

The prevalence of post-traumatic stress disorder (PTSD) in US combat soldiers: a head-to-head comparison of DSM-5 versus DSM-IV-TR symptom criteria with the PTSD checklist



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Summary

Background The definition of post-traumatic stress disorder (PTSD) underwent substantial changes in the 2013 edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). How this will affect estimates of prevalence, whether clinical utility has been improved, and how many individuals who meet symptom criteria according to the previous definition will not meet new criteria is unknown. Updated screening instruments, including the PTSD checklist (PCL), have not been compared with previously validated methods through head-to-head comparisons.

Methods We compared the new 20-item PCL, mapped to DSM-5 (PCL-5), with the original validated 17-item specific stressor version (PCL-S) in 1822 US infantry soldiers, including 946 soldiers who had been deployed to Iraq or Afghanistan. Surveys were administered in November, 2013. Soldiers alternately received either of two surveys that were identical except for the order of the two PCL versions (911 per group). Standardised scales measured major depression, generalised anxiety, alcohol misuse, and functional impairment.

Results In analysis of all soldiers, 224 (13%) screened positive for PTSD by DSM-IV-TR criteria and 216 (12%) screened positive by DSM-5 criteria (κ 0.67). In soldiers exposed to combat, 177 (19%) screened positive by DSM-IV-TR and 165 (18%) screened positive by DSM-5 criteria (0.66). However, of 221 soldiers with complete data who met DSM-IV-TR criteria, 67 (30%) did not meet DSM-5 criteria, and 59 additional soldiers met only DSM-5 criteria. PCL-5 scores from 15–38 performed similarly to PCL-S scores of 30–50; a PCL-5 score of 38 gave optimum agreement with a PCL-S of 50. The two definitions showed nearly identical association with other psychiatric disorders and functional impairment.

Conclusions Our findings showed the PCL-5 to be equivalent to the validated PCL-S. However, the new PTSD symptom criteria do not seem to have greater clinical utility, and a high percentage of soldiers who met criteria by one definition did not meet the other criteria. Clinicians need to consider how to manage discordant outcomes, particularly for service members and veterans with PTSD who no longer meet criteria under DSM-5.

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Introduction

The fifth edition of the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5) was released in May, 2013.¹ Although the DSM-5 includes major changes to some diagnostic categories (eg, neurodevelopmental and neurocognitive disorders), the core criteria for most of the common mental disorders affecting adults remain unchanged compared with the previous edition, DSM-IV-TR (2000).² Barely a word was altered in the description and number of symptoms required to meet diagnostic criteria for disorders such as major depression, dysthymia, bipolar, cyclothymia, generalised anxiety, panic, and obsessive compulsive disorder.

By contrast with these disorders, the definition of post-traumatic stress disorder (PTSD) underwent substantial change. Changes included moving PTSD out of anxiety disorders into a separate chapter for disorders related to trauma and stressors that now includes adjustment disorder, revision to the A trauma criterion, three

additional symptoms (taking the total from 17 symptoms to 20 symptoms), and a division of the avoidance cluster into avoidance and negative alterations in cognitions and mood.¹

Eight of the original 17 symptoms that had remained largely unchanged for more than 25 years (since DSM-III-R, 1987) were substantially reworded, introducing complex phrasing and obvious changes in meaning. For example, "sense of foreshortened future (e.g. does not expect to have a career, marriage, children, or a normal life span)" was changed to "persistent and exaggerated negative beliefs or expectations about oneself, others or the world (e.g., 'I am bad,' 'No one can be trusted,' 'The world is completely dangerous,' 'My whole nervous system is completely ruined')". The classic emotional numbing symptom "restricted range of affect (e.g. unable to have loving feelings)" was changed to "persistent inability to experience positive emotions (e.g. inability to experience happiness, satisfaction, or loving feelings)." New items addressing blame (self or others), "persistent

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negative emotional state”, and risk taking were added. Arguably many of these changes relate to depressive and dysphoria symptoms not specific to PTSD.³

The main purpose of revising any psychiatric definition is to enhance diagnostic accuracy and clinical utility. Although there is good evidence lending support to removal of the criterion A2 (response to trauma of “fear, helplessness, or horror”), essentially all of the other changes are subject to limitations inherent in consensus opinions and differing interpretations of available studies.⁴⁻⁷

At present, clinicians, researchers, and health-care administrators working with veterans face unique challenges transitioning from DSM-IV-TR to DSM-5 during this crucial time after 12 years of war. Studies of the new PTSD definition have focused predominantly on factor structure and depression overlap,^{3,8,9} or on preliminary exploration of proposed criteria in college students,¹⁰ earthquake survivors,¹¹ or non-representative convenience samples (individuals listed on research or

PTSD registries, or internet surveys with undetermined response rates).¹²⁻¹⁴ Investigators have relied on extrapolations or modifications of DSM-IV-based instruments,^{3,8,10,11,12,15} an internet survey developed by the APA DSM-5 trauma and stress-related sub-workgroup for preliminary investigation of proposed criterion changes,^{13,14} or in one case a non-final version of the PTSD Checklist-5 (PCL-5).⁹ None of these studies has directly compared DSM-5 with DSM-IV-TR criteria using independent measures. The only clinician test-retest field trial (also done before publication of the final criteria) produced promising reliabilities ($\kappa=0.63-0.69$).¹⁶ However, nearly half of DSM-5-defined PTSD diagnoses were discordant (discordance between DSM-IV-TR and DSM-5 was not presented), and the study population was restricted to veterans with a very high DSM-IV-TR PTSD prevalence (47–50%). The absence of systematic comparisons with final published criteria and the potential for high discordance compared with the previous definition raise questions for tens of thousands of service members and veterans undergoing treatment and disability assessments for service-related PTSD.

