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Impulsivity and cognitive flexibility as neuropsychological markers for suicidality: A multi-modal investigation among military veterans with Alcohol Use Disorder and PTSD

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Abstract

Objective: To examine relations between self-report and behavioral measures of impulsivity and cognitive flexibility with suicidal ideation and self-harm and suicide attempt history.

Methods: Eighty-seven military veterans who met DSM-5 diagnostic criteria for Alcohol Use Disorder (AUD) and Posttraumatic Stress Disorder (PTSD) were evaluated for current suicidal ideation and self-harm, suicide attempt history, impulsivity, and cognitive flexibility.

Results: Higher levels of self-reported impulsivity were associated with greater suicidal ideation and self-harm, and lower behavioral inhibition was associated with greater likelihood of endorsing a suicide attempt.

Conclusion: Use of multi-modal assessment of impulsivity and cognitive flexibility may aid in suicide screening and intervention among vulnerable and high-risk populations.

Keywords

suicide; posttraumatic stress disorder; alcohol use disorder; impulsivity; cognitive flexibility; veterans

Suicide is a significant public health concern with estimates of 800,000 deaths annually across the globe (World Health Organization, 2018). In the United States (U.S.), suicide is the 10th leading cause of death and claims approximately 45,000 lives each year (Centers for Disease Control and Prevention, 2017). U.S. veterans are at an increased risk for suicide compared to the general population (Blow et al., 2012; Kaplan, Huguet, McFarland, & Newsom, 2007). Though they made up only 8.5 percent of the U.S. adult population in 2014, veterans accounted for 17.8 percent of total adult suicides across the country (U.S. Department of Veterans Affairs, 2017). There is also evidence that veterans with Posttraumatic Stress Disorder (PTSD) or a Substance Use Disorder (SUD) are at an elevated

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risk for suicide compared to those without either disorder (Ilgen et al., 2010; Krysinska & Lester, 2010; Pompili et al., 2013).

The term “suicide,” referring to a person’s death caused by themselves, represents one facet of a broad web of nomenclature, including other phenomenon such as self-harm behaviors, suicidal gestures, and ideation (Gvion & Apter, 2011). Collectively, these terms will be referred to as “suicidality” or “suicidal behavior.” Recent initiatives by the U.S. Department of Veterans Affairs have identified suicide prevention as a leading priority for veterans (U.S. Department of Veterans Affairs, 2018). Various factors, including impulsivity (Smith et al., 2008) and cognitive flexibility (Miranda, Gallagher, Bauchner, Vaysman, & Marroquín, 2012), have been evaluated for their contribution to suicidal behavior (Beghi, Rosenbaum, Cerri, & Cornaggia, 2013; LeardMann, 2013). Burgeoning evidence suggests that neuropsychological markers can help researchers and clinicians better understand and treat psychopathology (Cuthbert, 2014). Given that suicidality is prevalent across SUD and PTSD populations, gaining a better understanding of the common underlying neuropsychological risk factors at play may lead to more effective interventions and risk management strategies.

Impulsivity is the tendency to act without planning or consideration of consequences (Evenden, 1999). Despite extant literature identifying impulsivity as a risk factor for suicidal behavior (Dougherty et al., 2004; Giegling et al., 2009; Liu, Trout, Hernandez, Cheek, & Gerlus, 2017; Smith et al., 2008), a recent meta-analysis found that impulsivity has only a small relationship with suicidality (Anestis, Soberay, Gutierrez, Hernandez, & Joiner, 2014). Mixed findings with respect to the link between impulsivity and suicide attempts may also be accounted for by a subtypes model of suicide. In this model, some individuals may consider suicide in a more impulsive, stress-response behavior, and others may tend to exhibit longer-term suicidal thoughts, such as in individuals with major depressive disorder (Bernanke, Stanley, & Oquendo, 2017. Alternatively, discrepant findings may be explained by differences in selected measurement modality or the particular facet of suicidal behavior assessed by the study (Anestis et al., 2014; Klonsky & May, 2014). Studies assessing the relationship between impulsivity and suicidality often use either self-report instruments (Kleiman, Riskind, Schaefer, & Weingarden, 2012) or behavioral tasks (Jollant, Lawrence, Olié, Guillaume, & Courtet, 2011). Both modalities hold a unique association with external “real-world” behaviors, yet they often have little to no correlation with one another (Cyders & Coskunpinar, 2011; Sharma et al., 2014). Thus, multi-modal assessment strategies may offer important insights as to how different facets of impulsivity relate to suicide risk.

