Factors Associated with Drug-related Harm Reduction Among Electronic Dance Music Event Attendees

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Introduction

Previous studies have shown that electronic dance music (EDM) event, also known as rave, attendees represent a high-risk group for recreational substance use.

The use of 3,4-methylenedioxymethamphetamine (MDMA), also known as molly or ecstasy, as well as cocaine and ketamine, has become increasingly popular at these events and has coincided with a rise in use-related adverse events among users.

There is a notable gap in research on substance-related harm reduction (HR), defined as strategies to limit personal adverse experiences resulting from substance use, particularly among EDM event attendees in the United States.

Objective

This study aimed to investigate associations between demographic factors, substance use patterns, and event attendance frequency with HR adoption to inform educational initiatives and promote more equitable health outcomes among EDM event attendees.

Methodology

Inclusion criteria
This cross-sectional study included adults aged 18 and older who attended at least two EDM events in the United States within the past two years and reported any substance use at these events.

Questionnaire overview
An anonymous Qualtrics survey was distributed via social media from September 2024 to January 2025 that collected demographic information, including age, gender, race, ethnicity, education, employment status, event attendance, and event substance use frequency.

The survey assessed 11 HR strategies for MDMA and 12 for cocaine and ketamine, using a Likert scale. Participants earned “safe” and “risky” scores based on their reported HR behaviors: a point toward the “safe” score was awarded for reporting “often” or “always” performing an HR behavior, while a point toward the “risky” score was given for “rarely” or “never” performing a behavior. Demographic variables were adjusted to improve statistical power. Event attendance and event substance use frequencies were categorized as frequent or infrequent.

Methodology Continued

Statistical analysis
HR scores were analyzed using Mann-Whitney U tests for two-group comparisons and Kruskal-Wallis (KW) tests with post-hoc Dunn’s tests for multi-group comparisons, with significance as $p < 0.07$. Logistic regression models were subsequently used to assess significant associations with fourth-quartile safe or risky scores, with $p < 0.05$ considered as statistically significant.

MDMA HR
- Avoid mixing MDMA with other stimulants
- Monitor fluid intake to avoid overhydration

Cocaine HR
- Alternate nostrils with each cocaine-use session
- Avoid sharing straws/spoons

Ketamine HR
- Avoid taking ketamine with other depressants
- Monitor fluid intake to avoid dehydration

- Avoid mixing the drug with other substances
- Testing the drug for fentanyl or other contaminants
- Obtaining the drug from a trusted or reliable source
- Surrounding yourself with people you trust when taking the drugs
- Plan in advance how much of the drug you will use for an electronic dance music event

Figure 1. Example of harm reduction (HR) strategies included in the survey questions. A copy of the full survey is included in the supplemental materials.

Results

Overview
398 participants completed the survey. Of the total participants, 319 used MDMA, 183 used cocaine, and 150 used ketamine at least once at an EDM event. The median safe score for MDMA use, cocaine use, and ketamine use was 8 (IQR: 7–9), 6 (IQR: 5–8), and 4 (IQR: 0–7), while the median risky score was 1 (IQR: 0–2), 3 (IQR: 2–5), and 1 (IQR: 0–3), respectively.

MDMA
Risky scores differed by usage frequency (U = 14139, $p = 0.007$) and employment status (U = 4663, $p = 0.026$). Safe scores differed by event usage frequency (U = 9174, $p < 0.001$) and event attendance frequency (U = 14268, $p = 0.043$).

Employed individuals trended towards decreased odds of high risky scores compared with individuals who were not employed (OR = 0.53, 95% CI = 0.27 - 1.06, $p = 0.066$). Frequent MDMA use was associated with decreased odds of high safe scores (OR = 0.47, 95% CI = 0.26, 0.83; $p = 0.010$) and trended towards increased odds of high risky scores (OR = 1.61, 95% CI = 0.95 - 2.77, $p = 0.081$) compared with infrequent MDMA use. Event attendance frequency was not associated with high safe or risky scores.

Results Continued

Cocaine
Differences in safe scores were observed across age groups (H = 13.47, p = 0.0092), with differences between the 18–22, 27–30, and 31–34 groups compared to the 35+ group. Event attendance frequency also influenced safe scores (U = 4837, $p = 0.025$).

