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An Early Exploration into Individuals in Treatment Who Co-Use Alcohol and Hallucinogens

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Abstract

There is renewed interest in the therapeutic properties of hallucinogens in the treatment of psychiatric disorders including alcohol use disorder (AUD). Interestingly, however, there is little data regarding the comorbid use of hallucinogens and alcohol among persons with AUD. The paucity of such data constrains both scientific interpretation and treatment development. This analysis, which utilizes data collected from individuals seeking treatment in facilities across North Central Florida, aims to address this gap by examining the use of hallucinogens among individuals seeking treatment for problems with alcohol. Further, by focusing on use patterns among those who report recent and regular use of both alcohol and hallucinogens, this analysis describes correlates with potential clinical utility.

Analyses revealed that recent and regular users of hallucinogens and alcohol were significantly younger than those in treatment who did not use hallucinogens ($p < 0.001$). Additionally, treatment seekers who reported regular use experienced more negative life consequences than those who were not regular users ($p < 0.01$). Results suggest that trends in age and drug consequences may contain valuable information to inform treatment modalities, risk prevention strategies, and general scientific knowledge with the help of future investigations.

Keywords: Hallucinogens, AUD, Treatment

Background

Following Albert Hofmann's development of lysergic acid diethylamide (LSD) in 1943, the scientific community began to explore the possible clinical utility of hallucinogens (Abraham et al., 1996). In recent years, there has been a resurgence of interest in hallucinogens' potential therapeutic significance in the treatment of numerous psychiatric disorders, including alcohol use disorder (AUD). For instance, a randomized clinical trial by Bogenschutz et al. (2022) found that psilocybin-assisted psychotherapy led to a more substantial decrease in heavy drinking days when compared to active placebo and psychotherapy groups. Psychedelic-assisted psychotherapy (PAP) is a modality of psychotherapy involving psychedelic substances with drug-free therapy sessions for integration and reflection, as well as psychotherapy during drug-administered

sessions (Schenberg, 2018). These studies suggest that the success of hallucinogens in the treatment of AUD is due to the combined effects of the hallucinogen and psychotherapy; however, the importance of the clinical setting cannot be overlooked. The non-clinical usage of hallucinogens and alcohol, on the other hand, is largely understudied.

A review by Calleja-Conde et al. (2022) provides some insight into those who use alcohol and hallucinogens recreationally. In reviewing 20 studies that investigated the relationship between hallucinogens and alcohol consumption in the last two decades, the consensus suggested the possibility for reducing alcohol consumption following the use of certain hallucinogenic drugs. Many of these studies, however, presented methodological concerns, such as biased recruitment tactics or lack of a control group, which partially undermined their conclusions (Calleja-Conde et al., 2022). Thus, more information is needed to better understand the potential therapeutic effects and trade-offs between alcohol and hallucinogens.

While the clinical practicality of hallucinogens for AUD continues to be explored through PAP, relatively little is known regarding the comorbid use of alcohol and hallucinogens in those with AUD. An investigation by Stephenson et al. (2022) that examined patterns of polysubstance use for a variety of substances offered new insights into hallucinogen use by those with AUD. Of the 2,785 treatment-seeking participants with severe AUD, 50% reported no lifetime use of hallucinogens, 29% had used 1-5 times, and 21% had used six or more times (Stephenson et al., 2022). The authors also identified five groups of qualitatively different patterns of polysubstance use. For instance, the extended polysubstance use group was classified as individuals who had the highest probability of using all investigated substances six or more times. The extended polysubstance use group had the highest probability of responding they had used hallucinogens six or more times, followed by responding they had used 1-5 times, and the least probable response in this group being no lifetime use of hallucinogens (Stephenson et al., 2022). This group also presented with a younger onset of alcohol problems, higher depressive symptoms, and more criminal behavior. Thus, the authors found that specific patterns of polysubstance use were differentially correlated to several demographic and behavioral factors. Regarding the co-use of alcohol and hallucinogens, however, we do not know if this specific type of polysubstance use is also differentially correlated to demographic or behavioral variables. Broadly, the characteristics of individuals in treatment who endorse the co-use of alcohol and hallucinogens are presently

unknown; however, uncovering these features has the potential to better inform treatment programs, risk detection strategies, and increase scientific understanding overall.

Given the limited research in this area, the present investigation aimed to examine the nature of alcohol and hallucinogen polysubstance use in those seeking treatment for substance use disorders (SUDs). This study aimed to (1) identify a sample of individuals in treatment for SUD who endorse problems with alcohol and varying levels of hallucinogen use, and (2) investigate precursory correlates of clinically relevant constructs in those who endorse recent and regular use of hallucinogens. By focusing on those who endorse the recent and regular use of hallucinogens, this analysis hoped to provide a glimpse into the current landscape of those in treatment who co-use alcohol and hallucinogens.