Cognitive flexibility and its counterpart, cognitive rigidity or inflexibility, characterize an individual’s ability to modify thinking and generate solutions in response to changing environmental factors (Schotte & Clum, 1987). Prior research has revealed an association between cognitive rigidity and suicidal behavior (Miranda et al., 2012; Jollant et al., 2011; Westheide et al., 2008). In addition to having distinguished individuals with a history of high-lethality suicide attempts (e.g., requiring intensive care) from non-attempters and low-lethality attempters (e.g., some degree of physical harm; Keilp et al., 2001), cognitive rigidity has predicted future suicidal ideation in individuals with previous attempts (Miranda et al., 2012). These findings add credence to theories suggesting that cognitive variables may underlie and act as mechanisms for suicidal behavior (Ellis & Rutherford, 2008). For

example, rigidity of thinking may render it difficult for an individual to adjust in the face of distress and identify alternative plans for coping. However, this risk factor has not been widely studied across various high-risk clinical populations or in combination with impulsivity.

Combining behavioral and self-report measures of impulsivity and cognitive flexibility offers a unique way to better understand two salient mechanisms that contribute to suicidal behavior. Previous studies have demonstrated that impairments in these domains may be linked to risk of suicide (Keilp et al., 2013; Richard-Devantoy, Ding, Lepage, & Turecki, 2016). However, other researchers highlight the problem of need for more data before generalizable conclusions can be made about these relationships (Saffer & Klonsky, 2018). Accordingly, the current study seeks to contribute to the literature using a multi-modal examination of a clinical population known to experience elevated levels of suicidality, veterans with alcohol use disorder and co-occurring PTSD (Jakupcak et al., 2009; Pietrzak et al., 2010; Pompili et al., 2013). Facets of suicidality considered in this analysis involve suicidal ideation, self-harm, and history of suicide attempts. The first objective was to assess the unique contribution of self-report and behavioral tasks measuring impulsivity and cognitive flexibility in explaining suicidal behavior (i.e., self-reported suicidal ideation, self-harm, and suicide attempt history). It was expected that impulsivity would be positively associated and cognitive flexibility would be negatively associated with suicidal behavior, respectively, or specifically, that increased impulsivity and decreased cognitive flexibility would be linked with increased levels of suicidal ideation and self-harm, as well as with a history of suicide attempts The second objective was to determine if these neuropsychological markers predicted suicidality (suicidal ideation, self-harm, and suicide attempt history) six weeks later.

Methods

Participants

Participants were 87 United States military veterans (*M*age = 40.25, *SD* = 11.38; 90.8% Male; 53% White, 18% Hispanic, 17% Mixed Race, 8% Black, 1% Asian, 1% Native American, 1% Hawaiian or Pacific Islander). All participants included in this study met diagnostic criteria for current PTSD based on the Clinician-Administered PTSD Scale for DSM–5 (Weathers et al., 2013a) and AUD based on the Mini-International Neuropsychiatric Interview, Version 7.0 for DSM-5 (Sheehan, 2014). Of these 87 participants, 43 (49.4%) indicated that they take medication for sleep, 35 (40.2%) take medication for pain, four take medication for psychosis (4.6%), and 60 (69%) take medication for depression. Further, 44 (50.6%) and 56 (64.4%) indicated that at the time of the initial screening for the study, they were currently in treatment for addiction and for PTSD, respectively. Further, 65 (74.7%) indicated that they were in a controlled environment such as a residential or inpatient facility at the time of screening. Participants (N = 87) completed a baseline visit and 52.9% returned 6-weeks later for a follow up visit (n = 46). The Stanford Institutional Review Board and the Human Research Protection Program at the VA Palo Alto Healthcare System approved the study and all participants provided written, informed consent.

Procedure

Suicidality Assessments.—The Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al., 2007) suicidality subscale was employed at baseline (α = .78) and follow up (α = .85) as a measure of suicidal ideation and self-harm. The IDAS-suicidality subscale is comprised of a 6-items (3-items for suicidal ideation, e.g., "I thought about killing myself"; 3-items for self-harm, e.g., "I cut or burned myself on purpose") to which participants respond using a 5-point Likert scale (1 = "not at all" to 5 = "extremely") to describe how much they felt or experienced each item in the past month. The possible range of scores is 6–30 with higher scores indicating greater suicidality. The IDAS-suicidality subscale displays strong reliability, good consistency, and good convergent and discriminant validity in relation to other measures of these same symptom dimensions, such as the Beck Depression Inventory-II (Watson et al., 2007). Lifetime suicide attempt history was assessed at baseline with a single item in which participants indicated "yes" or "no" in response to the item "Have you ever attempted suicide?". Research assistants were in the room at the time that the questionnaire was filled out and checked responses to ensure that all participants answered this question.

