A controlled evaluation of cognitive behavioral therapy for posttraumatic stress in motor vehicle accident survivors

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Abstract

Seventy-eight motor vehicle accident survivors with chronic (greater than 6 months) PTSD, or severe sub-syndromal PTSD, completed a randomized controlled comparison of cognitive behavioral therapy (CBT), supportive psychotherapy (SUPPORT), or a Wait List control condition with two detailed assessments. Scores on the CAPS showed significantly greater improvement for those in CBT in comparison to the Wait List and to the SUPPORT conditions. The SUPPORT condition in turn was superior (p=0.012) to the Wait List. Categorical diagnostic data showed the same results. An analysis of CAPS scores including drop-outs (n=98) also showed CBT to be superior to Wait List and to SUPPORT with a trend for SUPPORT to be superior to Wait List. The CBT condition led to significantly greater reductions in co-morbid major depression and GAD than the other two conditions. Results held up well at a 3-month follow-up on the two active treatment conditions.

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1. Introduction

Over 3 million Americans are injured in motor vehicle accidents (MVAs) each year (Blanchard & Hickling, 1997). Epidemiologic research (Norris, 1992; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995) has confirmed that MVAs are probably the leading cause of Posttraumatic Stress Disorder (PTSD) in this country. Prospective studies of injured MVA survivors have documented rates of PTSD ranging from about 8% (Mayou, Bryant, & Duthie, 1993) to about 40% (Blanchard & Hickling, 1997; Epstein, 1993), with a good estimate of the average value being about 25% (see Blanchard and Hickling, 1997, for a summary).
Prospective follow-up studies of injured MVA survivors (summarized in Blanchard and Hickling, 1997, and Blanchard & Veazey, 2001) show that about 50% of initial cases of PTSD remit within the first 6 months post-MVA. Those who continue to be symptomatic beyond 6 months, and especially beyond 12 months, tend to have a chronic course of the disorder with noticeable psychosocial impact (Kessler, Sonnega, Bromet, Hughes & Nelson, 1995; Blanchard & Hickling, 1997). This population thus seems ripe for research on treatment.

A great deal of research currently exists on psychosocial treatments for PTSD (see Foa and Meadows, 1997, and Foa, Keane, and Friedman, 2000, for recent summaries). Much of this research has either involved male combat veterans who were 10–25 years post-trauma or female survivors of sexual assault who were on average 5–10 years post-trauma. Very little research has used a mixed gender population, such as MVA survivors, who met the diagnostic (DSM-IV, APA, 1994) criteria for chronic PTSD, but who were relatively early in their PTSD career.

To the best of our knowledge four randomized controlled treatment trials (RCTs) have been published involving the psychosocial treatment of MVA survivors. The earliest, by Hobbs, Mayou, Harrison, and Worlock (1996) randomly assigned 106 MVA survivors attending the Emergency Department at a hospital in Oxford, UK, to either a 1-hour psychoeducational “de-briefing” session within 2 days of the MVA, or to routine medical follow-up care. Cases were excluded based on absence of psychological problems or inability to remember the accident. A follow-up assessment at 4 months post-MVA with the Impact of Event Scale (IES; Horowitz, Wilmer, & Alvarez, 1979) revealed no significant effects on IES scores for either group. The treated group was significantly worse on several scales from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983).

In another early intervention trial, this time in Australia, Bryant, Harvey, Dang, Sackville, and Basten (1998), randomly assigned 24 MVA and industrial accident survivors, who had been hospitalized because of injuries and who met criteria for Acute Stress Disorder (ASD) at an assessment on average 10 days after the accident, to either an intensive cognitive behavioral treatment regimen involving five 90-min sessions, or five similar length sessions of supportive counseling. At an assessment 6 months post-MVA, 8.3% of the treated sample met criteria for PTSD as compared to 83.3% of the control sample receiving supportive counseling. [Early prospective follow-up studies of MVA survivors with ASD by this research team (Harvey & Bryant, 1998) had shown a base rate of 67% of those with initial ASD or sub-ASD met criteria for PTSD 6 months later. Thus, their supportive counseling may have been detrimental to its recipients.]

In a second study involving a combination of MVA survivors and survivors of other traumas, all of whom were hospitalized and met criteria for ASD or sub-ASD, Bryant, Sackville, Dang, Moulds, and Guthrie (1999) compared prolonged exposure (n=14), prolonged exposure plus anxiety management (n=15) and supportive counseling (n=16), each delivered in five 90-min individual therapy sessions. Assessments with the CAPS (Clinician-Administered PTSD Scale; Blake et al., 1995) at about 6 weeks post-trauma and 7 months post-trauma revealed fewer cases of PTSD in prolonged exposure (14%) or prolonged exposure plus anxiety management (20%) than in supportive counseling (56%) at post-treatment and at the 7 month follow-up (15, 23 and 67%, respectively).

Finally, in a Canadian study, Fecteau and Nicki (1999) compared treatment combining cognitive and behavioral procedures, delivered in four sessions of about 2 hours duration, to a waiting list control with MVA survivors who ranged from 3 to 95 months post-MVA (mean 19 months). Their results showed 5 of 10 treated cases no longer met criteria for PTSD as contrasted with 0
of 10 cases in the Wait List condition. There was a significant differential effect on CAPS scores with the average for the treated group changing from 71 to 38 whereas the Wait List group changed from 77 to 75. A 6-month follow-up showed highly significant reductions in IES scores for the treated group from 46.1 (pre) to 15.5 (post) to 8.3 (6 months).