Methods

Participants

Data were obtained from a larger, ongoing study led by Dr. Sara Jo Nixon's Neurocognitive Laboratory. The present study leveraged a discreet chunk of data from this larger investigation and included individuals seeking treatment (n=2,334) for substance use disorders (SUDs) across treatment facilities in North Central Florida. Data used in this investigation were collected from 2010 to 2020. Participants were between 17 and 72 years old. Those with missing data on hallucinogen use were excluded, as well as those who reported over three standard deviations above the mean standard drinks per day. See Table 1 for a full overview of demographic characteristics.

Measures

Data were collected using a packet of questionnaires administered at the treatment facilities. The present study utilized a demographic questionnaire, an alcohol-use history questionnaire, a drug-use history questionnaire, the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983), Beck Depression Inventory (BDI; Beck, et al., 1996), the Short Inventory of Problems (SIP; Blanchard et al., 2003), and the Short Inventory of Problems adapted for drug use (SIP-D; Alterman et al., 2009). Pre-existing literature suggests that those with AUD and more frequent use of hallucinogens may be associated with more negative life

consequences and depressive symptomology (Stephenson et al., 2022), thus this study will expand and explore these potential correlates using the STAI, BDI, SIP, and SIP-D.

The alcohol-use history questionnaire calculated respondents' standard drinks per day in the six months prior to their current treatment. Standard drinks per day were also compared across differing levels of hallucinogen use in participants. In addition, the questionnaire asked if individuals considered themselves as having an AUD or being a problem drinker, and was used to categorize those with alcohol problems (n=1,382).

The drug-use history questionnaire informed the various levels of hallucinogen use by asking if individuals had ever used hallucinogens, if they had ever regularly used hallucinogens, and their date of last use. The questionnaire did not further define regular use, thus it was a subjective decision by the participant whether they saw their use as regular or not. Recent hallucinogen use was quantified as those who had used in the five years before the date of their data collection. Demographics queried included age, sex, and level of education.

Analytical Design

Figure 1 demonstrates the design and progression of the analysis. The investigation began by characterizing the overall sample of individuals seeking treatment for a substance use disorder (n=2,334; Figure 1A). This sample was then split into those who did (n=1,401; Figure 1B) and did not report alcohol problems, followed by the sample being filtered into sub-samples dependent on responses to progressively narrowed levels of hallucinogen use. The process of sample refinement began by separating those who reported ever having used hallucinogens from those who reported alcohol problems (n=707; Figure 1C). From this new sub-sample, another sub-sample was created by filtering those who endorsed regular hallucinogen use (n=266; Figure 1D). The last sub-samples were created from the previously described sub-sample of regular users and contained those who endorsed recent use, within the last five years, (n=136; Figure 1E) or non-recent use (n=103; Figure 1F). Any individuals with missing recent-use data were excluded from this final sub-sample refinement (n = 31). At the time each new sub-sample was created, differences across those who did and did not qualify for the new sub-sample were analyzed. The final analysis was different in that it compared three groups against each other only across SIP-D scores. This supplementary analysis compared recent, non-recent, and non-regular (n=441; Figure 1G) users of hallucinogens. This was done to interrogate the most current

landscape of treatment-seekers who co-use alcohol and hallucinogens to detect if drug-related consequences differed from those who only reported lifetime use of hallucinogens.

In summary, all the described sub-samples were progressively created from the larger initial sample of individuals who endorsed alcohol problems; thus, all levels contain those who use hallucinogens and report potential AUD. Differences in demographics, standard drinks per day, and scores on the BDI, STAI, SIP, and SIP-D were compared for each sub-sample. Statistical analysis for this investigation included the analysis of variance (ANOVA), t-test, and chi-squared comparisons.

