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Suicide ideation in female juvenile offenders with a history of 3,4-methylenedioxymethamphetamine (mdma or'ecstasy') consumption

Abstract

The current study was designed to determine the extent to which self-reported ecstasy use in a population of female juvenile adolescent detainees in a southern state is associated with suicide ideation and to examine distinctions, if any, between using ecstasy and suicide ideation outcomes among this population by ethnicity. Participants were 1327 females extracted from an overall sample of 2260 juvenile offenders housed at selected Youth Development Campuses (YDCs) in the state of Georgia. Adjusted odds ratios (ORs) with 95 percent confidence intervals (CIs) are presented. White female juveniles with a prior history of ecstasy use were just a little less likely to report having considered attempting suicide a month prior to their most recent incarceration (OR = 0.96, 95 percent CI = 0.74-1.27) compared to their African American confederates (OR = 1.14, 95 percent CI = 0.63-2.05). African American study participants were six times more likely to have sought and/or received treatment from a physician or health professional if they had tried to attempt suicide in the past offenders. Also of interest was the variation in rates of ecstasy use, in particular the observation that 15.9 percent and 55.8 percent of white and African American female offenders respectively in our sample reported having used Ecstasy prior to their most recent incarceration.

Keywords: Suicide ideation, juvenile offenders, mdma, ecstasy

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Introduction

In the U.S., suicide is a major cause of death among adolescent populations, accounting for a greater number of deaths than the next major leading causes of death combined for 15- to 24-year-olds.[1–5]. In 2005, it was reported that 17 percent of adolescents reporting that they had seriously considered making a suicide attempt and that by 2010 it was the third leading cause of death for young people between the ages of 10 and 24.[6, 7] Thinking about committing suicide, or suicide ideation can be operationalized as a phenomenon in adolescents[8] that may continue to exist and often recurs in adulthood.[9] In terms of cognitive attributes, suicidal ideation tends to reflect concerns and preoccupation of individuals specific to death and self-destructive behaviour. Suicidal ideation has been viewed as an initial stage on a continuum of suicidality and a primary marker for future suicidal behaviour, [2, 3] with women [4, 5, 10] and adolescent/young adults being at the greatest epidemiologic risk for suicidal behaviour .[5, 11, 10–14] Epidemiological data suggest that suicide ideation is extremely prevalent during the high-school aged adolescent period and that the prevalence of suicide attempts by this population roughly 6.3 percent.[15] Between the age groups of 10-14 to 15-19, the rate of completed suicide increases from 1.1 to 7.4 per 100,000.[16] However, much remains to be learned about the prevalence of suicide ideation or treats to do bodily harm or inflict self-injury with specific populations as function of targeted drug use [17, 18] given suicide ideation in concert with self-injurious behaviours are the strongest predictors of eventual suicide.[19, 20]

What is known is that drug use is a strong predictor and correlate of suicide ideation is drug use.[21–27] Substance use and psychiatric co-morbidity associated with substance use among adolescents remains a major public health concern in the United States (U.S.) and has consistently been associated with increased risk for suicide ideation.[22, 23, 25, 26] Yet little is known regarding specific substance use such by adolescents beyond its association with distal behavioural constructs such as factors depressive symptoms that contribute to suicide ideation.[28, 29] Of particular interest is 3,4-methylenedioxymethamphetamine (MDMA or '**Ecstasy**'), a drug of increased popularity among adolescents population.[30-34] Research documents a generally high prevalence of past-year ecstasy use among non-students and young adults between the ages 18-21 years[34] and that its use is considered the second most commonly used illicit drug among college students.[30, 35] Findings of a recent national community survey reported that in 2007 there were more than 12 million people in the United States who had used ecstasy at least once.[36] Moreover, recent increases had been observed in rates of ecstasy use, and initiation of use, among adolescents.[37–39]

