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A Short Form of the Mississippi Scale for Measuring Change in Combat-Related PTSD

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In large-scale surveys or program evaluations, investigators most often wish to assess multiple domains of functioning, while at the same time minimizing the overall length of the data collection protocols. In addition, studies of treatment interventions require instruments which offer the greatest opportunity of detecting change in the variables of interest. Toward these ends, we present an 11-item version of the Mississippi Scale for Combat-Related PTSD. The sample was composed of 436 war zone veterans who received specialized outpatient treatment for PTSD, and who were followed up in 4-month intervals for 1 year. Items were identified for inclusion in a short scale on half of the sample. The scale was then cross-validated on the other half. This short form of the Mississippi Scale has good internal consistency, good correspondence with the full scale, significant sensitivity to change in symptom severity, and significant relationships between change and clinicians' ratings of improvement after 1 year, number of treatment sessions received and number of months in treatment.

KEY WORDS: PTSD; measurement; change; treatment sensitivity.

INTRODUCTION

The scientific study of posttraumatic stress disorder (PTSD) requires reliable and valid measurement of the disorder. To this end Keane and his associates developed a 35-item, self-report questionnaire, the Mississippi Scale for Combat-Related PTSD (Keane *et al.*, 1988), which has become one of the most widely used measures of PTSD in war zone veterans. The

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Mississippi Scale was one of several instruments included in the National Vietnam Veterans Readjustment Study (Kulka *et al.*, 1990). In that study, it was found to yield the best single approximation to the final diagnosis of PTSD, which featured a structured clinical interview as its centerpiece. The Mississippi Scale achieved a sensitivity of 92% and a specificity of 84% with the final diagnosis of PTSD.

A major advantage of the Mississippi Scale is its continuous nature, which gives it great potential for testing the relationships between the intensity of PTSD and other variables. Its continuous nature also lends itself to development as a detector of change in the intensity of PTSD symptomatology. Keane and his colleagues concluded their paper by identifying "research on the scale's sensitivity to therapeutic interventions" as the next step in its psychometric development.

In addition to sensitivity to change, brevity is another feature that is highly desirable. A short instrument that is particularly sensitive to detecting change would be especially useful in large-scale surveys or program evaluations where investigators often must balance the wish to assess multiple domains of functioning with the need to minimize the overall length of the data collection protocol. Although a smaller number of items is desirable, considerations of construct validity argue for selection of enough items that the short scale maintains a strong correspondence with the larger scale. In this paper, then, we present an 11-item version of the Mississippi Scale which has good internal consistency, good correspondence with its larger counterpart, and is suggestive of sensitivity to improvement in symptom severity.

METHOD

Sample

The data were obtained as part of the national evaluation of the Department of Veterans Affairs (VA) PTSD Clinical Teams Program. Teams from six sites participated in an intensive outcome monitoring study: Boston, MA; Jackson, MS; Kansas City, MO; New Orleans, LA; Providence, RI; and San Francisco, CA. During 1990-1992, 554 male veterans were followed for 1 year after beginning treatment. Since the goal of the study was to develop an instrument that is sensitive to the impact of treatment, the 436 veterans for whom data were available at both intake and four months later were retained for analysis. All these veterans had served in a war zone: 371 in the Vietnam War, 14 in the Korean War, 40 in World War II, and 11 in two wars. They averaged 46.0 (SD = 8.9) years of age, with

12.8 (SD = 2.5) years of education. The 436 veterans with both intake and 4-month data did not differ significantly from the 118 other veterans in the sample with regard to era of war zone service, years of education, and intake Mississippi Scale score. Veterans with complete data were approximately a year and a half older on average than veterans with missing data. Loss of data at the 8-month and 1-year follow-up points left 328 veterans for analyses that included both of these time-points.

DESIGN

Veterans completed the Mississippi Scale for Combat-Related PTSD (Keane *et al.*, 1988) at the time of intake into treatment and at 4 months, 8 months, and 1 year later. The Mississippi Scale is composed of 35 items, with response alternatives coded from 1 to 5. Scores can range from 35 to 175. Common response alternatives include "never," "not at all true," and "very unlikely" at the low end to "always," "very frequently true" and "extremely likely" at the high end.

All treatment was conducted on an outpatient basis in a clinic setting. The predominant treatment modalities were individual and group psychotherapy, stress management and social skills training, and psychopharmacology. Over the course of the year, veterans stayed in treatment an average of 7.9 months (SD = 5.0) and received an average of 28.9 sessions (SD = 31.2). Clinicians' judgments of improvement in PTSD symptoms were obtained at 4 months, 8 months, and 1 year. Judgments were made on a 5-point scale, indicating substantial deterioration to substantial improvement. For purposes of data analysis, judgments were dichotomized as either improved or not improved.

