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Review Article

CLINICIAN-ADMINISTERED PTSD SCALE: A REVIEW OF THE FIRST TEN YEARS OF RESEARCH

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The Clinician-Administered PTSD Scale (CAPS) is a structured interview for assessing posttraumatic stress disorder (PTSD) diagnostic status and symptom severity. In the 10 years since it was developed, the CAPS has become a standard criterion measure in the field of traumatic stress and has now been used in more than 200 studies. In this paper, we first trace the history of the CAPS and provide an update on recent developments. Then we review the empirical literature, summarizing and evaluating the findings regarding the psychometric properties of the CAPS. The research evidence indicates that the CAPS has excellent reliability, yielding consistent scores across items, raters, and testing occasions. There is also strong evidence of validity: The CAPS has excellent convergent and discriminant validity, diagnostic utility, and sensitivity to clinical change. Finally, we address several concerns about the CAPS and offer recommendations for optimizing the CAPS for various clinical research applications. Depression and Anxiety 13:132–156, 2001 © 2001 Wiley-Liss, Inc.

Key words: ***posttraumatic stress disorder; structured interview; diagnosis; assessment; reliability; validity***

INTRODUCTION

Since its development in 1990 at the National Center for Posttraumatic Stress Disorder (PTSD), The Clinician-Administered PTSD Scale [CAPS; Blake et al., 1990] has become one of the most widely used structured interviews for diagnosing and measuring the severity of PTSD. Initially validated on combat veterans, the CAPS has now been used successfully in a wide variety of trauma populations, including victims of rape, crime, motor vehicle accidents, incest, the Holocaust, torture, and cancer. It has served as the primary diagnostic or outcome measure in more than 200 empirical studies on PTSD and has been translated into at least ten languages. In addition, a child and adolescent version of the CAPS has been developed and is now undergoing field testing and psychometric evaluation. Originally based on the PTSD criteria in the DSM-III-R, the CAPS has been revised several times in response to user feedback and changes in the PTSD diagnostic criteria, with the most significant revision occurring after the publication of the DSM-IV in 1994.

The present paper is an update on the CAPS and a critical review of the first 10 years of CAPS-related research. It was prompted by the increasing popularity of the CAPS, the rapid accumulation of empirical evidence that supports its use, and the need to inform current and potential CAPS users about the latest revisions and recommendations for administration and scoring. This paper consists of three sections. First, we provide a brief overview of the CAPS, describing the rationale for its development, its key features, and its evolution through an extensive revision for DSM-IV, as well as a description of other minor modifications. Second, we review the published literature on the CAPS, focusing in particular on psychometric studies of the CAPS and on pharmacological and psychosocial treatment studies that employed the CAPS as an outcome measure. Third, we discuss the implications of the findings and offer recommendations for using the CAPS in a range of research and clinical applications.

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This paper was not intended as an in-depth critique of the methodology or conceptual implications of the studies we reviewed, nor did we seek to reach any general conclusions about the current status of PTSD research. Rather, our main purpose was simply to identify studies that have used the CAPS and summarize the empirical findings that bear directly on its psychometric properties and utility for assessing PTSD. Finally, since the child and adolescent version is still undergoing validation, we focus here only on research examining the adult CAPS.

OVERVIEW OF THE CAPS

In developing the CAPS, the primary goal was to create a comprehensive, psychometrically sound interview-based rating scale that would be widely accepted as a standard criterion measure of PTSD. In this sense it was intended to serve a role in the field of traumatic stress analogous to that of the ubiquitous Hamilton Depression Rating Scale [HAM-D; Hamilton, 1960] in the field of depression. The CAPS was designed with a number of features intended to improve existing PTSD interviews and enhance the reliability and validity of PTSD assessment [see Blake et al., 1995, for a full discussion and a comparison of the CAPS with other PTSD interviews]. First, the CAPS can be used either as a dichotomous (present/absent) diagnostic measure or as a continuous measure of PTSD symptom severity. Second, the CAPS assesses both the frequency and intensity of individual PTSD symptoms on separate five-point (0–4) rating scales, and these ratings can be summed to create a nine-point (0–8) severity score for each symptom. This permits considerable flexibility in scoring: CAPS users can focus on the frequency, intensity, or severity ratings for individual PTSD symptoms, for the three PTSD symptom clusters (re-experiencing, avoidance and numbing, and hyperarousal), and for the PTSD syndrome as a whole.

Third, the CAPS promotes uniform administration and scoring through carefully phrased prompt questions and explicit rating scale anchors with clear behavioral referents. Initial prompt questions explicitly target each symptom, and follow-up prompts help interviewers clarify the inquiry as needed, anticipating typical points of ambiguity or confusion regarding the PTSD criteria. These features enhance standardization across interviewers and ensure comparability of scores across diverse settings, raters, and trauma populations. Fourth, the CAPS provides complete coverage of the PTSD syndrome. The original version of the CAPS included 17 items assessing the DSM-III-R symptoms of PTSD, 8 items assessing associated features (e.g., guilt, hopelessness, memory impairment), and 5 items assessing response validity, global severity, global improvement, and social and occupational impairment. As described below, the current version of the CAPS assesses all DSM-IV diagnostic criteria for PTSD, including Criterion A (exposure to a traumatic event), Criteria B–D (core symptom clusters of re-experiencing, numbing and avoidance, and hyperarousal), Criterion E (chronology), and Criterion F (functional impairment), as well as the associated symptoms of guilt and dissociation. Finally, the CAPS assesses current and lifetime PTSD symptom status. The prompts for lifetime diagnosis help the interviewer establish explicitly that any endorsed symptoms occurred as a syndrome within the same one-month period.

Initially it was decided that two parallel versions of the CAPS were needed in order to address two distinct assessment needs. The CAPS-1, or current and lifetime diagnostic version, was designed to assess PTSD symptom severity and diagnostic status over the past month, or for the worst month since the trauma. The CAPS-2, or 1-week symptom status version, was designed to measure PTSD symptom severity over the past week and was intended primarily for repeated assessment over relatively brief time intervals in pharmacological research. Apart from the different time frames assessed, the main difference between the CAPS-1 and CAPS-2 is that for the ten CAPS items where symptom frequency is rated in terms of a count (i.e., how often) as opposed to a percentage (i.e., how much of the time), the rating scale anchors on the CAPS-2 were based on a 1-week time frame, whereas for the CAPS-1, they were based on a 1-month time frame. The distinction between these two original versions of the CAPS led to some confusion in the field, such that the CAPS-2 was thought by some to be a revised version of the CAPS. In response to this confusion, as part of the DSM-IV revision, the CAPS-1 was renamed the CAPS-DX (i.e., CAPS-Diagnostic version), and the CAPS-2 was renamed the CAPS-SX (i.e., CAPS-Symptom Status version). As discussed below, these two versions were recently combined into a single instrument now simply known as the CAPS.

Following the publication of the DSM-IV in 1994, the CAPS was revised, both to bring it up to date with changes in the PTSD criteria and to incorporate user feedback accumulated since its release in 1990. The overarching goal for the revision was to ensure backward compatibility with the original CAPS. This was accomplished by retaining the basic structure, most of the prompt questions, and the values and stems for the rating scale anchors. The revision included four major modifications and a number of relatively minor ones. Major modifications included the following.

1. Adding a brief protocol for assessing Criterion A (exposure to a traumatic event). This consists of a 17-item self-report checklist of potentially traumatic events and follow-up questions to help the interviewer determine if a stressful event satisfies both parts of the DSM-IV definition of a traumatic event (i.e., the event involves life threat, serious injury, or threat to physical integrity; and the person responds with intense fear, helplessness, or horror).

2. Rewording some of the descriptors for the intensity rating scale anchors. This was done to achieve a consistent focus across items on the three key dimensions of intensity (duration, subjective distress, and functional impairment), to achieve roughly equal gradations of intensity between each of the rating scale values, and to provide examples applicable to a range of trauma populations.
3. Adding a three-point rating scale ("definite," "probable," and "unlikely") that requires interviewers to determine if a reported symptom is attributable to a specific traumatic event. This scale only applies to the last 9 of the 17 symptoms of PTSD (emotional numbing and hyperarousal) because the first 8 symptoms (re-experiencing, effortful avoidance, and amnesia) are all inherently trauma-linked.
4. Replacing six of the eight original associated features. The two items assessing guilt were retained, but the other items were felt to be either too population-specific (e.g., homicidality and disillusionment with authority) or too broad or complex to be assessed with a single item (e.g., sadness and depression). Also, feedback indicated that they were not routinely administered in most settings. They were replaced with three items that assess the dissociative symptoms of acute stress disorder: reduction in awareness, derealization, and depersonalization. The addition of these items meant that the CAPS could be used to assess acute stress disorder, either currently, if administered within 1 month of the trauma, or retrospectively.

The minor modifications included a) reordering the items to correspond to the order of the DSM-IV diagnostic criteria; b) adding items to fully assess Criterion E (duration requirement) and Criterion F (subjective distress and functional impairment requirement); c) renaming the CAPS-1 and CAPS-2, as described earlier; d) improving the formatting and typeface conventions; e) eliminating the "at its/their worst" convention for the intensity prompts; f) eliminating the phrase "without being exposed to something that reminded you of the event" from the frequency prompt for the first item assessing intrusive recollections; and g) adding an instruction to the interviewer to specify the basis of any QV (questionable validity) ratings.

Completing this discussion on the development of the CAPS are two significant, quite recent developments. One development is the decision to eliminate the "two CAPS" system (i.e., the distinction between the CAPS-1 or CAPS-DX and the CAPS-2 or CAPS-SX) and create a single CAPS scale that can be used to assess PTSD symptoms over the past week, past month, or worst month since the trauma. As noted earlier, the CAPS-2 or CAPS-SX was designed to monitor changes in symptom status over a 1-week time frame, and it appears to work well for this purpose, demonstrating excellent psychometric properties [Nagy et al., 1999]. The problem, however, is that for the ten CAPS items where symptom frequency is measured as "how often" versus "how much of the time" (i.e., as the number of occurrences rather than as a percentage of time) the CAPS-SX and CAPS-DX had different values because of the different time frame (i.e., for the past week time frame on the CAPS-SX 0=never, 1=once, 2=two or three times, 3=four or five times, and 4=daily or almost every day, but for the past month time frame on the CAPS-DX 0=never, 1=once or twice, 2=once or twice a week, 3=several times a week, and 4=daily or almost every day).

This means that scores on the two versions were not directly comparable, with CAPS-SX scores tending to yield lower scores when the reported frequency is in the 3–5 times a week range. As a result, investigators who wanted to use the CAPS to establish a PTSD diagnosis as an inclusion criterion, but were interested in weekly assessment intervals over the course of the study, needed to administer a CAPS-DX in the initial evaluation, then administer a CAPS-SX at baseline, mid-treatment, and post-treatment, and then a CAPS-DX at long-term follow-up if they wished to assess end-point diagnostic status. In general this is a workable scheme but proved to be needlessly cumbersome. Therefore, on the recommendation of the CAPS Advisory Group for the National Center for PTSD, the CAPS-DX and CAPS-SX were combined into a single version, which is now simply known as the CAPS. This was accomplished by two minor modifications to the CAPS-DX. First, the word "week" was provided as an alternative to "month" in the prompt questions for frequency [e.g., "How often have you had these memories in the past month (*week*)?"]. Second, for each item a space was provided to record frequency and intensity ratings for "past week," in addition to "past month" and "lifetime." When the new combined version of the CAPS is used to assess 1-week symptom status, frequency ratings for the ten items for which frequency is rated as a count are scored as 0=never, 2=once or twice a week, 3=several times a week, and 4=daily or almost every day, skipping the value 1=once or twice (a month). Thus, the combined CAPS is appropriate for assessing 1-month or 1-week intervals and yields comparable scores from either application.