The latest wars in Iraq and Afghanistan have led to extensive screening efforts by the US Department of Defense and Veterans Affairs in primary care, specialty care, and throughout deployment cycles. An important need exists for systematic study of newly revised criteria and corresponding clinical screening instruments. The PTSD checklist (PCL) is the most widely used instrument for screening, research, and assessment of treatment effectiveness.¹⁷⁻¹⁹ Although a new version (PCL-5) based on final published criteria, as well as the Clinician Administered PTSD Scale (CAPS-5), have been released and recommended for clinical use on the basis of preliminary (unpublished) validation,²⁰ it remains unknown how their use will affect clinical screening efforts and population prevalence estimates.

To the best of our knowledge, this study is the first to directly compare the newly released 20-item PCL-5 mapped to DSM-5 with the original validated 17-item PCL in a large population of infantry soldiers. Although we did not use a gold-standard structured clinical interview, we provide the first well-controlled head-to-head comparison of symptom endorsement, distribution of scores, and prevalence based on the new PCL-5 against the original PCL. We addressed several questions. Does the prevalence of PTSD symptom criteria differ according to the two definitions? How many soldiers who meet DSM-IV-TR criteria do not meet DSM-5 criteria according to the respective PCLs, and vice versa? How do the substantial wording changes affect symptom reporting? Do the new symptom criteria have greater clinical utility than the original? And finally, how does the distribution of scores compare, and what PCL-5 scores show optimum concordance with the most widely recommended original cutoffs?

	Survey A (n=911)	Survey B (n=911)
Age		
18–19 years	44 (5%)	34 (4%)
20–24 years	391 (44%)	408 (46%)
25–29 years	233 (26%)	214 (24%)
30–39 years	174 (20%)	179 (20%)
≥40 years	41 (5%)	49 (6%)
Men		
	807 (91%)	790 (90%)
Education		
High school or equivalent	390 (44%)	392 (45%)
College level	372 (42%)	376 (43%)
Bachelor's or higher	121 (14%)	109 (12%)
Married		
	477 (54%)	461 (52%)
Rank		
E1–E4	554 (62%)	512 (58%)
E5–E9	267 (30%)	294 (33%)
Officer or warrant	70 (8%)	78 (9%)
Deployment history		
Deployed in Iraq or Afghanistan	454 (50%)	492 (54%)
Deployed in other location	79 (9%)	63 (7%)
Never deployed	378 (42%)	356 (39%)
Screened positive for:		
PTSD (by either DSM-IV-TR or DSM-5)	146 (16%)	140 (16%)
Major depressive disorder*	82 (9%)	94 (10%)
Generalised anxiety disorder		
Moderate (total score ≥10)	142 (16%)	159 (18%)
Severe (total score ≥15)	54 (6%)	69 (8%)

Data are n (%). Percentages adjusted for missing values. None of the differences between survey groups were statistically significant. PTSD=post-traumatic stress disorder. *A positive screen for major depression was defined as five or more symptoms at “more than half the days” or higher (any days for suicidality), including depressed mood or anhedonia.²⁷

Table 1: Demographic and clinical characteristics

Methods

Participants

We administered an anonymous survey to soldiers from one infantry brigade in November, 2013, as part of the Walter Reed Army Institute of Research Land Combat Study^{21,22} using informed consent procedures approved by the institutional review board. This brigade included soldiers who had been deployed one or more times to Iraq or Afghanistan, soldiers who had been deployed on non-combat missions, and new arrivals without deployment experience. We recruited soldiers by coordinating with unit leaders who identified convenient times for group recruitment briefings during which soldiers could voluntarily consent. About two-thirds of brigade soldiers attended the recruitment sessions; of 2141 soldiers who attended, 1822 (85%) consented to participate, including 946 (50%) with combat exposure in Iraq or Afghanistan.

Procedures

The surveys covered demographics, deployment history, combat experiences (including the 17-item Combat Experiences Scale²¹), mental health, and functioning, and took about 45 mins to complete. All surveys included both the final published 20-item PCL-5 (Aug 14, 2013 version, created by FWW in collaboration with the National Center for PTSD)²⁰ and the original 17-item specific stressor PCL-S,¹⁷⁻¹⁸ located in the first half of the 15-page survey separated by two pages containing depression, anxiety, sleep, and physical health questions. Symptom questions on both the PCL-5 and PCL-S use the same structure, anchored to one stressful experience (usually the most traumatic one). Prevalence studies from the Iraq and Afghanistan wars have consistently relied on the PCL-S rather than the military version to ensure comparability across stressor types (military and non-military) and deployment timeframes (before, during, post-deployment).²¹⁻²⁵ Separate civilian or military versions no longer exist for PCL-5.

