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Decision-making in adolescents with suicidal ideation: A case-control study

Arielle H. Sheftall^{a,*}, Dustin J. Davidson^a, Sandy M. McBee-Strayer^a, John Ackerman^{a,b}, Kristen Mendoza^c, Brady Reynolds^d, and Jeffrey A. Bridge^{a,c}

^aThe Research Institute at Nationwide Children's Hospital, Columbus, Ohio, United States

^bDepartment of Psychiatry, The Ohio State University College of Medicine, Columbus, Ohio, United States

^cDepartment of Pediatrics, The Ohio State University College of Medicine, Columbus, Ohio, United States

^dDepartment of Behavioral Science, University of Kentucky College of Medicine, Lexington, Kentucky, United States

Abstract

Decision-making deficits have been associated with attempted suicide in adolescents and adults. This study examined Iowa Gambling Task performance in 19 youths with suicidal ideation and 19 never-suicidal comparison subjects. Group differences in decision-making did not persist after controlling for current affective problems and psychotropic medication use. Future research should determine the contribution of decision-making in predicting the transition from suicidal thoughts to suicide attempts.

Keywords

Iowa Gambling Task; Suicidal ideation; Decision-making

1. Introduction

Decision-making deficits have been shown to increase vulnerability to suicidal behavior in adolescents and adults (Richard-Devantoy et al., 2014). Adolescent suicide attempters make more disadvantageous decisions on laboratory tasks simulating real-life decision-making compared to non-suicidal adolescents (Ackerman et al., 2014; Bridge et al., 2012). This association, however, has not been examined in individuals who experience suicidal thoughts only. The present study investigated decision-making in adolescents with suicidal ideation to determine if decision-making deficits are associated with other aspects of suicidal behavior (e.g., suicidal ideation, plans). We hypothesized that suicidal ideators would perform worse on the Iowa Gambling Task compared to non-suicidal youth with psychiatric symptoms.

*Corresponding author. Fax: +1 614 722 3544. Arielle.Sheftall@nationwidechildrens.org (A.H. Sheftall).

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.psychres.2015.05.077>.

2. Methods

2.1. Sample

The sample consisted of 19 youths, 13–18 years old, who had suicidal ideation (suicidal ideators) during the past six months but no history of suicide attempts and 19 youths who had never engaged in suicidal behavior or had suicidal ideation (comparison subjects). All comparison subjects were matched on age (± 1 year), sex, and race. Both groups were recruited from local community behavioral health services at a large metropolitan children's hospital. Suicidal ideation was defined as thoughts of killing oneself that occurred in the past 6 months. Exclusion criteria for both groups included: IQ < 70 , non-English-speaking, and out of home placement.

Eligible suicidal ideators ($N=64$) were identified from a pool of 96 patients who agreed to be contacted about research opportunities. Two main reasons for exclusion were: inability to screen the family (21.9%) and families not attending their appointments (39.1%). There were no significant differences in age, gender, or race between participants and non-participants. Twenty-five suicidal ideators were recruited however six had a history of suicide attempt and were eliminated along with their matched comparison subject from the analyses as suicidal ideation was the focus of the study.

Comparison subjects came from a sample of 188 families where the adolescents were receiving treatment for psychiatric concerns and agreed to be contacted about research opportunities. Forty families were scheduled for appointments, 25 participated/completed assessments, and 19 were included in the analyses as six were matched to the ideators with a history of suicide attempt. No demographic characteristics differed between participants and non-participants.

This study was approved by the Institutional Review Board of The Research Institute at Nationwide Children's Hospital and informed consent and assent were obtained.

2.2. Assessments

For details on the assessments please refer to our previous report (Bridge et al., 2012). Demographic information was elicited using the General Information Sheet (Brent et al., 1993). IQ was assessed with the Kaufman Brief Intelligence Test (2nd Edition; Kaufman and Kaufman, 2004) and pubertal development was evaluated using the Petersen Pubertal Development Scale (Petersen et al., 1988).