More concerning are reports that ecstasy use can be neurotoxin resulting in deficits in memory and verbal ability.[40–42]Additional problems associated with the use of ecstasy include but are not limited to lowered immune function and sleeping disorders.[43, 44] Adolescent users of Ecstasy under 18 years of age are considered to be more vulnerable to its potential neurotoxin effects[45] which makes it an important item of investigation in terms of problem behaviours that may occur due to its use, in particular behaviours that may evince as indicators of suicide ideation. The concern is that, among U.S. adolescents, only 28 percent of suicide ideators received counselling in the past year.[46] This study aimed to offer several unique contributions to the literature examining the putative risk of suicide ideation associated with ecstasy use. First, this study focused on female adolescent juvenile offenders, offering findings that are most relevant for prevention efforts. Moreover, and

perhaps most importantly, this study examines suicide ideation with respect to black and white sub-population parameters independently. Female offenders were highlighted since prior investigations have suggested that adolescent girls are more likely than adolescent boys to report suicide ideation, attempts, and depressive symptoms.[15] Within this context, the current study was designed to determine the extent to which self-reported ecstasy use in a population of female juvenile adolescent detainees in a southern state is associated with suicide ideation and to examine distinctions, if any, between using ecstasy and suicide ideation outcomes among this population by ethnicity. Our analysis asserted there would be no statistically significant observations as a function of race/ethnicity.

Methods

Participants were 1327 females extracted from an overall sample of 2260 juvenile offenders housed at selected Youth Development Campuses (YDCs) in the state of Georgia. Health Educators approached prospective participants within the first three days of being admitted into the facilities, presented them with an overview of the study, and asked them to participate. Adolescents who agreed to take part in the study signed an assent form that gave members of the research team permission to contact their parents and/or legal guardian for their approval for participation. Prior to study implementation, approval was obtained from the university and the Department of Juvenile Justice Institutional Review Boards.

Measures

I. **Demographics:** Participants reported their age, race, and years of formal education, years incarcerated, and history of prior arrests.

II. **Suicide ideation:** Self-reported thoughts of suicide were measured using a scale from 1 to 3(1=Yes, 2=No, 3= Not Sure). Participants who responded "not sure" were excluded from the analysis. Since this item was not based on traditionally formally assessed by indices of reliability (the degree of measurement error) with respect to correct versus incorrect responses, no alphas were computed.

III. **Ecstasy use:** This was measured using a single item from the drug use measures included in the survey instrument measured on scale from 0 to 5 (0=never, 1=1-2 days, 2= 3-5 days, 3= 6-9 days, 4=10-19 days and 5= 20-31days). These response categories were recorded to compute a dichotomous variable of 1=never and 2= prior uses. Specifically, items asked during the last month before entering a detention centre or YDC, how often have you used any of the following on your own that is, without a doctor telling you to take them. Participants with missing data were not included in the analysis.

IV. **Analysis:** Data were examined with the use of SPSS software version 22.0. Descriptive statistics were employed to present a profile of the participant's demographic characteristics. Significance tests were conducted using univariate logistic regressions to examine the independent associations of participant's self-reported ecstasy use and dichotomized HIV risk behaviour correlates and history of having a prior STI before the most recent incarceration. Adjusted odds ratios (ORs) with 95 percent confidence intervals (CIs) are presented. Univariate regression analysis was selected because the least squares regression curve will minimizes the sum of squared differences between the estimated and the actual y values for given x values as well because of the given assumption of normality. This means that the sum of squares and partial derivatives of each parameter estimated in each equation are defined and equated to zero. This statistical tool was selected based on the assumptions that data used are continuous variables with multivariate normal distributions. Non-normality was assessed by using the Mardia's test for multivariate normality.[47,48] The resulting multivariate index was not significant thus confirming statistical evidence of a normal distribution. All data are reported as means for continuous variables with P, 0.05 considered statistically significant.

