify that CBT, not simply socialization, is the necessary component for positive change. However, prospective randomized controlled trials with longer-term follow-up are needed to determine further the specific individual, personality, and injury variables that may mediate the effectiveness of CBT in the treatment of emotional distress in ABI.

Acknowledgments: We thank the administrative and clinical staff of Peel Halton Acquired Brain Injury Services for their enthusiastic support of this study. Special thanks to Kadeen Johns, BSc, and Ephrem Pano, BSc, for their help with manuscript preparation, and Han Sol Kang

for her assistance with patient testing and manuscript preparation. The authors acknowledge the support of Toronto Rehabilitation Institute who receives funding under the Provincial Rehabilitation Research Program from the Ministry of Health and Long-Term Care in Ontario. The views expressed do not necessarily reflect those of the Ministry.

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