Suicidal ideation in the past month was measured using the Suicidal Ideation Questionnaire (SIQ-HS and SIQ-JR; Reynolds, 1988). Lifetime history of suicide attempts was assessed using the Columbia University Suicide History Form (Oquendo et al., 2003) and the Pierce Suicide Intent Scale (Pierce, 1977). Adolescent psychiatric problems were assessed using the Child Behavior Checklist DSM-oriented scales (Achenbach and Rescorla, 2001; Achenbach et al., 2003).

Adolescent substance use was measured using the Drug Use Screening Inventory (Tarter et al., 1996) and psychotropic medication history was assessed by the Services Assessment for

Children and Adolescents (Stiffman et al., 2000). Family history of suicidal behavior was assessed by a semi-structured interview using questions adapted from the Family History Screen (Weissman et al., 2000).

The Buss-Perry Aggression Questionnaire-Short Form (Diamond and Magaletta, 2006) assessed aggression and the Barratt Impulsiveness Scale-Adolescent version (Fossati et al., 2002) measured impulsivity. The parental self-report Children's Affective Lability Scale (Gerson et al., 1996) assessed emotional lability.

2.3. Iowa Gambling task (IGT)

Decision-making was assessed using the computerized version of the IGT (Bechara, 2007). Total net score on the IGT is the difference between total number of cards selected from advantageous decks (decks C' + D') and disadvantageous decks (decks A' + B'). Block scores are calculated for every 20 cards selected in the same manner. Total net scores range from -100 to 100 and block scores range from -20 to 20. Positive net and block scores indicate advantageous decision-making.

2.4. Statistical analysis

Demographic and clinical characteristics were compared between groups using paired t-tests, McNemar's Chi-square (χ^2), and Wilcoxon signed-rank test. Spearman correlations were conducted to test for associations among the variables. Wilcoxon signed-rank test was used to test for group differences in IGT total net and block scores as the scores were not normally distributed. Conditional logistic regression was used to assess whether the IGT total net score contributed independently to the prediction of suicidal ideator group status. In a separate post-hoc logistic regression analysis, we examined the contribution of the 5th block score as it has been shown in previous studies to be the optimal block to examine decision-making because the contingencies of the task should be learned at this point (Jollant et al., 2005, 2013).

Finally, as a sensitivity analysis, two-way repeated-measures ANOVA was conducted to examine main and interactive effects. The sphericity assumption was violated and cell sizes unbalanced thus the Greenhouse-Geisser correction and type IV sum of squares were used. Effect size was assessed by partial eta-squared (η_p^2).

3. Results

Demographic and clinical characteristics of subjects are presented in Table 1. Suicidal ideators were more likely to have current affective problems ($\chi^2=5.4$, $p=0.03$) and psychotropic medication use ($\chi^2=5.4$, $p=0.02$). All other variables did not differ, between groups.

Unadjusted analyses revealed no significant group difference on IGT total net score although there was a trend for suicidal ideators to perform worse overall ($Z=1.89$, p -value=0.06; Table 1). A significant group difference for the 5th block score ($Z=2.59$, p -value=0.01) was present with ideators faring worse than comparison subjects.

Two conditional logistic regression analyses were conducted; one with IGT total net score and the other with the 5th block score included as predictors. Current affective problems and psychotropic medication use were entered in the first step as both variables differed between groups. Next, the IGT scores were entered to examine the predictive value of decision making.

IGT total net score was not a significant predictor of ideator status ($OR_{adj}=0.96$, 95% CI=0.90–1.01; $p=0.12$) after controlling for current affective problems ($OR_{adj}=10.78$, 95% CI=0.88–131.61; $p=0.06$) and psychotropic medication use ($OR_{adj}=6.92$, 95% CI=0.63–76.09; $p=0.11$). The same occurred for the 5th block score ($OR_{adj}=0.90$, 95% CI=0.78–1.04; $p=0.15$) after controlling for current affective problems ($OR_{adj}=6.62$, 95% CI=0.84–52.00; $p=0.07$) and psychotropic medication use ($OR_{adj}=4.14$, 95% CI=0.39–43.99; $p=0.24$).