Results

Demographic analysis note that 67.8 percent (n=894) of respondents were African American, with whites comprising 32.2 percent (n=425). Around 40 percent (n=269) of female adolescents in the sample that reported a prior history of ecstasy use indicated having been incarcerated prior to their current incarceration compared to 25.6 percent (n=158) whom had not ($X2(1, N=1327)=23.16, p=0.001$. The mean age of African American study participants was 14.81 years (SD=1.23) and reported being 13.29 (SD=2.13) years of age when they first consumed alcohol and 13.51 (SD=1.34) being the age at which they first willing had vaginal sex prior to survey administration. In comparison, the mean age of white adolescent female offenders was 14.98 years (SD=1.24) and reported being 12.53 (SD = 2.06) years of age when they first consumed alcohol and 13.26 (SD=1.43) being the age at which they first willing had vaginal sex prior to survey administration. Approximately 15.9 percent (n =120) and 55.8 percent (n=266) of white and African American female offenders accordingly in our sample reported having used Ecstasy. More detail regarding demographic information on study participants is detailed in Table 1

Table 1 Demographic profile of study respondents by race/ethnicity (missing not included)

		Whites (n = 482)		Blacks (n = 764)	
	Grade	**(n/%) Yes**	**(n/%) No**	**(n/%) Yes**	**(n/%) No**
Highest Grade Finished	4th	0	0	0	2(.3%)
	5th	4(1.5%)	14(6.6%)	1(0.8%%)	12(1.9%)
	6th	7(2.6%)	21(10.0%)	5(4.2%)	52(8.2%)
	7th	14(15.4%)	47(22.3%)	17(14.3%)	118(18.6%)
	8th	102(38.3%)	61(28.9%)	28(23.5%)	197(31.0%)
	9th	64(24.1%)	43(20.4%)	40(33.6%)	156(24.5%)
	10th	39(14.7%)	20(9.5%)	22(18.5)	88(13.8%)
	11th	8(3.0%)	4(1.9%)	6(5.0)	10(91.6%)
	12th	1(.2%)	1(0/2%)	0	1(.2%)
Locked up before this time		168(58.5%)	119(55.1%)	74(61.7%)	293(46.0%)
		98(36.8%)	97(44.9%)	46(38.3%)	344(54.0%)
		266(100%)	216(100%)	120(100%)	637(100%)

Table Continues...

		Whites (n = 482)		Blacks (n = 764)	
	Grade	**(n/%) Yes**	**(n/%) No**	**(n/%) Yes**	**(n/%) No**
		68(25.5%)	41(19.0%)	33(27.7%)	130(20.4%)
Tattoes		199(74.5%)	175(81.0%)	86(72.3%)	506(79.6%)
		267(100%)	216(100%)	119(100%)	636(100%)
		253(94.8%))	192(89.3%)	103(87.3%)	540(84.9%)
Piercings		14(5.2%)	23(10.7%)	15(12.7%)	96(15.1%)
		267(100%)	215(100%)	118(100%)	636(100%)
		27(10.2%)	23(10.8%)	10(8.4%)	46(76.3%)
Month, consider attempting suicide		239(89.8%)	190(89.2%)	109(91.6%)	588(92.7%)
		266(100%)	213(100%)	119(100%)	634(100%)
		17(6.5%)	12(5.7%)	6(5.0%)	27(4.4%)
Month, make plans about suicide		246(93.5%)	199(94.3%)	113(95.0%)	590(95.6%)
		263(100%)	211(100%)	119(100%)	617(100%)

Ecstasy use

Bivariate associations between the assessed ecstasy use (e.g., yes versus never) correlates and self-reported problem behaviours and measures of suicide ideation well as corresponding prevalence ratios and their 95 percent confidence intervals are presented in Table 2. Table 2 also serves a descriptive purpose by showing the proportions of those who reported having ever used ecstasy previously, and those that did not with respect to their agreement or disagreement with selected correlates. Of note, eight of the fourteen correlates indicated that prior arrest was a potential risk factor. Associations were based on remarkably similar proportions (that is, the difference between groups was extremely small). With respect to ethnicity, white female juveniles who reported having used ecstasy previously were just somewhat more likely to report that they had been locked up before (OR=1.16, 95 percent CI=0.98-1.38), have tattoos (OR=1.17, 95 percent CI=0.98-1.40), and have body piercings (OR=1.50, 95 percent CI=0.98-1.40), however only having a body piercing proffered to be statistically significant (p = 0.025). African American respondents were nearly two times more likely to report having been incarcerated prior to their present stay (OR=1.71, 95 percent CI =1.21-2.40) and almost 1 and a half times more likely to have gotten a tattoo (OR =1.39, 95 percent CI =0.97-2.00). Of interest was that White female juveniles with a prior history of ecstasy use were just a little less likely to report having considered attempting suicide a month prior to their most recent incarceration (OR=0.96, 95 percent CI=0.74-1.27) compared to their African American confederates (OR=1.14, 95 percent CI=0.63-2.05). However, whites (OR=1.06, 95 percent CI=0.77-1.46) and African American female juvenile offenders (OR=1.13, 95 percent CI=0.54-2.38) indicated nearly the same level of risk pertaining to having actually made plans to committee suicide one month prior to their present period of incarceration. What was most unexpected was that African American study participants were more than six times more likely to have sought and/or received treatment from a physician or health professional if they had tried to attempt suicide in the past offenders (OR=6.13, 95 percent CI=1.39-27.02).

