Article

How Substance Users With ADHD Perceive the Relationship Between Substance Use and Emotional Functioning

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Abstract

Objective: Although substance use (SU) is elevated in ADHD and both are associated with disrupted emotional functioning, little is known about how emotions and SU interact in ADHD. We used a mixed qualitative–quantitative approach to explore this relationship. **Method:** Narrative comments were coded for 67 persistent (50 ADHD, 17 local normative comparison group [LNCG]) and 25 desistent (20 ADHD, 5 LNCG) substance users from the Multimodal Treatment Study of Children with ADHD (MTA) adult follow-up (21.7-26.7 years-old). **Results:** SU persisters perceived SU positively affects emotional states and positive emotional effects outweigh negative effects. No ADHD group effects emerged. Qualitative analysis identified perceptions that cannabis enhanced positive mood for ADHD and LNCG SU persisters, and improved negative mood and ADHD for ADHD SU persisters. **Conclusion:** Perceptions about SU broadly and mood do not differentiate ADHD and non-ADHD SU persisters. However, perceptions that cannabis is therapeutic may inform ADHD-related risk for cannabis use. (*J. of Att. Dis. 2018; 22(9S) 49S-60S*)

Keywords

substance use, qualitative research, MTA study, ADHD

Introduction

ADHD is a childhood-onset condition that often persists with many adverse outcomes (Barkley, Murphy, & Fischer, 2008), including substance use (SU) and substance use disorders (SUDs; Dunne, Hearn, Rose, & Latimer, 2014; Kessler et al., 2006; Molina & Pelham, 2014; van Emmerik-van Oortmerssen et al., 2012). In a meta-analysis of studies that prospectively followed children with and without ADHD into adolescence or adulthood, childhood ADHD predicted nicotine, alcohol, cannabis, and cocaine SUDs (Lee, Humphreys, Flory, Liu, & Glass, 2011). Assessing malleable behavioral mechanisms underlying this association may inform treatment and prevention efforts. Here we examine the role of emotional functioning in the context of SU and childhood ADHD by adopting a mixed qualitative–quantitative approach to identify novel directions for future research and intervention.

Disrupted emotional functioning is associated with both ADHD and SU. In ADHD, emotion dysregulation is argued to be either a core (Barkley, 2010) or associated component (Martel, 2009). Features of emotion dysregulation (e.g., quickness to anger) are predictive of negative functional

outcomes over and above core ADHD symptoms (Barkley & Fischer, 2010; Barkley & Murphy, 2010) and are not fully accounted for by psychiatric comorbidity (Surman et al., 2011). Regarding SU, negative reinforcement models propose that a primary motive among regular users is to escape or avoid negative affect that occurs during periods of non-use

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(Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Kassel, Stroud, & Paronis, 2003). This model has received some support in substance users with ADHD—for example, cigarette smoking abstinence elicits higher levels of negative affect in ADHD smokers than non-ADHD smokers (McClernon et al., 2008; McClernon et al., 2011). Moreover, negative affect improves immediately after smoking among individuals with ADHD (Mitchell et al., 2014). Such studies examining emotional functioning in ADHD samples are cross-sectional and restricted to one type of substance, although different forms of SU commonly co-occur and interact with emotional functioning over development. Therefore, studies of longitudinally assessed substance users with a history of ADHD are needed.

Perceptions also play an important role in SU (Del Boca, Darkes, Goldman, & Smith, 2002; Goldman, 2002). For example, in a longitudinal study of students in Grades 7 to 11, expected liking of a substance was predictive of SU initiation and escalation (Fulton, Krank, & Stewart, 2012). In another prospective study of young adults with alcohol-dependent fathers, alcohol expectations mediated the relation between externalizing symptoms and alcohol use (Schuckit & Smith, 2006), indicating that SU perceptions are an important factor in maladaptive use in at-risk samples. However, despite being at-risk for various SU outcomes, individuals with ADHD endorse lower levels of expectancies about the effects of different forms of SU (Harty, Pederson, Gnagy, Pelham, & Molina, 2015; Pedersen, Harty, Pelham, Gnagy, & Molina, 2014), suggesting that ADHD may be associated with decreased awareness of subjective effects of SU using traditional rating scales (Harty et al., 2015). To best capture such complex perceptions of SU and emotions in those with ADHD, qualitative methodology may have utility. Quantitative scales typically have a narrow, pre-determined focus, whereas a qualitative approach may provide a more inclusive examination of emotional experience using participants' own explanations, experiences, and terminology.