The two-way (group, affective problems) repeated-measures ANOVA revealed a significant main effect for block ($F(2.93,99.48)=3.24$, $p=0.03$, $\eta_p^2=0.09$). The BlockXGroup interaction was not cant main effect for block significant ($p=0.26$) and no other significant effects were revealed.

4. Discussion

This study expands the existing literature examining decisionmaking performance and suicidal behavior in adolescents. It is the first to our knowledge to focus primarily on suicidal ideation versus suicide attempts in youth. In unadjusted analyses, suicidal ideators and comparison subjects did not differ on IGT total net score however during the 5th block, ideators performed worse relative to comparison subjects. Once current affective problems and psychotropic medication use were adjusted for, no statistically significant differences were found. Thus, it appears that other factors, for our study specifically mood problems and current psychotropic medication use, may be better predictors of suicidal ideation in adolescents than decision-making dysfunction.

Several limitations of this study should be considered. First, the study's sample size is small and may not be representative of all adolescents with suicidal ideation. Second, the IGT has not been validated in adolescents and there are no normative data available for youth in our study's age range. Finally, the rate of participation in both groups was low and may have biased the sample towards those who might perform poorly on the IGT (e.g., more impulsive due to behavioral disorder).

Although the observed effect size for overall performance on IGT ($OR_{adj}=0.96$) is identical to our previous report that showed significant differences between adolescent suicide attempters and non-attempters (Bridge et al., 2012), the present findings were not significant after accounting for key covariates. These findings suggest that decision-making impairments in adolescents may play a role in increasing vulnerability to act on suicidal thoughts and may be one neurocognitive factor associated with suicide attempts, but not suicidal ideation.

It cannot, however, be assumed that disadvantageous decision-making increases vulnerability for all suicide attempters. Jollant et al. (2005), for example, found that violent attempters displayed significantly worse IGT performance compared to healthy controls, adults with affective disorders, and nonviolent attempters. Gorlyn et al. (2013), in a study of currently depressed, medication-free adults, found no differences on IGT performance among adult suicide attempters, non-attempters, and non-patient groups but a trend for violent attempters to perform worse than other groups. This may suggest, as concluded by Gorlyn et al. (2013), that decision-making deficits are associated with specific subtypes of suicidal behavior (i.e., those using violent means) rather than a universal marker of suicide attempt risk.

Future studies are needed that compare decision-making in a larger, more diverse sample of adolescents with suicidal ideation only to adolescents with a history of suicide attempt (violent and nonviolent) and never-suicidal controls to investigate whether decision-making deficits play a role in the escalation from suicidal ideation to suicide attempts. Utilizing a longitudinal design and comprehensively assessing other aspects of neurocognitive functioning to clarify the factors that increase the likelihood that suicidal ideation will lead to a suicide attempt in adolescents are also important next steps.

Disclosures and acknowledgments

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Table 1

Demographic and clinical characteristics of adolescent suicidal ideators and comparison subjects.

