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The Development and Exploration of a Twelve-Factor Model of Motivations for Using Substances

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THE DEVELOPMENT AND EXPLORATION OF A TWELVE-FACTOR MODEL OF

MOTIVATIONS FOR USING SUBSTANCES

by

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ABSTRACT

The existing literature suggests inconsistent and limited application of various salient motives to use substances across substance classes and has been further limited by only measuring substance use motives by the frequency at which one uses for a given reason. The purpose of this study was the development and initial validation of the Motivations for Substance Use Questionnaire (MUSQ). The MUSQ was intended to be a more comprehensive measure identifying motives to use that have been selectively included in some measures and expanding the breadth of substances addressed. We also aimed to index and test cognitive aspects of the motives (i.e., *wanting*, and *liking* and *satisfaction*) for use-related patterns.

Factor analysis ($n = 367$) indicated that the MUSQ was characterized by 12 factors: Reduce Anxiety/Unpleasant Arousal, Conformity, Effects of Other Substances, Relative Low Risk, Positive Social Interactions, Rebellion, Altered Perceptions/Experiential Processes, Performance/Arousal Enhancement, Increase Positive Affect, Manage Negative Social Interactions, Reduce Negative Affect, and Substitution. Regressions supported the predictability of *wanting*, but not *liking* and *satisfaction*, for severity and change variables. Canonical correlations were conducted to assess incremental validity of the MUSQ but were limited due to small effects and sample sizes. ANOVAs suggested salient motives differed by drug of choice. This measure may direct motivational interviewing dialogue by supporting change talk and may expand the current understanding of substance use motivation.

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DEDICATION

This project is dedicated to Tammy and Jim Harrison, and Marty and Angie Altenberger, my wonderful parents that loved and supported me throughout its completion. Without you all, I would not have grown into the woman I am proud to be today. To my good friends throughout graduate school who worked alongside me, reinforced my successes, and stood beside me through my obstacles throughout this two-year project, I am so thankful. Riley Davis, Lynda Hayes, Andrew Rozsa, Parker Lundy, Meleah Ackley, Mary Medlin and Brad Green – thank you for being my people. To my late sweet baby Bella and Sir. Winston Churchill (Winnie), thank you for your warm cuddles, your stinky kisses, and never letting me feel like I'm alone in this journey. Finally, this project is dedicated to those who have lost their lives from substance use disorders and those who continue to struggle with use-related problems. My hope is that one day my research and clinical practice will touch the lives of those who battle addiction and help their transition to recovery. You are not your addiction and we can recover.

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CHAPTER I – INTRODUCTION

Substance Use Disorders (SUDs) are a substantial economic and emotional burden on those afflicted and their support system. The prevalence of SUDs in the United States is rather high, with 3.9 and 9.9 percent of individuals meeting DSM-5 SUD diagnostic criteria for past year and lifetime diagnoses (Grant et al., 2016). High comorbidity of SUDs with mood, anxiety, and personality disorders demonstrates a complex expression of problems at the individual and societal level. SUDs cost the individual substantial time devoted to obtaining, using, and recovering from the substance and loss of relationships while costing the nation billions of dollars annually related to legal and health care costs, as well as reductions in work productivity (National Drug Intelligence Center, 2011). Because of the disabling impact of SUDs, as well as the diversity of reasons individuals begin and continue to use, it is necessary to understand individuals' motivations to use substances and how they vary by substance type, experience with use, and severity of use as it progresses from the beginning stages of initial substance use to dependence. Such fine-grained understanding is necessary to adjust treatment interventions to individual needs (i.e. motives to use) and guide prevention efforts to address all likely etiological pathways to addiction. A novel method of measuring these motives for substance use appears warranted. There were three distinct, but related, theoretical bases that influenced the development of this study and, more specifically, a comprehensive questionnaire assessing motives for substance use: *Addiction Syndrome Model*, *Transtheoretical Model for Stages of Change*, and *Motivational Enhancement Model*.

