



Screening for Traumatic Stress among Re-deploying Soldiers

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Given the frequency, duration, and intensity of recent combat deployments for US Soldiers, there is a need to develop a short, validated traumatic stress screening instrument identifying Soldiers showing symptoms of traumatic stress. This report details results from a blind validation study of 592 Soldiers returning from Iraq in March of 2004. In the report, we examine items in question 12 (traumatic stress experiences) from the DD FORM 2796 and items from the Post Traumatic Stress Disorder Checklist (PCL) in terms of their ability to identify Soldiers with symptoms of traumatic stress. We conclude that the four-items in the DD FORM 2796 are effective as a primary screen, and we provide recommendations for future research.

• Background

When Soldiers return from a deployment, mental health providers are often asked to conduct psychological screening. The assumption underlying screening is that early intervention is efficacious for the reintegration and long-term health and performance of Soldiers. In order to perform psychological screening efficiently, mental health providers need to triage large numbers of Soldiers. Unfortunately, the large number of redeploying Soldiers makes individual interviews with every redeploying Soldier unrealistic. Thus, there is a need to use a primary screening survey that functions as a mental health triage tool. Soldiers' responses to the primary screening survey can then be used to identify those requiring a secondary interview.

Psychological screening has been a research focus of the U.S. Army Medical Research Unit-Europe (USAMRU-E) in Heidelberg since 1996 (see Wright, Huffman, Adler, & Castro, 2002, for a review). Since that time, research has examined screening results across a range of operations (Adler, Wright, Huffman, Thomas, & Castro, 2002; Martinez, Huffman, Adler, &

Castro, 2000). Subsequent studies have developed the groundwork for validating the primary screening instrument (Wright, Thomas, Adler, Ness, Hoge, & Castro, in press).

Building on recent screening research (Wright, et al., in press), five content areas have been identified as the target of screening: (1) traumatic stress, (2) depression, (3) relationship problems, (4) alcohol, and (5) anger. Research efforts are currently focused on developing short, valid, and easily scored primary screening instruments for each of five domains. In this report, we discuss the evaluation of primary screens for traumatic stress.

• Current Study: Sample and Procedure

The current study is based upon responses from Soldiers returning from combat in Iraq. These Soldiers were screened as part of a formal psychological screening program requested by the unit's senior leadership. In all, 1,604 Soldiers were screened, and 1,578 Soldiers (98%) consented to having their data subsequently analyzed for the purposes of improving the

primary screen. Of the consenting Soldiers, 592 (38%) received face-to-face structured interviews conducted by psychiatric technicians or other clinical providers. These 592 Soldiers comprise the sample on which analyses in this report are conducted.

In the screening procedure, all Soldiers completed a primary screen (taking approximately 20 minutes). Soldiers' responses to the primary screen were evaluated using cut-off criteria established from prior studies. Soldiers exceeding criteria on any one of the five content areas were directed to a secondary interview.

A validation procedure containing two components was embedded in the screening process. First, a random sample (22%) of Soldiers scoring below established criteria were directed to secondary interviews. This provided a group of controls and also reduced the stigma associated with being singled out for a secondary interview. Second, clinical providers conducted the secondary interview blind to the results of the primary screen. That is, providers did not know whether Soldiers being interviewed were controls or positives, nor did they know which content area those exceeding criteria had endorsed.

Clinical providers used a validated structured interview (the MINI) developed by Sheehan et al. (1998). The MINI assessed the same content areas as those covered in the primary screen. Thus, analytically we were able to validate the primary screen by identifying items most predictive of clinical providers' evaluations. This examination of the congruence between primary screen survey items for traumatic stress and clinical providers' evaluations of traumatic stress comprise the remainder of this report.

• Key Assumptions

There are a number of analytic choices that must be made in this type of validation study. The analytic choices will affect the subsequent results. It is important, therefore, to specify our underlying rationale.

Create a Sensitive Test: The primary screen has two competing demands: (a) not missing any symptomatic Soldiers by using a test that is sensitive enough to

identify Soldiers with symptoms of traumatic stress, and (b) not overloading the secondary screening procedure with false positives by using a test that is specific enough to capture traumatic stress symptoms and not just any symptoms of psychological distress.