A repeated measures analysis of variance revealed a trend for total Mississippi Scale scores to decrease over the year ($F = 2.18$, 3/325 df, $p < 0.10$). Virtually all of the decrease occurred over the first 4-months ($F = 5.58$, 1/327 df, $p < 0.02$), with no change between 4 and 8 months ($F = 0.02$, 1/327 df, $p < 0.85$) or between 8 months and 1 year ($F = 0.01$, 1/327 df, $p < 0.90$). Significance of the overall effect was muted in part, because some of the items were insensitive to change. Therefore, we selected the first 4 months as the test period for the development of a short, change-sensitive version of the Mississippi Scale.

We proceeded by dividing the sample randomly into two subsamples of 110 each and one subsample of 200. First, the two subsamples of 110 were used to identify individual items that showed a significant decrease from intake to 4 months. Items in one or both subsamples that showed a decrease at $p < 0.10$ were selected for retention as a short form of the

Table I. Items Comprising the Short Form of the Mississippi Scale

1.	I have nightmares of experiences in the military that really happened.
2.	Lately, I have felt like killing myself.
3.	I fall asleep, stay asleep and awaken only when the alarm goes off.[a]
4.	My dreams at night are so real that I waken in a cold sweat and force myself to stay awake.
5.	I feel like I cannot go on.
6.	I do not laugh or cry at the same things other people do.
7.	I enjoy the company of others.[a]
8.	Unexpected noises make me jump.
9.	There have been times when I used alcohol (or other drugs) to help me sleep or to make me forget about things that happened while I was in the service.
10.	I lose my cool and explode over minor everyday things.
11.	I have a hard time expressing my feelings, even to the people I care about.

[a]Item is reversed in scoring.

Mississippi Scale. Two subsamples of 110 were utilized rather than one subsample of 220, because of the modest size of the decrease in scores relative to their variability. Two subsamples enabled us to cast a broad enough net to identify a reasonable number of candidate items. Second, the subsample of 200 was used to determine the psychometric adequacy of the short form as well as to cross-validate its ability to identify change. Third, the full sample was used to derive a cut-score for diagnosis that maximized the specificity and sensitivity of the short form in matching the full Mississippi Scale. Finally, the difference scores from intake to 4 months, from intake to 8 months, and from intake to 1 year were dichtomized as decreases versus increases for comparison with the clinicians' improvement ratings and with the number of sessions received and the number of months in treatment.

RESULTS

A paired-comparison t-test was performed on the difference between intake and four months for each item for each of the subsamples of 110. Eleven items displayed a decrease that was significant at $p < 0.10$ in one or both of the subsamples. These items are listed in Table I in their order of appearance in the full scale.

The eleven items were summed for the subsample of 200. Their internal consistency (coefficient alpha) was 0.83 at intake, 0.85 at 4 months, and 0.87 at both 8 months and 1 year. Their correlation with the full Mississippi Scale was 0.95 at both intake and 4 months, and 0.96 at both 8 months and 1 year. Since the full scale subsumed the short scale, some of

the correlation was due to this overlap. In order to evaluate the extent of the correlation independent of the overlap, we took the further step of correlating the short scale with the sum of the remaining 24 items. These correlations were 0.89 at intake, 0.90 at both 4 and 8 months, and 0.91 at 1 year, indicating that the vast majority of the correlation of the short scale to the full scale was independent of the overlap in items.

A repeated measures analysis of variance was performed on the scores for the short form for intake, 4 months, 8 months, and 1 year. There was a significant decrease for the year as a whole ($F = 13.14$, 3/325 df, $p < 0.0001$); and a significant decrease from intake to 4 months ($F = 35.90$, 1/327 df, $p < 0.0001$) but not from 4 to 8 months ($F = 0.06$, 1/327 df, $p < 0.80$) or from 8 months to 1 year ($F = 0.00$, 1/327 df, $p < 0.95$). The mean short form scores for these 4 time-points were 38.4 (SD = 7.9), 36.7 (SD = 7.7), 36.8 (SD = 8.2), and 36.8 (SD = 8.3), respectively. The mean decrease of 1.57 points represented a decrease of 4.1% from the initial level. By comparison, the full scale showed a mean decrease of 1.89 points, or 1.5% from initial level to 1 year later.

In order to ascertain the diagnostic potential of the short form, the full distribution of scores was compared to the dichotomized distribution of full scale scores for the entire sample. A cut-score of 107 was used for the full scale (78% of the sample), since prior work has found this score to identify PTSD among outpatients with maximal precision (Keane *et al.*, 1988). A cut-score of 34 for the short form (76% of the sample) produced 93% agreement with the full scale, with a sensitivity of 94% and a specificity of 88%. The kappa statistic for chance-corrected agreement was 0.79 ($z = 16.54$, $p < .00001$).

The association between change scores and improvement ratings at 4 months, 8 months, and 1 year were evaluated by chi-square tests. Clinicians' improvement ratings were dichotomized as either improved or not improved. These ratings were obtained only from the primary therapists. Interjudge reliability, therefore, could not be ascertained. The Ns differ from the previous analyses, due to the termination of many of the veterans from treatment during the course of the year.

