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PERSONALITY AND CUED ASSOCIATIONS INFLUENCE ALCOHOL AND CANNABIS USE IN ADOLESCENTS (AGED 13 – 17)

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Abstract

Early transitions to alcohol and cannabis use are associated with a variety of negative consequences including reduced physical and mental health, substance use disorders, educational and social problems. Youth aged 13 to 17 is a vulnerable time for initiation, escalation, and problems associated with use. This research focuses on specific personality traits: Sensation-seeking (SS), Impulsivity (IMP), Anxiety sensitivity (AS), and Negative thinking (NT) and cued associations known to have a direct relationship with adolescent substance use. We report here the predictive value of personality and its interaction with substance use associations including longitudinal transitions to initiation of use, increased frequency and quantity of use, and abuse. *Method:* Canadian youth (N=1552) from grades eight to ten were surveyed in Spring 2018, Winter 2018, and Spring 2019. All students received questions about alcohol and cannabis use including past year use, quantity and frequency of use, and abuse (AUDIT and CUDIT). Personality in Grade 8 students was assessed in Spring 2019 using the Substance Use Risk Profile Scale (SURPS), which reliably measures SS, IMP, AS, and NT traits. Cognitive associations with alcohol and cannabis use were measured in each survey. Two types of associations were assessed: behavioral associates and outcome expectancies. In the behavioral associate tasks, students responded with the first behavior that came to mind when presented a specific emotional or situational cue. The number of alcohol-related (e.g. get drunk) or cannabis-related (e.g. smoke pot) comprised the behavioral associates score. Alcohol and cannabis use cues each generated four open-ended outcomes that were subsequently self-rated for amount of liking (Likert scale) and category (e.g. social, emotional). *Results:* Personality had strong effects on both concurrent alcohol and cannabis use and problems. Both cognitive measures also strongly predict concurrent alcohol and cannabis use and problems. Personality also predicted the level of liking and category of expectancy outcomes as well as the number of behavioral associates. Longitudinal mediation analysis across the three waves revealed the prospective predictive power of both personality and cognition measures on initiation of use and problems. In addition, a latent construct with the cognitive associations as indicators mediated the effects of personality on both use and problems. *Conclusion:* Specific personality trait and cognitive associations are useful as both early indicators and as targets for prevention of transitions to alcohol and cannabis use in early adolescence. The specific findings should inform cognitive behavioral approaches to early prevention efforts.

Keywords: *Alcohol and cannabis use, personality, cognition, adolescents, early transitions*.

1. Introduction

Adolescence is a time of vulnerability, experimentation, and susceptibility to alcohol, and cannabis use (Smith & Anderson, 2001). Early substance use is related to many problems in adolescents including academic problems, substance use problems, and delinquent behavior, and interference with developing brain systems (Coffey & Patton, 2016; Wiers et al., 2007). Targeting adolescent alcohol and cannabis use, then, may prove to be cost effective and particularly valuable for preventing use and its related consequences.

1.1. Personality and substance use

Specific personality traits are useful in identifying youth vulnerable to problematic substance use (Castellanos-Ryan et al., 2013; Krank et al., 2011). The Substance Use Risk Profile Scale (SURPS) was developed to identify four personality traits that predict the risk of adolescent substance use and abuse: impulsivity, negative thinking, anxiety sensitivity, and sensation seeking (Krank et al., 2011; Woicik et al., 2009). Impulsivity, the inability to inhibit specific behaviors, is associated with increased use and misuse of many substances (Krank et al., 2011, Castellanos-Ryan et al., 2013). Negative thinking, the tendency for one to experience increased feelings of despair, is associated with a greater risk of substance

use in numerous studies in adults (Castellanos-Ryan & Conrod, 2012) and adolescents (Krank et al.; 2011). Anxiety sensitivity, the fear of anxiety-related physiological arousal and sensations and the potential loss of control over oneself (Castellanos-Ryan et al., 2013), predicts drinking motives and alcohol use problems in undergraduate students (Stewart et al., 1999; Woicik et al.; 2009), but is associated with lower levels of substance use in adolescents (Krank et al., 2011). Finally, sensation seeking, the tendency to pursue stimulation and novel experiences, is associated with alcohol-related problems (Conrod et al., 2000) and of hallucinogen use (Krank et al., 2011). Despite these findings, many studies examining the connection between personality traits and substance use do not comment on or postulate the mechanism through which personality impacts the trajectories of substance use in youth.