Impulsivity.

Self-report Assessment.: The Impulsivity subscale of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was administered at baseline as a measure of self-reported impulsivity at baseline. The DERS-Impulsivity subscale is comprised of 6, 5-point Likert scale items (e.g., "I experience my emotions as overwhelming and out of control"; "When I am upset, I feel out of control") to which participants response using a 5-point Likert scale ranging from 1 to 5 (1= Almost never [0–10%] to 5 = Almost always [91–100%]). The possible range of scores is 6–30 with higher scores indicating greater perceived impulsivity. Prior research demonstrates that the DERS has high internal consistency, good test–retest reliability, and adequate construct and predictive validity and has been utilized in AUD and PTSD populations (Fox, Hong, & Sinha, 2008; Gratz & Romer, 2004; Tull, Barrett, McMillan, & Roemer, 2007). For the present study, internal consistency was good (α = .87).

Behavioral Assessment.: The Color Word Interference Test of the Delis-Kaplan Executive Function System Tests (D-KEFS; Delis, Kaplan, & Kramer, 2001) was administered at baseline to assess impulsivity. The Interference subtask of the DKEFS-Color Word Interference Test as used in this study is a variant of the Stroop procedure. Prior research demonstrates that D-KEFS tests are a reliable measure of executive function deficits in many clinical populations, including populations with mild cognitive impairment and chronic alcohol use (Delis, Kramer, Kaplan, & Holdnack, 2004). Specifically, in the Inhibition condition of the DKEFS-Color Word Test, participants are asked to name, as quickly as possible, the ink color in which differently colored words are printed. The test captures ability to inhibit a dominant, overlearned and automatic verbal response. The scaled score of the Inhibition condition of the DKEFS-Color Word Interference Test was the primary outcomes used to measure impulsivity, where lower scores indicate more impulsivity.

Cognitive Flexibility.—The Wisconsin Card Sorting Test-64: Computer version 2-Research Edition (WCST) was used to measure cognitive flexibility (Heaton & PAR staff, 2008). This test uses stimulus cards to assess set-shifting as an index of cognitive flexibility. The WCST is a well validated and sensitive measure of executive functioning (Kongs, Thompson, Iverson, & Heaton, 2000). During the task, participants must match a stimulus card to the appropriate card deck based on shape designs and rules that shift throughout the task. The perseverative errors t-score was the primary outcome used to measure cognitive flexibility at baseline.

Covariates.—Participants completed a demographic questionnaire at baseline that assessed age, education, gender, and ethnicity.

AUD Symptoms.: AUD symptom severity in the past year was measured at baseline using the ten-item Alcohol Use Identification Test (AUDIT; Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). The AUDIT measures self-reported problems with alcohol use, including quantity/frequency of alcohol use and degree of hazardous drinking. The possible range of scores on the AUDIT is 0–40, with scores of eight or greater indicating problematic alcohol use. Prior research has supported use of the AUDIT to screen for alcohol use disorder and related symptoms (Allen, Litten, Fertig, & Babor, 1997; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). All participants in this study met criteria for an AUD diagnosis.

PTSD Symptoms.: The Clinician-Administered PTSD Scale for DSM-5 (Weathers et al., 2013) was utilized to measure past month PTSD symptom severity at baseline. The CAPS-5 is a structured interview involving 30-items, administered over approximately 45–60 minutes, that correspond to the PTSD diagnostic criteria in the DSM–5. Each of the 30 symptoms is rated on a 5-point Likert scale (0 = absent, 1 = mild/threshold, 2 = moderate/threshold, 3 = severe/markedly elevated, and 4 = extreme/incapacitating). Interviewers determine severity for each symptom based on the reported intensity and frequency of a symptom over the past month. The sum of the severity scores for all 30 items was used as an index of PTSD symptom severity (possible range of scores 0 – 120). Prior research in veterans demonstrates that the CAPS-5 total severity score has high internal consistency and interrater reliability, and good test–retest reliability (Weathers et al., 2018). It has also demonstrated good convergent validity with total severity score on the CAPS-IV and PTSD Checklist for DSM–5 and good discriminant validity with measures of anxiety, functional impairment, psychopathy, and alcohol abuse (Weathers et al., 2018). All participants in this study met criteria for a PTSD diagnosis.