To control for potential order effects⁶ and ensure independence of measures, soldiers alternately received either of two versions of the survey that were otherwise identical. Survey A had the original PCL-S located on page 4 followed by the PCL-5 two pages later, while Survey B had the PCL-5 on page 4 followed by the PCL-S two pages later. Randomisation was accomplished by bundling the surveys (each in identical envelopes) in an alternating manner (1:1 allocation) to ensure equal distribution and blinding of researchers and participants.

To ensure comparability in symptom reporting, instructions for both PCLs were standardised to read as follows: "Below is a list of reactions that soldiers sometimes experience following deployment or in response to other stressful life experiences. Please mark how much you have been bothered by each problem in the past month". These instructions have been used in many military studies,^{21,22,25} and have been shown to be equivalent to the original instructions.²⁶

Although scoring of PCL-5 symptoms has changed to 0–4 (range 0–80) and scoring of PCL-S uses 1–5 (range 17–85), corresponding response options are identical: "not at all", "a little bit", "moderately", "quite a bit", and "extremely". To meet DSM-IV-TR criteria on PCL-S, participants had to mark "moderately" or higher on at least one of five re-experiencing symptoms, three of seven avoidance symptoms, and two of five hyperarousal symptoms.² This symptom cluster scoring method is well established¹⁷⁻²³ and has been shown in two military studies to correspond to a moderate–high stringency PCL-S score of 44.^{17,19} To meet DSM-5 criteria on PCL-5, participants similarly had to mark "moderately" or higher on at least one of five intrusion (previously "re-experiencing") symptoms, one of two avoidance symptoms, two of seven negative cognition or mood symptoms, and two of six hyperarousal symptoms.^{1,20} The distribution of total scores was also compared anchored to PCL-S cut-offs validated in previous studies.¹⁷⁻¹⁹ To ensure uniformity in trauma exposure for purposes of PCL comparisons, we regarded service in war zones in Iraq or Afghanistan as sufficient to qualify for the A criterion; separate analyses were undertaken on all soldiers and on the 946 soldiers with such a history.

We measured major depressive disorder and generalised anxiety using the Patient Health Questionnaire (PHQ-9)²⁷ and Generalized Anxiety Disorder scale (GAD-7),²⁸ which both remain valid for DSM-5. We measured alcohol misuse using the AUDIT-C, following US and UK scoring recommendations.^{25,29} We measured functional impairment using the Walter Reed Functional Impairment Scale,³⁰ and the Veterans RAND 12-Item (VR-12) Health

	Survey A (n=911)		Survey B (n=911)	
	First (PCL-S)	Second (PCL-S)	First (PCL-S)	Second (PCL-S)
PTSD per DSM-IV-TR or DSM-5	123/855 (14%)*	95/880 (11%)	121/871 (14%)	101/883 (11%)
IVB2/5B2: intrusive dreams	127/852 (15%)*	96/878 (11%)	144/867 (17%)*	109/877 (12%)
IVB4/5B4: very upset on reminders	155/852 (18%)*	122/876 (14%)	174/864 (20%)**	123/874 (14%)
IVC3/5D1: trouble remembering	86/850 (10%)	75/873 (9%)	87/864 (10%)	73/876 (8%)
IVC4/5D5: loss of interest	156/850 (18%)	148/873 (17%)	194/864 (22%)**	143/876 (16%)
IVC5/5D6: distant, cut-off	182/852 (21%)	157/869 (18%)	198/867 (23%)**	153/878 (17%)
IVD1/5E6: sleep problems	265/849 (31%)	249/869 (29%)	324/864 (38%)*	280/872 (32%)
IVD3/5E5: concentration problems	195/848 (23%)*	164/870 (19%)	219/864 (25%)*	181/878 (21%)
IVD4/5E3: super alert	218/849 (26%)**	141/873 (16%)	240/862 (28%)**	168/875 (19%)
IVD5/5E4: jumpy	140/849 (16%)	115/869 (13%)	176/863 (20%)**	130/877 (15%)

Data are n/N (%). Numerators represent number of individuals who met DSM symptom-scoring criteria (top row) or number who reported symptom at "moderate" or higher level (all other rows). Missing values ranged from 3.6% to 6.9% in survey A and 3.6% to 5.4% in survey B. PTSD=post-traumatic stress disorder. *0<0.05 and **<0.01 comparing PCL items within each survey (eg, survey A PCL-5 vs survey A PCL-S; survey B PCL-5 vs survey B PCL-S). Note that comparisons between first PCLs (survey A PCL-S and survey B PCL-S) showed no significant differences except for three items: loss of interest, sleep problems, and jumpy, which showed somewhat higher endorsement on survey B. Comparison between second surveys (survey A PCL-5 and survey B PCL-5) showed no significant differences on any items.