In short, little is known about perceptions regarding emotional functioning and SU in youth with ADHD, and exploratory work may have important implications. We therefore examine young adults' narrative comments using mixed quantitative–qualitative analyses in a subsample of persistent and desistent substance users from the Multimodal Treatment Study of Children with ADHD (MTA; MTA Cooperative Group, 1999) to descriptively examine an understudied topic and generate hypotheses for future research. The MTA began as a 14-month randomized controlled trial of treatments for children with ADHD and continued as a prospective naturalistic follow-up study with regular assessments for 16 years. The MTA features a large multi-site sample ascertained via a gold-standard assessment; it also includes a local normative comparison group (LNCG) of classmates group-matched for age and sex (MTA Cooperative Group, 1999). Given that this is a well-characterized sample with and without ADHD who have been assessed for SU over time and were recruited across multiple sites, the MTA is a particularly rich sample to address the overarching goal of this study: to better understand the perceived role of emotional functioning in the context of SU in youth with a history of ADHD. To allow for variation in SU experience, we examined both SU persistence and desistence. In this exploratory investigation, we first assessed group differences (i.e., childhood ADHD/non-ADHD and SU persistence/desistence) regarding emotional functioning and SU via group comparisons of coded excerpts from qualitative interviews. Second, we performed substance-specific qualitative analyses to determine whether specific classes of substances yielded unique perceived emotion–substance relations.

Method

Participants

Participants were drawn from the 183 young adults who participated in the qualitative interview substudy of the MTA (detailed in Weisner et al., of this special section). In brief, recruitment aimed to oversample participants with an ADHD history as well as participants with persistent SU into early adulthood from four of the original seven MTA sites. For the current study, 92 young adults ($n = 70$ ADHD, $n = 22$ LNCG) were selected based on qualitatively confirmed persistent and desistent SU (see Jensen et al., of this special section). ADHD and LNCG groups did not significantly differ in age, sex, race, SU persistence, mood or anxiety disorders in the past year according to a semi-structured diagnostic interview conducted with young adults (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000), or site source (Table 1). Young adults in the ADHD group originally received a diagnosis of ADHD, Combined Type at study entry when they were 7.0 to 9.9 years old using procedures detailed by the MTA Cooperative Group (1999). Diagnostic and recruitment information on later assessments is available in Molina et al. (2013).

Procedures

Qualitative study recruitment. Participant recruitment and interviews occurred closest in time to MTA participants' regularly scheduled 14- or 16-year follow-up assessments, with the intention of oversampling participants with an ADHD history and participants with persistent SU through adolescence into early adulthood.

Qualitative interviews. A qualitative interviewing approach identified as the Eco-Cultural Family Interview and described in detail by Weisner et al. was conducted. This

Table 1. Participant Demographics.

	ADHD (*n* = 70)	LNCG (*n* = 22)	Test statistic	*p*
Age (*SD*)	24.37 (1.78)	23.88 (1.04)	*t*(90) = 1.75	.08
Sex (%)				
Male	52 (74)	18 (82)	$\chi^2(1) = 0.52$	.47
Female	18 (26)	4 (18)		
Race (%)				
White	54 (77)	18 (82)	$\chi^2(4) = 4.44$	.35
Black	7 (10)	1 (5)		
Non-Black/Hispanic	0 (0)	1 (5)		
Mixed	7 (10)	2 (9)		
Other	2 (3)	0 (0)		
SU group (%)				
Persistent	50 (71)	17 (77)	$\chi^2(1) = 0.29$	.59
Desistent	20 (29)	5 (23)		
Internalizing disorders (past year)				
Mood	3 (4.3%)	2 (9.1%)	$\chi^2(1) = 0.75$	.39
Anxiety	6 (8.6%)	2 (9.1%)	$\chi^2(1) = 0.01$	.94
Site (%)				
Berkeley	20 (29)	5 (23)	$\chi^2(3) = 0.62$	.89
Duke	22 (31)	7 (32)		
Irvine	17 (24)	7 (32)		
Montreal	11 (16)	3 (14)		

