Clinical Presentations in Combat Veterans Diagnosed with Posttraumatic Stress Disorder

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This article investigated subtypes of symptom patterns among male combat veterans diagnosed with posttraumatic stress disorder (PTSD) through a cluster analysis of their Minnesota Multiphasic Personality Inventory-2 (MMPI-2; Butcher, Graham, Ben-Porath, Tellegen, Dahlstrom, & Kaemmer, 2001) clinical and validity scales. Participants were 126 veterans seeking

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outpatient treatment for combat-related PTSD at a Veterans Affairs Medical Center. Two well-fitting MMPI-2 cluster solutions (a four-cluster solution and a three-cluster solution) were evaluated with several statistical methods. A four-cluster solution was determined to best fit the data. Follow-up analyses demonstrated between-cluster differences on MMPI-2 "fake bad" scales and content scales, the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986), Mississippi Combat PTSD scale (M-PTSD; Keane, Caddall, & Taylor, 1988), and Clinician-Administered PTSD Scale (CAPS-1; Blake et al., 1990). Clusters also were different in disability-seeking status, employment status, and income. Implications for research and clinical practice using the MMPI-2 with combat veterans presenting with PTSD are briefly addressed. © 2003 Wiley Periodicals, Inc. J Clin Psychol 59: 385–397, 2003.

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Since 1980, when posttraumatic stress disorder (PTSD) became an official psychiatric diagnosis (American Psychiatric Association, 1980), a growing body of research has investigated PTSD in civilians and veterans. National surveys suggest that 50 to 70% of the general population has experienced traumatic events in their lifetimes, with life-threatening accidents, robbery, and witnessing injury or murder most prevalent for men and women, and combat exposure additionally prevalent for men (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Norris, 1992; H.S. Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993). Furthermore, lifetime prevalence of PTSD is between 7 to 14% of individuals (Kaplan, Sadock, & Grebb, 1994; Kessler et al., 1995; Norris, 1992; H.S. Resnick et al., 1993), with PTSD currently estimated to be one of the costliest mental disorders in terms of impact on society as a whole (Kessler et al., 1999).

Among combat veterans, the most widely studied group has been those who served in Vietnam. In the large-scale 1980s National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990), current prevalence of PTSD was estimated at 15% among men and 9% among women who served. Lifetime PTSD prevalence was 31% among men and 27% among women Vietnam veterans exposed to combat, with an additional 11% of men and 8% of women suffering from "partial" (subclinical) PTSD. The NVVRS demonstrated that these veterans had significantly higher lifetime rates of major depression, dysthymia, obsessive-compulsive disorder, alcohol abuse or dependence, and antisocial personality disorder than their civilian control group (Kulka et al., 1990). Additional studies have supported high rates of comorbid substance abuse, anxiety, mood, and personality disorders for combat veterans (Davidson & Fairbank, 1993; Keane & Wolfe, 1990) as well as severely impaired social and occupational functioning (Frueh, Turner, Beidel, & Cahill, 2001).

Given the high rates of comorbid psychiatric disorders among combat veterans, trauma-specific symptom measures may be inadequate in comprehensively assessing long-term traumatic aftereffects (Briere & Elliott, 1997). One instrument that does assess a wide range of psychopathology and test-taking attitude is the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) and MMPI-2 (Butcher et al., 2001). Elhai, Frueh, Gold, Gold, and Hamner (2000) assessed combat and sexual trauma

samples, finding great similarities in MMPI-2 scores between these trauma groups despite the groups' differences in gender proportions.

Of the combat veteran studies, most MMPI/MMPI-2 studies reveal high elevations on Scale *F* (measuring an atypical and infrequent response style) and the highest clinical elevations on Scales *2* (*D*; indicating depressive symptoms) and *8* (*Sc*; suggesting impaired thinking and concentrating), with the *8–2* code type appearing to be most common in PTSD-diagnosed combat veterans (for a review, see Wise, 1996). This code type is often associated in MMPI/MMPI-2 literature with psychotic symptoms, depression, anhedonia, suicidal thoughts, anxiety, agitation, anger, difficulty concentrating, and somatic complaints (Butcher & Williams, 2000; Greene, 2000). Combat veterans often obtain additional high elevations on Scale *7* (*Pt*; measuring anxiety) of the MMPI-2, but not the MMPI (Wise, 1996).