1.2. Automatic cognitions using cued associations

Dual-processing theories suggest that decisions are influenced by two distinct cognitive systems with different methods of information retrieval: System One and System Two (Kahneman, 2011). System One is spontaneous, fast, and often operates without conscious awareness, whereas System Two operates at a conscious level of awareness, and is slower, reflective, and effortful (Kahneman, 2011). The automatic associative processes of System 1 influence decisions, judgements, and behaviors rapidly and without conscious awareness (Krank & Robinson, 2017). Research also shows that these automatic cognitions can lead to cognitive biases, which may also have impacts on future substance use (van der Vorst et al., 2013). Specifically, spontaneous memory association and outcome expectancy biases correlate with increased substance use (Fulton et al., 2012; Stacy & Wiers, 2010). Such cognitive biases can arise from social influence before an individual initiates substance use (Pilin et al. 2021;van der Vorst et al., 2013).) This paper sought to demonstrate that these findings can be extended to include personality as a mediator of adolescent substance use.

Automatic cognitive processes are engaged using indirect methods that ask for quick open-ended responses and do not ask the participant to consciously deliberate their answer. Word association tasks are indirect methods that use ambiguous single-word prompts or multi-word behavioral prompts that could be associated with substance-related cues (Krank et al., 2011; Krank & Robinson, 2017; Pilin et al., 2021; Stacy et al., 1994; Stacy, 1995). If the participant has strong automatic associations with the prompt and a substance, it is likely that these associations will be triggered automatically and will be reported on the measure spontaneously. More direct assessments, such as outcome expectancies, are also affected by automatic and unconscious influences (Ames et al., 2012; Krank & Robinson, 2017). Indeed, automatic influences from associative memory strongly impact judgements and decision-making (Kahneman, 2011). The outcome expectancy measure we use here emphasizes associative memory influences by encouraging top of mind responses and strongly predicts the growth trajectories of both alcohol and cannabis use in adolescents (Fulton et al., 2012).

1.3. Acquired-preparedness model

The Acquired-Preparedness Model (APM) describes how personality relates to substance use. The APM suggests that an individual's personality traits shape their learning experiences which then influence behavior, potentially leading to substance use (Smith & Anderson, 2001). The APM explains that personality traits may impact learned outcome expectancies, which then influence substance use behavior (Smith & Anderson, 2001). The present study examines the potential effects of personality on automatic cognitions and subsequent use (c.f. Pilin et al., 2021; van der Vorst et al., 2013).

2. Design and objectives

The purpose of this study was to test the hypothesis that cued and self-generated alcohol and cannabis associations mediate the effects of personality on use in longitudinal study of young adolescents. We test the mediation of personality (SURPS) measured at Time 1 by automatic cognitions measured at Time 2 on future substance use and problems at Time 3.

3. Methods

3.1. Procedures

The data used here was from a large longitudinal study of students enrolled sequentially in Grade 8 and surveyed twice each year over four years. Individual data from each wave was linked to allow longitudinal analysis. All measures were obtained on computers using Qualtrics. All procedures were approved by UBC Behavioral Research Ethics Board. The present analyses used SPPS and AMOS (Version 28). Mediation analysis used three consecutive waves (cf. Pilin et al. 2021).

3.2. Participants

Grade eight to ten students (N=1552) from a school district in western Canada completed Waves Four (Time 1 - May 2018), Five (Time 2 - November 2018), and Six (Time 3 - May 2019).