Table 2 Bivariate logistic regression of correlates of selected demographic characteristics and suicide ideation constructs among juvenile offenders who have and have not used ecstasy (white adolescent females only)

		Whites			
		Ecstasy (%)	**Ecstasy (%)**		
		Yes	**No**	**OR**	**95%CI**
				0.76	0.49-1.03
Locked up before this time	Y	63.20%	55.10%	1.16	0.98-1.38
	N	36.80%	44.90%	0.83	0.68-1.01
				0.68	0.44-1.06
Tattoos	Y	25.50%	19%	1.17	0.98-1.40
	N	74.50%	81%	0.8	0.62-1.04
				0.46	0.23-.92
Body Piercings	Y	94.80%	5.20%	1.5	0.98-2.28
	N	89.30%	10.70%	0.69	0.52-.91
				1.07	0.59-1.92
Month, consider attempting suicide	Y	10.20%	89.80%	0.96	0.74-1.27
	N	10.80%	89.20%	1.03	0.75-1.43
	Y	6.50%	5.70%	0.83	0.41-1.87
Month, make plan about suicide	N	93.50%	94.30%	1.06	0.77-1.46
				0.92	0.59-1.44
				1.25	0.24-6.44
If attempted, treated by doctor or nurse	Y	0.50%	55.60%	0.93	0.51-1.66
	N	0.50%	44.40%	1.15	0.40-3.31

Table 3 Bivariate logistic regression of correlates of selected demographic characteristics and suicide ideation constructs among juvenile offenders who have and have not used ecstasy (black adolescent)

		Blacks			
		Ecstasy (%)	**Ecstasy (%)**		
		Yes	**No**	**OR**	**95%CI**
				0.53	0.35-.79
Locked up before this time	Y	61.70%	46%	1.71	1.21-2.40
	N	38.30%	54%	0.91	0.80-.96
				0.67	0.43-1.04
Tattoos	Y	27.70%	20.40%	1.39	0.97-2.00
	N	72.30%	79.60%	0.93	0.85-1.02
				0.82	0.45-1.47
Body Piercings	Y	87.30%	84.90%	1.18	0.72-1.96
	N	12.70%	15.10%	0.97	0.89-1.05
				0.85	0.42-1.74
Month, consider attempting suicide	Y	8.40%	7.30%	1.14	0.63-2.05
	N	91.60%	92.70%	0.97	0.85-1.11

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Table Continues...

		Blacks			
		Ecstasy (%)	Ecstasy (%)		
		Yes	No	OR	95%CI
				0.86	0.34-2.13
Month, make plan about suicide	Y	5%	4.40%	1.13	0.54-2.38
	N	95%	95.60%	0.97	0.83-1.15
				0.96	0.15-.61
If attempted, treated by doctor or nurse	Y	71.40%	19.40%	6.13	1.39-27.02
	N	28.60%	80.60%	80.6	0.34-1.02

Discussion

An examination of the correlates of incident ecstasy use revealed that there was similar impact of correlates of incident of ecstasy use across this sample of adolescent female offenders regarding suicide ideation as a function of race. In this study, there were few differences between adolescent female juvenile offenders with a past history of ecstasy use in terms of selected risk practices and item specific indices of suicide ideation as it regards ethnic and/or racial indicators. Thus, distinctions among suicide ideation as a function of ecstasy use may not be helpful in assessing other risks associated with such experiences. In addition, use of ecstasy as an exclusive variable may be less informative than other drug and risk factors during investigations of suicide ideation. The most significant observation was that African American study participants were more than six times more likely to have sought and/or received treatment from a physician or health professional if they had tried to attempt suicide in the past offenders. Also of interest was the variation in rates of ecstasy use, in particular the observation that 15.9 percent and 55.8 percent of white and African American female offenders respectively in our sample reported having used Ecstasy prior to their most recent incarceration.