Table 2: PTSD checklist (PCL) administration order effects (identical symptoms on both PCL versions)

	All soldiers (n=1822)			Deployed in Iraq or Afghanistan (n=946)		
	PCL-5 (DSM-5)	PCL-S (DSM-IV)	κ	PCL-5 (DSM-5)	PCL-S (DSM-IV)	κ
Individual symptoms verbatim from PCL-5 (DSM-5) or PCL-S (DSM-IV)						
DSM-5 B1: repeated disturbing and unwanted memories of the stressful experience	278 (16%)	270 (16%)	0.65	218 (23%)	214 (23%)	0.61
DSM-IV B1: repeated disturbing memories, thoughts, or images of the stressful experience						
DSM-5 B2/DSM4 B2 (unchanged): repeated disturbing dreams of the stressful experience	240 (14%)	236 (14%)	0.65	187 (20%)	186 (20%)	0.63
DSM-5 B3: suddenly feeling or acting as if the stressful experience were happening again (as if you were actually back there reliving it)	158 (9%)	175 (10%)	0.62	118 (13%)	134 (14%)	0.61
DSM-IV B3: suddenly acting or feeling as if the stressful experience were happening again (as if you were re-living it)						
DSM-5 B4/DSM4 B4 (unchanged): feeling very upset when something reminded you of the stressful experience	296 (17%)	278 (16%)	0.64	210 (22%)	206 (22%)	0.62
DSM-5 B5: having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)	251(14%)*	207 (12%)	0.67	208 (22%)*	174 (19%)	0.66
DSM-IV B5: having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience						
DSM-5 C1: avoiding memories, thoughts, or feelings related to the stressful experience (for example, thoughts, feelings, or physical sensations)	301 (17%)	300 (17%)	0.63	217 (23%)	223 (24%)	0.62
DSM-IV C1: avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it						
DSM-5 C2: avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)	284(16%)*	229 (13%)	0.60	209 (22%)*	175 (19%)	0.60
DSM-IV C2: avoiding activities or situations because they reminded you of the stressful experience						
DSM-5 D1/DSM4 C3 (unchanged): trouble remembering important parts of the stressful experience	162 (9%)	159 (9%)	0.68	128 (14%)	130 (14%)	0.67
DSM-5 D2: having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)	274 (16%)*	181 (10%)	0.41	177 (19%)*	128 (14%)	0.41
DSM-IV C7: feeling as if your future somehow will be cut short						
DSM-5 D3 (new): blaming yourself or someone else for the stressful experience or what happened after it	191 (11%)	NA	..	112 (12%)	NA	..
DSM-5 D4 (new): having strong negative feelings such as fear, horror, anger, or shame	263 (15%)	NA	..	173 (19%)	NA	..
DSM-5 D5/DSM-4 C4 (unchanged): loss of interest in activities you used to enjoy	342 (20%)*	299 (17%)	0.71	233 (25%)	220 (24%)	0.74
DSM-5 D6/DSM-4 C5 (unchanged): feeling distant or cut-off from other people	355 (20%)	335 (19%)	0.71	248 (27%)	242 (26%)	0.71
DSM-5 D7: trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)	310 (18%)	305 (18%)	0.63	219 (24%)	228 (24%)	0.64
DSM-IV C6: feeling emotionally numb or being unable to have loving feelings for those close to you						
DSM-5 E1: irritable behaviour, angry outbursts, or acting aggressively	383 (22%)*	443 (26%)	0.68	287(31%)*	330 (35%)	0.65
DSM-IV D2: feeling irritable or having angry outbursts						
DSM-5 E2 (new): taking too many risks or doing things that could cause you harm	162 (9%)	NA	..	115 (12%)	NA	..
DSM-5 E3/DSM4 D4 (unchanged): being "super alert" or watchful or on-guard	381 (22%)	386 (22%)	0.65	283 (30%)	289 (31%)	0.65
DSM-5 E4/DSM4 D5 (unchanged): feeling jumpy or easily startled	291 (17%)	270 (16%)	0.71	230 (25%)	218 (23%)	0.71
DSM-5 E5/DSM4 D3 (unchanged): having difficulty concentrating	383 (22%)	376 (22%)	0.68	262 (28%)	268 (29%)	0.69
DSM-5 E6 /DSM4 D1 (unchanged): trouble falling or staying asleep	573 (33%)	545 (32%)	0.69	389 (42%)	375 (40%)	0.68
Symptom clusters according to DSM						
Meets DSM-5 and DSM-IV B criteria (1 of 5 re-experiencing or intrusion symptoms)	431 (25%)	415 (24%)	0.66	319 (34%)	314 (33%)	0.64
Meets DSM-5 C avoidance criterion (1 of 2 DSM-5 pure avoidance symptoms or 1 of 2 corresponding DSM-IV symptoms)	353 (20%)	334 (19%)	0.63	254 (27%)	247 (26%)	0.61
Meets original DSM-IV C criterion (3 of 7 original DSM-IV symptoms or 3 of 7 corresponding DSM-5 symptoms)	347 (20%)*	305 (18%)	0.69	248 (26%)	227 (24%)	0.69
Meets DSM-5 D criterion (2 of 7 new DSM-5 symptoms)	432 (25%)	NA		291 (31%)	NA	
Meets original DSM-IV D criterion (2 or 5 original hyperarousal DSM-IV symptoms or 2 of 5 corresponding DSM-5 symptoms)	522 (30%)	520 (30%)	0.70	371 (40%)	376 (40%)	0.70
Meets new DSM-5 E hyperarousal criterion (2 of 6 new DSM-5 symptoms)	532 (31%)	NA	..	377 (40%)	NA	..
Meets full DSM PTSD symptom criteria	216 (12%)	224 (13%)	0.67	165 (18%)	177 (19%)	0.66

Data are n/N (%) and κ coefficients for PCL-5-PCL-S agreement. Percentages adjusted for missing values (missing values were no more than 5.5% for any item). NA=not applicable. *Prevalence comparison between PCL-5 and PCL-S showed no significant differences (p<0.05) based on McNemar Test, except for these five symptoms and one cluster.