3.3. Measures

Alcohol and cannabis use (past year use) and problem use (AUDIT and CUDIT) were measured in all waves. Personality scores for impulsivity (IMP), negative thinking (NT), anxiety sensitivity (AS), and sensation seeking (SS) were obtained using the SURPS in Wave four. Cued association measures were obtained in Wave five including outcome expectancy liking (OEL, Fulton et al., 2012) and ambiguous word associates (WA, Pilin et al. 2021; Stacy et al, 1997; van der Vorst et al., 2013). For both cannabis and alcohol OEL scores, students were cued to list four things that would happen if they used and to indicate how much they would like or not like each outcome on a five-point Likert scale (-2 not like a lot, -1 not like, 3 neither, 1 like, 2 like a lot). Average Likert ratings over four ratings were used to create alcohol (AOEL) and cannabis (COEL) scores. For the WA task, adolescents were asked to write the first word that came to mind in response to a set of words with ambiguous meaning (e.g., Draft, Shot, Weed, etc.). Students subsequently rated each response for their perceived relation to alcohol or cannabis. Sums were calculated to obtain alcohol (AWA) and cannabis (CWA).

4. Results

4.1. Personality and associations predict alcohol and cannabis use and problems

Personality predicted future alcohol and cannabis use. In addition, both cognitive measures strongly predicted alcohol and cannabis use and problems. Personality also predicted the level of liking and the number of behavioral associates. Personality also modified the pattern of categories of cued responses (not shown).

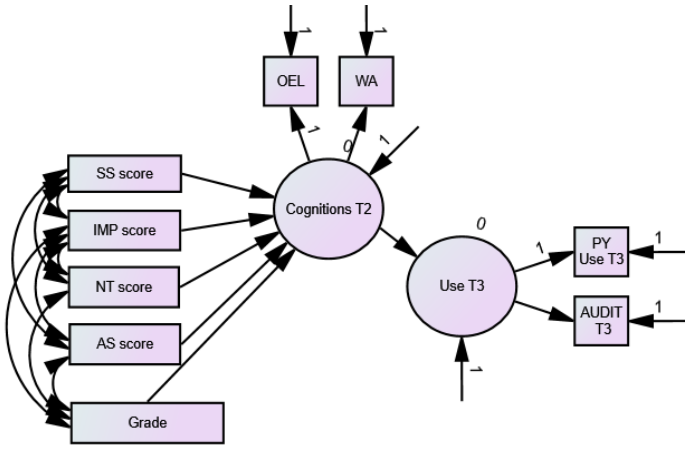
Table 1. Shows the concurrent relationship between Grade level, SURPS scores, and cued associations. Values represent log likelihoods with significance as indicated (> .05; ** > .01; *** > .001). Past year use was analyzed using a logistic regression. A negative binomial analysis was used with AUIDIT and CUDIT scores.*

	Grade	SS	AS	Imp	NT	OEL	WA
Alcohol use	1.10***	1.10***	.87***	1.06*	1.15***	1.15***	1.71***
AUDIT	1.75***	ns	.65*	1.18**	ns	2.14***	1.23*
Cannabis use	1.11***	1.14***	.87***	1.06*	1.15***	1.12***	1.08***
CUDIT	1.45*	1.85*	.650*	2.02*	1.86*	1.93***	1.41***

4.2. Substance use associations mediate personality effects on the growth of use and problems

Longitudinal mediation analysis across the three waves revealed the prospective predictive power of cognition measures on initiation of use and problems. In addition, a latent construct with the cognitive associations as indicators mediated the effects of personality on both use and problems (see Figure 1). The Cognitions latent construct in this model uses indicators from the two types of association tasks measured at Time 2. The Use construct at Time 3 uses both past year use and AUDIT or CUDIT for alcohol and cannabis respectively. Separate models were analyzed for alcohol and cannabis.

Figure 1. This diagram shows the final model for both alcohol and cannabis. Only significant paths are shown. Note that all direct effects of personality and grade were not significant for either alcohol or cannabis use at Time 3.



