

Investigating Decision-Making in Adolescents who Self-Harm

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Introduction

- Adults who engage in self-harm commonly display difficulties regulating emotions (Chapman et al., 2006) and altered processes for engaging in reward-related decision making (Richard-Devantoy et al., 2013), but less work is available for observing decision-making in adolescents who engage in self-harm.
- The Iowa Gambling Task (IGT) is one of the most widely used measures of decision-making (Bechara et al., 1994; Beitz et al., 2014). There is no agreed upon optimal metric of IGT performance (e.g., Buelow & Suhr, 2009).
- Research suggests two phases within the IGT, decision-making under ambiguity, where deck contingencies are not yet known in the first two blocks, and decision-making under uncertainty, where enough trials have elapsed such that participants have had the opportunity to pick up on the nature of the decks (last three blocks; Brand et al., 2007). These phases show differential relations with executive functions.
- The aim of this study was to evaluate IGT performance in two samples of adolescents who have a history of engaging in NSSI.

Methods

- Participants:** In Study 1, there were 44 participants (28 with a history of depression and NSSI, all female [$M_{Age} = 17.4$]) and in Study 2 there were 178 participants (107 with a diagnosis of depression, of which 58 endorsed a history of NSSI, 117 females [$M_{Age} = 16.5$]). Participants were between 13 and 21 years old. See Table 1 below for more demographic information.
 - Diagnostic status for Study 1 and Study 2 was based on the Kiddie Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version (KSADS). Study 1 NSSI was based on self-reported history of at least 4 lifetime episodes of NSSI (with one in the past month). Study 2 NSSI was a self-report of engagement in NSSI behaviors based off of the KSADS (yes/no).
 - IGT:** Participants completed 5 blocks of 20 trials and were allowed to select from each deck a maximum of 40 times.
- Analyses:** Groups were compared with t-tests or one-way ANOVAs on the three IGT metrics: overall performance, decision-making under ambiguity, and decision-making under uncertainty. Linear mixed effects models were used to estimate the effects of age, gender, IQ (based on the Vocabulary and Matrix Reasoning subtests of the Wechsler Abbreviated Scale of Intelligence), depressive symptoms (based on the Beck Depression Inventory), diagnostic status, block, and this interaction on three IGT performance metrics.

Demographic	Study 1		Study 2		
	Control (N = 16)	Patient (N = 28)	Control (N = 71)	Dep. No Self-Harm (N = 49)	Dep. Self-Harm (N = 58)
Mean Age (SD)	17.48 (2.4)	17.35 (2.3)	16.78 (2.0)	16.56 (2.1)	16.16 (1.7)
Age Range	13-21	13-21	12-19	12-19	12-20
Percent Female	100	100	61	67	71
Mean IQ (SD)	111.07 (10.4) ^a	105.46 (10.9) ^b	112.29 (12.2) ^a	112.0 (14.2) ^a	103.5 (14.9) ^b
Mean BDI (SD)	2.00 (2.4) ^a	30.93 (10.5) ^b	3.18 (3.3) ^a	22.0 (11.6) ^b	24.41 (12.1) ^b

Table 1. Study Demographics Note: Superscripts denote significant differences.

Results

- In Study 1, there was no difference between the groups in overall performance. Interpretation of the best-fitting model indicated a marginal effect of IQ ($p < .10$) on IGT performance.
- A negative interaction between group and block directionally indicated ($p = .14$) that individuals with NSSI did not learn as quickly as controls in the first three blocks of the IGT.
- In Study 2, a one-way ANOVA comparing overall performance between the three groups was marginally significant ($p = .056$). Follow-up t-tests indicated a marginally significant difference between depressed adolescents who do and do not have a history of engaging in self-harm ($p = .05$) where those without self harm demonstrated better decision-making. This difference appeared to be driven by decision-making under the uncertainty phase.
- In Study 2, there were no patient group differences in the three performance metrics (where the control group was the reference group) using mixed effects models. Intelligence was a significant predictor of overall performance and decision-making under uncertainty.

Discussion

- In both studies, there is subtle evidence that motivated learning is atypical in those who are suffering from depression and engaging in self-harm. The neurocognitive and affective mechanisms warrant further examination.
- Future studies should control for intelligence when comparing patient and control groups, given lower intelligence observed in those who self-harm and the role of intelligence in later IGT trials. Worse performance in the uncertainty phase may reflect lower intelligence, or, decreased ability to convert somatic signals into intuitions about deck utility.
- Composite measures of block performance may not be sensitive to decision-making deficits in this population, especially since decision-making is still improving in typically developing adolescents. Assessment of trial-by-trial learning may provide a more nuanced look at decision-making differences among this sample.