Note. LNCG = local normative comparison group; SU = substance use.

format features an approximately 2-hr guided conversation with interviewer prompts to discuss certain topics. Examples of interviewer prompts (if the information did not spontaneously emerge) included

> What are current stressors affecting you these days?
> What makes you similar or different emotionally from other young adults?
> When you first tried (insert substance), how did you feel?
> What substance do/did you like the best?
> What are some of the negative aspects of (insert substance)?
> Did your emotions affect your substance use?
> Did your substance use affect you emotionally?

Qualitative interview coding and reliability. As described in Weisner et al., interviews were digitally recorded, transcribed, and entered into a web-based research and analysis database system that allows integration of qualitative and quantitative data (Dedoose.com; Lieber & Weisner, 2010). The following topics were identified by raters of the interview transcripts:

> Topic 1: Emotional states precipitate SU
> Topic 2: SU positively affects emotional states
> Topic 3: SU negatively affects emotional states

When a topic was identified, it was coded on a 0 to 8 ordinal scale reflecting the degree of perceived association between emotion and SU for that particular topic: none (0), mild (1-2), moderate (3-5), substantial (6-8). Raters were blind to the scores of other raters and to the sites from which the excerpts were drawn. Kappa coefficients were >.70 between raters when determining whether a topic should be coded. Intra-class correlations indicated excellent consistency (ICC = .90) between raters when applying scores on the 0 to 8 scale.

The distribution of scores are reported by topic for descriptive purposes in Figure 1. The following percent of individual mean scores were in the moderate or substantial range (i.e., mean scores ≥ 3.0) for SU persisters and desisters, respectively: 88% and 67% (Topic 1), 76% and 21% (Topic 2), and 54% and 50% (Topic 3). An additional variable, a difference score of two topics, assessed the relative balance of positive and negative perceptions of SU and was created by subtracting the average score on a scale of 0 to 8 for each young adult for Topic 2 from Topic 3.

Data Analysis

Two-way between-groups analyses of variance (ANOVA) were conducted across all four variables to evaluate main effects for ADHD/LNCG group and SU persister/desister group, and their interaction. Given the small sample size of
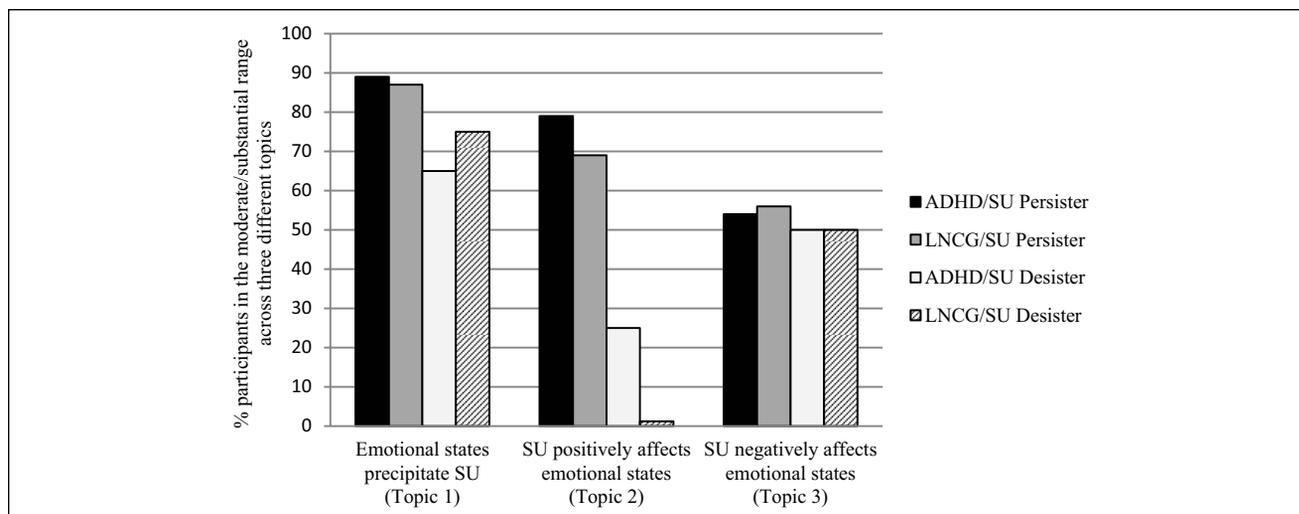
Figure 1. Percent of participants endorsing a moderate/substantial perceived relationship for each topic.