The balance between the sensitivity and specificity of the primary screen is determined by the value of the cut-off score. For example, on a four-item screen if we recommend that Soldiers who positively endorse any one item receive a secondary interview, we will almost certainly create a highly sensitive test – that is, the test should identify nearly all Soldiers who have clinically identifiable symptoms. Unfortunately, sensitivity and specificity are inversely related. That is, a highly sensitive test will result in Soldiers being misclassified as positives when they are not. As cut-off scores are made more stringent, for example by making it necessary for a Soldier to endorse two or three items positively, one should observe a decrease in sensitivity and an associated increase in specificity. With higher cut-off scores many true-positives may be missed (low sensitivity), but those who do meet the screening criteria will almost certainly have traumatic stress symptoms (high specificity).

Our approach to resolving these competing demands was to lean towards cut-off scores that maximized sensitivity. That is, select cut-off scores that increased the probability that Soldiers with traumatic stress symptoms would be identified in the primary screen. This decision was based on our position that the identification of symptomatic Soldiers is the key goal of screening and potentially worth the additional resources required for screening some false positives. A sensitivity value of 80% and a specificity value of 95% are standard in clinical trials. However, psychological symptom identification is less precise. Therefore, we adopted slightly lower sensitivity and specificity values. With this orientation, our goal was to be at least 70% sure those with traumatic stress would test positive. Even though we favored sensitivity values of at least 0.70, we found we also had to consider specificity values to avoid overwhelming the secondary interview process. Thus, we ultimately favored cut-off values where specificity values were around 0.90 (90% certain those who didn't have PTSD scored negative). In our summary of results,

however, we provide several cut-off scores to allow users to make informed decisions about alternative criteria given resource constraints (i.e., time and personnel).

In interpreting the results, some symptomatic Soldiers were missed using a sensitivity value of .70. However, Soldiers generally displayed comorbidity and the complete screen had four additional content areas. For instance, in the current study, 43% of the Soldiers showed symptoms on more than one dimension as assessed by clinical providers in the secondary interview. Thus, other content areas contributed to the identification of Soldiers in need of a secondary interview (Wright et al., in press). Analyses of other content areas will be covered in subsequent reports.

Levels of Severity: In the screening procedure, clinical providers made two major categorizations of severity for traumatic stress: (1) either immediate or standard referral for traumatic stress or PTSD, and (2) clinically-evident symptoms of traumatic stress or PTSD but not necessarily severe enough for referral (termed sub-clinical).

Consequently, when we evaluated the primary screen we had two choices on how to define symptomatic Soldiers. One choice was to define symptomatic Soldiers as those who were referred. The other choice was to define symptomatic Soldiers as those who showed any signs of traumatic stress in terms of either being referred or being sub-clinical.

Using only referred Soldiers provides a more exact definition of symptomatic cases. This more exact criterion reduces error in the statistical analyses and should therefore yield better specificity and sensitivity values. In contrast, including sub-clinical Soldiers as symptomatic cases along with the referrals creates a less exact definition of positive cases thereby introducing error and potentially lowering specificity and sensitivity values.

Despite the potentially negative consequences of including sub-clinical Soldiers as cases, we elected to provide analyses with this breakdown in addition to analyses based on the referral only group. We did so

under the belief that sub-clinical Soldiers with moderate symptoms might benefit from possible early intervention, and we were interested in how well a primary screen might identify both symptomatic and moderately symptomatic individuals.

• **Secondary Interview Results**

As previously noted, to ensure consistency among clinical provider evaluations, we implemented a structured secondary interview procedure using the MINI (Sheehan, et al., 1998). Clinical providers were trained on the use of the MINI and were required to read and follow the scripted format when doing secondary evaluations. Within the MINI structure, we assessed traumatic stress using two methods: (1) the original PTSD module of the MINI based on DSM-IV criteria (American Psychiatric Association, 1994), and (2) a revised version of the same PTSD module that we term traumatic stress. Note that we refer to this version as traumatic stress rather than PTSD because it no longer follows strict DSM-IV criteria. The reason for developing the traumatic stress module is addressed below.

Surprisingly, an extremely low number of Soldiers met full criteria using the original MINI. Of the 592 interviews, over half (N=339) reported exposure to potentially traumatic events, yet only two Soldiers met the MINI criteria for PTSD, this number is substantially lower than rates reported in other studies of combat veterans (e.g., Kulka, et al., 1991; Solomon, 1989). One problematic question that may account for this low number asked "Did you respond with intense fear, helplessness or horror?" Of the 339 Soldiers who reported exposure to traumatic events, only 37 positively responded to this question. Many of the Soldiers interviewed by the clinical providers reported that despite being affected by the events they experienced, they did not respond with strong emotions but let their training take over. In effect, they reported acting on "automatic pilot."