Despite the number of empirical studies on combat-related PTSD with the MMPI/MMPI-2, these investigations have typically explored general personality and behavioral characteristics of entire combat samples, ignoring differential subtypes of symptom patterns that may exist among these veterans. However, evidence from civilian trauma research (Carlin & Ward, 1992; Elhai, Klotz Flitter, Gold, & Sellers, 2001; Follette, Naugle, & Follette, 1997) and combat trauma research (Wise, 1996) suggests that trauma victims do not appear to constitute a homogeneous group in terms of reported symptoms. In fact, Wise (1996) cited several MMPI/MMPI-2 studies in which a combat sample was described with an *8–2* modal code type, even though 70 to 80% of the sample's veterans did not obtain this code type. Understanding symptom presentation subtypes would therefore be important in providing insight into the variety of ways in which combat veterans commonly manifest PTSD symptomatology. However, at present our understanding of such symptom subtypes is severely limited.

The present study attempts to explore the reported symptomatology in combat-related PTSD by conducting a cluster analysis of MMPI-2 profiles in male combat veterans presenting with PTSD. The aim is to describe subtypes of veterans beyond an examination of modal code types. To our knowledge, this is one of the first studies that cluster analyzes PTSD-diagnosed combat veterans' MMPI or MMPI-2 profiles. In light of evidence supporting similarities between combat and sexual trauma samples on the MMPI-2 (Elhai, Frueh, et al., 2000), it was anticipated that the present cluster solution would resemble that of a recent sexual trauma victim cluster analysis (Elhai et al., 2001), in which five clusters were found including an asymptomatic cluster, a severely disturbed cluster, and three clusters representing moderate levels of distress.

Method

Participants

Archival data were drawn from charts of 126 male veterans who were 18 years old or older, consecutively presenting to an outpatient specialty program for evaluation and treatment of combat-related PTSD at a Veterans Affairs Medical Center (VAMC) in the southeastern United States from September 1995 to September 1997. Institutional Review Board (IRB) approval was obtained, and the study was in compliance with the ethical treatment of human subjects. This sample of 126 men was a subsample of a larger participant pool that completed a full clinical evaluation for PTSD, but only the 126 men were diagnosed with PTSD and therefore included in the present study.

Participants' ages ranged from 30 to 68 years, with a mean of 48.70 ($SD = 5.79$). The majority (62.1%) was Caucasian; the remaining participants were primarily African Amer-

ican (37.9%). The number of completed years of education ranged from 5 to 18 (M = 12.55, SD = 2.38). At the time of evaluation, more than half reported being unemployed (57.9%) while 36.5% were employed full time and 5.6% part time. Annual income ranged from $0 to $90,000, with a mean of approximately $21,000 ($SD$ = $18,000). Most participants had served in the Army (63.7%); service in the Marines (17.7%), and Navy (11.3%) also was represented. Service in the Vietnam War was overrepresented (87.0%), with a minority serving in the Korean (2.4%) and Gulf (6.5%) Wars.

Procedure and Instruments

Participants were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, fourth ed. (DSM-IV) criteria (American Psychiatric Association, 1994). The VAMC's PTSD clinical team, consisting of a psychiatrist, clinical psychologist, clinical psychology intern, and clinical social worker, formulated diagnoses. All PTSD diagnoses were reached by team consensus after a thorough evaluation, including a chart review, psychosocial history interview, military history interview, and structured PTSD clinical interview [the Clinician-Administered PTSD Scale (CAPS-1); Blake et al., 1990]. The three interviews were rotated among team members, with each type of interview being conducted by only one team member per evaluation. Team members were trained in the administration and scoring of the CAPS-1 and routinely met to discuss coding issues for agreement purposes in rating across evaluations. Additional (nonmutually exclusive) Axis I diagnoses were based on nonstandardized clinical interviews and included major depressive disorder (86.8%), current substance abuse disorder (32.0%), anxiety disorder other than PTSD (30.6%), and psychotic disorder (11.6%), consistent with previous comorbidity findings of veterans with combat-related PTSD (Keane & Wolfe, 1990). Additional clinical information was gathered from a battery of self-report measures, described next.

CAPS-1. The CAPS-1 is a structured clinical interview designed to rate the frequency and intensity of the 17 PTSD symptoms based on DSM-IV standards. Strong interrater reliability (.92–.99), high internal consistency (.73–.85), and high convergent validity have been reported for the CAPS-1 (Weathers & Litz, 1994). The original CAPS-1 scoring rule (Blake et al., 1990) was used for diagnosing PTSD. The CAPS-1 total severity score (frequency + intensity, summed for Criteria B, C, and D) was used in analyses to assess for group differences.

