Development of a Scale to Broadly Assess Stress Reaction Symptoms Beginning in the Early Aftermath of Trauma: The Walter Reed EvaluatioN for Stress (WRENS) Scale

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Introduction

- Acute traumatic stress symptoms (ATSS) include somatic as well as psychological symptoms. ATSS impair acute function and severity of acute symptoms predicts symptom persistence.
- Current ATSS scales are limited by inability to use until days after symptom onset, lack of assessment of somatic symptoms that have been demonstrated to be common and to contribute to acute dysfunction.
- The Walter Reed EvaluatioN Stress (WRENS) scale was developed to address these limitations.

Methods

- Somatic and psychological domains and domain items were identified from the literature and expert opinion.
- Item characteristics, internal consistency of items, and scale validity were initially assessed using data from a large-scale longitudinal study (the AURORA study, characteristics of included participants shown in Table 1) evaluating adverse symptom development among individuals presenting to the emergency department (ED) after traumatic stress exposure (most commonly MVC).
- Mean, variance and adjusted item-total correlation were used to evaluate each item. Cronbach's alpha and mean inter-item correlation (MIIC) were used to assess internal consistency. Validity was evaluated via correlations of WRENS with ASD (x weeks), PTSD (6 weeks), Sheehan disability score (2 weeks), Physical/Mental Health (SF-12, 2 weeks)[1].

Table 1: Participant Characteristics

Characteristic	
Number of Participants	1,644
Age, Mean (SD)	34.9 (12.6)
Female, n (%)	1099 (67)
Race, n (%)	
Non-Hispanic Black	860 (52)
Non-Hispanic White	502 (31)
Hispanic	212 (13)
Other	61 (4)
Marital Status, n (%)	
Married	336 (20)
Separated/Divorced/Willowed	270 (16)
Single	1029 (63)
Income, n (%)	
<=$19,000	457 (28)
$19,000-$35,000	465 (28)
$35,000-$50,000	202 (12)
$50,000-$75,000	133 (8)
$75,000-$100,000	89 (5)
>$100,000	93 (6)
Employment Status, n (%)	
Employed	1115 (68)
Retired/Homemaker/Student	170 (7)
Unemployed	225 (14)
Education Status, n (%)	
High school or less	620 (38)
Some college	692 (42)
College or more	332 (20)

Table 2: The 36 questions in the final Walter Reed EvaluatioN Stress (WRENS) scale. Part A (20 questions) designed to be administered any time after trauma, part B (16 questions) designed to be administered after 24 hours.

Domain	Question	Mean	SD	Adjusted Item Total Correlation
Social Withdrawal	1. In the past few days, how much of the time did your physical health or emotional problems interfere with your social activities, like visiting friends or relatives?	4.81	3.16	0.51
Irritability	2. Over the past 24 hours, how often did you feel irritable, having angry outbursts, or acting aggressively?	3.56	3.22	0.60
Dissociation	3. Over the past 24 hours, how often did people, objects, or the world around you seemed strange or unreal	2.18	2.73	0.57
	4. Over the past 24 hours, how often did you feel as if you were in a dream?	3.60	3.80	0.37
	5. Over the past 24 hours, how often did you feel like you were not experiencing the normal passage of time?	4.04	3.71	0.34
	6. Over the past 24 hours, how often did you feel as if the events around the event were happening to someone else?	1.94	3.18	0.30
	7. Over the past 24 hours, how often did you feel as if you were watching yourself?	2.22	3.32	0.37
	8. Over the past 24 hours, how often did you feel like you were in a daze	4.70	3.53	
Pain	9. How would you rate your pain in the last 24 hours on average?	6.42	2.13	0.37
	10. How would you rate your pain in the last 24 hours at its worst?	7.29	1.97	
	11. When you were in pain in the past 24 hours, how much did you think about it hurting?	7.12	2.27	
	12. When you were in pain in the past 24 hours, how much did you think about how badly you wanted the pain to stop?	7.40	2.58	
Anxiety	13. Over the past 24 hours, how often did you have severe anxiety or panic?	3.58	3.06	0.69
	14. Over the past 24 hours, how often did you feel very nervous, worried, or anxious?	5.06	3.10	0.71
Hyperarousal	15. Over the past 24 hours, when were you "super-alert" or watchful, or on guard?	5.82	3.24	0.52
	16. Over the past 24 hours, how often did you feel jumpy or easily startled?	4.55	3.28	0.67
Rumination	17. Over the past 24 hours, how often did you feel distant or cut off from other people?	4.02	3.28	0.65
Depression	18. Over the past 24h, how often did you feel down on yourself, no good, or worthless?	3.81	3.32	0.65
	19. Over the past 24h, how often did you feel sad, depressed, or empty?	4.82	3.21	0.70
	20. Over the past 24h, how often did you have trouble experiencing positive feelings (e.g. being unable to feel happiness or having loving feelings for people close to you)	3.39	3.12	0.66
Somatic Symptom	21. Over the past 24 hours, how much of a problem have you had with headaches?	5.23	3.28	0.43
	22. Over the past 24 hours, how much of a problem have you had with dizziness?	3.04	3.07	0.50
	23. Over the past 24 hours, how much of a problem have you had with nausea?	2.42	2.97	0.45
Concentration/ Thinking/ Fatigue	24. Over the past 24 hours, how much of a problem have you had with fatigue?	5.43	2.85	0.49
	25. Over the past 24 hours, how much of a problem have you had concentrating?	5.08	2.95	0.59
	26. Over the past 24 hours, how much of a problem have you had taking longer to think?	4.80	3.03	
Avoidance	27. Over the past 24 hours, how often did you avoid memories, thoughts, or feelings related to the event?	4.72	3.07	0.53
	28. Over the past 24 hours, how often did you avoid external reminders of the event? (e.g., people, places, conversations, or activities)	4.47	3.19	0.55
Re-experiencing	29. Over the past 24 hours, how often did you have repeated, disturbing, and unwanted memories of the event?	5.31	3.21	0.66
	30. Over the past 24 hours, how often did you feel very upset when something reminded you of the event?	5.59	3.15	0.66
	31. Over the past 24 hours, how often did you have strong physical reactions when something reminded you of the event, like heart pounding, trouble breathing, or sweating?	4.42	3.26	0.69
Sleep Discontinuity	32. Over the last few nights, how much of a problem have you had falling asleep?	4.92	2.94	0.47
	33. Over the last few nights, how much of a problem have you had staying asleep all night?	5.31	2.97	0.48
	34. Over the last few nights, how much of a problem have you had waking up too early in the morning?	4.86	3.15	0.42
Nightmare	35. Over the last few nights, how much of a problem have you had with nightmares or bad dreams about the event?	3.00	3.24	0.62
	36. Over the last few nights, how much of a problem have you had with nightmares or bad dreams about other things?	2.50	2.95	0.51
	37. Over the last few nights, how much of a problem have you had with panic attacks during the night?	1.82	2.64	0.59
Self-Regulation	38. In the past few days, how often did you stop doing the things you wanted to do?	5.37	2.99	
	39. In the past few days, how often did you try to control your thoughts and feelings?	5.81	2.82	0.60
	40. In the past few days, how often did you make yourself think about things in a way to make you stay calm?	5.74	2.98	0.56
	41. In the past few days, how often did you simply notice your feelings and continue with what you were doing?	5.47	2.56	0.33
	42. In the past few days, how often did you find it hard to communicate clearly what you wanted to say to people?	4.68	3.22	
Emotional Numbing	43. Over the past 24 hours, how often did you find yourself "re-hashing" the circumstances related to the event in your mind?	6.11	3.13	0.58