Addiction Syndrome Model

First, according to the *Addiction Syndrome Model*, the expression of various

SUDs (e.g., Alcohol Use Disorder, Stimulant Use Disorder, Cannabis Use Disorder)

manifests in both general and unique ways. That is, some aspects of SUDs are similar

across substances (e.g., biopsychosocial vulnerabilities) and others are unique to a

substance, or group of substances (e.g., consequences of use and motivations to use). A

crucial component of the precursors to an addiction syndrome is that the individual must

(a) be exposed to the substance and (b) interact with the substance (Shaffer et al., 2004).

For some individuals, a combination of vulnerabilities and exposure to an object of

addiction manifests in an addiction syndrome. An addiction syndrome is characterized by

some unique consequences of a particular object of addiction (e.g., irritation or deviation

of the nasal septum for substances used intranasally; "blackouts" related to alcohol and

benzodiazepine use); however, the addiction syndrome shares several common

presentations among the various objects of addiction, some of which include: shifts in

social networks, deviant behavior, relapse, comorbid psychopathology, neurological

alterations, and object substitution. Likewise, motivations to engage in substance use may

be conceptualized as intervening variables that explain addiction-related behaviors in

specific or general patterns in relation to objects of addiction. For example, it is likely

that people use a variety of substances to cope with negative emotions (Baker, Piper,

McCarthy, Majeskie, & Fiore, 2004); however, individuals are likely to specifically use

opioids rather than stimulants to relieve pain (Blevins, Lash, & Abrantes, 2018). In

development of the present measure, we aim to capture both the global and unique

motivations to use.

Transtheoretical Model for Stages of Change

The second theoretical model that informed the current study was the

Transtheoretical Model for Stages of Change (Prochaska, DiClemente, & Norcross,

1992) and subsequently the third, Motivational Interviewing (MI; Miller, 1983)

specifically related to Motivational Enhancement Therapy (MET; Miller, Zweben,

DiClemente, & Rychtarik, 1992). The Stages of Change model delineates five

distinguishable stages of orientation to change that can characterize a given individual's

readiness to change a problematic behavior. The stages define a linear progression,

beginning with precontemplation (no desire or not recognizing a need to change

substance using behavior), and progressing to contemplation (thinking about change and

recognizing a need to change), preparation (combining intention with some behavioral

action for change), action (modifying substance using behavior), and maintenance

(actively supporting the behavior change through continued prevention efforts).

However, more often than not individuals struggling with a SUD progress through the

stages in a recycling nature via relapse, learning from past attempts, and modifying the

course of action in the next attempt at change. The Stages of Change is a general model

that applies across all SUDs and thus could be construed as a general feature in terms of

the Addiction Syndrome Model. In contrast, the relevance of a specific motive to use or

not use may vary in regard to a given user's status within the Stages of Change model

(i.e., their current stage). The relevance of a specific motive may also vary by the

substance that is the object of addiction, the severity of the SUD, the user's sociocultural

values, or the salience of environmental circumstances. Individuals come to treatment at

different stages of change, and it is necessary to recognize where they are at in their

desire and intention to change, as well as what motivational factors are impeding or promoting change to provide the most effective, individualized treatment plan, such as with Motivational Interviewing (MI) in Motivational Enhancement Therapy. The motives for substance use questionnaire in the current study will capture facets of motives to use and not use and is expected to provide information that maps on to the Stages of Change.

<div align="center">Motivational Enhancement Model</div>

MI is an effective therapeutic approach to stimulating behavioral change (Miller, 1983). In congruence with other client-centered approaches to treatment, the fundamental philosophy of MI posits that the client is the expert to their own challenges and motivations related to substance use whereas the therapist's role is to offer support and empathy, while encouraging motivation to change (Lundahl & Burke, 2009). The MI style respects that clients can identify why they want to use and, at the same time, identify reasons they do not want to use. The often-internal battle of "I want to change because a, b, c but I don't want to change because x, y, z" "is both the source of immobilization and mobilization" to change maladaptive behavior (Rollnick & Allison, 2004, p. 108). Motivational Enhancement Therapy (MET) utilizes MI techniques, incorporating personalized feedback into a brief manualized format (Ball et al., 2007; Miller, Zweben, DiClemente, & Rychtarik, 1992; Project MATCH Research Group, 1993; Stephens, Babor, Kadden, & Miller 2002). Feedback has the potential to establish discrepancy between the client's desire to use and not use, as well as between their use patterns and normative data. The realized discrepancy, and attending cognitive dissonance, can prompt consideration for change. Therefore, gathering pertinent data on motives to use, or not use substances, prior to initiating therapy, may help guide in-

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session discourse, and even allow therapy application to be more efficient. We will capture reasons to use and not use, as well as discrepancies in these motives, with the piloted questionnaire.

