

Assessing Acute Stress Reactions in Real Time: Validation of the SMART Tool for Operational Readiness

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Introduction

- Acute Stress Reactions (ASRs) are common in operational environments. One valuable tool to assess / study / understand ASRs are self-report assessments.
- Despite evidence that somatic symptoms are a core feature of ASRs and impair performance, such symptoms are not assessed in current measures (e.g., Acute Stress Disorder Scale).
- The **Stress Monitoring and Response Tool (SMART¹)** was developed to create a brief ASR self-report assessment that captures somatic as well as emotional, cognitive, and behavioral ASR domains.
- This study evaluates the validity of the SMART.

Methods

- The SMART was created using data from a large-scale observational study of civilian trauma survivors (AURORA trauma survivor cohort)²
- The SMART includes a 23-item Core Scale that can be administered any time after traumatic stress exposure, including in the immediate aftermath of exposure. It also includes 11 supplemental items that capture additional ASR symptoms that emerge 24 or later after trauma
- Civilian trauma survivors (N = 383) presenting to one of four trauma center emergency departments were enrolled
- Trauma survivors completed the SMART 1 hour, 2 days, and 7 days after enrollment. Survivors also completed additional assessments of psychological, physical, sleep, and neurocognitive functioning.
- Using these data we evaluated internal consistency, convergent and predictive validity, and sensitivity to change