Individuals in age groups 18-22, 23-26, 27-30, and 31-34 had decreased odds of high safe scores compared with individuals aged 35 and older (OR = 0.13, 95% CI = 0.02 - 0.53, p = 0.012; OR = 0.25, 95% CI = 0.09 - 0.70, $p = 0.009$; OR = 0.20, 95% CI = 0.06 - 0.060, OR = 0.05, 95% CI = <0.01 - 0.28, $p = 0.005$, respectively). Event attendance frequency was not associated with high safe or risky scores.

Ketamine
Risky scores differed across age groups (H = 13.51, p = 0.01), with differences between the 18-22 and 31-34 groups compared to the 23-26 group. Safe scores differed by employment status (U = 1149.5, p = 0.064). Event attendance frequency influenced both safe (U = 3102, $p = 0.026$) and risky (U = 2034.5, $p = 0.042$) scores.

Age groups were not associated with high risky scores when compared with individuals aged 35 and older. Event attendance frequency was not associated with high safe or risky scores.

Table 1. Factors associated with fourth-quartile safe or risky HR behavior analyzed with logistic regression

	Safe HR		Risky HR	
Characteristics	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
MDMA				
Employed	—	—	0.53 (0.27 -1.06)	0.066
Frequent event MDMA use	0.47 (0.26 - 0.83)	0.010	1.61 (0.95 - 2.77)	0.081
Frequent event attendance	1.47 (0.84 - 2.60)	0.18	0.84 (0.49 - 1.42)	0.51
Cocaine				
Age 18-22	0.13 (0.02 -0.053)	0.005	—	—
Age 23-26	0.25 (0.09 - 0.70)	0.009	—	—
Age 27-30	0.20 (0.06 - 0.60)	0.005	—	—
Age 31-34	0.05 (<0.01 - 0.28)	0.005	—	—
Frequent event attendance	1.47 (0.84-2.60)	0.18	0.84 (0.49 - 1.42)	0.51
Ketamine				
Age 18-22	—	—	1.75 (0.40 - 8.14)	0.46
Age 23-26	—	—	0.77 (0.20 - 3.28)	0.71
Age 27-30	—	—	0.68 (0.15 - 3.15)	0.61
Age 31-34	—	—	1.46 (0.34 - 6.69)	0.61
Employed	1.75 (0.44 - 11.65)	0.48	—	—
Frequent event attendance	1.39 (0.65 - 3.00)	0.40	0.48 (0.18 - 1.18)	0.12

MDMA: 3,4-Methylenedioxymethamphetamine, also known as Molly, Ecstasy. HR: Harm reduction. OR: Odds Ratio. CI: Confidence interval

Table 1. Factors associated with fourth-quartile safe or risky harm reduction (HR) behavior after logistic regression analysis. Comprehensive results, including score medians and IQRs, Mann-Whitney U test results, and Kruskal-Wallis test results with post-hoc Dunn tests for all demographics, are included in the supplemental materials.

Discussion

Overall, higher safe scores were observed with MDMA use compared to ketamine and cocaine use, highlighting the need for more substance-specific HR education.

Frequent MDMA use was associated with high risky scores, suggesting higher exposure may normalize unsafe practices, while employment was associated with decreased odds of high risky scores, potentially reflecting the stabilizing effects of a more structured lifestyle routine.

Younger cocaine users demonstrated lower odds of high safe scores, emphasizing the need for youth-focused HR education. Event attendance frequency did not exhibit any overall trends with high safe or risky scores.

While significant differences were found between specific age groups, employment, and event attendance frequency for ketamine-related HR, no overall trends were present with high safe or risky scores.

To our knowledge, this study is among the first to examine factors influencing HR practices at EDM events in the United States, revealing substance- and demographic-specific gaps. The lack of consistent predictors across substances highlights the need for inclusive education to improve safe recreational substance use at EDM events across all populations.

Study limitations include reliance on self-reported data and potential selection bias from voluntary participation. The study also lacked data on the incidence of substance-related adverse events or barriers to HR practices. Future research should address these gaps to inform targeted interventions for EDM attendees.

Supplemental Material

References

1. Palamar, J. J., Acosta, P., Le, A., Cleland, C. M., & Nelson, L. (2019). Adverse Drug-Related Effects among Electronic Dance Music Party Attendees. The International Journal on Drug Policy, 73, 81–87. https://doi.org/10.1016/j.drugpo.2019.07.005
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