The traumatic stress version of the PTSD module addressed this problem by omitting this item. Despite this revision, only an additional nine Soldiers met criteria for traumatic stress. Based on the number of Soldiers reporting traumatic stress symptoms we considered a further revision to be necessary. The low numbers of

Soldiers meeting the criteria for traumatic stress was traced to an item that required the individual to assess their level of functioning. Specifically, this item required Soldiers to report whether their functioning had been adversely affected by their traumatic stress symptoms. The item read, "During the past month have these problems significantly interfered with your work, or social activities, or caused significant distress." This item is part of DSM IV criteria for PTSD, yet only 11 Soldiers (2 from the PTSD module, 9 from the trauma module) endorsed the item. Given that these were professional Soldiers, there may be two reasons why they did not endorse this item. First, they may have been influenced by a need to present themselves well. Second, they may have found they could indeed function because of their professional identity and training despite the symptoms they reported.

Defining cases in terms of Soldiers who had traumatic stress symptoms consistent with DSM IV criteria while disregarding functional impairment and "helplessness and horror" yielded 37 referrals. We identify this group as the "MINI Traumatic Stress Referrals".

In addition to using the MINI-based traumatic stress criteria, clinical providers could make referrals for PTSD or traumatic stress based on their clinical judgment. This latitude was considered necessary because it was deemed important to have a mechanism by which Soldiers could be referred for full evaluation even if they did not strictly meet the MINI-based PTSD or traumatic stress criteria. By including all referrals an additional 11 Soldiers were added to the 37 MINI-based traumatic stress referrals resulting in 48 total clinician referrals.

Finally, Soldiers could be identified as sub-clinical by clinical providers if Soldiers had moderate traumatic stress symptoms but did not require a referral. By including sub-clinical Soldiers, an additional 45 Soldiers were added to the 48 referrals resulting in a total of 93 cases.

• Summary of Case Definitions

In summary, we identified three different criteria on which to validate the items on the primary screen (Note: the categories below are not mutually exclusive).

- **MINI Traumatic Stress Referrals:** These 37 cases were referred by clinical providers for traumatic stress using either the original PTSD MINI or the revised trauma module of the MINI without taking functioning into account. These criteria are the most stringent and clearly defined.

- **Clinician Referrals:** These 48 cases included all MINI Traumatic Stress Referrals cases as well as 11 Soldiers referred based upon the providers' clinical judgment.

- **Sub-clinicals and Referrals:** These 93 cases included those referred for traumatic stress in addition to Soldiers rated as sub-clinical by clinical providers.

• Traumatic Stress Items in Primary Screen

Item Descriptions. The traumatic stress items used in the primary screen came from two sources: Four items came from the National Center For PTSD Primary Care PTSD Screen and are used on the DD FORM 2796 (APR 2003), and 17 items came from the PTSD Checklist (PCL) developed by the National Center for PTSD (Weathers, et al., 1993). The PCL has routinely been used to identify symptoms of traumatic stress in military populations (e.g., Hoge, et al., 2004; Kang, et al., 2003).

The figure below shows the four traumatic stress items from the DD FORM 2796.

12. Have you ever had any experience that was so frightening, horrible, or upsetting that, IN THE PAST MONTH, you		
<u>No</u>	<u>Yes</u>	
<input type="radio"/>	<input type="radio"/>	Have had any nightmares about it or thought about it when you did not want to?
<input type="radio"/>	<input type="radio"/>	Tried hard not to think about it or went out of your way to avoid situations that remind you of it?
<input type="radio"/>	<input type="radio"/>	Were constantly on guard, watchful, or easily startled?
<input type="radio"/>	<input type="radio"/>	Felt numb or detached from others, activities, or your surroundings?

In the primary screen used in our validation study we had one variation from the DD FORM 2796. Specifically, in our validation study the header focused on the current deployment and read "Have you had an experience *on*

this deployment that was so frightening, horrible or upsetting that IN THE PAST MONTH, you..."