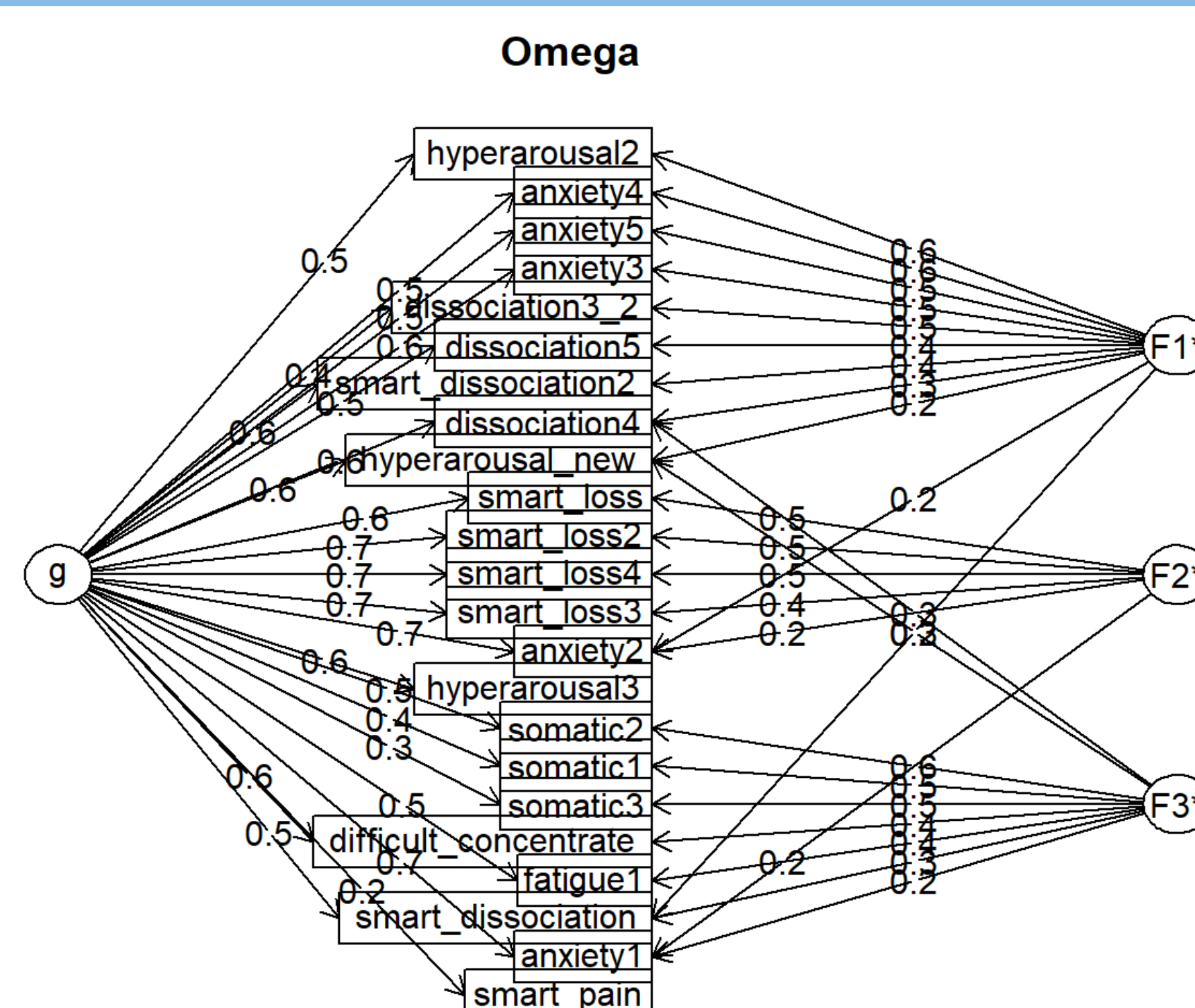


Figure 1. Omega reliability of SMART at 1 hour after trauma. $\omega = .95$

Table 1. The SMART demonstrated convergent validity with Subjective Units of Distress and Acute Stress Disorder assessments.

	1-hour SMART	2-day SMART	7-day SMART
2-day SMART	.71***		
7-day SMART	.62***	.73***	
1-hour SUDS	.44***	.34***	.24**
2-day SUDS	.54***	.63***	.36***
7-day SUDS	.52***	.61***	.61***
2-day ASD	.57***	.77***	.69***
7-day ASD	.56***	.66***	.79***

*** $p < .001$

Table 2. One hour SMART scores were strongly associated with later symptoms

	Physical health		Mental health		Sleep difficulties	
	2 days	7 days	2 days	7 days	2 days	7 days
SMART (1 hour)	-.43***	-.49***	-.52***	-.56***	.57***	.48***

*** $p < .001$

Table 3. Higher SMART scores were associated with worse neurocognitive functioning in domains highly relevant to warfighting.

SMART assessment	Quality of evidence accumulation (drift rate, v)	Cautious responding (boundary, a)	Processes outside of decision-making (non-decision time, t)
1-hour	-.16*	.10	-.08
2-day	-.06	.11	.10
7-day	-.04	.23**	.02

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4. In within-subject analyses, changes in SMART symptom burden over time was associated with changes in Subjective Units of Distress (SUD) scores.

SMART assessment	r
1-hour to 2-day	.22*
1-hour to 7-day	.34***
2-day to 7-day	.45***

* $p < .05$, ** $p < .01$, *** $p < .001$

Results

- The SMART demonstrated excellent reliability across all time points (McDonalds Omega $\geq .95$, see **Figure 1** for 1-hour Omega).
- Higher SMART scores were consistently associated with greater concurrent distress and acute stress symptoms (r ranged from .44-.79, p 's $< .001$, **Table 1**).
- Early (1-hour) SMART scores predicted later symptoms, including subjective distress, acute stress, sleep disturbances, and reduced physical and mental health (p 's $< .001$, **Table 2**).
- Individuals with elevated SMART scores showed worse neurocognitive functioning in domains critical to warfighting (**Table 3**).
- The SMART was sensitive to change over time: as subjective distress levels improved, SMART scores also improved (**Table 4**).

Conclusions

- The SMART is a reliable and valid stress reaction symptom assessment tool that captures the full spectrum of ASR symptoms
- As a relatively comprehensive and operationally-relevant measure, the SMART can support evaluation of the severity of stress reaction symptoms and the development of interventions to support peak warfighter performance/ optimization and long-term resilience

References

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- McLean, S.A., et al. The AURORA Study: A longitudinal, multimodal library of brain biology and function after traumatic stress exposure. Mol Psychiatry. 2020; 25: 283-296.

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