Data Analysis

Zero-order correlations were conducted to examine relations between measures of impulsivity and cognitive flexibility, and suicidal ideation (IDAS). A series of t-tests were conducted to determine if participants differed on measures of impulsivity and cognitive flexibility as a function of past suicide attempt history. Three hierarchical regression models (HRM; logistic and linear) controlling for covariates were tested to determine the extent to which multi-modal measures of impulsivity and cognitive flexibility explained variance in

suicide outcomes. Measures of impulsivity and cognitive flexibility were entered on Step 1 and AUD and PTSD symptom severity were entered on Step 2. An additional HRM model was performed to determine if cognitive variables at baseline predicted suicidality at 6-week follow up, controlling for suicidal ideation at baseline. Age, gender, education, and race were not associated with suicide outcomes and were removed from the HRM models for parsimony. Baseline suicidality (IDAS) and suicide attempt history did not differ as a function of whether the participants completed the 6-week follow-up visit.

Results

Thirty-three percent of the sample (n = 29) endorsed having had a past suicide attempt. T-tests indicated that cognitive flexibility, as indexed by perseverative errors on the WCST, was lower among those who endorsed a previous suicide attempt ($M = 43.36$, $SD = 6.33$) compared to those with no history of a suicide attempt ($M = 47.55$, $SD = 6.73$), t(79) = 2.773; $p < .01$, $g = 0.63$). Also, DKEFS Inhibition was lower among individuals with a past suicide attempt ($M = -8.59$, $SD = 2.73$) compared to those without history of a suicide attempt ($M = 10.37$, $SD = 2.85$), t(85) = 2.8166; $p < .01$, $d = .64$; Table 1).

Zero-order correlations (see Table 2) revealed that more impulsive emotion regulation difficulties on the DERS impulsivity subscale were associated with higher levels of suicidal ideation and self-harm.

Finally, results from the HRM (see Table 3) indicated that higher levels of self-reported impulsivity on the DERS impulsivity subscale were associated with greater suicidal ideation and self-harm. However, the relationship did not hold after controlling for AUD and PTSD symptom severity. A logistic HRM indicated that lower Inhibition (DKEFS) was associated with a positive history of suicide attempt. In terms of prospective relations, a HRM indicated that impulsivity and mental flexibility at baseline did not predict suicidality 6-weeks later.

Discussion

The results of this study revealed that lower inhibition and cognitive flexibility on behavioral tasks were associated with a positive suicide attempt history. In addition, greater self-reported impulsivity was associated with more self-reported thoughts of suicide and self-harm, but this relation did not hold after accounting for AUD and PTSD pathology. These findings are consistent with previous research implicating the role of cognitive flexibility and impulsivity in suicide risk in individuals with mental illness within the general population (Keilp et al., 2001; Richard-Devantoy, Berlim, & Jollant, 2014; Smith et al., 2008). Difficulty managing impulsivity and maintaining cognitive flexibility may increase risk of impulsive suicidal thoughts and behaviors as these functions are critical for slowing down and identifying alternative actions that yield more optimal outcomes.

Given that previous research has suggested that those who report suicidal ideation and those who actually attempt suicide may represent distinct populations (Bongar & Sullivan, 2013), it is important to include both ideation and attempts in a comprehensive evaluation of suicide risk factors. That different relationships were found for suicidal ideation versus attempts in the present study suggests that there may be neuropsychological factors that differentiate the

two groups. Other researchers also emphasized the study of associations among suicide attempt history and behavioral cognitive measures over the use of suicidal ideation or self-report measures (Keilp et. al., 2013). Further, a recent review of the literature indicated that neuropsychological performance on tasks of inhibition and decision making may distinguish those with suicide attempt history from those who only think about suicide (ideators). However, these same authors hold that there is not yet sufficient and consistent literature to make major conclusions at this time regarding the relationship of cognitive performance for ideators versus attempters (Saffer & Klonsky, 2018). Thus, the present study provides replication of previous findings such as those by Keilp and colleagues (2013). Furthermore, in the present study, multivariate findings linking neuropsychological factors to suicidal ideation and self-harm did not hold longitudinally. This is consistent with the literature demonstrating that suicide risk most often is associated with a short-term crisis (Simon et al., 2001) and as such, neuropsychological assessments may hold more relevance for current suicide risk than future risk. Additional research is needed to determine how neuropsychological factors relate to the context and time course of suicidality as it may help clinicians improve accuracy of risk detection and better-inform intervention practices (National Institute of Mental Health, 2017).