Taylor et al. (2001) recently described an uncontrolled trial of 50 MVA survivors with chronic PTSD (mean of 2.4 years post-MVA) that utilized a combination of cognitive and behavioral procedures similar to the present study. Treatment was in small groups and was for twelve 2-hour weekly sessions. Results showed 22 of the 50 (44%) no longer met criteria for PTSD at follow-up.

Our study differs from those of Hobbs et al. (1996) and Bryant et al. (1998, 1999) in focusing on MVA survivors with chronic PTSD. It differs from the study of Fecteau and Nicki (1999) in the use of a supportive psychotherapy control in addition to a Wait-List control and in restricting recruiting to a specified time window, 6–24 months post-MVA.

2. Method

2.1. Experimental design and patient flow

Recruitment of patients for this study began in March 1997 and concluded in July 2000. Treatment and 3-month follow-ups on all participants were completed in May 2001. As patients were recruited and completed the initial assessment, they were matched into triads based on initial CAPS score and randomly assigned to one of three therapists (see below) and then to one of three conditions: (1) a combination of cognitive behavioral treatment (CBT) procedures; (2) supportive psychotherapy (SUPPORT); or (3) a Wait List control condition. The latter were crossed over after the post-assessment to the CBT condition or clinical treatment.

2.1.1. Patient flow

Of 433 potential participants who were screened by telephone, 215 were offered appointments for assessment and 141 completed the assessment. Nine were excluded on the basis of co-morbid diagnoses (1 with Delusional Disorder, 1 with Bipolar, 5 with current alcohol or drug abuse or dependence, and 2 with noticeable cognitive impairment secondary to the MVA); 24 others were excluded because of too few symptoms or too low CAPS score. Ninety-eight attended at least one treatment session. Data from all of these were used in the intent-to-treat analysis. There were 20 dropouts (10 from CBT, 9 from SUPPORT, 1 from Wait List). Thus, 78 participants completed the post-treatment assessment.

2.2. Participants

Our sample included 98 individuals who met DSM-IV (APA, 1994) criteria for PTSD or severely symptomatic sub-syndromal PTSD [meets criterion A, E and F for PTSD and two of criteria B, C, or D (see Blanchard and Hickling, 1997, for a description of the utility of this category)]
with a CAPS score of 30 or greater. Demographic variables for the participants in each of the treatment conditions, and for the treatment drop-outs combined, are presented in Table 1.

The three conditions did not differ on any of the variables presented in Table 1. The dropouts did not differ significantly from treatment completers on any tabulated variable but showed trends to be younger ($p=0.07$) and to have suffered the MVA more recently ($p=0.08$) and to more likely be non-Caucasian ($p=0.08$).

The data in Table 1 illustrate some of the advantages of studying MVA survivors with PTSD. First, the sample is 27% male and 73% female. Treatment research with rape victims or Vietnam veterans tends to be exclusively with female or male populations, respectively. As mentioned earlier, with MVA survivors it is possible to analyze for gender effects on outcome. Moreover, 91% of the population were suffering from lingering physical injuries that often serve as a reminder of the MVA and which impede spontaneous remission of PTSD (Blanchard and Hickling, 1997, Chapter 9). Lastly, 60% of the population was engaged in litigation secondary to the MVA. This could impede recovery but, has not been an issue in PTSD treatment research with other populations. Only one individual (assigned to CBT) had been involved in an MVA that resulted in loss of life.

A reliability check on diagnosis of PTSD was made by having a trained graduate student assessor, blind to diagnosis, reassess half of the sample ($n=49$) by listening to audio tapes of the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Demographic information on patient completer groups and dropouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>CBT CBT Support Support Wait List Dropouts Dropouts</td>
</tr>
<tr>
<td></td>
<td>n=27 n=27</td>
</tr>
<tr>
<td>Gender (M/F)</td>
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<td>Average years of education</td>
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<td>SD</td>
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<td>Initial diagnosis</td>
<td>PTSD</td>
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<tr>
<td>Sub-syndromal PTSD</td>
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<tr>
<td>Initial CAPS Score</td>
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<tr>
<td>SD</td>
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<tr>
<td>Months since MVA</td>
<td>M</td>
</tr>
<tr>
<td>SD</td>
<td>9.2</td>
</tr>
<tr>
<td>Percent with continuing physical problems</td>
<td>92.6</td>
</tr>
<tr>
<td>Percent involved in litigation</td>
<td>55.6</td>
</tr>
</tbody>
</table>
initial interview. Kappa for diagnostic agreement was 0.789, $p<0.001$. Correlation of the two total CAPS scores was $r(N=49)=0.94$, $p<0.001$.

2.3. Therapists

In order to strengthen the external validity of the study, the three therapists (2 male, 1 female) were licensed, practicing psychologists in the community. Each saw patients in both treatment conditions. Each had over 5 years experience assessing and treating Vietnam veterans with PTSD at the local VAMC and a total experience level of 9–15 years, post-internship. They saw participants in their practice offices and were paid on a per-session basis.

The decision as to whether a patient would be referred for additional treatment immediately after the post-treatment assessment, or asked to wait until after the 3-month follow-up assessment, was left as a clinical decision by the therapist. Experimentally, we would have preferred that the patient be uncontaminated by additional treatment; however, patient needs took precedence. Eight patients, four each from CBT and SUPPORT, reported additional treatment in the 3 months between the post-treatment assessment and follow-up assessment.