Note. Each topic was scored on a scale from 0 to 8, where 0 to 2 corresponds to no/mild perceived relationship and 3 to 8 corresponds to moderate/substantial perceived relationship. Sample sizes varied because not all participants received a rating for each topic (n = 41-47 ADHD/SU persisters, n = 15-16 LNCG/SU persisters, n = 17-20 ADHD/SU desisters, n = 4 LNCG/SU desisters). SU = substance use; LNCG = local normative comparison group.

some subgroups (i.e., n = 5 for those in the LNCG/SU desister group[1]), interactions were underpowered and effect sizes (Cohen's d) are emphasized (Cohen, 1988), consistent with our exploratory aims. We then examined substance-specific themes. The prevalence of endorsements of these themes was calculated across groups and subjected to chi-square analysis.

Results

Quantitative Analysis of Emotion and SU Topics

Across the four variable (three topics, one difference score), two main effects for SU persister/desister status emerged (Table 2) such that SU persisters scored higher than SU desisters on Topic 2 (the perception that SU positively affects emotional status; $p < .001$) and the difference score (the relative balance of positive from negative perceptions of SU; $p = .04$). Examination of effect sizes for both variables revealed large effects for ADHD/SU persisters in comparison with SU desisters with or without ADHD (ds = 0.85-2.83). Effect sizes for LNCG/SU persisters in comparison with both SU desister groups were also large for Topic 2 (ds = 0.97-1.68). Main effects and interactions were not significant for any other variable.

Qualitative Analysis of Emotion and SU Topics

Because the most robust difference between SU persisters and desisters emerged for Topic 2, we conducted an exploratory qualitative analysis of participant narratives for this topic at a substance-specific level. The majority

of interview excerpts for that topic (n = 423 across participants) involved cannabis (49%), alcohol (29%), or cigarettes (14%). Overall, 82% of excerpts involved at least one of these substances for Topic 2. We limited qualitative analyses to these three substances. Two themes emerged.

Qualitative Theme 1: There is a perceived positive impact of cannabis on emotional functioning in persistent substance users via improvement in positive mood or reduction in negative mood—reduction in negative mood appears to be most apparent in ADHD persistent substance users. The frequency of endorsements indicating that cannabis was perceived to enhance positive mood was not equivalent across all four groups (χ^2 = 8.10, p = .044; Table 3). Pairwise comparisons were conducted and excluded the LNCG/SU desister subgroup given its small sample size for this and all other comparisons. These analyses indicated that significantly more ADHD/SU persisters (63%) and LNCG/SU persisters (60%) endorsed this qualitative theme than ADHD/SU desisters (24%; χ^2 = 7.77, p = .005 and χ^2 = 4.39, p = .036, respectively). ADHD and LNCG SU persisters did not differ. Types of positive mood identified by participants included descriptors such as feeling "good" or "relaxed." To exemplify these narratives,[2] when one ADHD/SU persister participant was asked about the effects of smoking cannabis, he stated,

> (I) just relax for a minute, take a break or I don't know . . . Just the good feeling. (Smoking cannabis) just gives you a good feeling. I don't know . . . Gives you a nice good "I can do it" feeling.