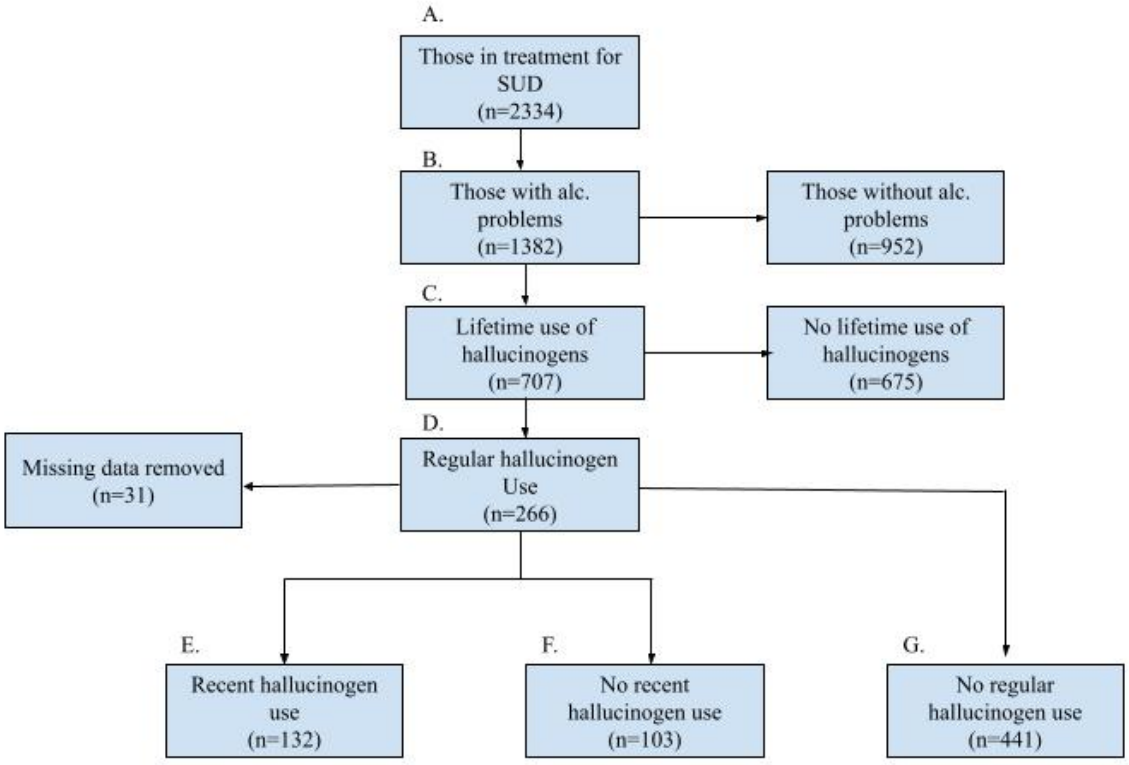

Figure 1. Progression of the flow of analysis. Capital letters on the top-left of each box denote a sub-sample created for each level of analysis.

Results

Tables are utilized to report the majority of findings in this investigation. For Tables 2-5, group comparisons were done on differences in demographics, standard drinks per day, and scores on the BDI, STAI, SIP, and SIP-D.

Individuals in Treatment for a Substance Use Disorder (SUD)

Table 1 depicts the demographics, standard drinks per day, BDI, STAI, SIP, and SIPD scores for all individuals in treatment (n=2334) from 2010-2020 (Figure 1A). Of the 2334 individuals, 40.4% were female with a mean age of 37.5 years. The mean years of education was 12.3 and they reported an average of 8.96 standard drinks per day.

Table 1. Results of all individuals in treatment.

	Overall Sample (n=2334)
	M(SD) [Min-Max]
Age	37.5 (10.6) [17.0, 72.0]
Sex	
Male	1360 (58.3%)
Female	944 (40.4%)
Missing	30 (1.3%)
Race	
Asian	9 (0.4%)
Black	563 (23.9%)
Native American	33 (1.4%)
Native Hawaiian/Pacific Islander	12 (0.5%)
Other	80 (3.4%)
White	1652 (70.2%)
Missing	5 (0.2%)
Years of Education	12.3 (2.13) [1.00, 30.0]
Standard Drinks per Day	8.96 (12.3) [0, 61.2]
BDI	19.7 (12.3) [0, 59.0]
STAI	45.3 (14.3) [7.00, 80.0]
SIP	20.1 (16.4) [0, 45.0]
SIP-D	31.7 (13.9) [0, 45.0]
Alcohol Problem Status	
No Self-Endorsed Problem with Alcohol	952 (40.8%)
Self-Endorsed Problem with Alcohol	1382 (59.2%)
Lifetime Hallucinogen Use	
No Lifetime hallucinogen Use	1199 (51.4%)
Lifetime Hallucinogen Use	1135 (48.6%)
Regular hallucinogen Use	
No Regular Hallucinogen Use	1925 (82.5%)
Regular hallucinogen Use	409 (17.5%)
Recent Hallucinogen Use	
No Recent Hallucinogen Use	487 (20.9%)
Recent Hallucinogen Use	418 (17.9%)
Missing	1429 (61.2%)

Note. BDI= Beck Depression Inventory, STAI= State-Trait Anxiety Inventory, SIP= Short Inventory of Problems, SIP-D= Short Inventory of Problems adapted for drug use.