The second development involved new options for interpreting CAPS scores. First, nine scoring rules for deriving a PTSD diagnosis have been developed and compared on their psychometric properties and utility for different assessment tasks [Weathers et al., 1999]. It should be emphasized that although several of these rules appear to be quite useful, more research is needed before firm recommendations can be made. A number of other rules are possible and may prove to have greater utility for some applications. Second, five rationally derived severity score ranges for interpreting CAPS total severity scores have been proposed and are currently being evaluated. These categories

are 0–19=asymptomatic/few symptoms, 20–39=mild PTSD/subthreshold, 40–59=moderate PTSD/threshold, 60–79=severe PTSD symptomatology, and >80= extreme PTSD symptomatology. Finally, a rationally derived 15-point change in CAPS total severity score has been proposed as a marker of clinically significant change. Again, it should be emphasized that these severity score ranges and the 15-point marker are preliminary, and unlike the scoring rules have not been empirically evaluated, but they offer some guidance to clinicians and investigators who use the CAPS to measure change.

In summary, the format and the procedures for administering and scoring the CAPS have evolved in the 10 years since it was first developed. However, the changes can be characterized as refinements rather than major revisions, and the goal of backward compatibility of the latest CAPS with the original version appears to have been accomplished [Weathers et al., 1999]. The CAPS now provides a range of options regarding administration and scoring. Interviewers can administer only the 17 core symptoms, all DSM-IV criteria (A-F), or add the associated symptoms. Current symptom status can be assessed for the past week or past month, and lifetime status can be assessed for the worst month since the trauma. By administering the 17 core symptoms plus the 3 dissociative items the CAPS can also be used to assess acute stress disorder. In terms of scoring options, the CAPS can be used to derive a PTSD diagnosis by using one or more of the available scoring rules, or a continuous severity score for each item, for the three symptom clusters or for the entire syndrome. Total severity scores summed over the 17 core symptoms can be interpreted with respect to the five proposed severity score ranges, from asymptomatic to extreme, and a 15-point change in CAPS scores can be used to indicate clinically significant change.

REVIEW OF THE CAPS-RELATED LITERATURE

LITERATURE SEARCH AND SELECTION OF STUDIES

We developed an initial list of studies to be included by searching the phrase "Clinician-Administered PTSD Scale" in the "Instruments" index of the PILOTS database. PILOTS is the most comprehensive database for the field of traumatic stress, containing virtually every relevant citation in journals and book chapters. This search, conducted in October 1999, yielded 241 citations. We excluded book chapters, review papers, dissertations, letters to the editor, an article on the child and adolescent version of the CAPS, and several studies in which CAPS-related data were included, but not in a form suitable for our purpose. This narrowed the list to a total of 210 studies deemed eligible for potential inclusion in our review.

For the purposes of this review, we divided the eligible studies into three categories: a) psychometric studies, which provided direct evidence of the reliability and validity of the CAPS; b) pharmacotherapy and psychotherapy studies, which provided evidence of the sensitivity of the CAPS to clinical change; and c) case-control studies, which provided additional validity evidence based on conceptually meaningful differences between individuals diagnosed with and without PTSD using the CAPS. In the following sections, we summarize all of the available studies in the first two categories since there was a manageable number of them and they provided the richest information regarding the utility of the CAPS. However, due to space constraints, we limit our discussion of studies in the third category to several representative examples, since these were more numerous and provided more limited validity evidence.

As noted earlier, the purpose of this review was to examine all available research addressing the psychometric characteristics of the CAPS and its usefulness as a standard criterion measure of PTSD. Accordingly, we placed few restrictions in selecting the studies to be included, realizing that the final set of studies would vary widely in their quality of design and interpretability of results. We felt that a consistent pattern of positive results across a large number of studies would provide unambiguous support for the CAPS, and that if the studies varied in quality, it would make an even stronger case with regard to the generalizability of the findings. In the process of evaluating a psychological assessment instrument, each study, regardless of how well-designed and executed it is, only contributes one piece of evidence and can never be considered definitive. Conclusive answers can be reached only by considering the accumulation of several different types of evidence across different trauma populations, settings, and research designs. In the next section, we briefly review some fundamental psychometric concepts in order to provide a conceptual framework for organizing and evaluating the evidence regarding the effectiveness of the CAPS.

PSYCHOMETRIC CONSIDERATIONS

Psychological assessment instruments are evaluated with respect to two important characteristics: reliability and validity. Reliability refers to the consistency of test scores over repeated observations. Three commonly reported types of reliability include internal consistency, test-retest reliability, and interrater reliability, each of which addresses a different potential source of error in test scores. Internal consistency refers to consistency over different items on a test. Requiring only a single administration of a test, it is usually indexed by coefficient alpha (Cronbach's alpha), which ranges from 0.00 to 1.00, with higher values reflecting a greater degree of intercorrelation among the items. Item-scale total correlations, which reflect how well each item correlates with the remaining items, are another useful source of information about internal consistency. Test-retest reliability refers

to consistency of test scores over repeated administrations. It is estimated by administering a test twice and calculating the correlation between the two scores. Interrater reliability refers to consistency of test scores over different raters. It is estimated by having two or more raters evaluate and score responses and then calculating either a correlation (only two raters) or intraclass correlation (more than two raters) on the scores. When an instrument is used to obtain a dichomotomous score, as in the case of a present/absent diagnostic decision, interrater or test-retest reliability is estimated by calculating a kappa coefficient, a chance-corrected measure of agreement.

Two different research designs are typically employed to evaluate the reliability of a structured interview such as the CAPS. In a simple interrater design, two or more raters independently rate the same interview. One rater administers and scores the interviews as usual, while additional raters either observe the interview live or, if more convenient, observe an audiotape or videotape of the interview. Since the information available to the raters is identical, the only potential source of error is inconsistency in scoring among raters. In a test-retest design, two independent raters administer and score the interview on separate occasions. This is a more stringent test of reliability because it involves inconsistency in scoring plus two additional potential sources of error: inconsistency in how raters ask the questions and inconsistency in respondents' answers. Although we follow common practice in referring to it as test-retest reliability, the reliability estimate this design yields is more precisely known as a coefficient of stability and interrater equivalence because it involves both occasions and raters as potential sources of error. An important consideration for the test-retest design is the interval between interviews. If the interval is too brief, respondents' answers in the second interview may be influenced by their memory of their answers in the first interview. If the interval is too long, genuine change in clinical status may occur, meaning that inconsistencies in responses are legitimate and not a source of error. In the assessment of PTSD, an interval of a few days to a week is probably reasonable for most applications.

Although reliability clearly is a desirable characteristic of an assessment instrument, a more important concern is validity, which refers to the extent to which evidence exists to support the various inferences, interpretations, conclusions, or decisions that will be made on the basis of a test. Traditionally, three types of validity have been identified. The first type is content validity, which refers to evidence that items on a test adequately reflect the construct being assessed. The second type is criterion-related validity, which refers to evidence that the test can predict some variable or criterion of interest. The criterion may be measured either at the same time the test is administered (concurrent validity) or at some point after the test (predictive validity). The third type is construct validity, which refers to evidence that the test measures the construct of interest and not other constructs. This can be demonstrated, for example, by showing that the test correlates strongly with other measures of the same construct (convergent validity) but not with measures of other constructs (discriminant validity).

However, this traditional approach to validity has recently been superseded by the latest revision of the Standards for Educational and Psychological Testing [APA, 1999], which maintains the following.

"[Different] sources of evidence may illuminate different aspects of validity, but they do not represent distinct types of validity. Validity is a unitary concept. It is the degree to which all the accumulated evidence supports the intended interpretation of test scores for the proposed purpose. Like the 1985 Standards, this edition refers to types of validity evidence, rather than distinct types of validity." (p. 11)

Thus, the new Standards argues for an integrative approach to validity, emphasizing a confluence of validity evidence from different sources, and its updated scheme for categorizing validity evidence represents a marked departure from previous editions. Categories include a) evidence based on test content; b) evidence based on response processes, which focuses on respondents' behavior during the test process; c) evidence based on internal structure, which focuses on relationships among test items and components; d) evidence based on relations to other variables, which includes convergent and discriminant evidence, criterion-related evidence, and the generalization of validity to new testing situations; and e) evidence based on consequences of testing, which focuses on both the intended and unintended outcomes of test use.

The new Standards also emphasizes that the process of validation applies not to tests themselves but rather to any specific interpretations that will be made on the basis of test scores. Therefore, stating that a test is valid begs the question: Valid for what purpose? To address this question specifically with regard to the CAPS, two main uses of the CAPS have been proposed. One is to establish a dichotomous PTSD diagnosis and the other is to provide a continuous measure of PTSD symptom severity. Thus, the two main interpretations of CAPS scores that should be the focus of validation are the following.

1. CAPS scores reflect severity of PTSD symptoms, for individual symptoms, symptom clusters, or the syndrome as a whole.
2. CAPS diagnoses reflect the presence or absence of PTSD.

One source of validity evidence that applies to these inferences is content-based evidence. This refers to the extent to which the content of a test corresponds to the construct being assessed. In this regard, the CAPS was written and revised by a team of experts in traumatic stress at the various branches of the Na-

tional Center for PTSD. It was based directly on the diagnostic criteria for PTSD in the DSM-III-R, and now DSM-IV, and represents these criteria faithfully. As noted earlier, the major revision of the CAPS that followed the publication of the DSM-IV not only reflected changes in the PTSD criteria but also took into account formal and informal feedback from a broad cross-section of CAPS users in other clinical research settings. Although difficult to quantify, there is clearly a consensus among those familiar with the CAPS that the content of the CAPS corresponds veridically to the construct of PTSD.

A second source of validity evidence has to do with the internal structure of the CAPS. As currently conceptualized in the DSM-IV criteria, PTSD is a multifaceted syndrome that consists of three closely related but distinct symptom clusters: re-experiencing, avoidance and numbing, and hyperarousal. If PTSD is a syndrome, then there should a reasonably high degree of correlation among all of the symptoms. If there are distinct but overlapping symptom clusters, then the items within the clusters should correlate more strongly with each other than they do with symptoms in other clusters. These relationships would be reflected in alpha coefficients and item-total correlations. Factor analysis, especially confirmatory factor analysis, in which competing hypotheses about the nature of PTSD can be directly compared, is another means of evaluating the internal structure of the CAPS.

A third, and particularly important, source of validity evidence involves the relationship between the CAPS and other variables. As conceptualized in the latest Standards, this source of evidence includes what used to be referred to as construct and criterion-related validity, and encompasses a broad range of evidence that the CAPS corresponds in theoretically meaningful ways with measures of other constructs. Relevant findings might include a) convergent evidence, showing relatively strong correlations between the CAPS and other measures of PTSD; b) discriminant evidence, showing relatively weak correlations between the CAPS and measures of different constructs; c) evidence of test-criterion relationships, showing the correspondence between the CAPS and a criterion such as a PTSD diagnosis or an indicator of clinically significant improvement in PTSD symptom severity; d) evidence that groups formed on the basis of the CAPS differ as hypothesized on some characteristic or behavior; and e) evidence that PTSD prevalence, severity, or symptom profile based on the CAPS vary as hypothesized in different groups.

PSYCHOMETRIC STUDIES

In this section, we describe the results of studies that emphasized the psychometric properties of the CAPS, including studies in which the CAPS was either the primary instrument being investigated or was included as a validational measure for another PTSD instrument. First, we summarize studies that examined reliability and convergent and discriminant validity. Then we summarize studies that address two other psychometric issues: the factor structure of the CAPS and the utility of various scoring rules for converting CAPS frequency and intensity scores into a dichotomous PTSD diagnosis. In reviewing these studies, we found that investigators often neglected to specify the version of the CAPS they administered and the scoring rule they used to determine a PTSD diagnosis. The version could usually be readily inferred, and with few exceptions was the CAPS-1 or CAPS-DX, the current and lifetime diagnostic version. In our discussion of the studies in this section, then, "CAPS" refers to the CAPS-1 or CAPS-DX, and "CAPS-2" is used explicitly to refer to the weekly symptom-rating version. Unless explicitly stated, however, the scoring rule could not be determined. For the purposes of this review we assumed, unless stated otherwise, that investigators used the original scoring rule, whereby a frequency of "1" or higher and an intensity of "2" or higher for a given CAPS item indicated symptom endorsement.