Characteristic	Suicidal ideators(N = 19)			Comparison subjects(N = 19)			Analysis	
	Mean	SD		Mean	SD		Statistic	Df P
Age (years) ^a	15.1	1.6		15.1	1.4		$t = 0.29$	18 0.77
IQ	97.7	15.4		102.2	11.3		$t = 0.90$	5 0.38
Pubertal level, boys	3.1	0.8		3.0	0.5		$t = 0.26$	5 0.81
Pubertal level, girls	3.7	0.3		3.4	0.4		$t = -1.64$	12 0.13
BIS-11A total score	69.2	8.6		65.6	10.3		$t = -0.96$	18 0.35
BPAQ-SF								
Physical aggression	5.0	4.0		5.3	4.0		$t = 0.23$	18 0.82
Verbal aggression	7.2	3.6		8.2	3.9		$t = 0.66$	18 0.52
Anger	6.6	4.3		7.4	4.4		$t = 0.53$	17 0.61
Hostility	7.8	2.6		6.3	3.1		$t = -1.34$	17 0.20
Total score	26.3	12.1		27.2	12.4		$t = 0.20$	18 0.84
Children's affective lability scale ^b								
Disinhibited/impersistent	6.7	5.0		6.7	5.2		$Z = -0.04$	0.97
Angry/depressed	13.2	7.4		17.1	11.4		$Z = -0.83$	0.41
Total score	19.5	10.7		22.8	14.2		$Z = -0.67$	0.50
	Mean	Std error		Mean	Std error		Statistic	P
Iowa Gambling Task Performance ^{*b}								
Block Score 1: card selection 1–20	-3.7	0.8		-2.8	0.8		$Z = -0.84$	0.40
Block Score 2: card selection 21–40	-0.8	1.4		0.8	0.9		$Z = -1.13$	0.20
Block Score 3: card selection 41–60	-1.5	1.6		3.4	1.5		$Z = -2.32$	0.02
Block Score 4: card selection 61–80	-1.7	1.9		1.7	1.8		$Z = -1.26$	0.21
Block Score 5: card selection 81–100	-4.6	1.6		2.0	1.8		$Z = -2.59$	0.01
Total Net Score	-12.1	5.1		5.1	5.4		$Z = -1.89$	0.06
	N	%		N	%		Statistic ^c	p

Characteristic	Suicidal ideators (N = 19)		Comparison subjects (N = 19)		Analysis	
	Mean	SD	Mean	SD	Statistic	Df P
Sex, % female ^a	13	68.4	13	68.4		
Race/ethnicity ^a						
White, non-Hispanic	12	63.2	12	63.2		
Black	4	21.1	4	21.1		
Other race	2	10.5	2	10.5		
Hispanic	1	5.3	1	5.3		
Household income, 4\$50,000/year	5	26.3	9	47.4	$\chi^2 = 1.6$	0.21
CBCL DSM-oriented scales						
Any affective/anxiety disorder	15	78.9	9	47.4	$\chi^2 = 3.6$	0.06
Affective disorders	15	78.9	8	42.1	$\chi^2 = 4.5$	0.03
Anxiety disorders	6	31.6	2	10.5	$\chi^2 = 2.7$	0.10
Somatic disorders	11	57.9	5	26.3	$\chi^2 = 3.0$	0.08
Any behavioral disorder ^d	8	42.1	11	57.9	$\chi^2 = 0.8$	0.37
Current psychotropic medication use ^e	12	63.2	5	26.3	$\chi^2 = 5.4$	0.02
Current alcohol or substance ^f use	8	42.1	12	63.2	$\chi^2 = 0.8$	0.37
Family history of suicidal behavior	5	26.3	1	5.3	$\chi^2 = 2.7$	0.10

BIS-11A, Barratt Impulsivity Scale-Adolescent version; BPAQ-SF, Buss Perry Aggression Questionnaire-Short Form; CBCL, Child Behavior Checklist.

* Number of advantageous cards minus number of disadvantageous cards.

^a Comparison subjects were matched to suicide ideators on age (± 1 year), sex, and race/ethnicity.

^b Wilcoxon Signed Ranks Test was conducted as data was not normally distributed.

^c McNemar's χ^2 was conducted for these variables.

^d Includes attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder.

^e Includes antidepressants, antipsychotics, antianxiety agents, mood stabilizers, and stimulants.

^f Includes marijuana, cocaine, amphetamine, lysergic acid diethylamide (LSD)/mescaline, tranquilizers, heroin/opiates, phencyclidine (PCP), or gases/fumes.