The therapists each had a general cognitive behavioral orientation. The first two authors conducted training in the specifics of the two therapy protocols. Therapy sessions were audio taped and scored for protocol adherence by graduate students initially blind to treatment condition. Refresher training sessions with the therapists were held 6 and 12 months into the project.

2.4. Measures

Advanced doctoral students in Clinical Psychology conducted all assessments after the first author and more senior assessors had extensively trained each student. To the extent possible, a participant was assessed at all points by the same assessor. The assessors were kept blind to treatment condition.

2.4.1. Initial assessment

Participants gave written informed consent at the initial visit. At the initial assessment a detailed description of the participant’s MVA was taken using a structured interview developed by the first two authors (Blanchard & Hickling, 1997). Next, the participant was assessed using the Clinician-Administered PTSD Scale (CAPS), developed and validated by personnel from the National Center for PTSD (Blake et al., 1995). The CAPS was scored both for the 2 months immediately following the MVA and for the current time. The current CAPS generated two scores, both a categorical diagnosis of either PTSD, sub-syndromal PTSD [positive for 2 out of 3 symptom clusters (Criterion B, C, and D) but not all 3] or non-PTSD, and a total score obtained by summing the ratings of frequency and severity of each of the 17 symptoms. The latter was our primary dependent variable.

Next, all participants were assessed for the possible presence of other Axis I disorders through the use of the SCID (First, Spitzer, Gibbon, Williams, & Benjamin, 1996). Assessors had been trained extensively in its use. Reliability checks on the most common co-morbid conditions, major depression and GAD, were obtained by having 20 interviews re-scored by a different doctoral student. These yielded significant ($p<0.001$) kappas of 0.800 and 0.857, respectively. The LIFE
Base (Keller et al., 1987) was administered as a structured interview to obtain a picture of current psychosocial functioning. This included the Global Assessment of Functioning (GAF; Endicott, Spitzer, Fleiss, & Cohen, 1977).

Several questionnaires were also administered to assess current state and provide data comparable to that reported in other studies. These included the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the State-Trait Anxiety Inventory (STAI; Spielberger, 1983), as measures of depression and anxiety as well as the Impact of Event Scale (IES; Horowitz, Wilmer & Alvarez, 1979), and the PTSD Checklist (PCL; Weathers, Litz, Huska, & Keane, 1994) as indicators of posttraumatic stress symptoms. The Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), scored for the Global Severity Index (GSI), was used as an indicator of overall psychological distress. A psychophysiological assessment, for which data are not part of this report, was also conducted.

A lengthy report summarizing all of the interview data was prepared by the assessor. These were reviewed with the senior author. Then the patient was asked to read the report for accuracy so that any mistakes by the assessor could be corrected. Participants were paid $50 for completing the initial assessment and told that copies of the report would be sent to any professionals of their choosing with their (participants’) written consent. A copy was sent to the treating therapist along with a demographic sheet containing contact information, and a summary sheet from the CAPS.

2.4.2. Post-treatment assessment

At the conclusion of treatment, participants were reassessed, usually by the same assessor. All of the questionnaires were repeated as was the psychophysiological assessment. The assessor, using a structured follow-up interview and LIFE methodology (Keller et al., 1987), assessed psychosocial status and all Axis I disorders. The CAPS was re-administered as the chief dependent measure and again scored both categorically for diagnosis and for a total symptom score.

Detailed reports of all of the interview material were prepared, reviewed by the project director and then sent to the therapist. The therapist reviewed the report with the patient. Participants were paid $50 for completing this assessment also.

At this point the therapist made a judgment as to whether the patient needed to be referred immediately for further treatment or could wait for the 3 month follow-up point, and conveyed this information to the participant.

2.4.3. Dropout assessment

To the extent possible all participants who attended an initial therapy appointment, but who did not complete at least 8 sessions, were reassessed with the same procedures described above for the post-treatment assessment. They were also paid $50 for this assessment. When we could not obtain dropout assessment data, we substituted the initial assessment data in the intent to treat analysis (10 cases).

2.4.4. Three-month follow-up assessment

All of the procedures used at the post-treatment assessment, including the interviews and questionnaires (but not the psychophysiological assessment) were repeated. Again, reports were generated, reviewed by the senior author and sent to the therapist. Participants were paid $50 for completing this assessment.
2.5. Matching and randomization

The senior author matched participants into triads, based on the CAPS score and diagnosis, and then randomly assigned triads to a therapist and to conditions within the triad.

2.6. Treatment

The two active treatment conditions have been described in detail elsewhere (Hickling & Blanchard, 1997, 1999) in reports on the pilot studies evaluating the treatments. Both treatments were manualized. In an effort to enhance external validity, the treatments allowed the therapist a range of 8–12 weekly sessions with an expected mode of 10. Thus, the therapist could end treatment after 8 visits if in his/her judgment maximum benefit had been obtained; on the other hand treatment could be extended up to 12 visits if the therapist believed the extra sessions were necessary. Mean number of visits for CBT was 9.8 (1.2) and for SUPPORT it was 10.0 (1.2). The conditions did not differ ($t[52]=0.49$, ns).

2.6.1. Cognitive behavioral treatment (CBT)

This condition combined several behavioral and cognitive procedures. The initial visit consisted of a detailed description of PTSD and its symptoms and discussion of how the specific patient’s symptoms fitted the description. Emphasis was placed on helping the patient to understand PTSD as a reaction to trauma, or “to normalize” the patient’s view of his/her symptoms. A description of the various components of treatment was given. Next, the patient was taken through a 16-muscle group version of progressive muscle relaxation (see Blanchard and Andrasik, 1985, for a complete script) and given an audiotape to guide home practice over the coming week. Patients were asked to practice the relaxation daily. Lastly, the patient was asked to write a very detailed description of the MVA and its immediate aftermath, including their thoughts and sensory perceptions, and bring it to the next session.