The 17 PCL items cover three domain areas: intrusive thought (5 items), avoidance (7 items), and hyper vigilance (5 items). A complete list of items is available

"The following questions relate to a traumatic experience or extremely stressful event you may have experienced (for example, an actual or threat of death or serious injury to you or someone else). Please rate the extent to which you have experienced the following in THE PAST MONTH"

from the authors. Our heading for the PCL items read: Unlike the DD FORM 2796 which uses a yes/no response format, the PCL uses a 5-item response format of (1) Not at all, (2) A Little Bit, (3) Moderately, (4) Quite a Bit, and (5) Extremely.

Scoring Criteria. Currently, there are no validated cut-off points for determining whether a soldier meets criteria on the DD FORM 2796. There are, however, three criteria accepted for scoring the PCL. Blanchard et al. (1996) report that total scores of 50 have been shown to provide acceptable cut-off values for identifying symptomatic individuals. In addition, however, they found even better psychometric properties associated with cut-off values of 44. Finally, Lang, Laffaye, Satz, Dresselhaus, and Stein (2003) report good psychometric properties with a PCL value of 30. In replicating their results, we examined the values of 50, 44 and 30 as potential cut-off scores. Of the 585 Soldiers who consented to allow their data to be used for secondary analyses and who completed the PCL, 148 or 25.2% had PCL scores equal to or greater than 30. Forty-one or 7% had PCL scores equal to or greater than 44, and 21 or 3.6% had PCL scores equal to or greater than 50.

• DD FORM 2796: Analyses and Results

Overview. In the first set of analyses, we examined the properties of the four items on the DD FORM 2796. Because no cut-off values have been established with the four items on the DD FORM 2796, we examined the properties of each possible cut-off (1 or more positive responses; 2 or more positive responses; 3 or more positive response; 4 positive responses).

We used two ways to evaluate question 12 of the DD FORM 2796. The first was to provide the classification tables and estimate the sensitivity and specificity. The second way was to examine the phi-coefficient measure of association between each cut-off value and the clinical providers' rating. The phi-coefficient is a measure of association ranging from 0 to 1. A value of 1 indicates perfect congruence between the primary screen and the clinical provider. So, for instance, a phi-coefficient value of 1 would be observed if all Soldiers who positively endorsed one or more traumatic stress item were also rated as having traumatic stress symptoms, and none of the Soldiers who endorsed zero items were rated as having traumatic stress. Phi-coefficient values of 1 are never observed in practice. Values of 0.30 are considered moderately strong measures of association (Cohen & Cohen, 1983).

We provide results for each of the three different case definitions: (1) MINI Traumatic Stress Referrals, (2) Clinician Referrals, and (3) Sub-clinicals and Referrals.

DD FORM 2796: Results for MINI Traumatic Stress Referrals

With the DD FORM 2796, classification tables can be calculated for each of the four different cut-off values. The first classification table assumes that a Soldier would have been identified as being positive for traumatic stress symptoms on the primary screen if he or she had endorsed one or more of the four possible DD FORM 2796 items. The second classification table assumes a positive case required the endorsement of two or more of the four items, and so on.

Table 1 reveals that items in the DD FORM 2796 corresponded well with clinical providers' ratings when the clinical providers used the MINI-based PTSD and Traumatic Stress modules as the basis by which to refer Soldiers.

When the cut-off value was set at one, the primary screen identified 32 of the 37 Soldiers who were identified as positive by the clinical providers. This resulted in a sensitivity value of 0.86. At the same time, however, the criterion of requiring only one of the four items to be endorsed produced 148 false positives. The

low specificity value of 0.73 meant that the majority of Soldiers who screened positive on 1 of the 4 items did not have clinical evidence of traumatic stress. A large reduction in false positives was garnered by requiring Soldiers to endorse at least 2 items. In this case, the sensitivity and specificity were 0.73 and 0.88, respectively. When the cut-off value required Soldiers to endorse 3 or more items, the test sensitivity dropped fairly dramatically (0.46) and the primary screen missed more symptomatic Soldiers it identified. At the same time, though, the specificity increased to 0.97 and very few false positives were identified. Requiring Soldiers to endorse all four items produced unacceptable sensitivity values as 29 of the 37 Soldiers were missed.

Table 1: Provider Referrals Based on MINI

Primary Screen with 1 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	405	148
Positive	5	32
Primary Screen with 2 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	488	65
Positive	10	27
Primary Screen with 3 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	538	15
Positive	20	17
Primary Screen with 4 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	552	1
Positive	29	8

A complete summary of the sensitivity, specificity and phi-coefficient values is provided in Table 2. Notice the phi-coefficients were all above 0.30 suggesting moderately strong relationships between the primary

screen cut-off values and the clinical provider evaluations.