MMPI-2. The MMPI-2 is a widely used, 567-item true–false questionnaire that assesses psychopathology. In the current study, the standard paper-and-pencil version was used with standard instructions. All three validity and ten clinical scales were included in the cluster analysis.

BDI. The BDI is a widely used 21-item, self-report measure of depressive symptoms. The BDI has demonstrated good reliability, yielding mean internal consistency estimates of .86 across studies. The BDI has been well validated, with concurrent validity ranging from .55 to .96 (Beck, Steer, & Garbin, 1988). The BDI total score was used in validating the cluster analytic findings.

Dissociative Experiences Scale-Fixed Response Format (DES-FRF). The DES (Bernstein & Putnam, 1986) is a 28-item, visual analogue-format self-report measure of dis-

sociative symptoms. The present study employed a revised version of the DES with a fixed response format (DES-FRF). The DES-FRF has demonstrated good alternate forms reliability with the original DES ($r = .71$), and strong internal consistency (coefficient $\alpha = .95$). A significantly lower inverse relationship with intelligence ($r = -.18$) was found when compared to the original DES ($r = -.42$) (Frueh, Johnson, Smith, & Williams, 1996). The total DES-FRF score was used in validation of the cluster analysis findings.

Mississippi Combat PTSD Scale (M-PTSD). The M-PTSD is a 35-item, Likert-format self-report measure of combat-related PTSD symptoms. In the NVVRS (Kulka et al., 1990), the M-PTSD served as a primary indicator and the best self-report measure of PTSD. Psychometric properties have been reported for the M-PTSD, with excellent sensitivity (.93), specificity (.89), and an overall hit rate of .90 in predicting PTSD (Keane, Caddell, & Taylor, 1988). The total M-PTSD score was used in validating the cluster analysis findings.

Statistical Analyses

Participants were excluded from analyses if their MMPI-2 profiles met at least one of the following criteria: (a) True Response Inconsistency scale (*TRIN*) *T* scores $\geq$ 100 (suggesting a mostly true or mostly false response trend), (b) Variable Response Inconsistency scale (*VRIN*) *T* scores $\geq$ 80 (suggesting a mostly random response trend), or (c) Cannot Say (CS) raw scores $\geq$ 15 (suggesting a significant number of missing responses). These criteria resulted in the exclusion of 11 participants. Additionally, MMPI-2 scale data were missing for 2 participants. Therefore, the remaining 113 male PTSD patients served as the overall sample.

First, an exploratory cluster analysis was performed with K-corrected *T* scores from MMPI-2 Scales *L*, *F*, *K*, and *1* through *0* as the clustering variables. An agglomerative hierarchical clustering procedure was implemented to produce preliminary cluster solutions. In this procedure, squared Euclidean distance served as the similarity coefficient. Cluster formation was achieved through Ward's (1963) method, designed to minimize the amount of within-cluster variance and produce smaller and more distinct clusters.

Results

Evaluation of Cluster Solutions

While agglomerative cluster analysis produces a hierarchy of possible cluster solutions, no adequate technique has been agreed upon in determining the optimal number of clusters that characterize one's data (Blashfield, 1980). Therefore, we implemented several methods to determine which cluster solution to use. First, the agglomeration schedule was examined to detect where a significant "jump" occurred in the agglomeration coefficient values (signifying that two relatively dissimilar clusters were combined) (Aldenderfer & Blashfield, 1984). For these data, a significant jump appeared to occur after the four- or three-cluster solutions, suggesting that one of these is probably the better solution.

Second, the agglomeration coefficients were plotted on a graph, in a search for significant "flattening" in their trend, analogous to a factor analysis scree test (Aldenderfer & Blashfield, 1984). This graph revealed a marked flattening trend after the four- or three-cluster solutions, suggesting that no new information is likely to be added after these steps.