Using the Addiction Syndrome Model, the Stages of Change Model, and the Motivational Enhancement Model as complementary components of a larger substance use disorder framework, one begins to understand just how complex the SUDs are. Arguably, the greatest complexity is in the numerous motivations to use, as is reflected in the extensive literature on the subject. Therapeutic approaches involving stages of change and motivational enhancement cannot be implemented effectively without identifying the motives for using, and the motives for stopping use, for the given individual in treatment. Given the complexity of the subject, a brief review of the literature on motivations for use was in order.

<div align="center">Measuring Substance Use Motives</div>

When assessing motivation for substance use, the literature points to somewhat overlapping concepts: situational contexts (i.e., cues or triggers) and cognitive motivations (i.e., self-identifiable reasons for using). Situational contexts may be recognized as circumstances in which a substance-using individual experiences an urge to use. The Inventory of Drinking Situations (Annis, 1982; IDS) and Drinking Context Scale (DCS; O'Hare 1997), for example, record the frequency in which one drinks alcohol in several contexts (e.g., *When there were fights at home*; *When it's semester break*; *When I'm at a restaurant ordering a meal*). Although these measures include items that relate more so to cognitive motivation (e.g., *When I'm having trouble relaxing or winding down*) and the contexts nevertheless provide important data regarding

antecedents to use, knowledge of significant contexts does not necessarily identify the

underlying motivation at play. Upon further examination of the first example, one cannot

decipher from the context of fighting at home whether the individual who drinks in this

context drinks to escape conflict with others, cope with anxiety, cope with depression, or

to become more assertive. Although these contextual measures have been cited in the

literature describing measures of motivations to use (e.g., Kuntsche, Knibbe, Gmel, &

Engels, 2005), we focused from this point on measures designed to solely address

cognitive motivations. What follows is a review of the empirical literature of published

substance use motive measures. We begin by discussing the factor structures of available

scales. We highlight factors that are common across different substance classes, as well

as scale content that has thus far been uniquely tied to specific substances. We encourage

readers to view our supplemental file for a succinct review of the existing substance use

motives literature. Following the in-depth review, we underscore both salient item

content addressed in published scales and motives assessed in studies of motives (i.e.,

without the utilization of published measures) to form the foundation of the hypothesized

factor structure in the development of the MUSQ for the present study (see Table 1 for

existing motive content falling within our hypothesized factor structure).

Table 1

Factors Identified in the Literature Under Hypothesized Factors & Non-Factors

Affect Reduction/Negative Arousal (ARNA)	
ACOPE	Coping with anxiety
AFEP	Anger/frustration/get away from problems or troubles
ANF	Because of anger or frustration
CHMD*	Changing mood
COPE*	Coping

Table 1 Continued

DCOPE	Coping with depression
EMES	Emotional escape
ESCP	Escape drinking
FRGT	To forget your worries
LONE	Loneliness
LSE	Low self-esteem
NAF	Negative affect
NP	Negative/personal
OCC	Keep me occupied
PD	Personal deficiency
PPSY	Personal psychological
PSM	Pathological/self-medication
RLX	Relaxation
SFMED*	Self-medication
STRSS	Handle stress
SUP	Suppression
TENR	Tension reduction
UPEM	Unpleasant emotions

Affect Enhancement/Positive Arousal (AEPA)