The relaxation training was progressively shortened to 8-muscle groups, then 4-muscle groups, then relaxation-by-recall without initial tensing of the muscles. It ended with teaching patients cue-controlled relaxation to use as an everyday coping strategy. Patients were asked to continue daily relaxation practice throughout treatment.

Two kinds of exposure were emphasized. First, was the reading aloud by the participant, of his/her description of the MVA. This was done at each session after the first for five sessions; as homework patients were asked to read it aloud at home 3 times per day. This was tapered to once per day when the patient complained of boredom in the task. This procedure was designed to force the participant to think about the accident, rather than avoid the thoughts.

The second form of exposure was in vivo exposure to fear arousing cues related to traveling by automobile. An individual hierarchy of tasks was constructed with the patient and travel tasks assigned for each week beginning in Week 3. It could range from sitting behind the wheel of the car, starting it, and backing out of the driveway, in very avoidant cases, to driving near the MVA site or under conditions vaguely related to travel conditions at the time of the MVA. Gentle pressure was exerted to have the patient accomplish more each week. In addition, they were urged to use the newly learned relaxation skills to counter the arousal caused by working on travel hierarchy items.
Simultaneously with the in vivo exposure, patients were instructed to monitor thoughts and feelings associated with the travel task. Cognitive therapy procedures derived from Meichenbaum (1985) and Beck and Emery (1979) were introduced. Patients were taught to identify negative self-talk and how to correct it with positive coping self-talk. They were also taught to identify cognitive fallacies and learned how to dispute them.

At the second visit, participants who were married or living in a supportive relationship were asked to bring their partner to the third session. At that session it was explained to the partner that the participant had PTSD and what the symptoms were. The partner’s assistance in completing travel hierarchy items was solicited. If there was no partner, or if the patient objected, this part was omitted.

The last formal part of the treatment was designed to counteract the numbing symptoms, especially the anhedonia and estrangement from others. We used a version of behavioral activation (Jacobson et al., 1996), derived from Lewinsohn’s work (Lewinsohn, Munoz, Youngren, & Zeiss, 1978). Participants were asked for descriptions of activities they used to enjoy before the MVA that they now avoided. The typical statement was the “I will go back to doing X when I feel better”. We told them it had to be turned around, that is, that he/she had to go back to doing X, and afterwards would begin to feel better. Similarly, they were urged to gradually re-approach people they felt estranged from.

As a last part of therapy attention was paid as needed to anger issues, especially anger at a responsible other driver or at fate or circumstance, and to existential issues such as the recurring thought that the patient could have died in the accident.

2.6.2. Supportive psychotherapy (SUPPORT)

In this condition the first session was very similar to the first session in the CBT condition in that PTSD and its symptoms were described in detail and how the individual’s symptoms fitted this picture. Again, there was an effort to “normalize” the experience. No relaxation was included.

The next 3 sessions were devoted to a detailed review of the participant’s life, from earliest childhood to the present, with particular attention to previous traumas and previous losses and how the participant had dealt with them. This was done in a supportive and caring fashion.

The remaining 4–8 sessions were devoted to providing the patient with support on issues raised by the participant, including interpersonal or relationship issues, work issues, etc. Very little direct advice was given; instead, the participant was asked what he/she felt or thought. In most cases there were ongoing interpersonal issues that occupied the sessions.

Care was taken not to encourage any driving. If the participant asked directly about a specific travel behavior, he or she was told to listen to his/her body and be guided by how he/she felt. Catastrophic thoughts about the MVA were not challenged. If a patient asked about relaxation or meditation, he/she was told to use his or her own best judgment. Thus, the effort was made not to encourage any of the specific elements of the CBT protocol, but instead to put those choices/initiatives back on the patient.

2.6.3. Wait-List controls

These individuals were told that their treatment would be delayed for 2–3 months and that they would need to be reassessed after that interval before beginning. After the post-treatment assessment, they were all given the CBT treatment if they were still interested in treatment.
2.6.4. Treatment fidelity
Almost all treatment sessions were tape-recorded. These tapes were scored by a doctoral student, who had not assessed the participant and who was blind to treatment assignment, for presence or absence of a number of therapist behaviors that could logically, based on the treatment manuals, be present at a session. We found 99% treatment fidelity in the CBT condition and 97% in the supportive psychotherapy condition. A reliability check on 20% of the tapes by a different doctoral student revealed a correlation of 0.87, \( p < 0.001 \), between the two scorings.

3. Results

3.1. Initial treatment outcome

The primary analysis in this study is the comparison of CAPS scores for the three conditions from pre-treatment to post-treatment. The relevant mean scores are in Table 2 along with the means for the sample available for the 3-month follow-up (to be discussed later).

A repeated measures ANOVA (Groups \( \times \) Time) revealed a significant main effect of Time (\( F[1,75] = 123.9, \ p < 0.001, \ \text{eta}^2 = 0.623 \)) and a significant interaction of Groups \( \times \) Time (\( F[2,74] = 15.1, \ p < 0.001, \ \text{eta}^2 = 0.287 \)) but no main effect of Groups. A follow-up ANCOVA on post-test scores, using pre-treatment scores as the covariate was significant (\( F[2,74] = 16.5, \ p < 0.001, \ \text{eta}^2 = 0.309 \)). Pairwise comparisons revealed that CBT was superior to the supportive psychotherapy condition (\( p = 0.002, \ \text{eta}^2 = 0.171 \)) and to the Wait List condition (\( p < 0.001, \text{eta}^2 = 0.171 \)).