Third, to further evaluate the three- and four-cluster solutions, a more precise iterative clustering algorithm (K-Means; Hartigan, 1975) was used that maximizes differences between cluster centroids and minimizes within-cluster variance for each solution. This method has the advantage of making more than one evaluation through the data, compensating for poor preliminary clustering. *T* score means from the 13 validity and clinical MMPI-2 scales per group served as initial cluster centers, with separate three- and four-cluster solutions requested. Based on resulting cluster solutions, two separate discriminant analyses were computed, using the 13 scales to predict cluster membership, resulting in significant Wilks' Lamba statistics (.11 and .04, for the three- and four-cluster solutions, respectively; $p < .001$). The three-cluster solution correctly classified 95.6% of participants, with 96.5% correct classification in the four-cluster solution. Individual analyses of variance (ANOVAs) yielded statistical significance ($p < .01$) for all scales (except *L*) in each solution. Thus, discriminant analysis results did not seem to significantly support the use of one solution over the other.

Therefore, results from the agglomeration schedule, the cluster analysis scree plot analogue, and discriminant analyses seem to argue for the use of either the three- or four-cluster solutions, although it is unclear which one is superior. We therefore decided to use the four-cluster solution since moving from the four- to three-cluster solution did not appear to markedly enhance the solution's fit to the data and could potentially result in the loss of important information in the process. Therefore, in the current sample we found that there were four clusters or subgroups of combat veterans with PTSD that produce fairly distinct mean MMPI-2 profiles.[1]

Cluster Profiles

Figure 1 presents the mean profiles of the four-cluster solution. The following are actuarial interpretations for each cluster's mean profile, adapted from MMPI/MMPI-2 literature identifying correlates of profile configurations (i.e., Butcher & Williams, 2000; Graham, 1999; Greene, 2000). Welsh profile codes also are provided. For simplicity, interpretations are based on clusters' two-point code types, where appropriate. However, it should be noted that several clusters' code types were not well defined because of multiple high-point scale elevations that are in close proximity within a cluster. Thus, the interested reader should consider additional scale elevations in interpretation.

Cluster 1 (n = 21) (*″′ + 12 867-34 90/5:# F-L/K). This profile suggests an open and honest test-taking attitude. With all clinical scales in the normal range, moderate *T* score elevations (60–64) on several scales suggest moderate levels of concern about bodily functioning as well as dissatisfaction, significant sensitivity to criticism, and unconventional thinking.

Cluster 2 (n = 31) (8**7216*304″′ + 9–5/:# F** *″′ + −/L:K). It is probable that this cluster's mean profile is invalid, perhaps due to the exaggeration/fabrication of psychopathology. Therefore, in accordance with standard MMPI-2 interpretation proce-

[1]When we examined cluster solutions containing fewer than four clusters, we noticed a significant qualitative increase in variance. Comparing the three- and four-cluster solutions, the three-cluster solution demonstrated less subtlety between clusters, simply representing the three clusters along a severity of pathology continuum. Additionally, the three-cluster solution merged the four-cluster solution's Cluster 1 (characterized as healthy) and Cluster 3 (characterized as depressed and anxious) into an ambiguous and mildly disturbed cluster, thus losing important cluster characteristics.

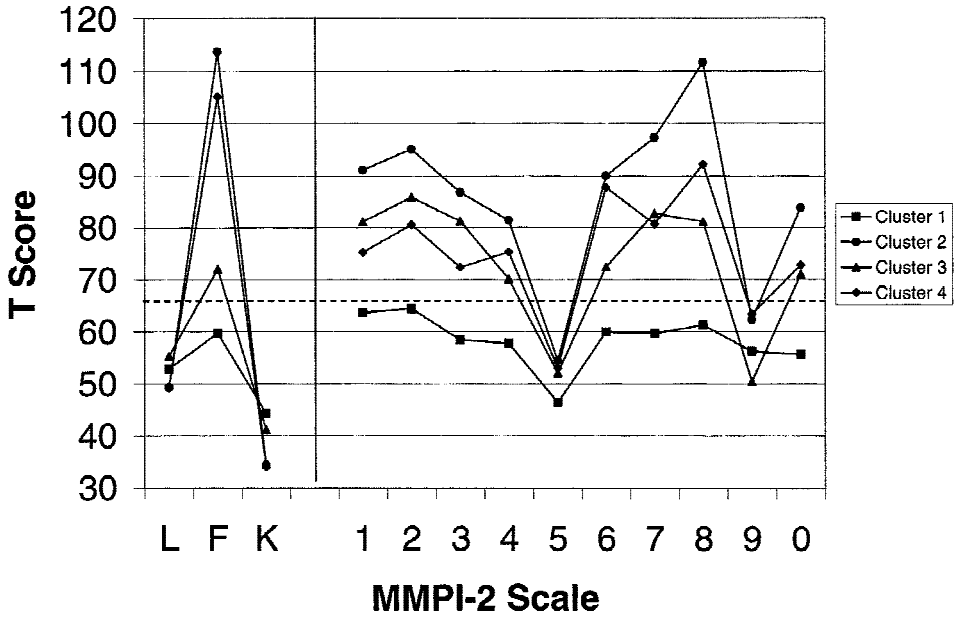

Figure 1. Mean cluster profiles for MMPI-2 Clinical and Validity Scales in the four-cluster solution.

dures, this cluster's profile will not be interpreted. However, it should be noted that it is possible that the apparent invalidity instead represents extreme genuine psychopathology.