Reliability, convergent and discriminant validity, and diagnostic utility. The CAPS has been the primary focus of several psychometric investigations. Blake et al. [1990] reported the first psychometric data on the CAPS. In a pilot study they administered the CAPS, the Combat Exposure Scale [CES; Keane et al., 1989], the Mississippi Scale for Combat-Related PTSD [Mississippi Scale; Keane et al., 1988], and the Keane PTSD Scale of the MMPI [PK scale; Keane et al., 1984] to 25 male combat veterans. To determine interrater reliability for the CAPS, a second rater observed and independently rated seven interviews. Excellent agreement was found between the two raters, with reliability coefficients for frequency and intensity scores across the three symptom clusters (re-experiencing, numbing and avoidance, and hyperarousal) ranging from .92 to .99. The raters also demonstrated perfect diagnostic agreement for the seven participants, five of whom had a positive diagnosis. Internal consistency for the three PTSD symptom clusters was high, with alpha coefficients ranging from .73 to .85 for the three symptom clusters. Regarding convergent validity, the CAPS correlated strongly with the Mississippi Scale (.70) and the PK scale (.84). It also correlated .42 with the CES, a moderate correlation that is typical for correlations between measures of trauma exposure and measures of PTSD.

Hovens et al. [1994] examined the psychometric properties of the CAPS in a Dutch sample, employing translations of the CAPS and other PTSD measures. Participants were 76 Dutch trauma survivors (51 males, 25 females), including combat veterans, resistance veterans, and concentration camp survivors. Participants were first diagnosed with or without PTSD, using DSM-III-R criteria, on the basis of an unstructured clinical interview. They were then administered the CAPS, the Mississippi Scale, the PK scale, and the

IES. Interrater reliability on the CAPS was evaluated through simultaneous ratings of nine interviews by two independent clinicians. Diagnostic agreement was perfect for these nine participants. Furthermore, reliability coefficients for frequency and intensity scores for individual items were strong, ranging from .59 to 1.00 for frequency, with a mean of .92, and .52 to 1.00 for intensity, with a mean of .86. At the symptom cluster level, reliability coefficients ranged from .92 to 1.00 for frequency and .92 to .98 for intensity. Regarding internal consistency, Hovens et al. [1994] found alphas of .63 for re-experiencing, .78 for avoidance and numbing, .79 for hyperarousal, and .89 for all 17core PTSD symptoms. No rationale was given for the decision to report internal consistency for intensity scores but not for frequency or severity (frequency + intensity) scores.

By using the clinical interview as the criterion, Hovens et al. [1994] found that a CAPS-based PTSD diagnosis had 74% sensitivity, 84% specificity, and 79% efficiency, and a kappa of .58. Because these figures were lower than expected, they examined discrepancies between the clinical interview and the CAPS. They concluded that in the clinical interview clinicians primarily emphasized re-experiencing symptoms in making a PTSD diagnosis, failing to give sufficient attention to the other two symptom clusters, particularly avoidance and numbing. They further found that many of the participants with discrepant diagnoses were only mildly symptomatic and thus more diagnostically ambiguous. As evidence of convergent validity, the total CAPS score correlated .73 with the Mississippi Scale, .74 with the PK scale, and .62 with the IES total score. Finally, with the exception of amnesia, the prevalence of each of the 17 core PTSD symptoms on the CAPS was significantly greater in participants with PTSD than in those without PTSD, indicating robust discrimination between the two groups.

As part of an effort to develop and evaluate a computer-administered version of the CAPS, Neal et al. [1994] administered both the computerized and the original interview versions of the CAPS to 40 military personnel (36 males and 4 females) with mixed trauma exposure, including combat, non-combat-related assaults, accidents, and disasters, and childhood physical and sexual abuse. To evaluate the reliability of the CAPS interview, ten participants were interviewed twice by independent clinicians, resulting in perfect diagnostic agreement. Treating the CAPS interview as the criterion, the computerized version had 95% sensitivity and 95% specificity, with a kappa of .90. Although the interval between the two versions was not specified, they appear to have been administered in a single session, which could have inflated this high level of agreement. An initial finding of a high correlation (.96) between total frequency and total intensity scores on both the interview and computerized versions of the CAPS led Neal et al. [1994] to use intensity scores alone as a continuous measure of severity in all further analyses. Internal consistency of intensity scores was high for both versions, with an alpha of .90 and a median item-total correlation of .77 for the interview version, and an alpha of .92 and a median item-total correlation of .70 for the computerized version. In addition, intensity scores on the two versions were strongly correlated, ranging from .55 to .92 for individual items and from .87 to .92 for the three symptom clusters. The correlation for total intensity score between the two versions was .95.

Hyer et al. [1996] investigated the utility of the CAPS for assessing older combat veterans. Participants were 125 male World War II and Korean combat veterans. They were administered a computer-assisted version of the SCID (SCID-DTREE), including the PTSD module, as well as the CAPS, by two clinicians. They also completed the Mississippi Scale, the IES, and the CES. To assure the comparability of the SCID-DTREE and the SCID, 25 participants were administered the SCID in a separate testing session by an independent clinician. In this subsample there was perfect agreement as to PTSD diagnostic status, not only between the SCID-DTREE and the SCID, but between the CAPS and the SCID. In the full sample, against a PTSD diagnosis based on the SCID-DTREE, the CAPS had 90% sensitivity, 95% specificity, and 93% efficiency, and a kappa of .75. The CAPS also demonstrated high internal consistency, with alphas of .88 for re-experiencing, .87 for avoidance and numbing, .88 for hyperarousal, and .95 for all 17 core items. CAPS diagnosis was correlated .81 with the IES, .61 with the Mississippi Scale, and .26 with the CES. The relatively low correlation with the CES is likely attributable in part to a restricted range on the CES, since most participants had moderate to heavy combat exposure.

As part of a large prospective study on the effects of trauma, Shalev et al. [1997] employed signal detection methodology to determine whether the CAPS or any of several questionnaire measures of PTSD, dissociation, and anxiety administered at 1 week or 1 month post-trauma could predict PTSD diagnostic status at 4 months post-trauma. Participants included 207 (98 male and 109 female) victims of civilian trauma recruited from the emergency room of a hospital. In most cases, the traumatic event involved a motor vehicle accident. Within a week of their trauma, participants completed the IES, the State form of the State Trait Anxiety Inventory [STAI; Spielberger et al., 1970], and the Peritraumatic Dissociative Experiences Questionnaire [PDEQ; Marmar et al., 1997]. Assessments at one month and 4 months post-trauma added the CAPS and the civilian version of the Mississippi Scale to this battery. They found that all of the questionnaires administered at either 1 week or 1 month post-trauma were predictive of PTSD diagnostic status at 4 months, but that none of the questionnaires differed significantly in terms of accuracy of prediction. In contrast, the CAPS at 1 month post-trauma, used as a continuous measure, was a

significantly better than all of the questionnaires in predicting a 4-month diagnostic status that was also based on the CAPS. Although Shalev et al. [1997] did not identify an optimal cutoff score for CAPS total severity, they did provide diagnostic utility data for a range of selected cutoff scores. These data indicate that a CAPS score of 40 yielded 93% sensitivity and 80% specificity.

To determine the prevalence of PTSD in veterans with spinal cord injuries, Radnitz et al. [1995] administered the CAPS and the SCID PTSD module to 126 male veterans receiving medical care for spinal cord injuries in inpatient and outpatient settings. Current and lifetime diagnostic status was assessed on both the CAPS and the SCID. To determine diagnostic status on the CAPS, Radnitz et al. [1995] used a variant of the original scoring rule (i.e., frequency ≥ 1, intensity ≥ 2), whereby either the frequency or intensity of an item had to be "2" or higher and the other dimension had to be a "1" or higher. As described below, this scoring rule was referred by Blanchard et al. [1995a,b] as the "Rule of 3." Although Radnitz et al. [1995] did not provide kappas or other diagnostic utility statistics except efficiency, we were able to calculate these from data provided in the tables. Treating the SCID as the criterion, for current diagnosis the CAPS had 83% sensitivity, 94% specificity, 93% efficiency, and a kappa of .73. For lifetime diagnosis the CAPS had 84% sensitivity, 90% specificity, 88% efficiency, and a kappa of .74. Although not explicitly stated, it appears that both interviews were administered by the same research assistant in the same session. Both of these factors, i.e., the lack of a time interval between interviews and the lack of an independent rater, could have inflated the correlation between the CAPS and the SCID. Finally, CAPS total severity scores appeared to strongly differentiate between participants with and without a PTSD diagnosis, although these mean differences were not evaluated by statistical test.

Although all of these studies provide valuable information, the most comprehensive investigations of the psychometric properties of the CAPS, based on data collected at the National Center for PTSD, are described in two articles currently submitted for publication. Weathers et al. [1999a] examined the reliability and validity of the CAPS-1/CAPS-DX in five samples of male Vietnam veterans, including 267 veterans from four different research projects and 571 veterans seen for clinical services. To evaluate the test-retest reliability (i.e., stability and rater equivalence) of the CAPS-1, 60 veterans were administered the CAPS twice, at a 2–3 day interval, by independent clinicians. For the three symptom clusters intraclass correlations ranged from .86 to .87 for frequency, .86 to .92 for intensity, and .88 to .91 for severity. Across all 17 symptoms intraclass correlations were .93 for total frequency, .95 for total intensity, and .95 for total severity. Following the revision of the CAPS for DSM-IV, the same design was implemented for the CAPS-DX in a smaller sample of 24 veterans. This study also yielded robust estimates of reliability, with intraclass correlations of .91 for total frequency, .91 for total intensity, and .92 for total severity. Using the optimal scoring rule, kappa, indicating test-retest reliability for a CAPS-based PTSD diagnosis, was .89 in the first sample and 1.00 in the second sample.

Examining internal consistency, Weathers et al. [1999a], in a combined research sample of 243 veterans, found alphas for the three symptom clusters ranging from .78 to .87 for frequency, .82 to .88 for intensity, and .82 to .88 for severity. Alphas for all 17 items were .93 for frequency, .94 for intensity, and .94 for severity. In the clinical sample, alphas for the three symptom clusters ranged from .64 to .73 for frequency, .66 to .76 for intensity, and .69 to .78 for severity. Alphas for all 17 items were .85 for frequency, .86 for intensity, and .87 for severity. The lower alphas in the clinical sample were likely due in part to a restricted range in CAPS scores, since most veterans referred for clinical services at the National Center report moderate to severe PTSD symptoms; they may also be due to a much larger and more diverse pool of clinicians, relative to the small number of well-calibrated clinicians who administered the CAPS to the research samples. Nonetheless, these scores provide excellent evidence supporting the CAPS as used in a clinical setting.

Weathers et al. [1999a] also reported validity evidence for the CAPS, focusing primarily on convergent and discriminant validity evidence and the diagnostic utility of the CAPS against a PTSD diagnosis based on the SCID. In the first research sample of 123 veterans, the CAPS total severity score correlated .53 with the CES, .91 with the Mississippi Scale, .77 with the PK scale, .89 with the number of PTSD symptoms endorsed on the SCID, and .94 with the PTSD Checklist [PCL; Weathers et al., 1993], a 17-item self-report measure of PTSD. CAPS total severity correlated somewhat less strongly, but still robustly, with measures of depression (.61 to .75) and anxiety (.66 to .76), findings that were expected given the substantial overlap between PTSD, depression, and anxiety. Much weaker correlations were observed between CAPS total severity and measures of antisocial personality (.14 to .33), a disorder conceptually distinct from PTSD. In an effort to bring these convergent and discriminant correlations into sharper relief, Weathers et al. [1999a] then calculated partial correlations, controlling first for nonspecific distress and symptom exaggeration by using the F scale of the MMPI-2, then for nonspecific distress again using the Global Severity Index (GSI) of the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1983]. After controlling for the F scale, the CAPS demonstrated strong partial correlations with measures of PTSD, including the Mississippi Scale (.83), the PCL (.89), and the number of PTSD symptoms on the SCID (.82). As predicted, however, partial correlations between the CAPS and measures of depression (.37 to .53) and anxiety (.37 to

.55) were markedly lower, and those between the CAPS and measures of antisocial personality were essentially zero (–.05 to .02). A similar, but even more striking pattern was found after controlling for the GSI. Further, these results involving the F scale were generally replicated in a second research sample.