Individuals Reporting Alcohol Problems

Table 2 highlights differences across individuals who did and did not report alcohol problems (Figure 1B). Those who reported alcohol problems were mostly male ($X^2 = 17.32$, $p<0.001$) and slightly older ($t= -11.50$, $p<0.001$, $d= 0.49$) than those who did not report alcohol problems. They also scored higher on the SIP than those who did not endorse alcohol problems ($t = -37.37$, $p<0.001$, $d = 1.81$), who instead scored higher on the SIP-D ($t = 2.99$, $p = 0.003$, $d = 0.14$).

Table 2. Results of individuals who did and did not endorse alcohol problems.

	No Self-Endorsed Problems with Alc. (n=952)	Self-Endorsed Problems with Alc. (n=1382)	Group Comparison	Overall Sample (n=2334)
	M(SD) [Min, Max]	M(SD) [Min, Max]		M(SD) [Min, Max]
Age	34.5 (9.88) [17.0, 72.0]	39.6 (10.7) [18.0, 70.0]	t = -11.50, p < 0.001, d = 0.49	37.5 (10.7) [17.0, 72.0]
Sex				
Male	507 (53.3%)	853 (61.7%)	$X^2 = 17.32$, p < 0.001	1360 (58.5%)
Female	431 (45.2%)	513 (37.1%)		944 (40.4%)
Missing	14 (1.5%)	16 (1.2%)		30 (1.3%)
Years of Education	12.0 (1.99) [4.00, 24.0]	12.4 (2.22) [1.00, 30.0]	t = -4.24, p < 0.001, d = 0.18	12.2 (2.13) [1.00, 30.0]
Standard Drinks per Day	1.97 (5.12) [0, 41.5]	13.8 (13.5) [0, 61.2]	t = -24.75, p < 0.001, d = 1.04	8.96 (12.3) [0, 61.2]
BDI	18.3 (12.5) [0, 59.0]	20.7 (12.2) [0, 58.0]	t = -4.51, p < 0.001, d = 0.19	19.7 (12.3) [0, 59.0]
STAI	43.6 (14.3) [12.0, 80.0]	46.4 (14.2) [7.00, 80.0]	t = -4.66, p < 0.001, d = 0.20	45.3 (14.3) [7.00, 80.0]
SIP	5.48 (9.29) [0, 45.0]	28.1 (13.9) [0, 45.0]	t = -37.37, p < 0.001, d = 1.81	20.3 (16.5) [0, 45.0]
SIP-D	32.8 (12.1) [0, 45.0]	30.9 (15.1) [0, 45.0]	t = 2.99, p = 0.003, d = 0.14	31.7 (14.0) [0, 45.0]
Lifetime Hallucinogen Use				
No Use	524 (55.0%)	675 (48.8%)	$X^2 = 9.55$, p = 0.002	1099 (51.4%)
Use	428 (45.0%)	707 (51.2%)		1135 (48.6%)
Regular Hallucinogen Use				
No Regular Use	809 (85.0%)	1116 (80.8%)	$X^2 = 7.83$, p = 0.005	1925 (82.5%)
Regular Use	143 (15.0%)	266 (19.2%)		406 (17.5%)
Recent Hallucinogen Use				
No Recent Use	168 (18.3%)	250 (18.1%)	$X^2 = 2.05$, p = 0.152	418 (17.9%)
Recent Use	168 (17.6%)	313 (22.6%)		487 (20.9%)
Missing	610 (64.1%)	819 (59.3%)		1429 (61.2%)

Individuals Reporting Lifetime Hallucinogen Use and Alcohol Problems

Table 3 shows differences across individuals who do and do not report ever having used hallucinogens and also endorsed alcohol problems (Figure 1C). Those who reported lifetime hallucinogen use were younger ($t = 7.28$, $p<0.001$, $d = 0.39$), had more years of education ($t = -5.08$, $p < 0.001$, $d = 0.27$), reported more anxiety ($t = -3.08$, $p = 0.002$, $d = 0.17$) and depressive symptoms ($t = -3.06$, $p = 0.002$, $d = 0.17$), and endorsed more negative consequences concerning both alcohol ($t = 2.14$, $p = 0.033$, $d = 0.12$) and drug use ($t = -2.48$, $p = 0.013$, $d = 0.15$).