Table 2
Pre-treatment, and post-treatment CAPS scores on all groups and 3-month follow-up CAPS scores on treated groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Time</th>
<th>Pre-Tx</th>
<th>Post-Tx</th>
<th>3-months FU</th>
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<tr>
<td>CBT (n=27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>M</td>
<td>68.2</td>
<td>23.7</td>
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<tr>
<td>SD</td>
<td>22.7</td>
<td>26.2</td>
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<tr>
<td>Support (n=27)</td>
<td></td>
<td>65.0</td>
<td>40.1</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>25.9</td>
<td>25.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>65.8</td>
<td>54.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wait List (n=24)</td>
<td></td>
<td>26.6</td>
<td>25.9</td>
<td></td>
</tr>
<tr>
<td>CBT (n=26)</td>
<td>Follow-up results</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>M</td>
<td>69.6</td>
<td>23.7</td>
<td>22.1</td>
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<tr>
<td>SD</td>
<td>22.9</td>
<td>26.2</td>
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<tr>
<td>M</td>
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<td>29.8</td>
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<tr>
<td>SD</td>
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eta²=0.383). The supportive psychotherapy condition was superior to the Wait List (p=0.012, eta²=0.126). All three comparisons remain significant at p<0.05 after a Bonferroni correction.

There was no main effect or interaction with therapist when the analyses were repeated as a 3 way ANOVA, Therapists × Groups × Time. Moreover, there was no main effect of Gender of patient or interaction of Gender × Groups × Time.

3.1.1. Re-analysis including drop-outs

The re-analysis including data from drop-outs revealed similar results, a main effect of Time (F[1,95]=91.0, p<0.001, eta²=0.489) and a significant interaction of Groups × Time (F[2,95]=9.36, p<0.001, eta²=0.165). The ANCOVA was also significant (p<0.001). The pairwise comparisons revealed the CBT was superior to Wait List (p<0.001, eta²=0.216), and to SUPPORT (p=0.013, eta²=0.084). There was a trend for supportive psychotherapy to be superior to Wait List (p=0.052, eta²=0.064). After a Bonferroni correction, the latter comparison was not significant.

3.1.2. Categorical analysis

A second way to view these data is in terms of the categorical variable of whether participants changed diagnostic category (from PTSD to sub-syndromal PTSD or non-PTSD). This could also be seen as a measure of clinically significant change. The categorical diagnostic data from before to after treatment are contained in Table 3.

These data were analyzed with a series of 2×2 chi squares comparing pairs of treatment groups on whether the participants who initially met criteria for PTSD continued to meet it at post-
treatment or not. These analyses revealed that CBT was superior to Wait List ($X^2[1,N=42]=11.52$, $p=0.001$) and showed a trend to be superior to SUPPORT ($X^2[1,N=42]=3.64$, $p=0.054$). The SUPPORT condition was not superior to Wait List ($X^2[1,N=42]=2.59$, $p=0.107$). Thus, in summary 76.2% of those with initial PTSD treated by CBT had improved, compared to 47.6% of those treated by supportive psychotherapy, and to 23.8% of those on the Wait List who were assessed twice.

3.1.3. Changes in categorical co-morbidity

Our assessments allowed us to examine possible changes in co-morbid Axis I conditions for the three groups. (It should be remembered that these co-morbid conditions were not explicitly targeted by the treatments.) Results from the two most common co-morbid conditions, major depressive disorder (MDD) and generalized anxiety disorder (GAD), are presented in Table 4.

The data on MDD and GAD were analyzed by a similar series of $2 \times 2$ chi squares comparing treatment groups on whether those who were initially positive for MDD (or GAD) were still positive at the post-treatment assessment. These analyses revealed, for those with MDD (49% of the sample), that CBT led to a significantly higher rate of recovery than SUPPORT

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnoses pre-treatment</th>
<th>Diagnoses post-treatment</th>
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<tbody>
<tr>
<td>CBT ($n=27$)</td>
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<td></td>
</tr>
<tr>
<td>MDD</td>
<td>11</td>
<td>MDD 2</td>
</tr>
<tr>
<td>Non</td>
<td>16</td>
<td>Non 9</td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support ($n=27$)</td>
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<td></td>
</tr>
<tr>
<td>MDD</td>
<td>17</td>
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<tr>
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<td>Non 7</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wait List ($n=24$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDD</td>
<td>10</td>
<td>MDD 7</td>
</tr>
<tr>
<td>Non</td>
<td>14</td>
<td>Non 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT ($n=27$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAD</td>
<td>8</td>
<td>GAD 2</td>
</tr>
<tr>
<td>Non</td>
<td>19</td>
<td>Non 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAD</td>
<td>11</td>
<td>GAD 9</td>
</tr>
<tr>
<td>Non</td>
<td>16</td>
<td>Non 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wait List</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAD</td>
<td>8</td>
<td>GAD 6</td>
</tr>
<tr>
<td>Non</td>
<td>16</td>
<td>Non 2</td>
</tr>
</tbody>
</table>

Table 4
Categorical changes in co-morbid major depressive disorder and GAD
(X²[1,N=29]=7.99, p=0.005) or than Wait List (X²[1,N=21]=5.74, p=0.017). SUPPORT and Wait List did not differ (p=0.901). Moreover, none of the participants in the CBT condition who were not depressed initially became depressed during treatment, whereas 2 cases each in the SUPPORT and Wait List conditions moved from non-depressed to depressed by the post-treatment assessment.