A. Question can be asked within 24 hours of trauma.
B. Question can be asked within a few days of trauma.
D. Question was dropped:

Results

- The 36 questions in the final Walter Reed EvaluatioN Stress (WRENS) scale. Part A (20 questions) designed to be administered any time after trauma, part B (16 questions) designed to be administered after 24 hours (Table 2).
- Initial WRENS scale Cronbach's alpha = 0.94 and MIIC = 0.39, suggesting good internal consistency and reliability.
- Correlations high between WRENS and ASD (0.79) and PTSD (0.83). Similar results are found for the scale using Part A questions (Table 3). These results suggest a high level of convergent validity.
- For the whole scale, correlations with pain, acute disability, depression, and somatic symptoms ranged from 0.40 to 0.73. Similar results are observed for the scale using Part A questions (Table 3). These results indicate good concurrent validity.

Conclusions

- Initial results suggest that the WRENS scale has good internal consistency and reliability and a high level of convergent and concurrent validity.
- In general, the WRENS scale demonstrated similar strength of association as ASD for acute impairment of mental function, and increased association with acute impairment of physical function.
- Further development and testing of the WRENS scale, and other scales that assess the severity of acute stress symptoms, are needed.

References

[1] Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. Front Public Health. 2018 Jun 11;6:149. doi: 10.3389/fpubh.2018.00149. PMID: 29942800; PMCID: PMC6004510.

Table 3: Scale Validity Evaluation using Pearson Product-Moment Correlation

Scale	ASD[1]	PCL-5[2]		SF-12 PCS[3]		SF-12 MCS[4]		NRS Pain Score[5]		SDS Total Score[6]		Depression Short Form - 8b T Score		Somatic Symptom Total Score[7]	
	Week 2	Week 2	Month 3	Week 2	Month 3	Week 2	Month 3	Week 2	Month 3	Week 2	Month 3	Week 2	Month 3	Week 2	Month 3
Scale using Part A 20 Questions	0.76	0.81	0.61	-0.16	-0.21	-0.61	-0.44	0.37	0.30	0.45	0.42	0.71	0.54	0.73	0.53
Scale using All 36 Questions	0.79	0.83	0.63	-0.19	-0.22	-0.63	-0.45	0.40	0.31	0.50	0.45	0.71	0.53	0.73	0.53

* p-values for all correlations are smaller than 0.05.
[1] Acute Stress Disorder (ASD) scale is only available at week 2 timepoint.
[2] Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL-5)
[3] 12-Item Short Form Health Survey (SF-12) Physical health score
[4] 12-Item Short Form Health Survey (SF-12) Mental health score
[5] Numeric Rating Scale (NRS) Pain Score
[6] Sheehan disability scale (SDS) total score
[7] Pennebaker Inventory of Limbic Languidness (PILL) and The Rivermead Post-Concussion Symptoms Questionnaire (RPQ) were used for somatic symptoms

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