At 4 months, 66% of those with a positive change score were judged to be improved compared to 56.3% of those with a negative change score (chi-square = 2.41, 1/249 df, $p = 0.12$). At 8 months, 72.5% of those with a positive change score were rated as improved compared to 62.5% of those with a negative change score (chi-square = 2.68, 1/234 df, $p = 0.10$). At 1 year, 76.6% of those with a positive change score were judged to be improved compared to 60.5% of those with negative change scores (chi-square = 5.94, 1/196 df, $p < 0.02$). Thus, there was a tendency that grew stronger over the year for clinicians to judge veterans with positive change

as improved. This correspondence reached a statistically significant level at one year. By way of comparison, there were no significant associations between improvement ratings and change scores for the full Mississippi Scale.

Although the positive change on the short scale could be perceived by clinicians and was labeled by them as improvement, the change might have occurred for reasons unrelated to treatment. In order to address the question of treatment-relatedness, the number of sessions of treatment and the number of months in treatment over the course of the year were compared to veterans' change scores at one year. Change scores were dichotomized as above, and ANOVAs were performed for sessions and months. Veterans with positive change scores received significantly more sessions (mean = 34.7 (SD = 36.1) vs mean = 23.7 (SD = 24.9); $F = 12.74$, 1/403 df, $p < 0.0005$) and were in treatment a greater number of months (mean = 8.6 (SD = 4.9) vs mean = 7.1 (SD = 5.0); $F = 8.84$, 1/404 df, $p < 0.005$) than veterans with negative change scores.

DISCUSSION

The short form of the Mississippi Scale has much to recommend it as an alternative to the full scale when time or other constraints make use of the full scale infeasible. The short form has good internal consistency and good correspondence with the full scale. Moreover, 8 of its 11 items closely approximate criterion symptoms for the diagnosis of PTSD (American Psychiatric Association, 1987): two for reexperiencing and intrusion (Nos. 1 and 4), three for avoidance and numbing (Nos. 5, 7 and 11), and three for hyperarousal (Nos. 3, 8, and 10).

For purposes of clarity, it is important to distinguish the present short form from a different short version of the Mississippi Scale that has been developed by Wolfe *et al.* (1993). Their "mini-Mississippi Scale" was derived from a factor analysis of the full scale and also consists of 11 items, four of which are represented among our 11 items (Nos. 1, 3, 8, and 10). In order to determine whether there was a need for another short scale, we examined change in mini-Mississippi Scores over the course of the year. The mini-Mississippi Scale was not sensitive to change over the entire year in general ($F = 0.70$, 3/325 dr, $p < 0.55$) or between intake and 4 months in particular ($F = 1.70$, 1/327 df, $fp < 0.20$).

The 11 items of the present short form were selected to be maximally sensitive to change in symptoms. Among the veterans undergoing outpatient treatment for PTSD and associated disorders in the present sample, this improvement was manifested almost entirely in the first four months of treatment, with symptom levels holding stable over the remainder of the ensuing year. We think that a likely explanation for this symptom pattern rests with the chronic nature of PTSD in this population. For the vast majority of veterans, their war zone service took place 20 or more years in the past. During this time, their symptoms may have been compounded by severely dysfunctional adaptations in their family and work lives. An examination of the content of the items revealed that items referring to interpersonal relationships explicitly are underrepresented among the change-sensitive items (2 of 11) compared to the change-insensitive items (9 of 24). It appears that treatment may have had the effect of providing veterans with some immediate relief of their purely affective and cognitive symptoms, while symptoms of a more interpersonal nature may have been more resistant to amelioration.

Although the decrease in symptom levels reached statistical significance, a question can be raised concerning the clinical significance of the decrease. Certainly, a much larger decrease would be more impressive. We have already commented on the chronic nature of the disorder and of the multiple obstacles to change that accompany chronicity as one set of factors working against large change. Another set of factors working against the detection of large change is the psychometric nature of the assessment of change. Typically, psychometrically assessed change is much more modest in magnitude than change that is assessed as a global judgment of functioning such as improvement or satisfaction with life. In fact, a recent study of the treatment of acute PTSD among Israeli soldiers found that treated soldiers were actually somewhat *more* symptomatic on psychometric measures after treatment, even though the soldiers themselves and their clinicians globally judged that they were feeling better and had improved (Shalev *et al.*, 1992; Solomon *et al.*, 1992; Solomon *et al.*, 1992). There is a place for multiple outcome measures. Psychometric measures are the most rigorous indices of change, and coincidentally, the most conservative.

As a final point, it must be noted that attribution of the cause of change in symptoms to the receipt of treatment specifically must be tempered by the absence of change data from an untreated comparison group. It is possible that the change might have occurred during treatment without having been due to treatment. The available information regarding treatment, however, lends credibility to the likelihood of cause. Decreased symptoms were associated significantly with clinicians' judgments of improvement and with both the number of sessions received and the number of months in treatment. Therefore, although the design of the study precludes a definitive demonstration that the short form is sensitive to treatment interventions, the data are suggestive of just such treatment sensitivity.

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