For those with co-morbid GAD (34.6% of the sample), CBT led to a significantly greater likelihood of remission than the SUPPORT condition (X²[1,N=19]=6.13, p=0.013) but not the Wait List condition (X²[1,N=16]=2.29, p=0.13). Wait List and SUPPORT did not differ (p=0.345). Again, no participant in CBT deteriorated whereas one each in SUPPORT and Wait List who had not met criteria for GAD at pre-treatment had deteriorated and met criteria at post-treatment.

3.1.4. Psychological test measures

In Table 5 are listed the pre-treatment and post-treatment values for each of the psychological tests (in the interest of brevity the 3-month follow-up values for the participants in CBT and SUPPORT are also listed). Also in the table are values for the Groups × Time interaction from the Groups × Time repeated measures MANOVA and whether the within group change is significant from pre-treatment to post-treatment (and from post-treatment to 3-month follow-up).

Examining the results in Table 5 one finds significant (p<0.01 or greater) change for those receiving CBT on each measure from pre-treatment to post-treatment with no additional change in follow-up. Those in the Wait List condition did not change on any measure. Participants in the SUPPORT condition showed significant within group change on all measures except state and trait anxiety.

Between group comparisons at post-test by ANCOVAs revealed that the CBT condition showed greater change than the other two groups (p<0.001 in all instances). Those in the SUPPORT condition changed to a significantly greater degree than those in Wait List on State Anxiety, PCL and Global Severity Index of the BSI.

3.1.5. Changes in LIFE base variables

Finally in Table 6 are the results from the three LIFE base variables for each group at pre-treatment, post-treatment (and 3-month follow-up). These variables are indicative of possible changes in Criterion F of PTSD.

These three variables, relations with family, performance of major role function and GAF (Axis V) scores were subjected to a Groups × Time MANOVA. The values for the univariate interaction terms and whether the within group change was significant are also presented in the table.

Examining Table 6, for comparisons of pre-treatment to post-treatment values, one finds significant changes in GAF scores for CBT and SUPPORT with no change in Wait List. Follow-up ANCOVAs showed significantly (p=0.001 or better) greater change on GAF for CBT than for SUPPORT or Wait List. The latter two did not differ. There is a similar pattern on the rating of performance in major role functioning with both of the treated groups improving over the course of treatment whereas the Wait List did not change. The Groups × Time interaction, however, was not significant. Relations with family members did not improve significantly for any group.
Table 5
Psychological test results for all groups at pre-treatment, post-treatment and 3-month follow-up

<table>
<thead>
<tr>
<th>Measure</th>
<th>Time</th>
<th>Groups</th>
<th></th>
<th>Time</th>
<th>Groups</th>
<th></th>
<th>F Value, eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CBT support</td>
<td>Wait List</td>
<td></td>
<td>CBT support</td>
<td>Wait List</td>
<td></td>
</tr>
<tr>
<td>Global severity</td>
<td>Pre</td>
<td>70.1 (9.3)a</td>
<td>73.2 (6.4)a</td>
<td>72.1 (10.4)a</td>
<td>70.1 (9.3)a</td>
<td>73.2 (6.4)a</td>
<td>72.1 (10.4)a</td>
</tr>
<tr>
<td>Index (BSI)</td>
<td>Post</td>
<td>57.3 (12.6)b</td>
<td>67.6 (9.0)b</td>
<td>74.2 (6.3)a</td>
<td>57.3 (12.6)b</td>
<td>67.6 (9.0)b</td>
<td>74.2 (6.3)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>58.4 (14.3)b</td>
<td>65.3 (13.1)b</td>
<td>–</td>
<td>58.4 (14.3)b</td>
<td>65.3 (13.1)b</td>
<td>–</td>
</tr>
<tr>
<td>BDI</td>
<td>Pre</td>
<td>24.3 (10.8)a</td>
<td>26.2 (11.9)a</td>
<td>25.2 (11.9)a</td>
<td>24.3 (10.8)a</td>
<td>26.2 (11.9)a</td>
<td>25.2 (11.9)a</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>11.6 (12.3)b</td>
<td>19.7 (12.1)b</td>
<td>24.0 (12.1)a</td>
<td>11.6 (12.3)b</td>
<td>19.7 (12.1)b</td>
<td>24.0 (12.1)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>12.6 (13.5)b</td>
<td>17.8 (13.0)b</td>
<td>–</td>
<td>12.6 (13.5)b</td>
<td>17.8 (13.0)b</td>
<td>–</td>
</tr>
<tr>
<td>State-anxiety</td>
<td>Pre</td>
<td>55.3 (14.1)a</td>
<td>56.3 (12.2)a</td>
<td>58.5 (10.9)a</td>
<td>55.3 (14.1)a</td>
<td>56.3 (12.2)a</td>
<td>58.5 (10.9)a</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>38.9 (14.0)b</td>
<td>50.7 (12.6)a</td>
<td>58.8 (12.3)a</td>
<td>38.9 (14.0)b</td>
<td>50.7 (12.6)a</td>
<td>58.8 (12.3)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>42.6 (15.4)b</td>
<td>49.1 (14.5)a</td>
<td>–</td>
<td>42.6 (15.4)b</td>
<td>49.1 (14.5)a</td>
<td>–</td>
</tr>
<tr>
<td>Trait-anxiety</td>
<td>Pre</td>
<td>55.7 (14.0)a</td>
<td>56.7 (10.4)a</td>
<td>58.9 (10.1)a</td>
<td>55.7 (14.0)a</td>
<td>56.7 (10.4)a</td>
<td>58.9 (10.1)a</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>41.0 (16.5)b</td>
<td>52.4 (12.3)a</td>
<td>57.1 (9.9)a</td>
<td>41.0 (16.5)b</td>
<td>52.4 (12.3)a</td>
<td>57.1 (9.9)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>40.6 (15.3)b</td>
<td>52.3 (12.6)a</td>
<td>–</td>
<td>40.6 (15.3)b</td>
<td>52.3 (12.6)a</td>
<td>–</td>
</tr>
<tr>
<td>PCL-total</td>
<td>Pre</td>
<td>54.4 (12.2)a</td>
<td>55.0 (14.7)a</td>
<td>55.9 (13.3)a</td>
<td>54.4 (12.2)a</td>
<td>55.0 (14.7)a</td>
<td>55.9 (13.3)a</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>31.3 (14.1)b</td>
<td>43.8 (14.6)b</td>
<td>53.9 (14.1)a</td>
<td>31.3 (14.1)b</td>
<td>43.8 (14.6)b</td>
<td>53.9 (14.1)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>31.1 (14.2)b</td>
<td>40.8 (14.4)b</td>
<td>–</td>
<td>31.1 (14.2)b</td>
<td>40.8 (14.4)b</td>
<td>–</td>
</tr>
<tr>
<td>IES-total</td>
<td>Pre</td>
<td>40.4 (13.8)a</td>
<td>38.7 (20.9)a</td>
<td>40.2 (15.9)a</td>
<td>40.4 (13.8)a</td>
<td>38.7 (20.9)a</td>
<td>40.2 (15.9)a</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>12.1 (14.9)b</td>
<td>27.4 (19.1)b</td>
<td>36.6 (17.2)a</td>
<td>12.1 (14.9)b</td>
<td>27.4 (19.1)b</td>
<td>36.6 (17.2)a</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>12.2 (13.6)b</td>
<td>24.0 (20.1)b</td>
<td>–</td>
<td>12.2 (13.6)b</td>
<td>24.0 (20.1)b</td>
<td>–</td>
</tr>
</tbody>
</table>