Table 3. Results of individuals who did and did not report ever having used hallucinogens.

	No Lifetime Hallucinogen Use (n=675)	Lifetime Hallucinogen Use (n=707)	Group Comparison	Overall Sample (n=1382)
	M(SD) [Min, Max]	M(SD) [Min, Max]		M(SD) [Min, Max]
Age	41.7 (10.7) [18.0, 70.0]	37.6 (10.2) [18.0, 66.0]	t = 7.28, p < 0.001, d = 0.39	39.6 (10.7) [18.0, 70.0]
Sex				
Male	423 (62.7%)	430 (60.8%)	$X^2 = 0.54$, p = 0.461	853 (61.7%)
Female	241 (35.7%)	272 (38.5%)		513 (37.1%)
Missing	11 (1.6%)	5 (0.7%)		16 (1.2%)
Years of Education	12.1 (2.28) [1.00, 30.0]	12.7 (2.11) [1.00, 21.0]	t = -5.08, p < 0.001, d = 0.27	12.4 (2.22) [1.00, 30.0]
Standard Drinks per Day	14.5 (13.4) [0, 61.2]	13.1 (13.5) [0, 61.2]	t = 0.99, p = 0.323	13.8 (13.8) [0, 61.2]
BDI	19.7 (12.2) [0, 58.0]	21.7 (12.0) [0, 56.0]	t = -3.06, p = 0.002, d = 0.17	20.7 (12.2) [0, 58.0]
STAI	45.2 (14.2) [7.00, 79.0]	47.6 (14.1) [20.0, 80.0]	t = -3.08, p = 0.002, d = 0.17	46.4 (14.2) [7.00, 80.0]
SIP	28.9 (13.1) [0, 45.0]	27.3 (14.6) [0, 45.0]	t = 2.14, p = 0.033, d = 0.12	28.1 (13.9) [0, 45.0}
SIP-D	29.6 (15.5) [0, 45.0]	31.9 (14.8) [0, 45.0]	t = -2.48, p = 0.013, d = 0.15	30.9 (15.1) [0, 45.0]
Regular Hallucinogen Use				
No Regular Use	675 (100%)	441 (62.4%)		1128 (80.5%)
Regular Use	0 (0%)	266 (37.6%)	N/A	273 (19.5%)
Recent Hallucinogen Use				
No Recent Use	0 (0%)	313 (44.3%)		313 (22.6%)
Recent Use	0 (0%)	250 (35.4%)	N/A	250 (18.1%)
Missing	675 (100%)	144 (20.4%)		819 (59.3%)

Individuals Reporting Regular Hallucinogen Use and Alcohol Problems

Table 4 displays differences in individuals who did and did not report regular use of hallucinogens (Figure 1D) alongside the co-use of alcohol. Regular users were slightly younger ($t = 3.40$, $p<0.001$, $d = 0.26$), more likely to be male ($X^2 = 4.57$, $p = 0.033$), and reported more

negative life consequences concerning drug use (t=-2.60, p = 0.009, d = 0.21) compared to non-regular users.

Table 4. Results of individuals who did and did not report regular use of hallucinogens.

	No Regular Hallucinogen Use (n=441)	Regular Hallucinogen Use (n=266)	Group Comparison	Overall Sample (N=707)
	M(SD) [Min, Max]	M(SD) [Min, Max]		M(SD) [Min, Max]
Age	38.6 (10.6) [19.0, 66.0]	35.9 (9.42) [18.0, 66.0]	t = 3.40, p < 0.001, d = 0.26	37.6 (10.2) [18.0, 66.0]
Sex				
Male	255 (57.8%)	175 (65.8%)	X^2 = 4.57, p = 0.033	430 (60.8%)
Female	183 (41.5%)	89 (33.5%)		272 (38.5%)
Missing	3 (0.7%)	2 (0.7%)		5 (0.7%)
Years of Education	12.8 (2.23) [1.00, 21.0]	12.6 (1.90) [7.00, 20.0]	t = 1.08, p = 0.278	12.7 (2.11) [1.00, 21.0]
Standard Drinks per Day	13.5 (13.4) [0, 61.2]	12.5 (13.7) [0, 59.0]	t = 0.20, p = 0.839	13.1 (13.5) [0, 61.2]
BDI	21.2 (11.9) [0, 54.0]	22.6 (12.1) [0, 56.0]	t = -1.47, p = 0.142	21.7 (12.0) [0, 56.0]
STAI	47.4 (14.7) [20.0, 80.0]	47.7 (13.0) [20.0, 79.0]	t = -0.27, p = 0.790	47.6 (14.1) [20.0, 80.0]
SIP	26.7 (14.8) [0, 45.0]	28.2 (14.2) [0, 45.0]	t = -1.21, p = 0.227	27.3 (14.6) [0, 45.0]
SIP-D	30.6 (15.7) [0, 45.0]	33.8 (13.0) [0, 45.0]	t = -2.60, p = 0.009, d = 0.21	31.9 (14.8) [0, 45.0]
Recent Hallucinogen Use				
No Recent Use	210 (47.6%)	103 (38.7%)	X^2 = 24.21, p < 0.001	313 (44.3%)
Recent Use	118 (26.8%)	132 (49.6%)		250 (35.4%)
Missing	113 (25.6%)	31 (11.7%)		144 (20.4%)