Findings from this study highlight the value of employing multiple modalities of assessment and suggest that inclusion of self-report and behavioral measures may offer a more informed case conceptualization. For example, although significant relations emerged between a self-report measure of impulsivity and self-reported suicidal ideation and self-harm, the same pattern did not occur for behavioral measures. Previous studies have demonstrated that impulsivity is a multidimensional construct, such that self-reported impulsivity (demonstrated on questionnaires) differs from behavioral impulsivity (demonstrated on neuropsychological tasks; Cyders & Coskunpinar, 2011; Reynolds et al., 2006; Sharma, Markon, & Clark, 2017). However, other research has contradicted these findings by demonstrating overlap among self-reported and behavioral impulsivity (Meda et al., 2012). Further research is needed to disentangle the differences between behavioral and self-report measures of impulsivity and how these measurement tools and the constructs they capture impact clinical applications, such as assessment of suicide risk.

Despite multiple strengths of the current study including multimodal and longitudinal assessment within a high-risk clinical population, limitations should be noted. First, the sample is moderately sized for a study involving neuropsychological measures and findings need to be replicated within a larger sample. Given that suicide is a low base rate event, larger samples are also needed for future studies to ensure that results appropriately capture trends among individuals with positive suicide attempt histories. Second, the present study employed a measure that combines suicidal ideation and self-harm into a single scale. These two constructs are distinct in that self-harm often lacks an intent to die and is treated differently in terms of management in a clinical setting (Bongar & Sullivan, 2013), whereas SI is often used clinically as a primary indicator of risk for suicide and need for steps to protect a patient’s safety. Thus, it will be beneficial for future studies to examine suicidal ideation and self-harm using measures that capture them separately. Third, this study relied on a single-item, self-report question to determine if participants had a past suicide attempt. Use of a structured interview format or more detailed suicide risk history may be helpful to

provide additional support for findings in future studies. Fourth, it is important to note that the findings of the present study may not generalize to populations without co-occurring PTSD and Alcohol Use Disorder, or to non-veterans. Fifth, previous research has highlighted the PTSD symptoms of insomnia and nightmares as being associated with suicide risk (Littlewood, Gooding, Panagioti, & Kyle, 2016). Future research could examine associations between these variables with both cognitive and suicidality variables to better-understand suicide risk in this population. Sixth, while the present study examined behavioral task scores at a particular point in time, future research could examine whether change in neuropsychological measures between baseline and retest are associated with change in suicide risk.

Finally, while identifying neural markers has potential to improve clinical assessment and management of suicide risk in vulnerable populations, the same institutions that work with these individuals often are limited by cost, space, lack of trained personnel, and time. Novel solutions are required to democratize access to neuropsychological assessments as it relates to suicide prevention, such as the use of technologies (e.g., use of tablets for rapid assessment administration and intervention delivery) and open-source resources (e.g., NIH toolbox; Gershon et al., 2013). In summary, the current study represents an important step toward improving our understanding of specific neuropsychological factors that may distinguish those who are at risk for suicide from those who are not.

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Table 1.

Demographic and Descriptive Statistics by Suicide Attempt History

	No Suicide Attempt History	Suicide Attempt History	*t*	*Hedges' g*
	n = 29	n = 58		
	M(SD)	M(SD)		
Suicidality				
Baseline Suicidal Ideation and Self-Harm (IDAS Suicidality)	9.1(3.0)	10.2(3.2)	−1.57	−0.35
Baseline Suicidal Ideation and Self-Harm (IDAS Suicidality) at 6-weeks	8.4(2.5)	10.0(3.3)	−1.59	−0.52
Measures				
Self-Reported Impulsivity (DERS)	15.5(5.9)	14.8(5.2)	.54	0.13
Behavioral Impulsivity (DKEFS Inhibition)	10.4(2.9)	8.6(2.7)	2.82**	0.64
Cognitive Flexibility (WCST)	47.5(6.7)	43.4(6.3)	2.77**	0.63
PTSD Symptom Severity (CAPS)	33.2(7.6)	35.9(8.5)	−1.45	−0.33
AUD Symptom Severity (AUDIT)	24.1(8.7)	24.2(11.3)	−.03	−0.01
Demographic Factors				
Age	39.4(11.0)	41.9(12.2)	−.94	−0.21
Education Years	14.2(2.0)	13.5(1.3)	2.17*	0.44
	No Suicide Attempt History	**Suicide Attempt History**	X^2	
	%, N	**%, N**		
Demographic Factors				
Gender Male	62%, 54	29%, 25	1.10	
Ethnicity Caucasian	34%, 30	18%, 16	.09	

** = p < .01;

* = p < .05.