Cluster 3 (n = 30) (*27138″604′ + −59/:# F′ + −L/K). This mean profile suggests an open acknowledgment of emotional problems and psychopathology, with a perceived inability to cope with one's problems. Individuals with this profile suffer from moderate emotional distress, with a depressed, anxious, and irritable mood. Guilt and significant worry is usually present. These patients likely suffer from anhedonia, low self-confidence, and a pessimistic outlook on life. They may overreact to stress in an agitated manner. In terms of cognition, difficulty concentrating and making decisions are usually present, with poor judgment. Socially, these individuals are introverted and avoid people. Suicidal ideation is often present.

Cluster 4 (n = 31) (8*627″14 03′ + 9–5/:# F** *″ ′ + −L/:K). This mean profile is probably invalid due to exaggeration or fabrication of psychopathology. An interpretation is therefore not presented. However, it is possible that instead the profile is characteristic of severe genuine psychopathology.

Between-Cluster Comparisons

Symptoms Across Clusters. To further assess the distinctiveness of clusters, several between-cluster comparisons were conducted. First, the 15 content scales of the MMPI-2 were employed. Analyses were performed on the content scales' *T* scores using one-way, between-groups ANOVAs, with alpha set at .003 to allow for a familywise alpha of .05. As Table 1 indicates, all content scales were significant at the .003 level, providing some external support for the distinctiveness of clusters. Tukey HSD comparisons yielded a

Table 1
Comparisons of MMPI-2 Content Scale T Scores Across Clusters

Scale	Cluster 1 (n = 21) M (SD)	Cluster 2 (n = 31) M (SD)	Cluster 3 (n = 30) M (SD)	Cluster 4 (n = 31) M (SD)	$F(3,109)$
Anxiety (*ANX*)	62.19 (10.40)	86.19 (5.96)$_a$	78.00 (9.65)$_b$	80.84 (8.64)$_{ab}$	33.70*
Fears (*FRS*)	57.52 (11.30)$_a$	78.12 (12.34)	63.97 (11.29)$_{ab}$	67.48 (13.82)$_b$	13.10*
Obsessions (*OBS*)	56.52 (11.85)$_a$	78.10 (8.97)	63.27 (10.57)$_a$	70.39 (8.73)	22.90*
Depression (*DEP*)	60.10 (9.83)	92.03 (4.68)	78.20 (8.88)	86.48 (7.48)	78.22*
Health Concerns (*HEA*)	65.05 (10.47)	94.87 (9.49)	78.80 (10.03)$_a$	80.00 (12.07)$_a$	34.25*
Bizarre Mentation (*BIZ*)	56.24 (7.52)$_a$	94.35 (17.26)	65.50 (10.86)$_a$	85.03 (13.51)	46.66*
Anger (*ANG*)	60.24 (12.33)$_a$	75.97 (8.89)$_b$	65.80 (11.94)$_a$	73.68 (9.61)$_b$	11.93*
Cynicism (*CYN*)	59.95 (11.01)$_a$	70.19 (7.79)$_b$	58.13 (8.40)$_a$	70.45 (9.20)$_b$	15.24*
Antisocial Practices (*ASP*)	54.62 (10.01)$_{ab}$	61.06 (12.48)$_{ac}$	51.77 (9.09)$_b$	65.52 (9.85)$_c$	10.32*
Type A (*TPA*)	59.57 (12.62)$_{ab}$	66.45 (10.55)$_a$	55.37 (10.59)$_b$	67.00 (10.83)$_a$	7.70*
Low Self-Esteem (*LSE*)	54.00 (9.56)	83.03 (9.67)	64.57 (10.70)	74.16 (11.05)	37.69*
Social Discomfort (*SOD*)	56.57 (16.01)	81.74 (6.98)	68.87 (13.24)	71.19 (9.38)	20.52*
Family Problems (*FAM*)	55.57 (8.15)$_a$	77.03 (12.04)$_b$	59.33 (9.64)$_a$	74.87 (10.17)$_b$	30.04*
Work Interference (*WRK*)	57.57 (8.15)	87.32 (6.17)	73.23 (8.48)	78.81 (8.65)	61.81*
Negative Treatment Indicators (*TRT*)	58.95 (10.88)	91.19 (7.54)	72.70 (12.83)	84.19 (9.06)	48.29*