Finally, again focusing on the sample of 123 participants, Weathers et al. [1999a] reported the diagnostic utility of three CAPS scoring rules for predicting a SCID-based PTSD diagnosis. The original, rationally derived scoring rule (frequency ≥ 1, intensity ≥ 2, or F1/I2) had 91% sensitivity, 71% specificity, and 82% efficiency, with a kappa of .63. These figures reveal the F1/I2 rule to be relatively lenient, with excellent sensitivity but only moderate specificity, suggesting that it tends to somewhat overdiagnose PTSD relative to the SCID. The two other rules were empirically derived on this sample. The second rule, which assigns a positive diagnosis if the CAPS total severity score is 65 or greater (TSEV65), had 82% sensitivity, 91% specificity, and 86% efficiency, with a kappa of .72. Although the higher kappa indicates a better correspondence with the SCID than the F1/I2 rule has, the TSEV65 rule appears to be relatively stringent, tending to somewhat underdiagnose PTSD relative to the SCID. The third rule, derived by empirically calibrating each CAPS symptom with the analogous SCID symptom (SXCAL), had the closest correspondence to the SCID, with 91% sensitivity, 84% specificity, and 88% efficiency, with a kappa of .75. Although these results require cross-validation, the SXCAL rule appears to be the optimally efficient rule, and therefore the best choice for differential diagnosis.

In the second article based on National Center data, Nagy et al. [1999] described the only comprehensive investigation of the CAPS that focused specifically on the CAPS-2. To evaluate interrater reliability, Nagy et al. administered the CAPS-2 to 30 (29 male, 1 female) inpatients and outpatients in treatment for PTSD, all but two of whom were combat veterans. Interviews were videotaped and scored by three additional raters, resulting in four ratings for each participant. Intraclass correlations ranged from .76 to .99 for the 17 core PTSD symptoms, and from .92 to .97 for the three symptom clusters, with values of .98 for total frequency, .96 for total intensity, and .98 for total severity. Internal consistency and convergent and discriminant evidence were examined in two additional samples of male combat veterans: 20 veterans enrolled in a pharmacologic trial and 37 veterans in inpatient PTSD treatment program. All participants were administered the CAPS and the IES. In addition, the 20 participants in the drug trial were administered the Hamilton scales for depression and anxiety (HAM-D and HAM-A), and the 37 inpatients completed the BDI and the Beck Anxiety Inventory [BAI; Beck et al., 1988].

In the combined sample alphas were .25 for re-experiencing, .69 for avoidance and numbing,.70 for hyperarousal, and .79 for all 17 items. In the combined sample, the CAPS correlated .37 with the IES. For the participants in the drug trial the CAPS correlated .34 with the HAM-D and .36 with the HAM-A. In the inpatient sample the CAPS correlated .67 with the BDI and .51 with the BAI. Taken together, these results are generally in line with results from studies involving the CAPS-1. However, the alpha for the re-experiencing cluster and the correlation of the CAPS with the IES were lower than those found previously. It is unclear whether these findings are sample-specific and reflect some idiosyncrasies of the particular participants or settings in the study or whether they are attributable to some aspect of the CAPS-2.

Although not designed primarily as psychometric investigations of the CAPS per se, other investigations have nonetheless provided additional evidence of its reliability and validity. Hovens et al. [1994] used the CAPS as a criterion measure in the evaluation of a new self-report measure of PTSD, the Self-Rating Inventory for Posttraumatic Stress Disorder (SIP). The SIP consists of 51 items, 22 assessing DSM-III-R PTSD symptoms and 29 measuring other trauma-related sequelae, particularly those associated with the proposed diagnostic category of disorders of extreme stress not otherwise specified (DESNOS). This study included two samples: the same 76 participants used in their previous study on the CAPS plus 59 (22 male and 37 female) psychiatric outpatients. Although the psychiatric outpatients were not selected on the basis of a known trauma history, 18 of them reported exposure to various types of civilian trauma, including sexual and physical assault, traumatic loss of a loved one, and motor vehicle accidents. Combining all participants with a trauma history across the two samples, Hovens et al. [1994] found that the CAPS correlated .73 with total SIP score, .75 with the DSM-III-R items on the SIP, .70 with the civilian version of the Mississippi Scale, .72 with the PK scale, and .61 with the IES. Correlations for the DSM-III-R symptom clusters between the CAPS and the SIP were .54 for re-experiencing, .69 for avoidance and numbing, and .71 for hyperarousal.

Two studies by Neal and colleagues also provide convergent validity evidence. First, Neal et al. [1994] assessed 70 (59 male and 11 female) military personnel with mixed military and civilian trauma exposure, presumably similar to, or overlapping with, the sample they evaluated for their study on the computerized CAPS described earlier. They examined the correlations of two CAPS variables, total intensity and number of symptoms endorsed, with the PK scale, the IES, and the GSI of the SCL-90. Although no rationale was offered for why they used intensity rather than severity scores, presumably this was because of the high degree of correlation between frequency and intensity scores they found in their previous study on the computerized CAPS. Similar patterns of correlations were found for both CAPS variables. Total CAPS intensity correlated .85 with the PK scale, .78 with the IES, and

.77 with the SCL, whereas the number of CAPS symptoms correlated .84 with the PK scale, .81 with the IES, and .74 with the SCL-90. The strong correlations with the PK scale and the IES offer convergent evidence, but the nearly as strong correlations with the SCL-90 failed to provide strong discriminant evidence. However, given the high rates of comorbidity found in PTSD and given that the SCL-90 primarily reflects nonspecific distress, the SCL-90 is not an optimal measure for discriminant evidence. Second, Neal et al. [1995] administered the CAPS, the IES, the PK scale, and the Mississippi scale to 30 (29 male and 1 female) World War II prisoners of war. In this study the CAPS correlated .63 with the IES, .71 with the PK scale, and .81 with the Mississippi Scale, again providing convergent evidence for the CAPS as a measure of PTSD.

Two studies by Blanchard and colleagues provide evidence regarding interrater reliability and convergent validity. Blanchard et al. [1995b] employed the CAPS as the primary diagnostic measure of PTSD in a study of male and female motor vehicle accident victims. All CAPS interviews were audiotaped and an independent rater re-scored 15 randomly selected interviews. Interrater reliability for individual items ranged from .82 to .99, with a mean of .98, and kappa for a PTSD diagnosis was .81. Blanchard et al. [1996a,b] also used the CAPS as the criterion measure in a psychometric evaluation of the PCL. Participants were 27 (3 male and 24 female) motor vehicle accident victims and 13 female sexual assault victims. Interrater reliability for the CAPS, based on 19 audiotaped and independently rescored interviews, was again quite strong. Coefficients for individual items ranged from .84 to .99 for individual items, with a mean of .94, and kappa for a PTSD diagnosis was .84. Correlations between the PCL and the CAPS supplied convergent evidence. Correlations between PCL items and corresponding CAPS items ranged from .39 to .79, with all but three correlations above .60 and seven correlations above .70. In addition, the correlation between the total scores on the PCL and the CAPS was .93.

Finally, two studies utilized the CAPS in the validation of the Davidson Trauma Scale [DTS; Davidson et al., 1997], a 17-item self-report measure of DSM-IV PTSD symptoms. Like the CAPS, the DTS assesses PTSD symptoms on two dimensions: frequency, which corresponds to the frequency dimension on the CAPS, and severity, which corresponds to the intensity dimension of the CAPS. The DTS assesses symptoms over the previous week. To obtain convergent evidence for the DTS, Zlotnick et al. [1996] administered the DTS and the CAPS to 50 female sexual abuse survivors. They found correlations of .72 between DTS total frequency and CAPS total frequency and .57 between DTS total severity and CAPS total intensity. For total DTS and total CAPS scores for each of the three symptom clusters, they found correlations of .70 for re-experiencing, .53 for avoidance, and .73 for hyperarousal. As part of a comprehensive psychometric investigation of the DTS, Davidson et al. [1997] administered the DTS and the CAPS to a mixed sample of 102 female sexual assault victims and male combat veterans, finding a correlation of .78 between total scores on the DTS and CAPS.

CAPS factor structure. The final two issues we will discuss address the factor structure of the CAPS and the development and evaluation of various scoring rules for deriving a CAPS-based PTSD diagnosis. Two studies have examined the factor structure of the CAPS using confirmatory factor analysis. Buckley et al. [1998] tested a single hypothesized factor structure consisting of two factors: a) Intrusion and Avoidance and b) Hyperarousal and Numbing. Although these factors cut across the three DSM-III-R and DSM-IV symptom clusters of PTSD, there is theoretical and empirical justification for this two-factor structure. In fact, Buckley et al. [1998] sought to replicate a previous study by Taylor et al. [1998], in which this structure was derived in an exploratory factor analysis. Analyzing CAPS scores from a combined sample of 217 male and female motor vehicle accident victims, Buckley et al. [1998] found support for the hypothesized two-factor structure across several indices of model fit.

In a more comprehensive analysis, King et al. [1998] conducted a confirmatory factor analysis of CAPS scores in 524 male combat veterans seen for clinical services at the National Center for PTSD in Boston. In this study King et al. [1998] tested four competing models, three of which involved dividing Criterion C (numbing and avoidance) into two distinct factors of effortful avoidance (criteria C1 and C2) and emotional numbing (criteria C3–C7). The first model was a four-factor, first-order solution consisting of four correlated primary factors: re-experiencing, effortful avoidance, emotional numbing, and hyperarousal. The second model, which was similar to the one Buckley et al. [1998] evaluated, was a two-factor, higher-order solution, with one factor comprising re-experiencing and effortful avoidance and the other comprising emotional numbing and hyperarousal. The third model was a single factor, higher-order solution that hypothesized a single PTSD factor comprising the four symptom clusters. The fourth model was a single-factor, first-order solution that hypothesized that all 17 symptoms load on a single PTSD factor. King et al. [1998] found that the first model provided the best fit to the data, suggesting that PTSD, as assessed by the CAPS, consists of four correlated but distinct symptom clusters. This finding supports the CAPS as a measure of PTSD in that the internal structure of the CAPS corresponds to the DSM PTSD symptom clusters, albeit with the additional, conceptually meaningful distinction between effortful avoidance and emotional numbing.

CAPS scoring rules. Finally, one of the recent developments in the CAPS has been the explication and evaluation of various rules for converting continuous

CAPS scores into a dichotomous PTSD diagnosis. From the outset it was recognized that the original, rationally derived F1/I2 rule described earlier was only an initial working rule that might be replaced by others once sufficient empirical evidence had accumulated. Over time, a number of new rules have been proposed and have recently appeared in the literature. Blanchard et al. [1995a] were the first to compare the impact of adopting different scoring rules. In an investigation of 100 (35 male and 65 female) motor vehicle accident victims they proposed and evaluated three different scoring rules, all of which involved converting CAPS frequency and intensity scores into a dichotomous score for each symptom, then following the DSM requirements (one re-experiencing symptom, three numbing and avoidance symptoms, and two hyperarousal symptoms) to derive a PTSD diagnosis. According to the Rule of 2, a symptom is considered present if the severity score for an item (frequency + intensity) is ≥ 2 (i.e., frequency and intensity are both ≥ 1). Similarly, the Rule of 3 requires an item severity score > 3 (either frequency or intensity is ≥ 2 and the other is ≥ 1). This is similar to but more inclusive than the original F1/I2 rule. Last, the Rule of 4 requires an item severity ≥ 4. Blanchard et al. found that the three rules yielded markedly different PTSD prevalence estimates, with 44% for the Rule of 2, 39% for the Rule of 3, and 27% for the Rule of 4. Furthermore, they found that participants who met the Rule of 4 had higher scores on measures of depression and anxiety, and greater functional impairment, relative to those who only met the Rule of 3.