Individuals Reporting Recent and Regular Hallucinogen Use and Alcohol Problems

Table 5 depicts the differences across those who endorse recent and regular use of hallucinogens, versus those who reported regular, but not recent use (Figures 1E & 1F). Age was statistically significant (t = -9.82, p<0.001, d = 1.28) within this level of analysis, with the mean age of those who endorsed recent and regular use approximately 10 years younger than those who did not report hallucinogen use within the last five years (Figure 2).

Table 5. Results of individuals who reported recent or no recent use of hallucinogens.

	No Recent Hallucinogen Use (n=103)	Recent Hallucinogen Use (n=132)	Group Comparison	Overall (n = 235)
	M(SD) [Min, Max]	M(SD) [Min, Max]		M(SD) [Min, Max]
Age	41.7 (9.73) [24.0, 66.0]	31.2 (6.78) [18.0, 52.0]	t = -9.82, p < 0.001, d = 1.28	35.9 (9.72) [18.0, 66.0]
Sex				
Male	73 (70.9%)	83 (62.9%)	X^2 = 0.92, p = 0.338	156 (66.4%)
Female	30 (29.1%)	47 (35.6%)		77 (32.8%)
Missing	0 (0%)	2 (1.5%)		2 (0.8%)
Years of Education	12.4 (1.82) [8.00, 17.0]	12.8 (1.85) [8.00, 20.0]	t = 1.49, p = 0.137	12.6 (1.84) [8.00, 20.0]
Standard Drinks per Day	13.2 (14.2) [0, 52.9]	12.8 (13.7) [0, 59.0]	t = -0.18, p = 0.858	13.0 (13.9) [0, 59.0]
BDI	24.5 (12.3) [3.00, 51.0]	21.6 (11.8) [0, 54.0]	t = -1.81, p = 0.071	22.9 (12.1) [0, 54.0]
STAI	49.3 (12.4) [22.0, 78.0]	47.0 (13.3) [20.0, 79.0]	t = -1.37, p = 0.173	48.0 (12.9) [20.0, 79.0]
SIP	28.4 (14.6) [0, 45.0]	27.9 (14.4) [0, 45.0]	t = -0.25, p = 0.799	28.1 (14.4) [0, 45.0]
SIP-D	32.8 (13.9) [0, 45.0]	33.8 (13.3) [0, 45.0]	t = -0.54, p = 0.592	33.4 (13.5) [0, 45.0]