Table 3: Direct comparison of DSM-5 and DSM-IV-TR symptoms, clusters, and full criteria based on PCL-5 and PCL-S

Survey (developed from Veterans RAND 36-item Health Survey), with physical and mental components weighted according to developers' guidelines.³¹

Statistical analysis

We scanned surveys using ScanTools (National Computer Systems), with quality control verifying error rates below

0.25%, and analysed results using SPSS (version 12.0). We used χ^2 squared analysis for comparisons involving independent groups (eg, Survey A vs B, deployed vs non-deployed), McNemar tests and Cohen's κ measures of agreement for comparisons involving the same individuals (eg, PCL-5 vs PCL-S), and paired t tests (with PCL-S scoring recoded to 0–4) for symptom severity. We identified optimally efficient PCL-5 cutoffs (highest κ coefficients) for selected validated PCL-S cutoffs; if two PCL-5 scores produced nearly identical κ coefficients against a particular PCL-S cutoff (<0.01 difference), we regarded the score most closely matching the PCL-S distribution prevalence as optimum.

Role of the funding sources

The sponsors of the study had no role in the study design, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all data in the study and had final responsibility for the decision to submit for publication.

Results

1822 soldiers completed a survey: 911 received survey A and 911 received survey B. Demographics, deployment histories, and prevalences of screening positive for PTSD, depression, and generalised anxiety were well-matched between groups (table 1).

We recorded statistically significant order effects, but these were highly consistent across the two surveys, with lower endorsement on the second PCL, irrespective of version (table 2). Of nine identical items on the PCL-S and PCL-5, five showed differences between the first and second PCLs on survey A (PCL-S followed by PCL-5), and eight showed differences between the first and second PCLs on survey B (PCL-5 followed by PCL-S). The direction and magnitude of all differences was similar (mean 22%; table 2).

Table 3 combines data from both surveys and compares the prevalence of verbatim symptoms, clusters, and full criteria for all soldiers and those with combat deployment. We recorded no between-group difference in the number of soldiers meeting full symptom criteria when assessing all soldiers and those deployed to Iraq or Afghanistan (table 3), or those with no combat deployment. There was substantial agreement in reporting of individual symptoms ($\kappa > 0.60$ for 16 of 17 symptoms), with no significant differences in prevalence or level of symptom severity for most of the original 17 symptoms. We noted statistically significant differences (consistent for all soldiers and combat-exposed soldiers) for four symptoms that underwent important wording changes, but the magnitude of these differences remained small, and statistical significance might have been due in part to large sample sizes.

The PCL-5 and PCL-S showed identical reliabilities, and nearly identical associations with combat exposure, major depression, generalised anxiety, alcohol misuse, and functional impairment (table 4).