More recently, Weathers et al. [1999b] described and compared nine scoring rules, drawing on data from the same five samples in the Weathers et al. [1999a] psychometric article described earlier. Four of the nine rules were rationally derived, including the original F1/I2 rule, the Item Severity ≥ 4 (ISEV4) rule, which is identical to Blanchard's Rule of 4, and two rules based on clinicians' judgments regarding which frequency/intensity combinations constitute a symptom. The other five rules were empirically derived, including four rules calibrated in various ways against the SCID PTSD module, and one rule identified by Orr [1997], based on a study of physiological reactivity in female incest survivors. Kappa coefficients indicating test-retest reliability for the rules ranged from .72 to .90 in an initial sample of 60 veterans, and from .68 to 1.00 in a follow-up sample of 24 veterans. Kappa coefficients for predicting a PTSD diagnosis based on the SCID ranged from .63 to .75. As in the Blanchard et al. [1995a] study, the nine rules yielded widely varying prevalence estimates, ranging from 26% to 49% in a combined research sample of 243 veterans and 47% to 82% in a clinical sample of 571 veterans. The F1/I2 rule was the most lenient in the clinical sample and second most lenient in the research sample. The two rules based on clinicians' ratings were the most stringent in both samples. Also, compared to participants who met criteria only by the F1/I2 rule, those who met criteria for the most stringent rule had significantly higher scores on measures self-report measures of PTSD, depression, anxiety, and nonspecific distress.

A third study, by Fleming and Difede [1999], examined the impact of adopting different scoring rules on the CAPS-2 in a sample of hospitalized burn patients. Although they recognized that the CAPS-2 was not suitable for a diagnosis of PTSD because of the one-week time frame, they deliberately chose it for their study because they were interested in acute PTSD symptoms within the first 2 weeks after the trauma. Administering the CAPS-2 to 69 (48 male and 21 female) participants, they compared the effects of adopting essentially the same scoring rules described by Blanchard et al. [1995a]. The one exception was that Fleming and Difede appear to have used the F1/I2 rule rather than the more inclusive Rule of 3 of Blanchard et al. [1995a]. Compared to the previous two studies, they found less variability among the different rules in terms of estimated prevalence of PTSD. The Rule of 3 and the Rule of 4 both yielded a prevalence of 25%, while the Rule of 2 yielded a prevalence of 32%. Furthermore, they found no significant differences on the IES or self-report measures of acute stress and nonspecific distress between participants who met criteria only by the Rule of 2 and those who met criteria by the Rule of 3 or the Rule of 4. However, differences were found on all self-report measures between all participants who met criteria for PTSD by at least the Rule of 2 and those who did not meet criteria for PTSD by any of the rules.

Taken together these three studies of scoring rules for the CAPS indicate that there are important consequences to adopting a particular rule. Prevalence estimates can vary considerably and participants who meet criteria by lenient rules may be less symptomatic and less impaired relative to those who meet criteria by more stringent rules. Weathers et al. [1999b] discuss three implications of these findings. First, investigators should always explicitly describe and defend their choice of a CAPS scoring rule. Second, for many applications, an efficient and informative strategy would be to use several scoring rules, ranging from lenient to stringent, and compare the different results obtained. Third, when using different scoring rules is not feasible, investigators should select scoring rules that are best suited for the purpose of the study. Lenient scoring rules are most appropriate for screening, when a lower threshold for diagnosis is needed to avoid false negatives. Stringent rules are most appropriate for confirming a diagnosis or creating an unambiguous PTSD group for case-control research, when a higher threshold is need to avoid false positives. Moderate rules are most appropriate for differential diagnosis, when false negatives and false positives are weighted equally and the goal is to minimize the overall number of diagnostic errors.

Finally, we note that it is possible that some of the diagnostic utility data cited for the CAPS in this section, even though it is consistently high, might actually have been stronger had different scoring rules been applied. In discussing the articles in this section, we assumed that unless stated otherwise investigators used the original F1/I2 rule to derive a PTSD diagnosis from CAPS scores. However, the Weathers et al. [1999b] article, in particular, demonstrated that the F1/I2 rule is a relatively liberal rule and may not be optimal for differential diagnosis.

Discussion. Considering all the accumulated evidence, the CAPS appears to have excellent psychometric properties across a wide variety of clinical research settings and trauma populations. Interrater reliability for continuous CAPS scores was consistently at the .90 level and above, with diagnostic agreement at times reaching 100%. Test-retest reliability, a more stringent measure of agreement, was nearly as strong, although it was only evaluated in one study and needs replication. These findings suggest that trained and calibrated raters can achieve a high degree of consistency in using the CAPS to diagnose PTSD and rate PTSD symptom severity. In addition, internal consistency was generally high, with alphas typically in the .80 to .90 range for the three PTSD symptom clusters and for the entire syndrome.

Although somewhat more variable and therefore more difficult to easily summarize, evidence of validity was also strong. Regarding convergent evidence, the CAPS generally demonstrated correlations at the .70 level and above with self-report measures of PTSD such as the Mississippi Scale, the PK scale, the IES, the PCL, and the DTS, often reaching the .80 to .90 range. Diagnostic utility of the CAPS was evaluated in five studies, and with one exception in which the criterion was a clinical diagnosis based on an unstructured interview, was quite robust, with sensitivities and specificities above .80, and often above .90, and kappas above .70. To date, however psychometric studies of the CAPS offer little in terms of discriminant evidence. More data on this are needed. Because individuals with PTSD, especially chronic PTSD, often have comorbid disorders and experience high levels of distress, it may prove to be difficult to obtain unequivocal discriminant evidence, particularly with measures of depression and anxiety, since these two constructs overlap conceptually with PTSD. Weathers et al. [1999a] tried to address this problem by including measures of a construct conceptually unrelated to PTSD (antisocial personality) and by partialing out the effects of nonspecific distress. These two approaches appeared to be successful in providing discriminant evidence, but more creative research on this issue is needed.

We close this section with a brief discussion of some fundamental questions regarding the psychometric investigation of the CAPS. First, regarding convergent and discriminant evidence there are no absolute standards for what constitutes "good" evidence. How large should convergent validity coefficients be? How small should discriminant validity coefficients be? How large a difference should there be between convergent and discriminant coefficients? Reasonable answers to these questions must be informed by a well-articulated theoretical model and ultimately based on expert judgment.

Second, is it appropriate to evaluate a putative "gold standard" such as the CAPS against self-report measures? When a correlation between the CAPS and another measure is lower than expected it is unclear if the "problem" lies with the CAPS or with the alternative measure, or a combination of both. This question is particularly important with respect to self-report measures of PTSD, which are subject to misinterpretation and to response biases such as social desirability, exaggeration, minimization, and even random responding. In addition, they vary significantly in format, including their correspondence with DSM criteria for PTSD, the dimension of symptom severity they emphasize (e.g., subjective distress, functional impairment, and frequency), and the time frame they assess (past week and past month). Finally, they vary in the quality of their psychometric properties. Any of these characteristics, alone or in combination with characteristics of different samples, could affect their correlation with the CAPS. In general, in PTSD research, as in other areas of psychopathology, the diagnostic standard is a clinical interview because interviewers can clarify as needed, ask for examples, observe clinically relevant behaviors, and evaluate potential response bias. Most importantly, with an interview it is ultimately the clinician who makes the final rating, not the participant.

This, then, raises a third question. What measure should serve as the criterion for evaluating the diagnostic utility of the CAPS? Part of the problem is that there is no other single measure that has been widely accepted as a criterion measure of PTSD. The SCID PTSD module comes the closest, but there is evidence that suggests that it may not be as reliable as the CAPS, which sets an upper limit on how well the CAPS can perform in predicting it. In fact, as Weathers et al. [1999b] have argued, the CAPS appears to be more strongly associated with the SCID PTSD module than the SCID PTSD module is with itself. Another possibility might be to use a multiple converging measures approach, such as was used in the National Vietnam Veterans Readjustment Study [NVVRS; Kulka et al., 1990] or the so-called LEAD standard approach proposed by Spitzer and colleagues. Both approaches could readily be applied to the CAPS and would provide valuable new information.

TREATMENT OUTCOME STUDIES

Design and analysis issues. In this section, we describe pharmacological and psychosocial treatment outcome studies that employed the CAPS as a primary outcome measure. Our main focus in this section is on

the ability of the CAPS to detect genuine changes in PTSD symptom severity in the context of a clinical intervention. A key question addressed in this section is "What empirical results would constitute evidence supporting the claim that the CAPS is in fact sensitive to change?" We hypothesize four results that we would expect to occur in a treatment outcome study if this claim is true. First, we would expect to find a reduction in CAPS scores from pre-treatment to post-treatment. This should be true for virtually any intervention, for any of the following reasons:

1. Possible placebo effects.
2. Possible statistical regression (i.e., participants selected on basis of extreme scores tend to show less extreme scores on subsequent testing).
3. The fact that repeated assessment, particularly interview-based assessment, may be considered an intervention in and of itself since it includes many putative active ingredients of psychotherapy, including a) a safe, professional interpersonal context; b) therapeutic exposure and emotional and cognitive processing through disclosure of painful aspects of the trauma and trauma-related symptoms; and c) education about PTSD symptoms and self-monitoring.

Second, if a study includes one or more comparison groups, there should be greater improvement in the group or groups that receive a more potent treatment or a treatment with more putative active ingredients of therapy. Third, changes on the CAPS should parallel changes in other measures of PTSD. Finally, if the active therapy ingredient targets PTSD specifically, then the CAPS should show greater reduction relative to measures of other constructs such as depression, anxiety, and global distress and impairment.

In reviewing these studies, we focused only on data related specifically to the CAPS. It was not our intent to address the effectiveness of pharmacological or psychosocial treatments for PTSD per se or to rigorously critique the research methodology of the various studies. Nonetheless, within this limited scope of our review, we identified several issues with regard to the reporting of CAPS data that required several decisions about how to extract and summarize CAPS-related results and present them in a standard format. First, studies varied considerably in terms of the outcome measures they included and how the data were reported and analyzed, differing on a) which CAPS scores were included (e.g., frequency, intensity, or severity scores for individual items, for the three symptom clusters, or for the syndrome as a whole); b) which additional measures were included; c) how scores were presented (e.g., means and totals); d) how change was quantified (e.g., change scores, percent change, statistical significance, effect size, and graphic presentation only); and e) how complete the data analyses were. In general, in response to this variability, we tried to extract the results most relevant to the CAPS and present them as uniformly as possible. For the purposes of this review, we used percent change as the primary metric for comparing results across studies and across instruments within the same study. This is a commonly reported metric, particularly in the pharmacology literature. It is easily calculated when not provided, readily comprehensible, and applicable for any type of study, from case studies to large randomized trials. Where possible, we identified or calculated percent change for the primary outcome variables in each of the studies. In addition, we included the results of statistical significance tests of key comparisons when they were provided.

Second, studies varied in terms of how many measurement points they included. All studies included assessments at pre-treatment and post-treatment, but others included assessments at screening, extended baseline, pre-treatment, post-treatment, additional intervals during treatment, and one or more long-term follow-ups. To simplify our presentation, whenever possible, we examined only pre-post changes for all studies. These data were available for almost all studies and were sufficient as evidence of the sensitivity of the CAPS to clinical change. Also, in the studies that presented additional follow-up data, pre-post changes were generally sustained and sometimes continued to improve, so little would have been gained by examining additional assessment periods.

Third, there was some ambiguity with regard to the terms investigators used to describe their study designs. Terms such as open trial, uncontrolled trial, and open label do not adequately characterize the essential aspects of the research designs they were used to describe nor were they used consistently across studies. The questions we used as a guide in depicting the various research designs were the following.

1. Is the treatment condition known to the participant?
2. Is the treatment condition known to the assessor?
3. Is there at least one comparison condition?
4. Is the comparison condition within-subjects, as in a crossover design, or between-subjects, as in a randomized controlled trial?

Answers to these questions were not always stated explicitly, although the investigators may have intended to imply them by the labels they used to describe their studies. In particular, unless otherwise specified, we assumed that assessments were not blinded. Fourth, studies often did not explicitly identify which version of the CAPS was used. This could sometimes be inferred, but in general, unless there was some specific indication that the CAPS-2/CAPS-SX was used, we assumed that the CAPS-1/CAPS-DX was used. Finally, the final sample size often differed from the initial one due to attrition and inclusion/exclusion criteria. We report the sample size on which the final data analyses were based.