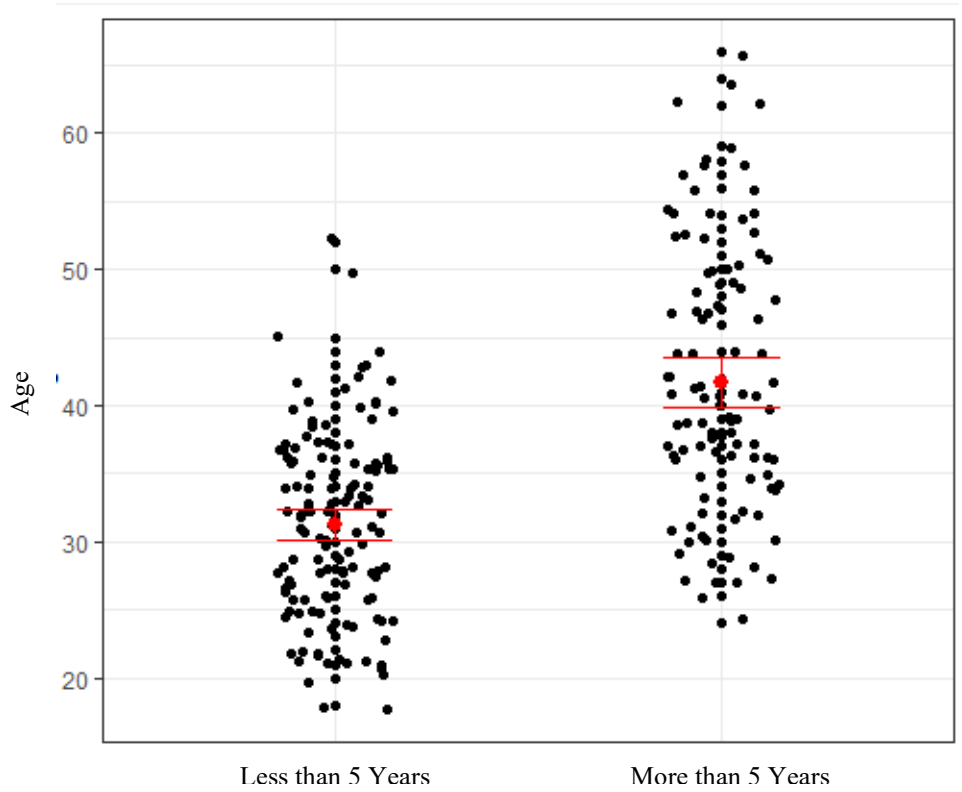

Figure 2. Comparison of age across those who endorse recent versus non-recent use of hallucinogens and alcohol problems.

Individuals Reporting Recent Use, No Recent Use, or No Regular Use of Hallucinogens

The final analysis compared recent, no recent, and no regular (Figure 1G) hallucinogen use across solely SIP-D scores. This allowed for a further examination into the role of life consequences within the most current landscape of treatment-seekers who co-use alcohol and hallucinogens. As depicted in Figure 3, non-regular hallucinogen users reported lower scores on the SIP-D ($p<0.01$), demonstrating this group experiences fewer negative drug consequences compared to the two other groups of regular hallucinogen users.

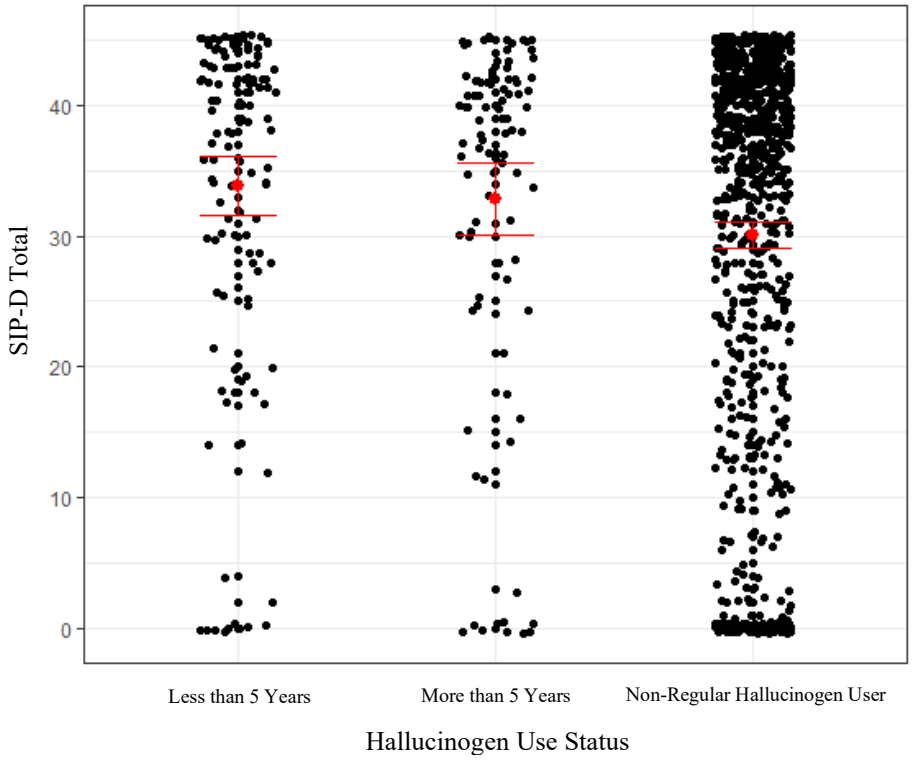

Figure 3. Comparison of SIP-D scores across those who reported recent, non-recent, or non-regular hallucinogen use.