	All soldiers		Deployed in Iraq or Afghanistan	
	PCL-5	PCL-S	PCL-5	PCL-S
Distribution of total PCL scores				
Mean (SD)	11.8 (16.0)	27.2 (14.0)	15.6 (17.8)	30.9 (15.7)
25th, 50th, 75th, 90th, and 95th percentiles	0, 4, 18, 36, 49	17, 21, 33, 49, 59	1, 9, 26, 43, 53	18, 25, 39, 56, 63
Cronbach's reliability	0.96	0.96	0.96	0.96
Deployment history				
PTSD/never deployed (%)	43/668 (6%)	42/658 (6%)	NA	NA
PTSD/other location (%)	8/142 (6%)	5/140 (4%)		
PTSD/Iraq or Afghanistan (%)	165/941 (18%)	177/940 (19%)		
Combat exposure				
PTSD/low combat (%)	NA	NA	20/300 (7%)	27/301 (9%)
PTSD/medium combat (%)			51/305 (17%)	52/304 (17%)
PTSD/high combat (%)			94/336 (28%)	98/335 (29%)
Overlap with major depression (MDD)				
MDD/PTSD (%)	109/216 (50%)	118/224 (53%)	79/165 (48%)	91/177 (51%)
MDD/no PTSD (%)	63/1532 (4%)	55/1512 (4%)	40/776 (5%)	28/763 (4%)
Correlation MDD and PTSD total scores	0.734	0.717	0.730	0.732
Overlap with generalised anxiety disorder (GAD; score ≥ 15)				
GAD/PTSD (%)	80/214 (37%)	84/222 (38%)	59/164 (36%)	65/176 (37%)
GAD/no PTSD (%)	41/1514 (3%)	37/1493 (2%)	29/764 (4%)	23/751 (3%)
Correlation GAD and PTSD total scores	0.785	0.759	0.790	0.775
Overlap with high AUDIT-C score (≥ 8)				
AUDIT-C/PTSD (%)	48/213 (23%)	50/220 (23%)	36/163 (22%)	39/175 (22%)
AUDIT-C/no PTSD (%)	229/1513 (15%)	225/1493 (15%)	112/765 (15%)	108/753 (14%)
VR-12 mental component score (MCS)				
PTSD/ >85 th percentile (%)	4/247 (2%)	2/250 (1%)	2/129 (2%)	1/128 (1%)
PTSD/15th–85th percentile (%)	95/1167 (8%)	103/1154 (9%)	79/606 (13%)	85/608 (14%)
PTSD/ <15 th percentile (%)	111/248 (45%)	111/249 (45%)	81/160 (51%)	87/159 (55%)
Correlation MCS and PTSD total scores	-0.586	-0.543	-0.607	-0.575
VR-12 physical component score (PCS)				
PTSD/ >85 th percentile (%)	26/244 (11%)	21/241 (9%)	17/97 (18%)	14/96 (15%)
PTSD/15th–85th percentile (%)	107/1166 (9%)	122/1163 (10%)	83/631 (13%)	99/633 (16%)
PTSD/ <15 th percentile (%)	77/252 (31%)	73/249 (29%)	62/167 (37%)	60/166 (36%)
Correlation PCS and PTSD total scores	-0.312	-0.295	-0.306	-0.285
Walter Reed Functional Impairment Scale (WRFIS; tertiles)				
PTSD/high functioning (%)	11/590 (2%)	13/585 (2%)	9/282 (3%)	12/282 (4%)
PTSD/moderate functioning (%)	41/635 (6%)	39/625 (6%)	30/324 (9%)	27/323 (8%)
PTSD/low functioning (%)	162/513 (32%)	170/516 (33%)	124/328 (38%)	136/329 (41%)
Correlation WRFIS and PTSD scores	0.585	0.565	0.578	0.569
Data are n/N (%) or within-group correlation coefficients unless otherwise stated. Higher scores on MCS and PCS represent higher functioning, whereas higher scores on WRFIS represent worse functioning. None of the prevalence comparisons between PCL-5 and PCL-S (ie, all soldiers PCL-5 vs PCL-S or deployed soldiers PCL-5 vs PCL-S) was statistically significant. We calculated correlations between PCL total scores and other continuous clinical measures within each column using the Pearson method. NA=not applicable.				
Table 4: Associations between clinical measures and screening positive for post-traumatic stress disorder (PTSD) by the PCL-5 or PCL-S				

Although we noted substantial agreement between PTSD screening criteria ($\kappa = 0.67$), of 221 soldiers who met DSM-IV-TR symptom criteria by PCL-S, 67 (30%)

	Total meeting criteria	Met both DSM criteria	Met only DSM-IV-TR criteria	Met only DSM-5 criteria	κ coefficient
All soldiers (n=1707)					
PTSD by PCL-5	221 (13%)	154 (9%)	67 (4%)	59 (3%)	0.67
PTSD by PCL-5	213 (13%)				
PCL-5 ≥ 30	504 (30%)	415 (24%)	89 (5%)	90 (5%)	0.75
PCL-5 ≥ 15	505 (30%)				
PCL-5 ≥ 40	285 (17%)	221 (13%)	64 (4%)	55 (3%)	0.75
PCL-5 ≥ 28	276 (16%)				
PCL-5 ≥ 44	233 (14%)	182 (11%)	51 (3%)	54 (3%)	0.74
PCL-5 ≥ 32	236 (14%)				
PCL-5 ≥ 50	164 (10%)	128 (8%)	36 (2%)	35 (2%)	0.76
PCL-5 ≥ 38	163 (10%)				
Deployed in Iraq or Afghanistan (n=937)					
PTSD by PCL-5	176 (19%)	123 (13%)	53 (6%)	42 (4%)	0.66
PTSD by PCL-5	165 (18%)				
PCL-5 ≥ 30	379 (40%)	321 (34%)	58 (6%)	59 (6%)	0.74
PCL-5 ≥ 14	380 (41%)				
PCL-5 ≥ 40	230 (25%)	182 (19%)	48 (5%)	46 (5%)	0.73
PCL-5 ≥ 27	228 (24%)				
PCL-5 ≥ 44	190 (20%)	151 (16%)	39 (4%)	39 (4%)	0.74
PCL-5 ≥ 31	190 (20%)				
PCL-5 ≥ 50	134 (14%)	105 (11%)	29 (3%)	19 (2%)	0.78
PCL-5 ≥ 38	124 (13%)				

Figure: PCL-5 cutoff scores validated in previous studies and corresponding optimum PCL-5 cutoffs* (complete data only)

Data are n (%) unless otherwise stated. *Optimal PCL-5 cutoffs for each PCL-5 cutoff were defined as the most efficient (highest) κ coefficients. If two coefficients were nearly identical (<0.01 difference), the highest κ value that also matched the PCL-5 distribution prevalence was selected as the optimum matching cutoff score.

did not meet DSM-5 criteria by PCL-5, and 59 additional soldiers only met DSM-5 criteria (figure); overall, 126 (45%) of 280 soldiers meeting either criteria had discordant results. Results were similar for soldiers with combat deployments ($\kappa=0.66$). Order effects did not explain the discordance. Of 95 soldiers who met DSM-5 criteria on Survey A (the second PCL), 22 (23%) did not meet DSM-IV-TR criteria from the first PCL on that same survey; of 101 soldiers who met DSM-IV-TR criteria on Survey B, 19 (19%) did not meet DSM-5 criteria.