Table 2: Provider Referrals Based on MINI

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
2796: 1 or More	0.31	0.86	0.73
2796: 2 or More	0.41	0.73	0.88
2796: 3 or More	0.46	0.46	0.97
2796: 4 or More	0.42	0.22	1.00

Based on these analyses, it appears reasonable to use a cut-off value of 2 if one is relying solely upon question 12 of the DD FORM 2796 as a primary screening instrument for Soldiers showing symptoms of traumatic stress.

DD FORM 2796: Results for Clinician Referrals

The second set of analyses examined the ability of the primary screen to identify any Soldier identified as needing a referral for PTSD or traumatic stress. Recall this group included the 37 MINI-based traumatic stress module Soldiers in addition to 11 others referred for full evaluation based upon clinical provider judgment.

Table 3 provides the classification table results. Notice that the results were very similar to those based upon the MINI Traumatic Stress Referrals. That is, when one used the cut-off value of one of more positive responses, the DD FORM 2796 identified almost all of the referred Soldiers (40 of the 48) for a sensitivity of 0.83, but it also identified 140 false positives for a low specificity value of 0.74. When a Soldier endorsed two or more items on the DD FORM 2796, the sensitivity dropped to 0.69 as 15 positive Soldiers were missed; however, the specificity increased to 0.89. Using a cut-off value requiring Soldiers to endorse 3 or more items positively or to endorse all 4 items positively resulted in high specificity values (few false positives), but unacceptably low sensitivity values.

Table 3: Any Provider Referrals

Primary Screen with 1 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	402	140
Positive	8	40

Primary Screen with 2 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	483	59
Positive	15	33

Primary Screen with 3 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	528	14
Positive	30	18

Primary Screen with 4 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	541	1
Positive	40	8

A summary of these results is provided in Table 4. Notice that the sensitivity rates are consistently lower than those based upon the MINI Traumatic Stress Referral criteria in Table 2. Nonetheless, a cut-off criterion of 2 or more endorsed items provided a reasonable value upon which to identify symptomatic individuals on a primary screen.

Table 4: Any Provider Referrals

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
2796: 1 or More	0.34	0.83	0.74
2796: 2 or More	0.44	0.69	0.89
2796: 3 or More	0.42	0.38	0.97
2796: 4 or More	0.37	0.17	1.00

The final set of analyses involving the DD FORM 2796 items focused on the ability of question 12 in the DD FORM 2796 to identify any Soldier displaying symptoms of traumatic stress. In this categorization, we defined symptomatic Soldiers as the 48 referred Soldiers along with the 45 sub-clinical Soldiers.

Table 5 reveals that from a statistical perspective, relaxing the definition of a case by including the sub-clinical group introduced error into the model. This, in turn, had a fairly dramatic impact on the sensitivity of the primary screen. Notice, for instance, that even with the most relaxed cut-off criteria (one or more items endorsed), the primary screen still missed 31 of the 93 symptomatic Soldiers for a sensitivity value of 0.67. With a cut-off value of two or more items endorsed, the sensitivity dropped to 0.51.

Table 5: Any Symptoms

Primary Screen with 1 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	379	118
Positive	31	62

Primary Screen with 2 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	452	45
Positive	46	47

Primary Screen with 3 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	487	10
Positive	71	22

Primary Screen with 4 or More Positive Response to DD FORM 2796 Trauma Items		
Clinical Provider	Negative	Positive
Negative	496	1
Positive	85	8

Table 6 provides phi-coefficient, sensitivity and specificity values. In contrasting Table 6 with Table 2 (referrals based on MINI Traumatic Stress modules) and Table 4 (any referrals), it is clear that the items in the DD FORM 2796 are good at identifying Soldiers who were judged as needing referrals, but are relatively poor at identifying Soldiers who have moderate symptoms.

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
2796: 1 or More	0.34	0.67	0.76
2796: 2 or More	0.42	0.51	0.91
2796: 3 or More	0.35	0.24	0.98
2796: 4 or More	0.25	0.09	1.00

• PCL Analyses and Results

Overview. In the second set of analyses, we examined the ability of the 17-item PCL (Weathers, et al., 1993) to identify symptomatic Soldiers. In the PCL analyses, we examined the properties of the cut-off values of 30, 44 and 50.