Pharmacological and psychosocial treatment studies. In this section, we review 10 pharmacological and 19 psychosocial treatment studies that used the CAPS as a primary outcome measure. These studies and their key findings relevant to the CAPS are presented in Tables 1 and 2. We consider the results with respect to the four issues outlined above with regard to evidence of sensitivity to clinical change, including within-groups effects (pre-post change), between-groups effects (differential change due to nature of intervention, e.g., drug versus placebo), change on the CAPS relative to change on other measures of PTSD, and change on the CAPS relative to measures of other constructs (e.g, anxiety, depression, and global distress and functional impairment). Whenever possible we present the percent change values for each measure described in Tables 1 and 2. However, some studies only reported the results of significance tests and did not include actual values for one or more key measures. The studies in Tables 1 and 2 are arranged chronologically and numbered within each table. For ease of presentation in the following sections, we refer to studies by number rather than by author(s) and year.

Within-groups effects. Among the pharmacological studies, there was a significant reduction in CAPS total score in eight of the nine studies that reported inferential statistics (Table 1, all but Study 5 reported significance levels; all of those but Study 8 were significant). Considering only participants who received a drug, for the nine studies that reported actual CAPS score values (all but Study 2), the reduction in CAPS total score ranged from 10–63%, with a median of 33%. The psychosocial studies yielded similar findings, with evidence of even greater improvement. There was a significant reduction in CAPS total score in 10 of the 13 studies that reported inferential statistics (Table 2, Studies 1–4, 6, 8, 10–13, 15, 16, and 19 reported significance levels; all of those but Studies 1, 6, and 8 were significant). Considering the participants who received an active intervention and showed the most improvement, for the studies that reported actual CAPS score values (all but Studies 1, 8, and 16), the reduction in CAPS total score ranged from 19–100%, with a median of 50%.

Between-groups effects. Overall, there were relatively few controlled trials. Of the ten pharmacological studies, only three were randomized, placebo-controlled trials (Table 1, Studies 2–4). Two of these (Studies 2 and 3) found significantly greater reduction in CAPS scores for the drug group relative to the placebo group. The third study (Study 4) found slightly greater improvement for drug versus placebo, although the effect was not significant. Similarly, of the 19 psychosocial studies, only 6 were randomized, controlled trials (Table 2, Studies 1, 4, 12, 13, 16, and 19), although an additional 3 studies (2 crossover designs and 1 program evaluation) included a comparison condition (Studies 8, 10, and 17). Only two of the six randomized, controlled trials (Studies 12 and 16) found significant between-groups effect, with significantly greater reduction in CAPS scores for a more active, trauma-focused intervention than for a control condition. Two of the other four studies (Studies 4 and 13) found greater improvement for active interventions relative to control conditions, but the effects were not significant. Of the remaining two studies, Study 19 included two active interventions, which showed substantial, equivalent improvement but no minimal intervention control condition; Study 1 employed a very brief intervention and found no within-groups or between-groups changes on any measures. Finally, in Study 10, a quasi-experimental program evaluation, between-groups differences were found among three types of PTSD inpatient programs.

CAPS versus other PTSD measures. In general, CAPS results matched the results for self-report PTSD measures, particularly the IES. Among the pharmacological studies, the CAPS had comparable results to the IES in three studies (Table 1, Studies 1, 4, and 6) and to the DTS in two other studies (Studies 5 and 9), with differences ranging from 0–7 percentage points. For the psychosocial studies differences between the CAPS and other PTSD measures were more variable and somewhat larger. Eight studies (Table 2, Studies 2, 4, 5, 11, 12, 15, 16, and 19) found a greater reduction on the CAPS relative to the IES, with differences ranging from 1–24 percentage points. On the other hand, four studies (Studies 3, 9, 14, and 18) found a greater reduction on the IES, with differences ranging from 7–26 percentage points. In addition, the CAPS showed a comparable or greater reduction relative to the PK scale (Study 1), the Mississippi Scale (Study 5), the Civilian Mississippi Scale (Study 15), the PSS (Study 9), the MPSS-SR (Study 7), the PCL (Study 11), and the Penn Inventory (Study 19).

CAPS versus measures of depression. All but two of the pharmacological studies included a measure of depression, primarily the HAM-D and MADRS. Four studies (Table 1, Studies 1, and 8–10) found greater reduction on the HAM-D relative to the CAPS, with differences ranging from 2–13 percentage points. A fifth study (Study 2) found significant within-groups and between-groups effects for both the CAPS and the HAM-D but did not report actual rating scale values. However, two studies (Studies 6 and 7) found greater reduction on the CAPS relative to the MADRS, with differences of 9 and 10 percentage points, respectively. One study (Study 5) found slightly greater reduction on the CAPS relative to the BDI. The BDI was also included in 12 of 19 psychosocial studies, with ten (Table 2, Studies 2, 6, 7, 11–13, 15, 16, 18, and 19) finding greater reduction on the CAPS and two (Studies 5 and 9) finding equivalent reduction on the two scales. Except for a case study (Study 7), which found a 48% reduction on the CAPS and an 18% increase on the BDI, the greater reduction on the CAPS ranged from 2–18 percentage points.

CAPS versus measures of anxiety. Four pharmacological studies included the HAM-A. Three (Table 1,

TABLE 1. Summary of CAPS findings from pharmacological treatment studies of posttraumatic stress disorder*

Authors (year)	Participants	Design	Drug	Duration	Key CAPS-related findings
1. Nagy et al. [1993]	Male combat veterans (N=19)	1. Non-blinded, uncontrolled 2. CAPS-2	Fluoxetine	10 weeks	1. Significant reduction in CAPS-2 total score (34%) 2. Comparable reduction on IES (39%) 3. Somewhat larger reduction on HAM-D (47%) and HAM-A (41%) 4. With response defined as 50% reduction in CAPS total score, a 2-point improvement on CAPS global severity rating, and consensus of two clinicians, 7 participants (37%) had good responses, 5 (26%) had partial response, and 7 (37%) did not respond
2. van der Kolk et al. [1994]	1. Civilian with mixed trauma (N=23, 12 male/23 female) 2. Combat veterans and civilians with mixed trauma (N=24, 23 male/1 female)	Double-blind, randomized, placebo-controlled	Fluoxetine	5 weeks	1. Significantly greater reduction in total CAPS score for drug relative to placebo, after adjusting for initial CAPS score and site 2. Greater reduction in CAPS total score for civilian sample relative to veteran sample 3. Significant reduction in numbing and hyperarousal symptoms but not reexperiencing or avoidance 4. Significantly greater reduction in HAM-D score for drug relative to placebo
3. Katz et al. [1994/1995]	Combat veterans and civilians with mixed trauma (N=45, 34 male/ 11 female)	Double-blind randomized, placebo-controlled multi-center	Brofaromine	14 weeks	1. Significant reduction in CAPS total score for both groups (drug=48%, placebo=29%), with significant, between-groups difference 2. 55% of drug group and 26% of placebo group no longer met diagnostic criteria for PTSD 3. On CGI, drug group had significantly greater mean improvement and more participants rated as very much improved
4. Baker et al. [1995]	Combat veterans and civilians with mixed trauma (N=114, 92 male/22 female)	Double-blind randomized, placebo-controlled Multi-center	Brofaromine	10 weeks	1. Significant reduction in CAPS total score for both groups (drug=33%, placebo=31%), but no between-groups difference 2. Comparable results for IES, with somewhat smaller reduction in IES total score in both groups (26%) and no between-groups differences 3. No between-groups difference on DTS or Physician's Global Evaluation (within-groups analyses not presented)
5. Hertzberg et al. [1996]	Male combat veterans (N=6)	Multiple baseline, open label but assessment blind	Trazodone	4 months	1. Reduction in CAPS total score (15%) 2. Comparable reduction on DTS (15%) 3. Somewhat smaller reduction on BDI (10%), little change on STAI-S (+1%) 4. Four of 6 participants rated as much improved on CGI, 2 rated as minimally improved
6. Neal et al. [1997]	Military personnel and civilians with mixed trauma (N=20, 18 male/2 female)	1. Non-blinded, uncontrolled 2. Computerized CAPS, intensity scores only	Moclobemide	12 weeks	1. Significant reduction in computerized CAPS total score (50%) 2. Comparable reduction on IES (49%) 3. Somewhat smaller reduction on MADRS (41%), HAM-A (44%), and CIS (39%) 4. Computerized CAPS change score correlated .76 with IES change score, but only .31 with MADRS and .32 with HAM-A change scores
7. Bouwer and Stein [1998]	Male torture victims (N=14)	Routine clinical care, non-blinded, un-controlled	Sertraline (n=9) Imipramine (n=2) Fluoxetine (n=2) Clomipramine (n=1)	8 weeks	1. Significant reduction in CAPS total score (63%) 2. Somewhat smaller reduction on MADRS (53%) 3. 12 of 14 participants rated as very much or much improved on CGI

(continued)

TABLE 1. (*Continued*).

Authors (year)	Participants	Design	Drug	Duration	Key CAPS-related findings
8. Cañive et al. [1998]	Male combat veterans (N=14)	Routine clinical care, non-blinded, uncontrolled	Bupropion	6 weeks	1. Trend for reduction in CAPS total score (10%), significant reduction (16%) in CAPS hyperarousal score, but not in reexperiencing (+1%) or avoidance/numbing (9%) scores 2. Ten of 14 participants rated as very much or much improved on CGI 3. Significant reduction on HAM-D (26%) but not HAM-A (12%)
9. Hertzberg et al. [1998]	Male combat veterans (N=10)	Non-blinded, uncontrolled	Nefazadone	12 weeks	1. Significant reduction in CAPS total score (32%) 2. Significant, somewhat smaller reduction on DTS (28%) 3. Significant reduction on HAM-D (34%) but not BDI (7%) 4. Ten of 10 participants rated as much improved or very much improved CGI
10. Clark et al. [1999]	Male combat veterans (N=13)	Open label but assessment (except CGI) blind, uncontrolled	Divalproex	8 weeks	1. Significant reduction in CAPS total (18%), reexperiencing 21%), and hyperarousal (29%) scores, nonsignificant reduction in avoidance/numbing score (7%) 2. Significant, somewhat larger reduction on HAM-D (31%) and HAM-A (27%) 3. Eleven of 13 participants rated as much improved or very much improved on CGI

**BDI, Beck Depression Inventory; CGI, Clinical Global Impressions; CIS, Clinician Impression of Severity; DTS, Davidson Trauma Scale; HAM-A, Hamilton Rating Scale for Anxiety, HAM-D, Hamilton Rating Scale for Depression; IES, Impact of Event Scale, MADRS, Montgomery-Asberg Depression Rating Scale; STAI, State-Trait Anxiety Inventory.*

TABLE 2. Summary of CAPS findings from psychosocial treatment studies of posttraumatic stress disorder*