ALRT	To become alert
BOR	Boredom
BOR/ENR	Relieve boredom/get energy
CEL	Celebration
CHMD*	
EMEN	Emotional Enhancement
ENH	Enhancement
ENJ	Enjoyment
ENR	To get more energy
GOOD	To feel good
PEM	Pleasant emotions
PEP	Peps me up
PLS	Pleasure
POSAF	Increase positive affect
PSYEF*	Psychoactive effects
SOC/EN*	Social/enhancement
SOC/RC*	Social/recreation
SOC/CEL*	Social/celebratory

Table 1 Continued

Social/Relational (SR)	
ACPT	Peer acceptance
ASRT	Assertiveness power
BEL	Belonging
CNFL	Conflict with others
CONV	Convivial
DOM	Dominance power
EMEQ	Emotional equivalence with others
FAM	Family drinking
GTFI	To have a good time with others/fit in
IMEN	Image enhancement
INH	Disinhibition
PARTY	Party
PRIM	Private intimate
PSOC	Positive social
PTWO	Pleasant times with others
SAPRTY*	Stay awake to party
SOC	Social
SOC/CEL*	
SOC/EN*	
SOC/RC*	
SOCAX	Social anxiety
SOCCOM	Social comradery
SOCF	Social facilitation
SOCINH	Overcoming social inhibitions
SOCINT	Social interaction
SOCPO	To be sociable/polite
Altered Perceptions/Experiential Processes (APEP)	
ACTEN	Activity enhancement
ALTP	Altered perceptions
CREAT	Creativity
CUR	Curiosity
EXPAN	Expansion (of the mind)
EXPER	Experimentation
FACT*	Facilitate activity
FDEN	Food enhancement
INUN	To seek insights and understanding

Table 1 Continued

VARY	Desire for variety

Relative Low Risk (RLR)

ANON	Concerns about anonymity/data transfer
AVDET	Avoiding detection
LEGAL	It is legal
NGTST	Get high without having a positive drug test
PSYEF*	
PURE	Greater purity
RLR	Relative low risk/safer than other drugs
SOCACC	Socially more acceptable
TOLPREF*	Better tolerability/preferred to heroin

Functional/Self-Medication (FSM)

ACADM	Academic outcomes
BODEN	Body enhancement
BRVAG	Become brave/aggressive
CNC	Concentration
COPE*	
COUGH	To control coughing
FACSX	Facilitation of sex
FACT*	
GW	Gain weight
ILL	Illness
LW	Lose weight
MED	Medical use
NRWL	Weight lifting no longer yielded results
NSPS	Non-sexual physical sensation
PAIN	Pain
PAIN/SLP	Pain/sleep
PERF	Performance
PHDIS	Physical discomfort
PHEF	Physical effects
SAPRTY*	
SFMED*	
SLFMNG*	Prefers self-managed substitution/detox
SLP	Sleep
SPS	Sexual physical sensation
SPTEN	Enhance sport

Table 1 Continued

STAWK	Stay awake
STRONG	Become stronger
STUD	Study
THERAP	Therapeutic
WITH	Withdrawal
WITHC	Withdrawal/craving

Substitution (SUB)

NHA	No (good quality) heroin available
NPMED	Does not get preferred opioid substitution treatment medication
NSDOS	Insufficient substitution dosage
REDSTP	To reduce/stop using non-prescription opioids/heroin/other drugs
SLFMNG*	
SUB	To substitute non-prescription opioids/heroin
TOLPREF*	

Effects of Other Substances (EOS)

ALU	Alcohol use
CNTR	Counteract effects of other drugs
DEEF	Decrease effects of other substances
INEF	Increase effects of other substances
MNGE	Manage effects of other drugs
OSU	Other substance use

Conformity/Rebellion (CR)

CNFO	Conformity
COMP	To comply with others
OTH	Others also smoke
REBEL	Rebellion
SOCPR	Social pressure to use

Contextual/Situational (Non-Factor)

ACCESS	Easier to obtain than non-prescription opioids/heroin
AVAIL	Availability
CHPX	Prescription fee too high
CTH	Lower price than heroin
DKDR	Did not know that it was available from doctors
DWT	Difficulties with office hours/transportation efforts
FINAN	Financial reasons
INSR	No health insurance
LAEA	Limited access to cannabis/ease of access to synthetic cannabinoids