As with the previous analyses involving question 12 of the DD FORM 2796, we provide results for each of the three different case definitions: (1) MINI Traumatic Stress Referrals, (2) Clinician Referrals, and (3) Sub-clinical and Referrals.

PCL Results for the MINI Traumatic Stress Referrals

Table 7 provides the results of the different PCL cut-off values. Two of the Soldiers meeting the MINI Traumatic Stress criteria for traumatic stress or PTSD failed to complete the entire PCL. Thus, the analyses were based upon 35 rather than 37 cases.

In Table 7, notice that a cut-off value of 30 does an excellent job of identifying symptomatic Soldiers. With a PCL score of 30, the primary screen identified 33 of the 35 symptomatic Soldiers resulting in a sensitivity value of 0.94. Unfortunately, a PCL score of 30 produced 115 false positive values resulting in specificity value of 0.79 well below the target value of .90. Using a PCL score of 44 or 50 significantly improved the specificity values, but produced sensitivity values below the target value of .70.

Clinical Provider	Primary Screen with PCL Score of 30 or More	
	Negative	Positive
Negative	435	115
Positive	2	33

Clinical Provider	Primary Screen with PCL Score of 44 or More	
	Negative	Positive
Negative	530	20
Positive	14	21

Clinical Provider	Primary Screen with PCL Score of 50 or More	
	Negative	Positive
Negative	539	11
Positive	25	10

Table 8 provides the phi-coefficient, sensitivity and specificity values associated with Table 7.

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
PCL - 30	0.40	0.94	0.79
PCL - 44	0.52	0.60	0.96
PCL - 50	0.34	0.29	0.98

Based on these results, the PCL with cut-off values of 30, 44 or 50 was not appreciably better than the 4-item DD Form 2796. It is possible, however, that a cut-off value between 30 and 44 would have produced good sensitivity and also have provided acceptable specificity values.

PCL Results for Clinician Referrals

The second set of PCL analyses examined the ability of the primary screen to identify any Soldier identified as needing a referral for PTSD or traumatic stress. Table 9 presents the classification table results.

Table 9: Any Provider Referrals

Clinical Provider	Primary Screen with PCL Score of 30 or More	
	Negative	Positive
Negative	430	109
Positive	7	39
Clinical Provider	Primary Screen with PCL Score of 44 or More	
	Negative	Positive
Negative	518	21
Positive	26	20
Clinical Provider	Primary Screen with PCL Score of 50 or More	
	Negative	Positive
Negative	529	10
Positive	35	11

Table 10 provides the phi-coefficient, sensitivity and specificity results.

Table 10: Any Provider Referrals

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
PCL - 30	0.40	0.85	0.80
PCL - 44	0.42	0.43	0.96
PCL - 50	0.32	0.24	0.98

Notice the sensitivity values were low when we compared the results of any referral to results of referrals based on the MINI Traumatic Stress modules. The decline in sensitivity values was similar to the decline found with the DD FORM 2796 results.

PCL Results for Sub-clinicals and Referrals

The final set of analyses involving the PCL examined the ability of the scale to predict Soldiers displaying any symptoms of traumatic stress. Recall that in this case we included those whom the clinical providers identified as sub-clinical in the definition of a case. The classification table results are presented in Table 11.

Table 11: Any Symptoms

Clinical Provider	Primary Screen with PCL Score of 30 or More	
	Negative	Positive
Negative	405	89
Positive	32	59
Clinical Provider	Primary Screen with PCL Score of 44 or More	
	Negative	Positive
Negative	480	14
Positive	64	27
Clinical Provider	Primary Screen with PCL Score of 50 or More	
	Negative	Positive
Negative	486	8
Positive	78	13

Phi-coefficient, sensitivity and specificity values are presented in Table 12.

Table 12: Any Symptoms

Cut-Off	Index used for Evaluating Cut-Off		
	Phi-Coefficient	Sensitivity	Specificity
PCL - 30	0.39	0.64	0.82
PCL - 44	0.38	0.30	0.97
PCL - 50	0.25	0.14	0.98

As with the DD FORM 2796, sensitivity values were low when using the PCL to identify Soldiers displaying any degree of symptoms. Many of the Soldiers displaying moderate symptoms were missed using the PCL as they were missed using the DD FORM 2796.

• **Summary and Recommendations**

The following summary of findings and corresponding recommendations are provided.