Table 2. Means (*SD*) From Emotion and Substance Use Topics as a Function of ADHD/LNCG Group and Substance Use Persistence/Desistence Group.

Variables	SU persisters		SU desisters		F values			Cohen's *d*					
	ADHD (n = 39-47)	LNCG (n = 15-16)	ADHD (n = 17-20)	LNCG (n = 4)	ADHD group status	SU group status	ADHD × SU group status	SU persister ADHD v. SU persister LNCG	SU persister ADHD v. SU desister ADHD	SU persister ADHD v. SU desister LNCG	SU persister LNCG v. SU desister ADHD	SU persister LNCG v. SU desister LNCG	SU desister ADHD v. SU desister LNCG
Topic 1: Emotional states precipitate SU	4.40 (1.45)	4.36 (1.48)	3.85 (1.79)	3.54 (1.40)	0.13	1.99	0.08	.03	.34	.60	.31	.57	.19
Topic 2: SU positively affects emotional states	3.96 (1.30)	3.36 (1.72)	1.76 (1.59)	1.28 (0.33)	1.46	23.26**	0.02	.39	1.52	2.83	.97	1.68	.41
Topic 3: SU negatively affects emotional states	3.05 (1.71)	3.30 (1.80)	2.76 (2.07)	2.14 (1.59)	0.75	0.21	0.45	−.14	.15	.55	.28	.68	.34
Difference of positive from negative perception scores	1.02 (2.05)	−0.06 (1.88)	−1.00 (2.68)	−0.86 (1.52)	0.48	4.26*	0.79	.55	.85	1.04	.41	.47	−.06

Notes. Sample sizes varied because not all participants received a rating for each topic. Topics are focused on emotions as an antecedent to SU (i.e., Topic 1) and consequence of SU (i.e., Topics 2 and 3). Topics 1 to 3 were scored on a scale of 0 to 8. The difference score variable is the within participant average of Topic 2 minus the within participant average of Topic 3, which was then averaged across participants. The values listed here do not equal the difference of Topic 2 from Topic 3 for some groups (e.g., for the MTA/SU persister group, 3.96 − 3.05 ≠ 1.02) as some participants did not have scores for both Topics 2 and 3. Those participants who had values for only Topic 2 or 3 were excluded in the calculation of the difference score variable. SU = substance use; LNCG = local normative comparison group.
*p < .05. **p < .001.

Table 3. Frequency Endorsements (%) for Each Qualitative Theme.

	SU persisters		SU desisters				
	(1) ADHD[a] (n = 25-46)	(2) LNCG[b] (n = 4-15)	(3) ADHD[c] (n = 7-17)	(4) LNCG[d] (n = 2-4)	χ^2	p	Pairwise contrasts
Qualitative Theme 1							
Cannabis perceived to enhance positive mood	29 (63%)	9 (60%)	4 (24%)	2 (50%)	8.10	.044	1,2 > 3
Cannabis perceived to reduce negative mood	26 (57%)	7 (47%)	3 (18%)	1 (25%)	8.27	.041	1 > 3
Alcohol perceived to enhance positive mood	18 (60%)	3 (38%)	10 (53%)	3 (100%)	3.75	.289	
Alcohol perceived to reduce negative mood	9 (30%)	1 (13%)	5 (26%).	1 (33%)	1.06.	.787	
Cigarettes perceived to enhance positive mood	8 (32%)	1 (25%)	1 (14%)	1 (50%)	1.31	.728	
Cigarettes perceived to reduce negative mood	17 (68%)	2 (50%)	4 (57%)	0 (0%)	3.87	.276	
Qualitative Theme 2							
Cannabis perceived to improve ADHD/ADHD symptoms	23 (50%)	2 (13%)	2 (12%)	0 (0%)	14.09	.003	1 > 2,3
Alcohol perceived to improve ADHD/ADHD symptoms	1 (3%)	0 (0%)	1 (5%)	0 (0%)	0.60	.897	
Cigarettes perceived to improve ADHD/ADHD symptoms	2 (8%)	0 (0%)	1 (14%)	0 (0%)	0.91	.824	