Note. Scores sharing the same lowercase subscript are not significantly different from each other ($p < .05$).
*$p < .003$.

variety of between-group differences ($p < .05$), with most measures indicating Cluster 2 scoring highest, followed by cluster 4, with cluster 1 scoring the lowest.

Next, given the concern that a subgroup of veterans may exaggerate or feign PTSD to obtain disability compensation (Frueh, Hamner, Cahill, Gold, & Hamlin, 2000; P.J. Resnick, 1997), we examined between-cluster differences on several MMPI-2 measures of overreported psychopathology. These scales included the Infrequency-Back Side scale (*Fb*), Infrequency-Psychopathology (*Fp*), Obvious minus Subtle index (*O-S*), and the Dissimulation scale (Ds_2). Analyses were performed on *T* scores using one-way, between-groups ANOVAs, with alpha set at .013 to allow for a familywise alpha of .05. As Table 2 indicates, all of these scales were significant. Tukey HSD comparisons yielded many between-group differences ($p < .05$), as Cluster 2 scored the highest on these measures followed by Clusters 4, 3, and 1, in descending order.

Table 2
Comparisons of MMPI-2 "Fake Bad" Scale T Scores Across Clusters

Scale	Cluster 1 (n = 21) M (SD)	Cluster 2 (n = 31) M (SD)	Cluster 3 (n = 30) M (SD)	Cluster 4 (n = 31) M (SD)	$F(3,109)$
Fb	61.31 (11.48)	115.83 (8.73)	82.12 (18.57)	105.90 (12.87)	87.73**
Fp	54.71 (9.34)$_a$	86.26 (23.83)$_b$	56.81 (9.20)$_a$	76.62 (18.14)$_b$	23.00**
$O - S$	73.05 (43.33)	265.74 (38.53)	148.40 (46.11)	211.46 (39.39)	100.63**
Ds_2	58.98 (10.62)	98.96 (10.95)	70.96 (10.63)	85.38 (9.05)	74.53**

Note. Scores sharing the same lowercase subscript are not significantly different from each other ($p < .05$).
**$p < .001$.

Table 3
Comparisons of BDI, DES-FRF, M-PTSD, and CAPS-1 Scores Across Clusters

Scale	Cluster 1 (n = 21) M (SD)	Cluster 2 (n = 30) M (SD)	Cluster 3 (n = 29) M (SD)	Cluster 4 (n = 29) M (SD)	$F(3,105)$
BDI	15.38 (8.00)	37.17 (8.75)	25.90 (9.89)$_a$	29.07 (7.22)$_a$	27.40**
DES-FRF	43.14 (7.16)$_a$	67.37 (17.93)	46.86 (13.76)$_{ab}$	55.90 (22.29)$_b$	11.14**
M-PTSD	97.52 (13.96)	124.33 (13.33)	107.55 (11.93)$_a$	113.28 (11.90)$_a$	19.71**
CAPS-1	58.26 (13.92)	95.03 (13.54)	84.25 (14.99)$_a$	77.85 (17.41)$_a$	23.87**

Note. Scores sharing the same lowercase subscript are not significantly different from each other ($p < .05$).
**$p < .001$.

Clusters also were compared in terms of scores on the BDI, DES-FRF, M-PTSD, and CAPS-1. One-way, between-groups ANOVAs were used with alpha set at .013 to allow for a familywise alpha of .05. As Table 3 indicates, significant differences were found for these scales. Tukey HSD comparisons yielded many between-group differences ($p < .05$), as Cluster 2 generally scored highest on these measures followed by Clusters 4, 3, and 1, in descending order.