Evidence for the mediation in both alcohol and cannabis models is found in both the absence of direct effects of personality on future use and the significance of indirect effects. Only the latent cognitions construct at Time 2 directly influences use at Time 3. Although personality and grade have direct effects on the cognitive construct, they do not have any direct effect on use at Time 3 when the mediator is included. However, personality scores and grade all have significant indirect effects through the cognitive constructs on both cannabis and alcohol use at Time 3.

Table 2. Standardized direct and indirect effects on alcohol and cannabis use. Confidence intervals and point estimates were obtained using bias corrected bootstrapping. All significance levels reached at least p <.01 with the exception of the indirect effect of AS (p < .05).

	Direct effects				Indirect effects	
Source	**Alcohol cognitions**	**Cannabis cognitions**	**Alcohol use T3**	**Cannabis use T3**	**Alcohol use_T3**	**Cannabis use T3**
Grade_2018	0.341	.291	-	-	0.283	.218
NT_score	0.259	.333	-	-	0.215	.249
IMP_score	0.195	.178	-	-	0.162	.133
AS_score	0.162	-.117	-	-	-0.134	-.087
SS_score	0.275	.278	-	-	0.228	.208
Alcohol cognitions	-	-	0.829	-	-	-
Cannabis cognitions	-	-	-	.748	-	-

5. Discussion

This study provides strong support for the acquired preparedness model (Smith & Anderson, 2001). In fact, the analysis supports full mediation of personality effects by cued association tasks. Specifically, this approach suggests that risky personality traits change the things learned about substance use and modifies our associative memories. In particular, sensation-seeking, impulsivity, and negative thinking each contributes to learning more positive outcome associations with substance use and more cued associations with substance use. This learning translates into greater substance use in the future. By contrast, but consistent with our previous findings, anxiety sensitivity appears to exert a protective effect on immediate use transitions in this population with more negative outcome associations with substance use and fewer cued associations with substance use. As in two previous mediation studies (van der Vorst, 2013; Pilin et al., 2021) increased age effects are also fully mediated by cognitions. This somewhat surprising finding strengthens the hypothesis that what is learning about substance use is critical to the trajectory of substance use during this vulnerable developmental phase.

The particular associative tasks used in this study were chosen for several reasons. First, they are unobtrusive. Thus, for example, the outcome expectancy task (Fulton et al., 2012) allows unique responses from participants and does not confront naïve youth with suggestive outcomes that might only be relevant to regular or heavy users. This method assesses not only preexisting expectancies but also perceived desirability of these consequences. The latter part of this is especially important as the same consequences may be perceived as either negative or positive by different individuals. For example, "alcohol will make me sleepy" could be incentive to use for some or a deterrent for others. Second, the nature of these tasks is such that they are likely to tap into more fast, automatic and even unconscious processes (System 1, Kahneman, 2011). These tasks elicit rapid responses without requiring significant deliberation as participants are instructed to complete the task as quickly as possible. As such, the WA task is considered to be an indirect measurement of substance use – related memory associations. Word association tasks have been found to be among the most useful assessments of association (Stacy & Wiers, 2010). Finally, there is a synergistic relationship between outcome expectancies and memory association. The latent construct using these measures is more predictive than either measure separately largely due to an interaction between these two predictors. Outcome expectancies measure response – outcome associations which are different from cue – behavior associations. Memory associations derive from an association between the environment, context, or experience and the substance (van der Vorst et al., 2013). Each has a separable role in the translation of associations to behavior.

6. Conclusion

Adolescents learn quickly from many sources contributing to an extensive associative network that powers many of the judgements and choices we make (Kahneman, 2011), This perspective has important implications for the development of effective prevention programs (Krank & Goldstein, 2006). Such programs should target the learned associations that contribute to risky substance use choices. One

example of a program that does target individual learning experiences is Preventure (Conrod, 2016; Conrod et al., 2000). Preventure is a brief targeted program that focuses on personality specific experiences and trains positive alternative behaviors such as coping skills. Evidence to date suggests that this approach is effective in preventing or delaying adolescent substance abuse (Conrod, 2016). Our results suggest directions for future developments of even more effective prevention approaches.

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