Table 1 Continued

MV	Motor vehicle
NAT	No access to opioid substitution treatment
NTHP	No take-home prescription
POSREV	Positive reviews from others
PRPCRM	In preparation for a crime
PRSN	Was in prison
PWR	Problems/non-compliance with treatment regulations
SEXAS	Facilitate sexual assault
TPC	Testing personal control
UT*	Urges/temptations to use
Unclear or Vague (Non-Factor)	
GTTH	To get through the day
HIGH	Get high
TSTGD	Because it tastes good
Addiction as a Motive (Non-Factor)	
ADD	Addicted
HAB	Habit
UT*	

Gaps in the Measures of Substance Use Motivations

Incomplete Coverage of Substances within Measures

Several questionnaires have been designed for evaluation of motives to use one

particular class of substances. The most common are those for alcohol use, followed by

marijuana, and some specific to prescription medications. In addition, a few measures of

substance use motivations examine motives in relation to several substances, but either

omit substances of high prevalence use (e.g., marijuana) or aggregate substances that

really do not belong together into the same class.

One of the earliest measures of alcohol motives, the Definitions of Alcohol Scale

(DAS) identified two factors: *social/celebratory* (i.e., external/positive) and

personal/deficiency (i.e., internal/negative) (Mulford & Miller, 1960). Subsequent

measures of drinking motives followed a similar theoretical structure, albeit assigning different factor names, and many expanded the range of motives. For example, the Reasons for Drinking Questionnaire (RDQ) factors were identified as *positive reinforcement (social)* and *negative reinforcement (coping)* (Farber, Khavari, & Douglass, 1980). Examination of motivation factors from the Drinking Motives Questionnaire (Cooper, Russell, Skinner, & Windle, 1992; DMQ) has yielded a three-factor model (*coping*, *social rewards*, and *affective enhancement*), four-factor model (adding a *conformity* motive; Cooper, 1994), and a five-factor model differentiating coping with depression and coping with anxiety within college student (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007) and adolescent populations (MacLean & Lecci, 2000).

Again, we see overlap in the content but inconsistency in factor naming across measures. Cronin's (1997) content in the factors of the Reasons for Drinking Scale (RDS) (*tension reduction*, *social comradery*, *enhancement*) parallel the DMQ (1992) three-factor model (*coping*, *social rewards*, and *affective enhancement*). Similarly, the DMQ (1994) four-factor model (*coping*, *social rewards*, *affective enhancement*, and *conformity*) and Carpenter and Hasin's (1998) Reasons for Drinking Scale (RDS) (*negative affect*, *social facilitation*, *enjoyment*, and *social pressure to use*) display similar content.

The drinking motive literature formed the basis for most subsequent motive measures extending beyond alcohol use. Simons, Correia, Carey, and Borsari (1998) developed the Marijuana Motives Questionnaire (MMQ) using college populations by modifying the DMQ and expanding the four-factor model to include a fifth factor, *expansion* ("of the mind"; e.g., *I use marijuana so I can be more creative and original*; *I*

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use marijuana to be more open to experiences). The DMQ and MMQ address both positive and negative valence (i.e., attractiveness or averseness) and internal (i.e., *coping*, *enhancement*, *expansion*) and external (i.e., *social*, *conformity*) forces driving motives. Comparisons between marijuana and alcohol use motives using the DMQ and MMQ revealed significant differences in the degree of frequency of motives for each substance such that endorsement of marijuana frequency motives were higher than the frequency of alcohol motives, albeit in the same ranking order (Tkalić, Sučić, & Dević, 2013). In a subsequent study, Simons, Correia, and Carey (2000) demonstrated that social and conformity motives significantly predicted alcohol use, but not marijuana use, while expansion of the mind motives did not influence the prediction of alcohol use. The formation and validation of this fifth factor supports differential characteristics of motives between alcohol and marijuana use, lending to the notion that motives for using vary by substance type.