Notes. LNCG SU desisters were excluded from pairwise contrasts due to small sample size. SU = substance use; LNCG = local normative comparison group.
[a]ADHD SU persisters *n* = 46, 30, and 25 for analysis of cannabis, alcohol, and cigarettes, respectively (i.e., among ADHD SU persisters, these were the number of participants who commented on each respective substance).
[b]LNCG SU persisters *n* = 15, 8, and 4 for analysis of cannabis, alcohol, and cigarettes, respectively (i.e., among LNCG SU persisters, these were the number of participants who commented on each respective substance).
[c]ADHD SU desisters *n* = 17, 19, and 7 for analysis of cannabis, alcohol, and cigarettes, respectively (i.e., among ADHD SU desisters, these were the number of participants who commented on each respective substance).
[d]LNCG SU desisters *n* = 4, 3, and 2 for analysis of cannabis, alcohol, and cigarettes, respectively (i.e., among LNCG SU desisters, these were the number of participants who commented on each respective substance).

The frequency of endorsements via reduction in negative mood was also significant (χ^2 = 8.27, *p* = .041). Pairwise comparisons indicated a different trend in which significantly more ADHD/SU persisters (57%) endorsed this theme than did ADHD/SU desisters (18%; χ^2 = 7.55, *p* = .006; Table 3). LNCG/SU persisters did not significantly differ from ADHD/SU persisters or ADHD/SU desisters, although comparison with the latter group approached significance (*p* = .077). Types of negative mood identified by participants included descriptors such as feeling "irritated" and "frustrated." This perceived regulatory function to manage negative mood was described by one ADHD/SU persister as follows:

> I'm a little more on the edge maybe. Like I get a little more edgy, I get more irritated easy, that's another reason why I like smoking pot, it mellows me down that way I won't get irritated

A similar pattern did not emerge for alcohol or cigarette smoking.

Qualitative Theme 2: There is a perceived positive impact of cannabis use on ADHD in ADHD persistent substance users. The frequency of endorsements for this qualitative theme was not equivalent across all four groups (χ^2 = 14.09, *p* = .003; Table 3). Pairwise comparisons indicated that significantly more ADHD/SU persisters (50%) endorsed this theme than LNCG/SU persisters (13%) and ADHD/SU desisters (12%; χ^2 = 6.29, *p* = .012 and χ^2 = 7.58, *p* = .006, respectively). As an example of endorsements for this theme, some ADHD/SU persisters stated that cannabis helped attentional aspects of their ADHD.

> But over the years, now that I've got older it helps me focus . . . I would rather smoke before I go to class than not cause I pay attention better in class. I will take better notes . . . and . . . ask the teacher more questions if I smoke before I go to class.

Some ADHD/SU persisters reported that cannabis improved their ADHD, but then qualified this with a statement about the emotional impact of cannabis. For example, one participant indicated that smoking cannabis was therapeutic for her ADHD symptoms, but then stated,

> It's like a teddy bear. It's something that makes me feel better. I'm sure that's what addicts say all the time. It does. It makes me feel like I'm like, okay, it's a winder down . . . I'll go home and have a half of a blunt and probably pass out and watch some TV. . . . it's a relaxation device for me.

Other ADHD/SU persisters referenced improvement in mood as a function of cannabis use and described positive effects on mood that appeared to calm hyperactive-impulsive ADHD symptoms:

> I feel like (cannabis) calms me down. Like I said, I do—I do like my personality, I'm not gonna complain about the ADHD. I'm not gonna complain about being on the go all the time. But, like I said, you got to have some downtime.