The most common reason for not meeting DSM-5 criteria among the 67 soldiers was not reporting one of two DSM-5 C avoidance symptoms; 38 (57%) met DSM-5 criterion B, 14 (21%) met criterion C, 40 (60%) criterion D, and 46 (69%) met criterion E. The most common reason for not meeting DSM-IV-TR criteria among the 59 soldiers was not reporting three of seven DSM-IV-TR C avoidance symptoms; 33 (56%) met DSM-IV-TR criterion B, 12 (20%) met criterion C, and 42 (71%) met criterion D.

Optimally efficient PCL-5 cutoffs against four validated PCL-5 cutoffs were nearly identical overall and for soldiers with combat deployment ($\kappa=0.73-0.78$). At each cutoff, a similar number of soldiers had discordant results in either direction, with substantial discordance even at the most stringent cutoffs. Overall prevalence ranged widely with increasingly specific cutoffs (30–10% overall, 41–13% for combat deployed), with higher specificity cutoffs (PCL-5

44 or 50, or symptom cluster method) expected to be most accurate in this population survey.^{17,18}

Additional analysis (not shown) showed that total PCL-5 score that achieved optimum efficiency against the DSM-5 definition was 33 for all soldiers ($\kappa=0.82$) and 34 for deployed soldiers (0.80); compared with the DSM-IV-TR definition a PCL-5 score of 34 was optimum for all soldiers and combat deployed (0.69 for both).

Discussion

In this large population of infantry soldiers comparable to other infantry samples,^{21–23,25} DSM-5 and DSM-IV-TR PTSD symptom criteria performed nearly identically, and in most instances the wording changes did not affect soldiers' propensities to report symptoms. However, our findings show that the new criteria did not have greater clinical utility, a conclusion based on nearly identical overlap with other psychiatric disorders and association with functional impairment.

Although the two scales were highly comparable on the population level, with κ scores representing substantial agreement (0.66–0.78), the underlying discordance level has important implications for clinical assessment and treatment. More than 30% of soldiers who met the symptom criteria under DSM-IV-TR did not meet DSM-5 criteria, and an equivalent number met criteria only under DSM-5. We noted similar findings with various PCL cutoffs; at the highest specificity cutoffs, about 20% who met criteria by one scale did not meet criteria by the other. To what degree discordance in this study was directly due to criterion changes is not entirely clear. The 0.67 agreement level was as good or better than most test–retest studies of the original PCL and gold standard diagnostic instruments, such as the CAPS.^{17,18,32} However, the discordance seen in our sample was most strongly correlated with not meeting criterion C (a finding consistent with other studies^{8,11,14}), and was evident even in individuals who met the DSM definition on their second PCL administration, indicating that repeat testing is an unlikely explanation for the discordance.

Our findings mirror those from the only DSM-5 clinician test–retest study. At the Houston VA–Menninger field site where a κ score of 0.69 for clinician diagnoses was documented, 42% of patients were considered to have PTSD (47% by DSM-IV-TR);¹⁶ however, 79% of these patients received a PTSD diagnosis by either clinician; thus almost half of clinician DSM-5 PTSD diagnoses were discordant.

An important limitation of our study was the absence of a comparison with a structured diagnostic interview. However, we think that our findings make an important clinical and public health contribution. First, no matter what PCL-5 cutoffs end up being validated in the future using gold-standard measures, those results will not change the distribution of PCL-5 scores in this military population, nor its comparison with the original validated PCL. The PCL is the most extensively used screening

instrument in civilian, military, and veteran populations.^{17,19,21–25} Having a direct calibration (item-by-item and overall distribution) will remain valuable for studies of prevalence in military populations irrespective of which cutoffs are established in future studies. Second, although a DSM-5 version of the CAPS is available, it is itself in the process of validation. Third, the literature is replete with studies using gold-standard instruments (CAPS, CIDI, SCID, MINI) that have clearly shown that there is no uniform cutoff for any self-report screening instrument, including the PCL.^{17–19} Optimum cutoffs vary widely depending on the population (ie, general, primary care, specialty mental health), purpose (ie, clinical screening, population prevalence estimate, monitoring treatment effectiveness), and expected prevalence, leading to wide ranging recommended cutoffs (30–50 on original measure).^{17,18} The new PCL-5 is no different, as our findings show, drawing attention to the importance of understanding these test properties to make educated decisions on optimum use. Finally, clinicians are already using the new PCL-5, on the basis of recommendations from the Department of Veterans Affairs, and this study establishes benchmark psychometrics against the original scale in a relevant population.