Acknowledgements

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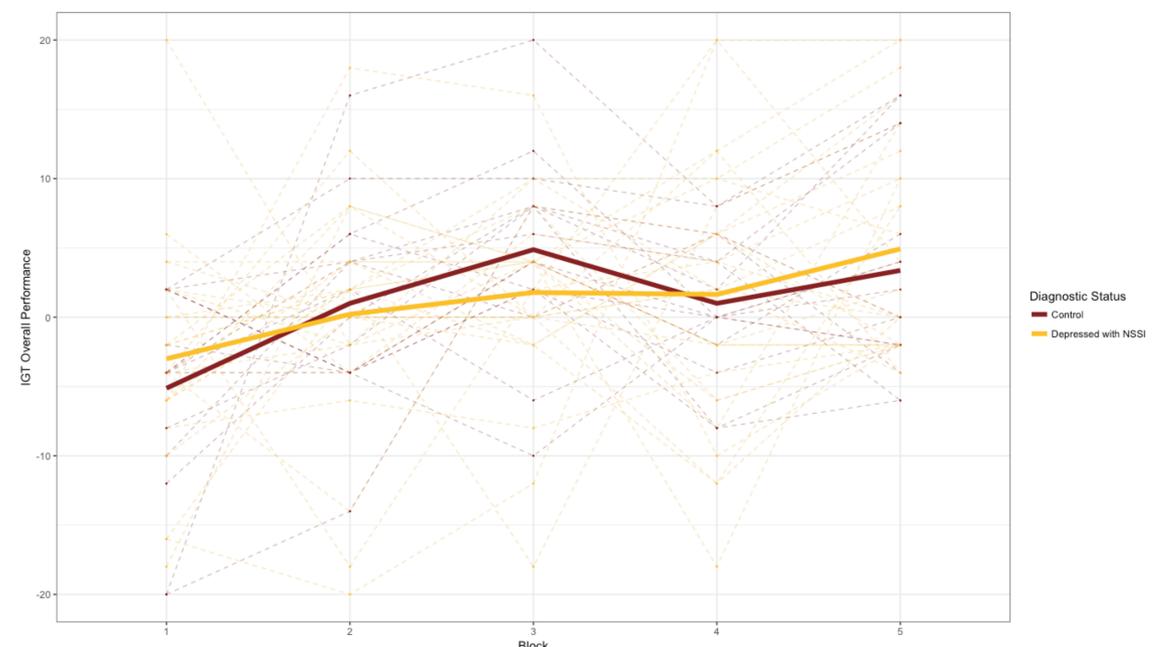