Discussion

Our first analysis into those who reported alcohol problems showed these individuals were mostly male and older than treatment-seekers without alcohol problems. Those with alcohol problems scored significantly higher on the SIP, while those without scored higher on the SIP-D. The next sub-sample of those with lifetime use of hallucinogens and alcohol problems were younger than those who had never used hallucinogens, reported more years of education, and presented elevated levels of anxiety, depression, and negative life consequences related to

both alcohol and drug use. Those who engaged in regular use of hallucinogens and had alcohol problems were also younger, more likely to be male, and endorsed more negative life consequences related to their drug use. Recent and regular users of hallucinogens were significantly younger than those who endorsed regular, but not recent use of hallucinogens. The last analysis across the three groups of recent, non-recent, and non-regular users found that non-regular users of hallucinogens reported fewer negative drug consequences.

One key finding of this report was the differences in age across groups. While age showed statistically significant differences at each level of analysis, the most substantial difference appeared between recent and non-recent users of hallucinogens. The mean age of recent and regular users was almost ten years younger than those who did not report recent use with an effect size of d=1.28. The mean age of recent and regular hallucinogen users was also six years younger than the mean age of all individuals in treatment in this analysis. These findings suggest that the current landscape of hallucinogen and alcohol users in treatment may be younger than the average individuals in treatment. A report from 2022 shows that among young adults aged 19-30, hallucinogen use had significantly increased when compared to the past five and ten years of use by young adults (Patrick et al., 2023). Thus, the younger individuals in treatment who reported increased levels of hallucinogen use, alongside the co-use of alcohol, may be linked to the growing trend of young adults using hallucinogens. Future work should continue investigating trends in age among those who use hallucinogens and alcohol.

Another finding of this investigation concerns life consequences. Individuals who endorsed having ever used hallucinogens, compared to those who had not ever used, reported elevated levels of anxiety, depression, and negative life consequences in the context of both alcohol and drug use. Further, those who reported regular use of hallucinogens experienced more negative drug consequences compared to those who did not regularly use. These findings are partially reflective of Stephenson et al.'s (2022) results, which highlight that individuals with AUD who were most likely to have used hallucinogens six or more times engaged in an extended polysubstance use pattern that was correlated with younger onset of alcohol problems, higher depressive symptoms, and more criminal behavior. In the present study, results similarly demonstrated that those in treatment with more hallucinogen use were younger and experienced elevated negative life consequences due to drugs. Taken together, perhaps those who engage in

regular use of hallucinogens and alcohol are also engaging in more regular use of a variety of substances, and therefore are experiencing exasperated life consequences related to a variety of drug use. Future investigations should explore these possibilities to better understand the lived experiences of those who co-use alcohol and hallucinogens, and if the frequent use of hallucinogens is related to the more frequent use of a variety of substances.

This study also interrogated standard drinks per day across comparison groups in response to mixed findings on the trade-offs of hallucinogens and alcohol in non-treatment-seeking individuals (Calleja-Conde et al., 2022). This investigation found no significant differences in standard drinks per day across any groups of hallucinogen users. The present results suggest that hallucinogen use to any level may not reduce or inflate alcohol consumption in individuals seeking treatment. Thus, trade-offs between alcohol and hallucinogens suggested by previously mentioned literature may not be applicable to treatment populations.

One limitation of this investigation is the lack of data regarding the different types of hallucinogens used by participants. This study did not investigate the types of hallucinogens used and therefore the potential trends in specific hallucinogenic substances used by individuals in treatment remain unknown. Furthermore, another limitation is the classification of MDMA, or ecstasy, as a hallucinogen. Those within the scientific community have suggested that MDMA does not fit the pharmacology of a hallucinogen and instead should be classified as an entactogen (Nichols, 1986; Nichols & Oberlender, 1990). This investigation, however, followed drug classification standards set forth by the Substance Abuse and Mental Health Services Administration (SAMHSA) and did not include entactogens as a potential response option for participants. The different pharmacology of MDMA, compared to other hallucinogens, may present different use patterns or experiences for individuals and should be investigated further among treatment-seekers.

This study presents preliminary findings to better understand individuals in treatment who co-use alcohol and hallucinogens. Results inform the gap surrounding characteristics, trade-offs, and consequences experienced by this specific group of polysubstance users. The investigation's results support the limited available research on the subject by showing that those who co-use alcohol and report regular use of hallucinogens may experience more exasperated drug consequences. Further, the increasing trend of hallucinogen use by young adults was supported

by the younger groups of alcohol and hallucinogen users demonstrated within this sample; specifically, those who endorsed recent use of hallucinogens were substantially younger than those who were not recent users. Future work should build upon these findings and investigate the co-use of alcohol and hallucinogens among treatment-seekers. As shown, this information has the potential to better inform treatment modalities, risk prevention strategies, and general scientific understanding.

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