Disability Status Across Clusters. Clusters were next compared to assess for a difference in whether they were applying or planning to apply for any type of disability compensation, coded as 1 (*Yes*) and 2 (*No*), based on interview, chart review, and self-report questions from a psychosocial history questionnaire. A 4 × 2 chi-square analysis (Cluster Membership × Disability Status) was used. Clusters differed in disability status, $\chi^2(3, n = 87) = 14.73$, $p = .002$. Post hoc pairwise chi-square comparisons were conducted ($\alpha = .008$, to control for multiple comparisons), revealing only two significant pairwise differences: Cluster 2 was overrepresented by disability seekers when compared to Cluster 1; Cluster 4 was overrepresented by disability seekers when compared to Cluster 1.

Demographic Differences Across Clusters. Last, clusters were compared on several demographic variables. One-way, between-groups ANOVAs were used for continuous-scaled variables, with chi-square analyses for categorical-scaled variables. Alpha was set at .013 to allow for a familywise alpha of .05. Clusters were not different in terms of years of education, $F(3,91) = .13$, $p > .05$, or racial ethnicity (African American/Caucasian), $\chi^2(3, n = 111) = 2.52$, $p > .05$. Clusters were significantly different in terms of annual income, $F(3,91) = 6.26$, $p = .001$, with Tukey HSD comparisons yielding between-group differences ($p < .05$) for Clusters 1 and 2, and well as 1 and 3 (with lowest incomes in Clusters 2 and 3). Employment status (employed/unemployed) also was different between groups, $\chi^2(3, n = 113) = 11.78$, $p = .01$, with unemployment overrepresented in Cluster 4, and especially in Clusters 2 and 3.

Discussion

Overall, the present study revealed four distinct subtypes of clinical presentations of combat PTSD, as measured by the MMPI-2. This study, therefore, empirically demon-

strates that PTSD-diagnosed combat veterans represent heterogeneous patterns of symptom endorsement rather than being categorized by a single MMPI-2 code type.

To assess the distinctiveness of obtained clusters, the four clusters were compared on a variety of self-report measures. Results indicated that clusters were differentiated on the basis of their MMPI-2 content scales and several "fake bad" scales as well as the BDI, DES-FRF, M-PTSD, and CAPS-1, with Cluster 2 scoring highest and Cluster 1 scoring lowest. In addition, cluster membership was related to disability-seeking status, income, and employment status. Thus, these self-report measures validate the distinctiveness of clusters.

In terms of characteristics of the sample's clusters, Cluster 1 was unique in that it represented a nonpathological profile. Only moderate elevations were observed for Scales *1*, *2*, *6*, and *8* within this cluster. Thus, despite seeking treatment and being diagnosed with PTSD from multiple sources of information, on average this group of 21 men (nearly 20% of the sample) appeared to score in the nonclinical range on the MMPI-2 clinical scales. Additionally, Cluster 1 scored in the nonclinical range on nearly all of the MMPI-2's content scales, the BDI, DES-FRF, and CAPS-1. This cluster's mean M-PTSD score did, however, approach the established PTSD cutoff of 107 (Keane et al., 1988). Therefore, it is possible that this cluster represents veterans who primarily suffer from some degree of PTSD while not necessarily suffering from the range or severity of comorbid psychiatric diagnoses noted in other veterans.

Within the solution, Cluster 2 appeared to be composed of men with the most extreme MMPI-2 elevations in the sample (with an apparently invalid mean profile). Scale *8* was the highest clinical elevation, with Scales *7*, *2*, *1*, and *6* also extremely elevated. In fact, all scales except Scales *5* and *9* were elevated in this cluster. The men in this cluster also obtained the highest mean elevation on nearly all MMPI-2 content scales as well as the BDI, DES-FRF, M-PTSD, and CAPS-1. Because Cluster 2 participants obtained extreme mean elevations on the "fake bad" scales and additionally were overrepresented by disability seekers, it is possible that this group of 31 veterans (27% of the sample) represents veterans who overreported their mental health symptoms. In fact, this estimate would be consistent with previous estimates that up to 20% of veterans seeking treatment for PTSD may exaggerate or malinger their symptoms (Gold, Frueh, Chobot, & Brady, 1996). Interestingly, this group also was one of the least employed of the groups, with the lowest income, perhaps related to their disability seeking.

However, it should be noted that detecting malingered PTSD is extremely complicated, and MMPI-2 "fake bad" scores should only be used as malingering screening tools. In fact, most veterans seeking disability compensation do not malinger symptoms, but may be accurately reporting genuinely severe symptoms (Elhai, Gold, Frueh, & Gold, 2000; Gold & Frueh, 1999). Moreover, recent research with civilian trauma victims suggests that extreme elevations on the *F* scale are related to genuine psychiatric symptoms experienced by this population (i.e., posttraumatic stress, depression, and dissociation), with dissociation found to be the strongest predictor of *F* scores among victims (Klotz Flitter, Elhai, & Gold, in press).