Moreover, some ADHD participants perceived their ADHD and mood as intermingled: if smoking cannabis improved their ADHD, then it also had a positive impact on their mood (and vice versa). For example, when one participant was asked about his ADHD and then about cannabis use, he stated,

> I mean, at times (ADHD) makes me really angry and stuff like that . . . People are supposed to be on the same wavelength as me or something . . . When, they're not. And, I just get really enraged and I get pissed off . . . Yeah, "What the fuck? Are you doing this shit to fuck with me?" And, they're not, you know? But, it's just that's just my personality, that's just who I am . . . (To manage this), smoking weed, really, really, really helps like—I can fucking go ape shit and I'll go fucking smoke a blunt or I'll smoke a bowl, or I'll smoke a joint or something, and I'll just—I'll chill out.

A similar pattern did not emerge for alcohol or cigarette use.

Discussion

Prospective studies of children diagnosed with ADHD, including the MTA, have demonstrated a relationship with SU and SUDs (Howard et al., 2015; Molina et al., 2007; Molina et al., 2013). The current study utilized a mixed qualitative-quantitative approach that extended such findings by examining the role of emotional functioning in SU in a subsample of persistent and desistent substance users. We first performed a quantitative analysis of topics coded from interviews with young adults that yielded main effects for SU persistence on two of four topics. SU persisters perceived that (a) SU had a positive impact on their emotional functioning and (b) the positive benefits of SU on emotional functioning outweighed the negative impact of use in comparison with SU desisters. Consistent with these findings, other studies assessing the narratives of SU persisters and desisters indicate that the experience of SU differentiates these two groups. For example, Liebregts et al. (2015) reported that desistent cannabis users exhibit differences in agency, goal-setting strategies, and ability to envision another self when attempting to quit in comparison with persistent cannabis users. Findings from the current study add to the evidence for such group differences and indicate

that perceptions about the role of emotional functioning in SU are important as well. In terms of treatment implications, one key barrier to SU treatment is the belief that treatment is not needed (Gates, Copeland, Swift, & Martin, 2012). Findings from this study would add that persistent substance users may be dissuaded from seeking treatment because their SU is perceived to be adaptive (i.e., SU has a positive impact on emotional functioning, which outweighs the negative emotional impact). Perceptions about the role of emotion in SU did not differentiate ADHD and LNCG persistent substance users in this study; therefore, treatment development efforts targeting perceptions about the role of emotion may not be specific to those with a history of ADHD—at least in regards to SU in general.

In-depth exploratory analysis of the personal reflections regarding this positive emotional outcome of SU allowed greater specification by different substances. Two themes emerged. First, there was a perceived positive impact of cannabis on emotional functioning in persistent substance users (both ADHD and LNCG groups) via improvement in positive mood or reduction in negative mood (the latter was particularly applicable to the ADHD group). Such perceptions are consistent with research on the subjective effects of cannabis use (Green, Kavanagh, & Young, 2003). The perceived mitigating effects of cannabis on negative mood for ADHD SU persisters is consistent with models of SU in ADHD patients. For example, Molina and Pelham (2014) propose that negative mood may maintain patterns of use, and expectancies about use (e.g., beliefs that negative mood will improve following SU episodes) may be substance-specific in individuals with ADHD. In accordance with our findings, this may be particularly applicable to cannabis users with childhood ADHD. One clinical implication of this is that treatments should target how cannabis users with a history of ADHD cope with their negative emotional states. Mindfulness and acceptance-based interventions may be particularly promising treatments to address this mechanism given their effects on negative mood as a mediator of treatment outcome (Brewer, Elwafi, & Davis, 2013; Brown et al., 2008; Witkiewitz et al., 2014).

The second theme that emerged from our exploratory analysis was that 50% of ADHD/SU persisters perceived that cannabis improved ADHD. Endorsement rates for other subgroups ranged from 0% to 13%. To our knowledge, only one other study (Harty et al., 2015) has considered perceptions about cannabis use in a sample with ADHD in childhood, and no study has identified a perception that cannabis is therapeutic for ADHD in an ADHD sample. Such perceptions are common online (Mitchell et al., 2016) and have been advocated in case study findings (Strohbeck-Kuehner, Skopp, & Mattern, 2008), but are in stark contrast with laboratory-based studies in non-ADHD cannabis-using samples on neurocognition (McDonald, Schleifer, Richards, & de Wit, 2003; Ramaekers, Kauert, Theunissen, Toennes, &

Moeller, 2009; Ramaekers et al., 2006). Findings from this study suggest that these perceptions need to be compared against the acute and chronic effects of cannabis use in a controlled laboratory setting. Future studies should also differentiate between perceptions that cannabis improves mood versus improving ADHD symptoms—some in our sample appeared to conflate the effects on ADHD with effects on mood.