- Question 12 on DD FORM 2796: The four items comprising question 12 of the DD FORM 2796 did a reasonable job identifying Soldiers who were independently assessed as needing referrals for traumatic stress and PTSD. Specifically, using a cut-off value of two or more positive endorsements resulted in a primary screen that had good sensitivity and specificity. The statistical properties of the DD FORM 2796 were

particularly good when strict referral criteria (MINI-based PTSD and Traumatic Stress modules) were used as the basis for referrals. Question 12 of the DD FORM 2796 also has an advantage as a primary screen in that it is easy to score. A quick examination can easily determine whether any two of the four items were positively endorsed.

- The 17-item PCL: Overall, the 17-item PCL was no better than the four items on the DD FORM 2796 in terms of sensitivity and specificity. One advantage to the PCL, however, was that the number of items (17) and the response format of the items (5-point options from "Not at All" to "Extremely") allow for much more finely tuned cut-off values than were possible on the DD FORM 2796. For instance, analyses reveal a PCL score of 36 maintains a high degree of sensitivity (0.77) while also achieving reasonable specificity (0.90) when compared to the 35 referrals based on the MINI Traumatic Stress modules. Whether a value of 36 is consistently optimal, however, needs to be verified in other samples.

- Levels of Severity: Both the DD FORM 2796 and the PCL did a better job predicting traumatic stress symptoms when the criteria for traumatic stress symptoms were strictly defined than when loosely defined. That is, neither the 2796 nor the PCL did a good job when the criteria included sub-clinical cases. While the primary screen is likely to be effective in identifying relatively severe cases, it is likely to be less effective in identifying those with moderate symptoms.

- Secondary Screening Procedure: It is important to recall that we had to use a modified version of the MINI in order to conduct the analyses. Two items in particular were problematic: the question about helplessness and horror and the question about impaired functioning. Future work needs to verify and clarify this possible revision to DSM-IV criteria for PTSD or at a minimum find ways of asking these items that are acceptable to Soldiers.

• Future Directions

Based on these results, the following research program is in the process of being executed by the USAMRU-E.

- Modify Secondary Screening and Re-Test: A new sample of Soldiers returning from Iraq will be recruited to participate in a psychological screening study. In this screen, the same blind validation process will be implemented; however, the secondary screen will be modified to address the PTSD criteria issues noted in this document.

- Develop New Primary Screen: It is likely that between five and ten items could be selected from a combination of PCL and DD FORM 2796 items to create a short scale that would have excellent predictive properties.

- Investigate Timing of Screening: The percentage of Soldiers referred for traumatic stress was remarkably low when compared with other studies of soldiers returning from Iraq (Hoge et al., 2004). In the current study only about 3% of Soldiers showed evidence of traumatic stress. In contrast, Hoge et al. found rates around 15%. One possible explanation for these differences is that traumatic stress symptoms may increase over time. Hoge et al. surveyed Soldiers 3 to 6 months post-deployment while the results of the screening study were based on Soldiers who had only recently returned. We need to understand when mental health screening should be implemented in order to be most effective. A study is underway to resurvey Soldiers who participated in the original data collection to see whether symptoms of traumatic stress increase at 3 to 4 months post-deployment.

- Investigate Role of Anonymity: Differences in rates of traumatic stress between the current study and other studies (Hoge et al., 2004) may also be related to anonymity. The screening procedure is not anonymous, and may produce downwardly biased estimates. To the degree possible, it is important to understand how anonymity impacts reports of psychological symptoms to help arrive at accurate sample-based estimates. A study is underway to investigate this issue.

- Explore Individual Risk Factors. It is possible that Soldiers' previous personal or clinical history may result in different patterns of responses on the primary screen. If so, cut-off values may need to be adjusted for individual differences. For instance, a Soldier with a previous trauma history may need a different cut-off

score than a Soldier without trauma history. Research to identify such factors can help tailor the primary screen to individual Soldiers. For instance, Thomas et al., (2004) explore the role of individual risk factors such as having relatives with alcohol problems as a factor contributing to mental health referrals.

- Analyze Mental Health Data from DD Form 2796. Military personnel taking part in our screening study also completed a DD Form 2796 while in Iraq. Thus, they filled out some of the same items in two different settings a few weeks apart. It would be informative to examine Soldiers responses to the DD Form 2796 items completed in theatre and link these to our clinical providers' secondary interview results.

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