Another potential limitation was the inability to study the effect of changes to the A trauma criterion. However, clinicians generally agree (supported by the Department of Defense and Veterans Affairs policies) that service in an active warzone is sufficient to qualify for this criterion, and thus the recent A criterion changes are not expected to affect prevalence as they would in a civilian population.

The randomised design minimized test–retest biases and confirmed the necessity of controlling for order effects, the importance of which is often under-appreciated. Many studies have relied on extrapolations of DSM-IV-TR measures or have appended existing scales with new DSM-5 symptoms without fully considering the potential for outcomes to be affected by order effects or lack of independence of new items from the original scales.^{3,8,10–12,15}

Additional strengths of our study included anonymous surveys to encourage honest reporting,³³ high consistency across multiple variables, and large sample including non-deployers with a prevalence consistent with the general population, as well as combat exposed soldiers.

A range of PCL-5 cutoffs from 15 to 38 performed similarly to PCL-S validated cutoffs of 30 to 50,^{17–19} with PCL-5 scores of 31–32 and 38 providing optimum agreement with the two best established PCL-S cutoffs (44 and 50), and 33–34 providing optimum agreement with both DSM criteria. These results are consistent with preliminary recommendations from the Department of Veterans Affairs.²⁰ Similar to recommendations for the original PCL, lower PCL-5 cutoffs (<31) could be used in some clinical settings to maximise the identification of individuals with PTSD, but will yield high false-positive rates and unnecessary clinical assessments, especially in general or primary care populations where prevalence is

Panel: Research in context

Systematic review

The definition of post-traumatic stress disorder (PTSD) underwent substantial changes in the 2013 edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). However, it is unknown how this will affect prevalence, whether clinical utility has been improved, and how many individuals who meet symptom criteria according to the previous definition will not meet new criteria. Updated screening instruments, including the PTSD checklist (PCL), lack head-to-head comparisons with previously validated methods. The very limited number of published studies involving the new definition, as well as unpublished meeting presentations, were reviewed, and many gaps in the literature were identified.

Interpretation

This is the first direct comparison of DSM-5 and DSM-IV-TR PTSD symptom criteria based on the most widely used screening instrument in a large sample of infantry soldiers. The encouraging finding is that the original and updated PCL instruments performed nearly identically, and in most instances the DSM-5 revisions did not significantly affect soldiers' propensities to report symptoms. However, the DSM-5 PTSD symptom criteria did not seem to have greater clinical utility compared with DSM-IV-TR, based on nearly identical overlap with other psychiatric disorders and functional impairment. More than 30% of soldiers who met criteria under DSM-IV-TR did not meet DSM-5 criteria, and an equivalent number met criteria only under DSM-5. From a clinical and policy perspective, these findings raise fundamental concerns as to whether changing the PTSD definition (a definition proven to be highly useful in guiding treatment for more than 25 years) will actually enhance diagnosis and clinical care, and what this means for current and future generations of veterans. In addition to relying on clinical judgment, clinicians should recognise the subjectivity involved in developing consensus-based diagnoses, gather relevant assessment and clinical data, and document which diagnostic criteria they apply.

low relative to specialty mental health care populations.^{17,18} A cutoff of 38 is recommended for accurately measuring population prevalence^{17,18} consistent with previous military studies.^{21–25}

In view of the discordant findings seen in this PCL-based study and the one clinician test–retest study, clinicians will need to consider how to manage discordant results,¹⁶ particularly for service members and veterans with PTSD who no longer meet criteria under DSM-5. Although the Department of Defense and Veterans Affairs issued policy that existing diagnoses will not be changed based on DSM-5, crucial questions remain, including whether PTSD is in fact more closely related to adjustment disorder than anxiety disorders, as implied by their new association in the trauma and stressor-related disorders chapter. DSM-5 recommends use of the adjustment disorder diagnosis for individuals with sub-threshold

symptoms, which would include those who meet the previous definition but not the current one. However, this label carries a particularly pejorative connotation in the US military, where adjustment disorder of less than 6 months can lead to administrative separation without benefits,³⁴ and chronic adjustment disorder conveys a message of weakness and failure to adapt.

In summary, the new PCL-5 seems equivalent to the original PCL-S. The PCL-5 can be scored per DSM-5 criteria or as a continuous measure. However, from a clinical and policy perspective, our findings concerning discordance, and absence of differences in overlap with other disorders and impairment raise fundamental concerns as to whether changing the PTSD definition (a definition proven to be highly useful in guiding treatment for more than 25 years) will enhance diagnosis and clinical care, and what this means for current and future generations of veterans. In addition to relying on clinical judgment, clinicians should recognise the subjectivity involved in developing consensus-based diagnoses, gather relevant assessment and clinical data, and document which diagnostic criteria they apply.

Contributors

CWH, LAR, and JEW designed the study. CWH and FWW undertook the search of published works, and FWW provided the final DSM-5 study instrument. LAR and JEW coordinated the study with the IRB, oversaw data collection, and supervised survey scanning and preparation of the dataset. CWH did the analysis. All authors (CWH, LAR, JEW, RKH, and FWW) contributed to the analytic strategy and interpretation of the data, with important statistical input from RKH and FWW. CWH drafted the paper. All authors provided critical revisions to the manuscript.

Declaration of interests

We declare no competing interests.

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