At a broad level, there is a need to understand the deleterious effects of cannabis use (Volkow, Baler, Compton, & Weiss, 2014; Volkow et al., 2016), particularly in vulnerable populations such as those with ADHD, as legalized recreational use among adults could significantly increase access to cannabis among youth and is a growing concern for pediatric health in the United States (Saloner, McGinty, & Barry, 2015). This exploratory analysis also demonstrates the utility of a qualitative approach to identify perceptions that are not captured using traditional quantitative methods (Harty et al., 2015; Pedersen et al., 2014). Contrary to past studies that have demonstrated nicotine (Conners et al., 1996; Levin et al., 1996; Potter & Newhouse, 2004, 2008) and *ad libitum* cigarette smoking (Mitchell et al., 2014) improve attention in adults with ADHD, participants with ADHD histories did not perceive improvement in such functioning when asked to reflect on their smoking in the current study. This may be another disjunction between fact and perception among individuals with ADHD.

Limitations and Future Directions

Small sample size limited power to detect group differences for subgroup analyses, particularly for analysis of specific substances (i.e., alcohol, tobacco, cannabis). Furthermore, while the aim of this study was to examine childhood ADHD, we did not examine persistence of ADHD into adulthood. In addition, although the purpose of the current study was to examine perceptions about SU in general given that this is an understudied topic in substance users with ADHD, future studies should explore aspects of emotional functioning over the course of SU (e.g., initiation, maintenance, and cessation). Finally, despite that internalizing disorders may be characterized by poor emotion regulation, they were infrequent in the current sample: rates between ADHD and LNCG samples were low (i.e., <10%) and did not differ between groups. Other aspects of emotional dysregulation, such as anger, may be just as, if not more, relevant to SU in ADHD than depression or anxiety (Molina & Pelham, 2014).

Conclusion

These findings are the first, to our knowledge, to incorporate qualitative methodology to examine the relation between emotions and SU in a longitudinal sample of childhood diagnosed with ADHD. Young adults' narratives revealed that those who are persistent substance users perceive a link between their emotions and SU in comparison with SU desisters, particularly the perception about the positive impact of SU on emotional states and the relative balance of positive and negative effects of use. Secondary exploratory analyses revealed cannabis-specific effects themes associated with childhood ADHD: Cannabis is perceived to have a therapeutic effect on negative mood and ADHD symptoms. The current study is the first to identify such perceptions about the effects of cannabis in an ADHD sample, which can generate testable novel hypotheses about cannabis use and perceived effects on mood and ADHD in the laboratory setting and natural environment. Clarifying the role of these potentially malleable perceptions may inform development of treatment and prevention efforts.

Juvenile Justice and Delinquency Prevention/Department of Justice: Karen Stern, PhD. Additional investigators involved in Qualitative Interview Substudy: Thomas S.Weisner, PhD, & Jeffrey Good, PhD UCLA.

Declaration of Conflicting Interests

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Notes

1. Sample sizes varied across topics because not all participants received a rating (on a scale of 0 to 8) for each topic. Data analysis was repeated with 0 entered for any participant who did not receive a rating for a particular topic—this supplemental analysis, available from the first author, did not result in any change in statistical significance or interpretation.

2. Examples that typified endorsements are reported. Vague use of pronouns (e.g., "it") were replaced with specific terms used elsewhere in the post (e.g., "smoking cannabis") and denoted by use of parentheses. Also, use of . . . . within quotes indicates a natural pause in speech or excerpt portions removed to allow for brevity while maintaining the overall context of the quote.

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