Authors (year)	Participants	Design	Intervention	Number of sessions/ duration	Key CAPS-related findings
1. Boudewyns et al. [1993]	Male combat veterans (N=20)	Ramdomized, controlled trial, assessments not blinded	1. EMD 2. exposure control 3. routine clinical care (group therapy without exposure)	Two 90-minute EMD or exposure sessions in 2 weeks	1. No significant reduction in any CAPS symptom or symptom cluster scores 2. No significant reduction on Mississippi Scale or IES 3. No significant reduction in psychophysiological responding
2. Busuttil et al. [1995]	Military personnel, veterans and civilians with mixed trauma (N=34, 28 male/6 female)	Uncontrolled, assessments not blinded	Inpatient group therapy	12 days	1. Significant reduction in CAPS total intensity (54%), global improvement (59%), and global severity (55%) scores 2. Significant, somewhat smaller reduction in IES (42%) and PK (48%) 3. Significant, somewhat smaller reduction on SCL-90 (43%), and BDI (39%) 4. 26 or 34 (76%) participants no longer met PTSD diagnostic criteria
3. Thompson et al. [1995]	Civilians with mixed trauma (N=23, 17 male/6 female)	Uncontrolled, assessments not blinded	Multicomponent cognitive-behavioral protocol (imaginal and in vivo exposure, cognitive restructuring)	8 weekly sessions	1. Significant reduction in CAPS total score (35%) 2. Significant, somewhat larger reduction on IES (42%) 3. Comparable reduction on SCL-90 (38%), larger reduction on GHQ (61%)
4. Boudewyns and Hyer [1996]	Male combat veterans (N=61)	Randomized, controlled trial, assessments blinded	1. EMDR 2. exposure control 3. routine clinical care (group therapy without exposure)	5-7 EMDR or exposure sessions in 6 weeks	1. Significant reduction in CAPS total score for all three groups (EMDR=33%, exposure=21%, routine care=17%), but no significant between-groups differences 2. No significant reduction on IES 3. Significant between-groups differences on POMS anxiety scale and heart rate reactivity, with EMDR and exposure group showing reduction in scores and no-exposure control group showing slight increase
5. Carlson et al. [1996]	Male combat veterans (N=4)	Single-subject replication series	EMDR	12 sessions, 2 sessions per week	1. At 3-month followup, reduction in CAPS total score across 4 participants ranged from 34–100%, with 3 of 4 showing > 80% improvement 2. Comparable reduction on IES (34–88%), but smaller reduction on Mississippi Scale (6–46%) 3. More variable outcome on BDI and STAI-S and STAI-T (1 participant showing slight increase on these scales, other 3 showing reduction of 50–100% reduction on BDI and 8–41% on STAI)
6. Frueh et al. [1996]	Male combat veterans (N=11)	Uncontrolled, assessments not blinded	Multicomponent cognitive-behavioral protocol (education, imaginal and in vivo exposure, social skills training, anger management)	29 sessions in 17 weeks	1. Trend for reduction in CAPS total score (21%) 2. Significant reduction on HAM-A (31%), CGI (34%) and heart rate reactivity (14%) 3. No significant reduction on BDI, SPAI, or STAXI
7. Hall and Henderson [1996]	Female sexual abuse victim (N=1)	1. Case study 2. CAPS-2	Cognitive processing therapy	17 weekly sessions	1. Reduction in CAPS-2 total scores (48%) 2. Smaller reduction on MPSS-SR (31%) 3. Somewhat smaller reduction on SCL-90 (26%), and slight increase on BDI (+18%)

(continued)

TABLE 2. (*Continued*).

Authors (year)	Participants	Design	Intervention	Number of sessions/ duration	Key CAPS-related findings
8. Pitman et al. [1996]	Male combat veterans (N=17)	Crossover, assesssments blinded	EMDR, with and without eye movement	12 weekly sessions (6 in each condition)	1. Little change in CAPS total score, with slight increase after eye movement condition and slight decrease after no eye movement condition 2. Comparable result for Mississippi Scale, with slight increase after both conditions, and mixed results for IES, with significant reductions for intrusion or avoidance subscale depending on condition and trauma memory evaluated 3. Significant reduction on SCL-90 in eye movement condition 4. Therapy integrity ratings significantly correlated with CAPS change score in both conditions (.55, .62), but with SCL-90 in eye movement condition only (.69)
9. Thrasher et al. [1996]	Male physical assault victims (N=2)	Single-subject replication series	Cognitive restructuring	10 sessions	1. Substantial reduction in CAPS total score for both participants (67–90%) 2. Comparable reduction in IES (76–91%) and PSS (79–80%) 3. Comparable reduction on BDI (65–92%)
10. Fontana and Rosenheck [1997]	Male combat veterans (N=785)	Quasi-experimental program evaluation	1. Long-stay PTSD program 2. Short-stay PTSD program 3. General psychiatric unit	Variable (approximately 1–3 months)	1. Significant reduction in CAPS total score for all three programs (long-stay=13%, short-stay=19%, psychiatric=16%) 2. Significant between-groups effect, with veterans in short-stay PTSD programs and general psychiatric inpatient units showing greater improvement 3. No significant reduction on Mississippi Scale (long-stay=0%, short-stay=3%, psychiatric=3%) 4. Significant, larger reduction on ASI psychiatric score (long-stay=24%, short-stay=26%, psychiatric=26%) and significant, smaller reduction on BSI (long-stay=2%, short-stay=11%, psychiatric=12%), both with significant between-groups effects similar to those for the CAPS
11. Hicling and Blanchard [1997]	Motor vehicle accident victims (N=10, 1 male/ 9 female)	Uncontrolled trial, nonblinded assessments	Multi-component cognitive-behavioral protocol (education, relaxation, exposure, cognitive restructuring)	10 weekly sessions	1. Significant reduction in CAPS total score (68%) 2. Comparable reduction on IES (66%), significant but smaller reduction on PCL (39%) 3. Significant, somewhat smaller reduction on BDI (50%) and significant, smaller reduction on STAI-S (19%) and STAI-T (20%) 4. Five of 8 participants with full PTSD and 1 of 2 with subsyndromal PTSD at pre-test no longer met diagnosis at post-test; 3 of 8 with full PTSD at pre-test were subsyndromal at post-test
12. Carlson et al. [1998]	Male combat veterans (N=35)	Randomized, controlled trial, non-blinded assessments except at 9-month follow-up	1. EMDR 2. Biofeedback-assisted relaxation 3. Routine clinical care	12 sessions in 6 weeks	1. Significant Group x Time interaction at 3-month followup, with EMDR group showing significantly greater reduction on CAPS total score (69%) compared to relaxation group (20%0 2. Similar pattern with smaller reduction on IES (EMDR=45%, relaxation=14%) 3. Similar pattern with smaller reduction on BDI (EMDR=57%, relaxation=22%), and substantially smaller reduction in both groups on STAI-S (EMDR=14%), relaxation=18%) and STAI-T (EMDR=22%, relaxation=11%) 4. Of participants completing first follow-up 7 or 9 (78%) in EMDR group versus 2 of 9 (22%) in relaxation group no longer met PTSD diagnostic criteria

(continued)

TABLE 2. (*Continued*).

Authors (year)	Participants	Design	Intervention	Number of sessions/ duration	
13. Conlon et al. [1998]	Motor vehicle accident victims, 1 week post-accident (N=40, 19 male/21 female)	Randomized, controlled trial, non-blinded assessments	1. Debriefing 2. Monitoring (assessment-only control)	Single 30-minute debriefing session	1. Significant reduction in CAPS total score for total sample (53%; debriefing=70%, monitoring=37%), but not significant between-groups difference at follow-up 2. Interpretation of CAPS change scored is somewhat ambiguous because CAPS-2 used at baseline and CAPS-1 used at followup 3. Comparable reduction on IES (total sample=50%; debriefing=55%, monitoring=44%)
14. Lazrove et al. [1998]	Civilians with mixed trauma (N=8, 2 male/6 female)	Uncontrolled trial, assessments conducted by non-treating research assistant	EMDR	3 weekly sessions	1. Substantial reduction in CAPS total score (70%) 2. Larger reduction on IES-R (87–.96% for intrusion, avoidance, hyperarousal subscales) 3. Comparable reduction on BDI (68%), smaller reduction on SCL-90 (42%) 4. All of the participants who completed treatment no longer met diagnostic criteria for PTSD
15. Lubin et al. [1998]	Female victims of mixed civilian trauma	Uncontrolled trial, assessments conducted by non-treating research assistants	Trauma-focused, cognitive behavioral group therapy	16 weekly sessions	1. Significant reduction in CAPS total score (39%) 2. Significant, smaller reduction on Civilian Mississippi Scale (9%) and IES (16%) 3. Significant, somewhat smaller reduction on BDI (33%) and smaller reduction on DES (21%) and SCL-90 (23%)
16. Marks et al. [1998]	Civilians with mixed trauma (N=87, 56 male/31 female)	1. Randomized, controlled trial, blinded assessments 2. CAPS-2	1. Imaginal and in vivo exposure 2. Cognitive restructuring 3. Exposure plus cognitive restructuring 4. Relaxation (placebo control)	10 sessions in an average of 16 weeks	1. Significant reduction in CAPS-2 total score, with effect sizes ranging from 1.30 to 2.00 for three active intervention groups and .60 for relaxation group 2. Significant between-groups effect for CAPS-2 total score, with greater reduction for three active intervention groups pooled versus relaxation group 3. Similar within-groups and between-groups results for IES (within-groups effect sizes from 1.30 to 1.50 for active intervention groups, .08 for relaxation group) 4. Similar within-groups and between-groups results for BDI (within-groups effects sizes from 1.20 to 1.70 for active intervention groups, .07 for relaxation group) 5. With improvement defined as > 2 SDs, 47–53% of participants in active intervention groups showed improvement on CAPS-2 total score, versus 15% in relaxation groups. Somewhat higher rates found in IES (50–60% for active intervention groups, 20% for relaxation group) 6. 63–75% of participants in active intervention groups versus 55% in relaxation group no longer met diagnostic criteria for PTSD
17. Pantalon and Motta [1998]	Male combat veterans (N=6)	1. Crossover, single-subject replication series, non-blinded assessments 2. CAPS-2	1. Implosive therapy (imaginal exposure) 2. Anxiety management training	12 weekly sessions	1. Reduction in CAPS-2 score (reexperiencing and avoidance only; hyperarousal scores not reported) ranged from 46–88% (M=71%) across the six participants 2. Lower but substantial reduction on PCL (8–100%, M=50% across the six participants; reexperiencing and avoidance only; hyperarousal scores not reported)

(continued)

TABLE 2. (*Continued*).

Authors (year)	Participants	Design	Intervention	Number of sessions/ duration	
18. Rothbaum et al. [1999]	Male combat veterans (N=1)	Case study	Virtual reality exposure	14 sessions, 2 session per week	1. Reduction in CAPS total score (34%) 2. Larger reduction on IES (45%) 3. Smaller on BDI (19%) and STAXI-T (21%), substantially larger reduction on STAXI-S (63%) Key CAPS-related findings:
19. Tarrier et al. [1999]	Civilians with mixed trauma (N=62, 36 male/ 26 female)	Randomized, controlled trial, assessments blinded	1. Imaginal exposure 2. Cognitive therapy	Average of 10-12 sessions over 6 months	1. Significant within-groups reduction in CAPS total score for both groups (32% for exposure group, 35% for cognitive therapy group), but no between groups difference 2. Comparable within-groups reduction on IES (31–33% for intrusion, 25–34% for avoidance), somewhat smaller reduction on Penn Inventory (22–27%); no between-groups difference on either 3. Somewhat smaller within-groups reduction on BDI (27–31%) and BAI (23–25%); no between-groups difference 4. Comparable to somewhat larger within-groups reduction on GHQ (30–46%), but no between-groups difference 5. 59% of exposure group versus 42% of cognitive therapy group no longer met diagnostic criteria for PTSD

**ASI, Addiction Severity Index; BDI, Beck Depression Inventory; BSI, Brief Symptom Inventory; DES, Dissociative Experiences Scale; EMDR, Eye Movement Desensitization and Reprocessing; CHQ, General Health Questionnaire; HAM-A, Hamilton Rating Scale for Anxiety; IES, Impact of Event Scale; MPSS-SR, Modified PTSD Symptom Scale — Self-Report; PCL, PTSD Checklist; PK, Keane MMPI PTSD scale; POMS, Profile of Mood States, PSS, PTSD Symptom Scale; SCL-90, Symptom Checklist-90; SPAI, Social Phobia and Anxiety Inventory; STAI, State-Trait Anxiety Inventory; STAXI, State-Trait Anger Expression Inventory.*

Studies 1, 8, and 10) found greater reduction on the HAM-A relative to the CAPS, with differences ranging from 2–9 percentage points. The fourth study found a 5 percentage point greater reduction on the CAPS. One pharmacological study (Study 5) found a greater reduction on the CAPS relative to the STAI-S. Three psychosocial studies (Table 2, Studies 5, 11, and 12) included the STAI–S, two included the STAI-T (Studies 11 and 12), and one (Study 19) included the BAI. In each case the CAPS showed greater reduction, ranging from 2–59 percentage points.