*a Means within a column which share a superscript do not differ at p=0.01.
Table 6
LIFE base variables for three groups at all stages of assessment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Conditions</th>
<th>Support</th>
<th>Group × (Pre-Post) F value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CBT</td>
<td>Support</td>
<td></td>
</tr>
<tr>
<td>Major role function</td>
<td>Pre</td>
<td>2.9a (1.7)</td>
<td>3.2a (1.4)</td>
<td>2.9a (1.4)</td>
</tr>
<tr>
<td>1=No impairment high level of functioning</td>
<td>Post</td>
<td>2.3b (1.4)</td>
<td>2.7a (1.4)</td>
<td>2.8a (1.4)</td>
</tr>
<tr>
<td>3=Mild impairment</td>
<td>FU</td>
<td>2.5b (1.5)</td>
<td>2.6b (1.5)</td>
<td>–</td>
</tr>
<tr>
<td>5=Severe impairment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relations with family</td>
<td>Pre</td>
<td>2.2a (0.7)</td>
<td>2.4a (0.9)</td>
<td>2.6a (0.9)</td>
</tr>
<tr>
<td>1=Very good</td>
<td>Post</td>
<td>1.9a (0.9)</td>
<td>2.2a (0.8)</td>
<td>2.3a (1.0)</td>
</tr>
<tr>
<td>3=Fair</td>
<td>FU</td>
<td>2.0a (1.1)</td>
<td>2.0a (0.8)</td>
<td>–</td>
</tr>
<tr>
<td>5=Very poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global assessment of functioning (Axis V)</td>
<td>Pre</td>
<td>53.9a (11.4)</td>
<td>56.0a (9.7)</td>
<td>56.0a (13.1)</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>75.8b (12.2)</td>
<td>64.3b (13.4)</td>
<td>60.4b (9.6)</td>
</tr>
<tr>
<td></td>
<td>FU</td>
<td>74.7b (12.8)</td>
<td>66.3b (15.1)</td>
<td>–</td>
</tr>
</tbody>
</table>

*a Means within a column which share a superscript do not differ at p=0.05.
3.2. Three-month follow-up outcome

In Table 2 are the mean CAPS scores for CBT and the supportive psychotherapy condition for 52 of the 54 treatment completers. We lost one participant from the CBT condition and one from the support condition (96.3% retention). These data were subjected to a Groups × Time repeated measures MANOVA which revealed a significant main effect of Time ($F[2,98]=24.2, p<0.001$, $\eta^2=0.687$) and a significant interaction of Groups × Time ($F[2,98]=2.19, p=0.048$, Pillai’s corrected, $\eta^2=0.164$). An ANCOVA on follow-up scores using pre-treatment as the covariate revealed that those receiving CBT continued to have significantly lower CAPS scores than those in the support condition ($F[1,50]=9.78, p=0.003$, $\eta^2=0.164$). The decreases in CAPS scores from post-treatment to the 3-month follow-up were not significant.

3.2.1. Categorical analysis

At the 3-month follow-up point 4 of 21 participants initially diagnosed with PTSD still met criteria for PTSD in the CBT condition as compared to 12 of 21 participants in the SUPPORT condition ($X^2[1,N=39]=4.50, p=0.034$). Thus, in the SUPPORT condition there was one relapse, whereas one participant in CBT improved during follow-up to the point of no longer meeting criteria for PTSD.