In terms of suicidal behaviours, about 9.1 percent of our total sample reported previously having attempting to committee suicide (10.4 percent for whites and 7.4 percent for African Americans), and of the sample reported having attempted suicide in the period prior their current incarceration, 10.2 percent of whites and 8.4 percent of African American had indicted past use of ecstasy. While about 8.1 percent reported suicidal ideation only. These levels are much lower for both suicide and ecstasy use reported by Kim and associates in 2011[49] and the Centres for Disease Control and Prevention.[6, 7] It may be that other social or behavioural factors for ecstasy users may explain the findings herein. Nonetheless, our examination is important given that MDMA is an indirect serotonergic agonist which causes flooding of the serotonin system and frequently results in temporary positive changes in mood. From a physiological perspective, the serotonergic system combines a widespread innervation of most cortical and subcortical structures, [50] including the largest nucleus, the dorsal raphe as well as the median raphe nucleus, which projects to all parts of the brain. [51] The raphe nuclei are a medium size cluster of nuclei located in the brain stem traditionally considered to be the medial portion of the reticular formation. Their main function is to release serotonin to the rest of the brain. Thus, ecstasy may impact functional roles of serotonin which may influence the occurrence of mood disorders frequently affiliated with a predisposition for suicidal behavior that contribute to impulsive aggressive traits that possibly manifest in the form of increased risk for suicidal behaviour.[52,53] Moreover, that regular use of ecstasy may damage serotonin neurons, consequently resulting in a decrease in serotonin production,[54] which has the capacity to manifest in increases in depressive symptoms, including but not limited to aggression,[55] impulsivity[56] and poor judgment: [57] all factors that contribute to suicide ideation and thoughts of inflicting self-harm. This may be why some researchers have found ecstasy use to be a correlate of increased sexual risk taking and the past occurrence of sexually transmitted infections (STIs) among adolescent offender populations.[58, 59] Our results should be interpreted with some limitations in mind. First, deals with the problems associated with using survey methods to collect information on sensitive and personal issues such as drug use and suicide, especially in incarcerated settings with adolescent populations. This may impact measures in terms of the magnitude of self-reported ecstasy use, making it possible to be either underestimated rather than overestimated.Second, the small number of ecstasy users, due to a low prevalence, limits our ability to perform precise analyses to probe the likely nature of correlates, albeit we made use of a robust sample. Last, operational definitions via items employed may play a role in both the self-reported incident of suicide and use of substances among this population. Another major limitation of our study pertains to sample size, specifically the small sample size of the comparison groups. Research notes that many behavioral studies may be influenced by the presence of confounding variables.[60] Consequently, larger sample sizes are preferred since confounding variables must be controlled for in the analysis. Thus a more complex statistical model may have been required. Also, the value of the statistical significance depends on the standard error of the estimator and the power of the study. Therefore, given smaller sample sizes in terms of use verses non-use, our level of power is possibly decreased, meaning findings may reflect such in the resulting risk ratios and 95 percent CIs. This has been reported to occur because Logistic regression overestimates odds ratios in studies with small to moderate samples size by inducing systematic bias in a direction away from the null hypothesis, or in other words, the odds ratios shifting away from one.

Conclusion

In conclusion, ecstasy is a commonly used illegal drug among U.S. adolescent populations including adolescent offenders. Additionally, studying the associations linking ecstasy use with factors that may contribute to mental health morbidity and even suicide, is extremely important if public and mental health practitioners are to both expand on current epidemiological data to deal with this serious and extremely prevalent problem among high-school aged adolescent such to reduce the prevalence of suicide attempts by this population.

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Conflicts of interest

There is no conflict of interest declared by the author.

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