CAPS versus global measures of distress and impairment. In the pharmacological studies, reduction in CAPS scores were accompanied by global measures of functioning, including the CGI in the six studies that employed it (Table 1, Studies 3, 5, 7, and 8–10), the CIS (Study 6), and a relatively stringent consensus definition of treatment response (Study 1). Five psychosocial studies (Table 2, Studies 2, 3, 7, 13, and 15) included the SCL-90 and one (Study 10) included the BSI. In each case the CAPS showed greater reduction, ranging from 3–28 percentage points. In contrast, two studies (Studies 3 and 19) found greater reduction on the GHQ relative to the CAPS, and one study (Study 10) found greater reduction on the ASI psychiatric score.

Discussion. The 29 treatment outcome studies reviewed in this section provide ample evidence of the sensitivity of the CAPS to clinical change. We summarize the results by returning to the four hypothesized results discussed at the outset of this section. First, there was clear and consistent evidence of within-groups effects in both the pharmacological and the psychosocial treatment studies. Stronger within-groups effects were found in the psychosocial studies. This could be due to the fact that with one exception the drugs used in the studies reviewed were all antidepressants, and their efficacy for treating PTSD has not been clearly established. The symptom relief they bring about may be due more to their antidepressant effects rather than to specific effects on PTSD symptoms such as re-experiencing and effortful avoidance. In contrast, all of the psychosocial interventions involved some type of trauma-specific component, and most included some form of direct therapeutic exposure or cognitive processing, which have been shown to have specific effects on PTSD symptoms. This finding could also be due to the fact that in general the psychosocial interventions involved considerably more patient-therapist contact than did the pharmacological trials.

Second, there was some evidence of between-groups effects, although relatively few studies included a comparison condition. Two of the three pharmacological trials with a placebo control found greater reduction on the CAPS in participants who received the drug. Results were more inconsistent for the psychosocial trials. Only two of the six randomized trials, plus one quasi-experimental program evaluation, found a significant between-groups effect. However, two of the non-significant trials employed quite limited interventions, and a third trial compared two active interventions, exposure and cognitive restructuring. Clearly, more randomized, placebo-controlled trials are needed before this issue can be resolved.

Third, reduction in CAPS scores was mirrored by reduction in self-report measures of PTSD, particularly the IES. The CAPS showed a slightly greater reduction than the IES in 2 of 3 pharmacological studies and 7of 11 psychosocial studies, although the margins, especially in the pharmacological trials, were generally small. Fourth, there was some evidence of greater reduction on the CAPS than on measures of depression, anxiety, and global distress, particularly on self-report measures such as the BDI, STAI, and SCL-90.

Finally, in commenting about the populations studied, although the CAPS was developed in a male combat veteran population, and many of the early studies focused exclusively on this population, the CAPS has now been extended to increasingly diverse samples that include females and victims of various types of civilian trauma. Of the studies reviewed in this section, 11 of 29 included at least some females and 15 of 29 included at least some participants with civilian trauma.

VALIDITY EVIDENCE FROM CASE-CONTROL DESIGNS

In this section, we consider validity evidence from studies in which participants were designated as PTSD-positive ("cases") or PTSD-negative ("controls") based on the CAPS and then compare this evidence on some biological or psychological measure or experimental task. Such case-control studies were too numerous and diverse to summarize briefly. Instead, we describe several representative examples from different research domains to illustrate that groups formed on the basis of a CAPS diagnosis differ in conceptually meaningful ways on a variety of characteristics or behaviors.

The first example involves the psychophysiology of PTSD. Physiological reactivity to reminders of the trauma is a core symptom of PTSD, and a growing number of studies have found that individuals with PTSD show greater reactivity than those without PTSD in laboratory-based physiological assessments. Much of the early work was conducted with male combat veterans, but more recent studies have examined male and female victims of civilian trauma. Blanchard et al. [1996a] used the CAPS to classify 105 male and female motor vehicle accident victims as PTSD, subsyndromal PTSD, and non-PTSD. They also included a control group of 54 participants who had not experienced an accident. They found that compared to participants without PTSD, those with PTSD showed a significantly greater increase in heart rate in response to brief audiotapes depicting each participant's unique traumatic experience. They also found that an in-

crease of two beats per minute had reasonable diagnostic utility, yielding 69% sensitivity and 78% specificity among accident victims.

The second example comes from a more recent line of research on auditory event-related potentials (ERP) in PTSD. Several different investigators have documented abnormal ERPs in individuals with PTSD and have suggested that such characteristic responses may be associated with the attention and concentration difficulties often seen in PTSD. Metzger et al. [1997] used the CAPS to classify male Vietnam combat veterans as PTSD or non-PTSD groups and then further divided the PTSD participants into medicated and unmedicated groups. Administering a three-tone auditory "oddball" task, they found significantly smaller P3 amplitudes in the unmedicated PTSD group, relative to the medicated PTSD group and the non-PTSD controls.

The third example involves research on the association of chronic PTSD and physical health problems. Beckham et al. [1998] used the CAPS to classify 276 male Vietnam combat veterans as PTSD or non-PTSD, then assessed participants' current health status and reviewed their medical records. Health measures included health complaints, current and lifetime physical conditions, number of physician-rated medical categories, and total number of physician-rated illnesses. After controlling for a variety of potentially confounding third variables, including age, socioeconomic status, ethnicity, combat exposure, alcohol problems, and smoking history, they found that veterans with PTSD had significantly more health problems across all indicators compared to veterans without PTSD.

The last example represents an effort to identify potential risk factors for PTSD. Yehuda et al. [1995] used the CAPS to classify a community sample of 72 Nazi concentration camp survivors as PTSD or non-PTSD. They also included a comparison group of 19 demographically matched participants who had not experienced the Holocaust. The purpose of the study was to examine the relationships among lifetime trauma history, recent stressful life events, and severity of current PTSD symptoms. As expected, Yehuda et al. [1995] found that Holocaust survivors with PTSD had greater lifetime trauma exposure and more recent stressful life events than did survivors without PTSD or comparison participants. By using the CAPS as a continuous measure of PTSD symptom severity, they found that lifetime trauma was significantly associated with avoidance and hyperarousal, but not with re-experiencing, within a combined sample of all Holocaust survivors. In a similar analysis, they found that recent stressful life events were significantly associated with all three CAPS symptom clusters.

These examples, and the other case-control studies that we did not discuss, provide additional evidence that the CAPS is a valid measure of PTSD diagnostic status and symptom severity. They demonstrate that when the CAPS is used to classify trauma-exposed individuals as PTSD or non-PTSD, the resulting groups differ significantly in a theoretically consistent way on key dependent variables.

GENERAL DISCUSSION AND RECOMMENDATIONS

In the 10 years since it was developed, the CAPS has proven to be a psychometrically sound, practical, and flexible structured interview that is well-suited for a wide range of clinical and research applications in the field of traumatic stress. Moreover, it has been successfully used with many different traumatized populations. It has excellent reliability, yielding consistent scores across items, raters, and testing occasions. There is also considerable validity evidence that supports the use of the CAPS as a measure of PTSD diagnostic status and symptom severity. Evidence of content validity derives first from its direct correspondence with the DSM-IV diagnostic criteria for PTSD and second from the fact that it was developed by experts in the field of traumatic stress and revised based on feedback from many clinicians and investigators who used it in real-world settings. Evidence from a growing number of psychometric investigations indicates it has strong convergent and discriminant validity, strong diagnostic utility, and is sensitive to clinical change. In addition, factor analyses, especially confirmatory factory analyses, have shown that the factor structure of the CAPS corresponds well to current conceptualizations of PTSD. Finally, when the CAPS is used in case-control designs, individuals designated as PTSD differ from those without PTSD in predictable, theoretically meaningful ways. Clearly more research on the CAPS is needed, but at this point the CAPS is the most extensively investigated structured interview for PTSD.

Criticism of the CAPS tends to focus on three concerns. The first concern is that the CAPS is cumbersome and lengthy. In response, the CAPS clearly is longer on paper than other PTSD interviews, but it does not necessarily take longer to administer. Most of the CAPS questions are optional probes, only some of which would likely be administered during a given interview. A standard administration of the CAPS involves asking the initial probe under frequency for each item. With an articulate, motivated respondent this single questions may elicit all the information necessary to rate both the frequency and intensity of a given symptom. All other probes are to be used only if: a) a response is incomplete, vague, confusing, or in some way insufficient to make a rating, and therefore needs to be clarified, or b) the respondent does not understand what is being asked.

In our experience, even with ideal respondents, some degree of clarification is inevitable. To enhance uniformity of administration, we have included a

number of follow-up probes that address the most common points of clarification. This reduces variability due to idiosyncratic questioning across different interviewers and provides a helpful structure for less experienced interviewers. Furthermore, the CAPS was designed as a comprehensive yet flexible instrument that would meet the demand of almost any PTSD assessment task, including diagnosis, evaluating symptom severity, and conducting a functional analysis of symptoms for case conceptualization and treatment planning. Therefore, in some assessment contexts it may opted not to assess Criterion A, elicit descriptive examples of symptoms, administer the global ratings or the guilt and dissociation items, or rate lifetime PTSD.

The second concern, closely related to the first, is that the CAPS is too complicated and difficult to learn. In response, our own experience, based on dozens of training sessions, is that after a 2-hour orientation trainees naïve to the CAPS can make highly reliable ratings of a role-played interview. With some self-study and a few practice interviews, they can achieve a uniform, clinically sensitive administration. CAPS trainees, including those with little or no experience with structured interviews or assessing PTSD, typically find that the CAPS is very straightforward to learn. In fact, less experienced interviewers tend to have the most favorable responses because they appreciate the structure the CAPS provides.

The third concern centers on the question of whether frequency and intensity ratings overlap to such an extent as to be essentially redundant. Clearly, they appear to be strongly correlated at the syndrome level and even at the symptom cluster level. At the item level, however, the correlations between frequency and intensity are moderate, suggesting that they measure correlated but distinct dimensions. We have several responses to this concern. First, the separate assessment of frequency and intensity explicitly defines what is meant by symptom severity, thereby reducing variability in clinical judgment, especially among less experienced interviewers. Second, this is a meaningful, theoretical distinction, employed successfully for example in the substance abuse literature, where typologies of drinkers are based on how often a person drinks, as well as how much they consume at any given setting. Third, adding frequency and intensity together yields a nine-point scale (0–8) that allows finer gradations of severity. This increases variance attributable to individual differences, thereby avoiding a restriction of range that could lower estimates of reliability and validity. Fourth, it allows the assessment of the differential impact of treatment on the frequency versus the intensity of symptoms.

Last, we close with some recommendations for the use of the CAPS in clinical research and the presentation of CAPS data in empirical reports. First, for newly initiated research, investigators should use what is now the sole version of the CAPS, the combined DSM-IV version, and explicitly identify it as such. For research already underway or completed, investigators should explicitly identify the version used, either the CAPS-1 or CAPS-2 (DSM-III-R versions) or the CAPS-DX or CAPS-SX (DSM-IV versions). Also, if the CAPS is used as a diagnostic measure, investigators should specify the scoring rule used to obtain a diagnosis. Second, investigators should briefly specify the experience and training of CAPS interviewers, both in terms of their general background in psychopathology and structured interviewing, and in terms of their specific experience with the CAPS. Also, whenever possible they should attempt to collect and report reliability data on the interviewers and participants involved. Even something as modest as inter-rater reliability on a small number of audiotaped interviews is helpful for documenting the quality of the CAPS data.

Third, investigators should take greater advantage of the flexibility of the CAPS in analyzing their data. Some examples include a) using multiple CAPS scoring rules and comparing the results for lenient, moderate, and stringent rules; b) using the CAPS as both a dichotomous and a continuous measure, reporting not only diagnostic status but symptom severity scores, which would be valuable for comparing findings across studies; c) breaking out CAPS symptom severity scores into the three DSM-IV symptom clusters and examining the results by cluster; d) examining the symptom clusters further by separating Cluster C into effortful avoidance (C1 and C2) and emotional numbing; and e) dividing scores even further into frequency, intensity, and severity scores for each of the symptom clusters. Finally, although considerable progress has been made in the development and evaluation of PTSD assessment measures, including the CAPS, reliance on a single instrument should be avoided. We advocate multimodal assessment of PTSD, an approach that relies on converging evidence from multiple sources, and we encourage investigators to include multiple measures of PTSD and comorbid disorders whenever possible.

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