Figure 1. Overall IGT Performance by Diagnostic Group for Study 1

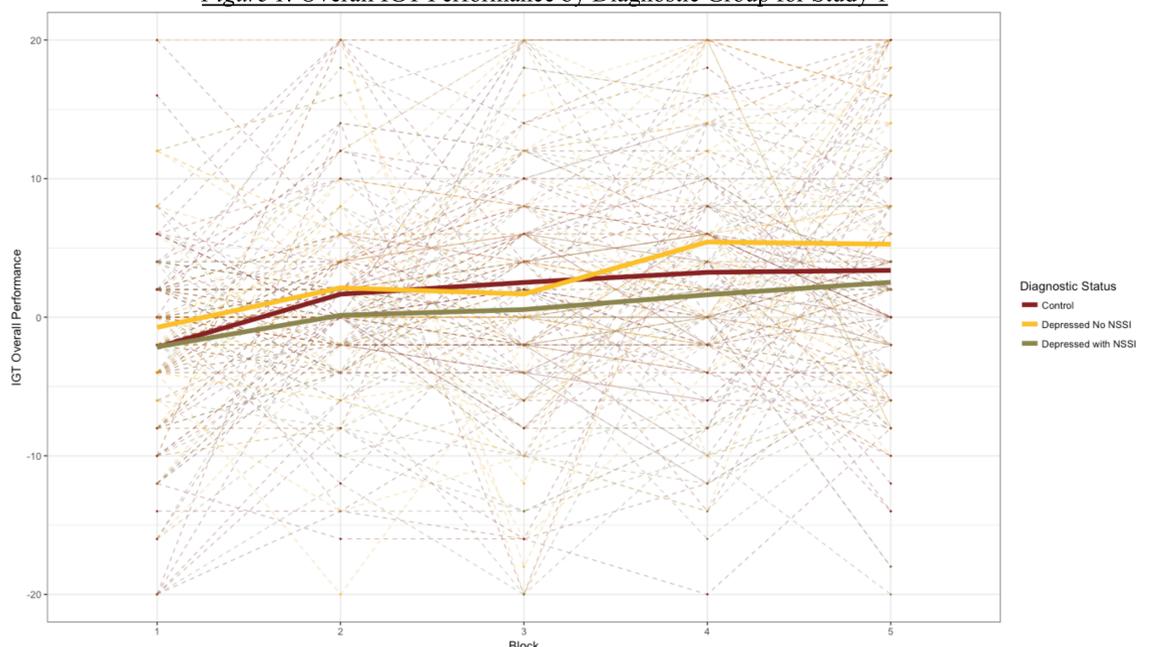


Figure 2. Overall IGT Performance by Diagnostic Group for Study 2

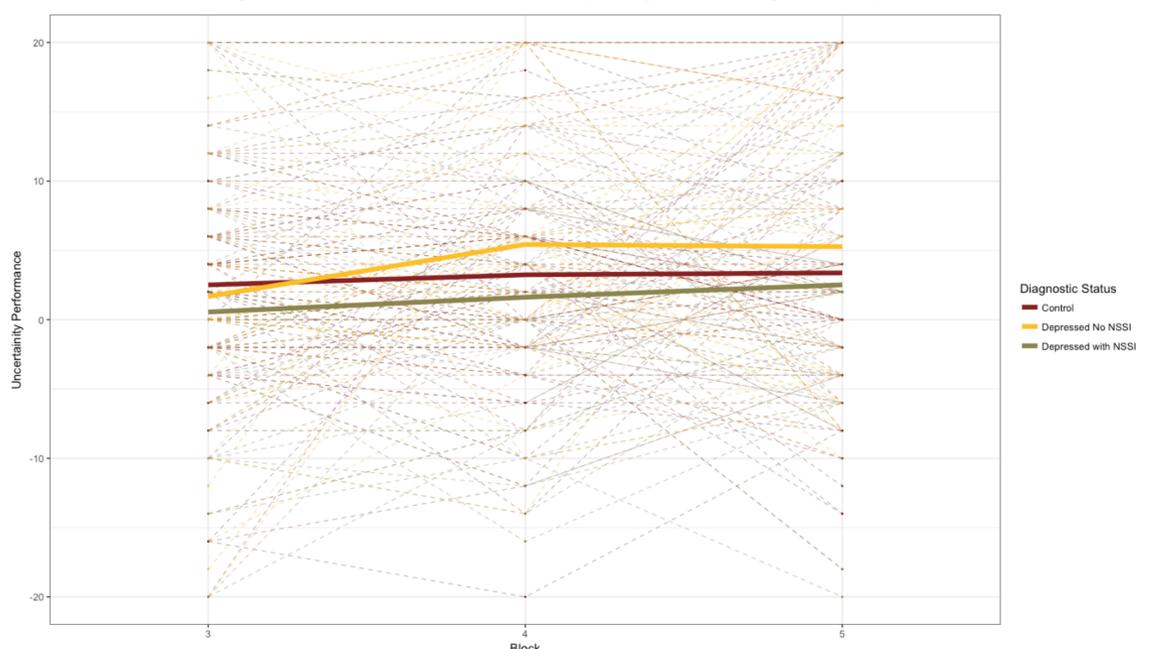


Figure 3. IGT Uncertainty by Diagnostic Group for Study 2

IGT Metric Mean	Study 1		Study 2		
	Control (N = 16)	Patient (N = 28)	Control (N = 71)	Dep. No Self-Harm (N = 49)	Dep. Self-Harm (N = 58)
Overall Performance (SD)	5.13 (17.2)	5.57 (16.6)	8.62 (24.4) ^{a,b}	13.76 (22.5) ^a	2.69 (23.6) ^b
Ambiguity (SD)	-4.13 (9.9)	-2.79 (10.6)	-0.51 (12.4)	1.39 (12.7)	-2.00 (9.8)
Uncertainty (SD)	9.25 (15.4)	8.36 (13.8)	9.13 (20.62) ^{a,b}	12.37 (17.7) ^a	4.69 (19.4) ^b

Table 2
IGT Metric Means
by Study and Diagnostic
Group