Clusters 3 and 4 overall lie between Clusters 1 and 2 in terms of level of scale elevations. For Cluster 3, all mean clinical scores were elevated except Scales *5* and *9*, with the highest scores on Scales *2*, *7*, *1*, *3*, and *8*, respectively. The overall configuration for Cluster 3 in fact closely resembled that of Cluster 2, with a lowered overall profile.

Cluster 3's mean profile also is very similar to that of Cluster 4. However, there are several important differences between their profiles, other than an obvious difference in severity of disturbance. Specifically, Cluster 4 obtained a mean *F* score that was higher than that of Cluster 3 and approached the elevation level that Cluster 2 obtained. Addi-

tionally, when compared to Cluster 3, Cluster 4 revealed lower scores on the "neurotic" scales (*1*, *2*, and *3*) and higher overall scores on the "psychotic" scale tetrad (*6*, *7*, *8*, and *9*), with a "psychotic V" configuration. Interestingly, in contrast to Cluster 4, Cluster 3 demonstrated lower elevations on Scales *4* and *9* and higher elevations on Scale *2*. Cluster 3 also was represented by lower income and less employment. Overall then, compared to Cluster 4, Cluster 3's subset of veterans may represent PTSD-diagnosed veterans who are more depressed and anxious and less energetic.

Similarly to Cluster 2, Cluster 4 also was overrepresented by disability seekers and scored high on the "fake bad" scales (with an apparently invalid mean group profile). This cluster also reported less income and lower rates of employment, possibly related to their disability seeking. Thus, it is possible that many in this group of 31 veterans (27% of the sample), while perhaps not completely fabricating PTSD symptoms, may have exaggerated genuine symptoms of PTSD.

Interestingly, the obtained four-cluster solution in the present study bears some similarities to the five-cluster solution found in a recent cluster analysis of sexual trauma patients diagnosed with or without PTSD (Elhai et al., 2001). Both the present study and the sexual trauma study found a nonpathological cluster of participants (Cluster 1 in the current study). The present study's most extremely elevated cluster (Cluster 2) closely resembles the most disturbed cluster of the sexual trauma study, except that the current study's most elevated cluster obtained lower scores on Scales *4* and *6*. The lower Scale *4* scores in the veteran group are likely attributable to the older age of this group, as Scale *4* scores typically decrease with older age (Greene, 2000). Thus, overall it appears that combat samples (diagnosed with PTSD) and sexual trauma samples (diagnosed with or without PTSD) may include a subgroup of individuals showing little psychopathology and another subgroup evidencing extreme elevations.

One methodological limitation involves the characteristics of cluster analysis. Cluster analysis is a descriptive statistical technique that lacks formal statistical hypothesis testing. Furthermore, determining the number of clusters in cluster analysis can be subjective in interpretation. The present study used several approaches to evaluate the cluster solutions to obtain the best solution that fit the data. However, no procedures have been universally agreed upon in forming the precise number of clusters (Blashfield, 1980). Next, our method of validating cluster formation with multivariate procedures, although common in clinical research, has been criticized (Blashfield, 1980). Finally, the majority of measures examined were self-report in nature and thus vulnerable to the biases inherent in self-report instruments. Although we did not possess treatment use or outcome data for this sample, these kinds of data would be important in further validating the distinctiveness of clusters.

Conclusion

In sum, the present study revealed four distinct subtypes of PTSD presentations on the MMPI-2 that were validated by additional self-report and clinician-administered measures as well as demographics. Clinically, it is important to recognize the heterogeneity in PTSD presentations. Selecting appropriate treatments should reflect the fact that PTSD presentations may vary, as may veterans' treatment needs. Future studies should replicate the methodology used here to assess if other samples of PTSD-diagnosed combat veterans yield similar symptom patterns. Additional symptom measures should be used to assess for the distinctiveness in clusters. Resulting clusters could eventually be followed in treatment to assess the effect of cluster membership on treatment response. In particular, it will be interesting to determine whether certain clusters are more responsive to

specific treatment components (e.g., exposure therapy, social skills training, psychiatric medication) to develop and evaluate treatment matching strategies.

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