IDAS = Inventory of Depression and Anxiety Symptoms; DERS = Difficulties in Emotion Regulation Scale; WCST = Wisconsin Card Sorting Test; DKEFS = Delis-Kaplan Executive Function System Tests; AUDIT = Alcohol Use Disorders Identification Test; CAPS = Clinician-Administered PTSD Scale for DSM-5.

Table 2.

Correlations between predictors and covariates

	1	2	3	4	5	6	7
1. Ever attempted suicide	-						
2. IDAS Suicidality	.18	-					
3. DERS Impulsivity	−.03	.27*	-				
4. WCST Cognitive Flexibility	−.35**	−.01	.11	-			
5. DKEFS Inhibition	−.32**	−.20	−.12	.18	-		
6. AUDIT AUD Symptom Severity	.02	−.05	.03	.14	.11	-	
7. CAPS PTSD Symptom Severity	.15	.18	.31**	−.02	−.04	.11	-

N =79–84

** = p < .01;

* = p < .05.

IDAS = Inventory of Depression and Anxiety Symptoms; DERS = Difficulties in Emotion Regulation Scale; WCST = Wisconsin Card Sorting Test; DKEFS = Delis-Kaplan Executive Function System Tests; AUDIT = Alcohol Use Disorders Identification Test; CAPS = Clinician-Administered PTSD Scale for DSM-5.

Table 3.

Results from hierarchical multiple regression analyses for suicidality and suicide attempt at baseline and follow-up.

		IDAS Suicidality Baseline					IDAS Suicidality 6-Week					Suicide Attempt			
	Predictor Variables	β	R^2	ΔR^2		Predictor Variables	β	R^2	ΔR^2		Predictor Variables	β(SE)	Wald	OR/ Exp(β)	95% CI
Step 1			.10	.10	Step 1			.10	.10	Step 1	DERS Impulsivity	.27	.25	.87	.51–1.5
	DERS Impulsivity	.24*				DERS Impulsivity		−.17			WCST Cognitive Flexibility	.27	2.7	.64	.38–1.1
	WCST Cognitive Flexibility	−.03				WCST Cognitive Flexibility		.27			DKEFS Inhibition	.26*	3.9	.59	.36–1.0
	DKEFS Inhibition	−.17				DKEFS Inhibition		−.14		Step 2					
Step 2			.10	.01	Step 2			.09	.01		DERS Impulsivity	.30	.96	.75	.42–1.3
	DERS Impulsivity	.22				DERS Impulsivity	−.21				WCST Cognitive Flexibility	.28	2.8	.63	.37–1.1
	WCST Cognitive Flexibility	−.03				WCST Cognitive Flexibility	.27				DKEFS Inhibition	.27*	4.1	.58	.34-.98
	DKEFS Inhibition	−.17				DKEFS Inhibition	−.15				AUDIT AUD Symptom Severity	.26	.36	1.2	.70–1.9
	AUDIT AUD Symptom Severity	−.03				AUDIT AUD Symptom Severity	−.03				CAPS PTSD Symptom Severity	.29	2.1	1.5	.86–2.6
	CAPS PTSD Symptom Severity	.08				CAPS PTSD Symptom Severity	.09								
					Step 3			.17	.08						
						DERS Impulsivity	−.24								
						WCST Cognitive Flexibility	.23								
						DKEFS Inhibition	−.12								
						AUDIT AUD Symptom Severity	−.01								
						CAPS PTSD Symptom Severity	.07								
						Suicidality Baseline	.28								

N =78;

* = p < .05.

IDAS = Inventory of Depression and Anxiety Symptoms; DERS = Difficulties in Emotion Regulation Scale; WCST = Wisconsin Card Sorting Test; DKEFS = Delis-Kaplan Executive Function System Tests; AUDIT = Alcohol Use Disorders Identification Test; CAPS = Clinician-Administered PTSD Scale for DSM-5.