3.2.2. Psychological test measures

The 3-month psychological test results (see Table 5) revealed further arithmetic improvement from post-test to follow-up on all measures for both groups except the BDI for those in the CBT condition. None of these changes were significant.

3.2.3. LIFE base measures

The 3-month results for the LIFE base variables are in Table 6. There were no changes from post-treatment to the 3-month follow-up.

4. Discussion

A combination of cognitive and behavioral treatment (CBT) procedures led to significantly greater reductions on our chief dependent variable, the CAPS, than either a Wait List control condition or a supportive psychotherapy (SUPPORT) condition. Similar results were found for the categorical variable of whether participants continued to meet the symptomatic criteria for PTSD or not. These results thus replicate the Canadian results of Fecteau and Nicki (1999) in finding treatment is superior to assessment only (Wait List) and extend them by showing that CBT is superior to an active treatment control, SUPPORT. The supportive psychotherapy condition led to a highly significant within group change and was also superior to the Wait List condition.

Our results also replicate those of Bryant, Harvey, Dang, Sackville and Basten (1998) who found that a CBT treatment was superior to supportive counseling in a population suffering from acute stress disorder secondary to accidents. Our study extends their results in that our population had chronic PTSD (average time since trauma was 13 months at the beginning of treatment) and our SUPPORT condition was clearly beneficial and superior to Wait List whereas theirs seemed
possibly detrimental. When a more conservative re-analysis including drop-outs was performed, CBT remained superior to the Wait List condition and the SUPPORT condition \((p<0.05\) or better after Bonferroni correction). SUPPORT was no longer superior to Wait List.

Similar results were found on several psychological tests, including those related to PTSD, the IES and PCL, and those indicative of more generalized psychological distress, the BDI and STAI and BSI Global Severity Index. The results from the CAPS hold up at a 3-month follow-up comparison of those receiving CBT and SUPPORT. On a group basis, there was slight, non-significant decline in CAPS scores from end of treatment to 3 months.

Some of the most exciting (to us) results were the changes in co-morbid Axis I psychopathology. Forty-nine percent of the sample met criteria for major depressive disorder at the start of treatment, while 35\% met criteria for GAD. The CBT condition (82\%) led to significantly greater reductions in major depression than the SUPPORT condition (28\%) or the Wait List (30\%). Likewise, with GAD, the CBT condition (75\%) led to greater reductions in GAD than SUPPORT (18\%) and showed a trend to be superior to Wait List (37\%). These results were obtained in the CBT condition without specifically targeting the major depression or GAD. They imply that the significant benefit in PTSD symptoms generalizes to other conditions. Although others (e.g. Bryant et al., 1998, 1999; Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998) have reported significant decreases in symptoms of depression (BDI) or anxiety (STAI), to the best of our knowledge, no one else has reported categorical results like these on benefits to co-morbid conditions when CBT is applied for PTSD.

Seventy-six percent of those with full PTSD, who were treated with CBT, no longer met this diagnosis at post-treatment. Thus, our fraction with clinically meaningful improvement surpasses that of Fecteau and Nicki (1999) who found 50\% no longer met criteria for PTSD and that of Taylor et al. (2001) who found 44\% no longer meeting criteria for PTSD. Of the five failures, two showed large reductions in CAPS scores, from mid-70s to mid-30s but still met the criteria for PTSD at post-treatment. Two others with very severe PTSD (CAPS scores of 99 and 123) showed only slight improvement. The therapist for one of these patients volunteered that, if he had had twice as many visits, he thought he might have been successful. The last failure also showed only a slight reduction in symptoms. It thus seems clear that more work is needed to find ways to help our treatment failures. For some that might be merely more of the same treatment, whereas for others a different approach might be needed.

The SUPPORT condition led to a significant reduction in CAPS scores and clinically meaningful improvement in 48\% of those with initial PTSD. It was also superior to the Wait List condition. This implies that a condition such as we have described is clearly psychologically active and can be of noticeable benefit for about half of those with MVA-related PTSD.

Three other aspects of the study warrant comment. First, we have shown that men and women suffering from PTSD from the same type of trauma respond equally well to treatment. Second, we have shown that community based practitioners can be trained to follow a treatment protocol and obtain very good results. Lastly, we have shown that neither lingering physical injuries nor on-going litigation interfere in treatment outcome.

There are certain limitations to this study. First, we had a very high dropout rate, 20\%. These dropouts tended to be younger and to have experienced their accident more recently. Most of the dropouts occurred after the first visit. Clearly, work is needed to find ways to hold a larger fraction of eligible treatment seekers in treatment. Moreover, including the dropouts reduces the difference between the SUPPORT and Wait List condition to non-significance.
Second, we had very few minorities in the study (10%) and they were disproportionately represented in the dropouts. While the 10% is only slightly less than the minority population of our area, the dropout problem is bothersome. We cannot readily generalize our results to a minority population.

Third, we had follow-up data for only 3 months post-treatment. Although these data revealed good maintenance of symptom reduction, longer follow-up would obviously be desirable.

Regardless of these limitations, we think the study clearly shows the benefits of CBT as a treatment for chronic PTSD secondary to motor vehicle accidents.

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Request for further information should be sent to the first author at the Center for Stress and Anxiety Disorders, 1535 Western Avenue, Albany, NY 12203. This research was supported by a grant from NIMH MH-48476.

References