More recent measures of motives for specific classes of drugs have expanded or collapsed factors on the DMQ and MMQ. The Opioid Prescription Medication Motives Questionnaire (OPMMQ) measures individuals' motives to misuse (one's own prescription) or illegally use prescription opioids (those that one does not have a prescription for), such as oxycodone and methadone. The OPMMQ retains the three-factor DMQ structure and includes a fourth factor, *pain* (i.e., management of physical pain) (Jones, Spradlin, Robinson, & Tragesser, 2014). Likewise, the Prescription Stimulant Motives Scale (PSMS) measures individuals' motives for illicit use and misuse of prescription stimulants, such as methylphenidate and amphetamines. The PSMS preserves the five-factor MMQ, but incorporates a sixth factor, *academic outcomes* (i.e.,

to perform better in school; *to study*) and a seventh factor, *lose weight* (Blevins, Stephens, & Abrantes, 2016). On the other hand, the Non-Medical Prescription Drug Motives Questionnaire (NMPDMQ), which similarly measures illicit use and misuse of prescription stimulants, collapses the DMQ's core content in the social and enhancement factors into a single factor (i.e., *social/recreation*), retains the *conformity* factor, establishes a fourth factor (i.e., *performance*) that parallels the PSMS's academic outcomes with less specificity to school (e.g., *to be more efficient; to help you stay organized*), and combines coping with physiological discomfort (e.g., *to manage pain*; *to help you sleep*) and mental distress into a fifth factor (i.e., *self-medication*; Milner, 2015).

The Comprehensive Marijuana Motives Questionnaire (CMMQ), developed specifically for marijuana use motives from open-ended participant responses, taps several factors for marijuana use motives: *reduced inhibition related to alcohol use*, *enjoyment*, *conformity*, *coping*, *experimentation*, *boredom*, *celebration*, *altered perceptions*, *social anxiety*, *sleep*, *relative low risk* (e.g., *because it is safer than other drugs*), and *availability* (e.g., *because it is there*; Lee, Neighbors, Hendershot, & Grossbard, 2009). Here, we see the familiar coping (i.e., *coping*, *boredom*), enhancement (*enjoyment*), social (i.e., *social anxiety, celebration*), and conformity motive content similar to that of the DMQ parsed apart, as well as shared content with the MMQ. Specifically, the CMMQ dissected the MMQ's *expansion* factor content into *experimentation* and *altered perceptions*. The CMMQ included a component of physical discomfort in its *sleep* factor and introduced the *relative low risk*, *reduced inhibition related to alcohol use*, and *availability* motives for the first time in a psychometrically examined measure.

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Although relatively comprehensive in capturing motives for use, the motives addressed with the Clinical Substance Use Motives Questionnaire (discussed below) were not assessed for marijuana use, despite marijuana's high prevalence rates (Blevins, Lash, & Abrantes, 2018). The Reasons for Using Drugs Survey (discussed below) also compared motives by substance type, but combined several qualitatively different substances (i.e., PCP, heroin, amphetamines, psychedelics, sedatives, and codeine) as an "other drugs" comparison group, which limited the extent to which one can conceptualize motivations for these distinct substances (Novacek, Raskin, & Hogan, 1991). Indeed, psychedelics such as LSD and mushrooms are likely to be related to using to be more creative, and to a greater extent than use of sedatives. Overall, there is greater development of motive factors on a limited number of substances (i.e., alcohol, marijuana, and prescription medications), but to the degree that multiple substances are examined in relation to motives, they are compressed into categories of heterogeneous substances that limits interpretation or are limited in substances considered.

Incomplete or Inconsistent Coverage of Motives within Measures

Existing psychometrically examined measures do not address the breadth of motivations and substance types necessary to be applicable to the general substance using population. In fact, one of the more comprehensive studies of frequency of substance use motives by substance type dates back to 1986, in which high school seniors self-reported their motives for use of alcohol, amphetamines, barbiturates, cocaine, heroin, LSD, marijuana, tranquilizers, and other opioids (Johnston & O'Malley, 1986). The thirteen items, while wide-ranging in motive content, were not factor analyzed nor psychometrically evaluated, and not all items were asked in regard to each type of

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substance. For example, the motive "to get to sleep" was a motive option for alcohol, barbiturates, tranquilizers, and other opioids, but not for marijuana (although sleep was a motive factor for the CMMQ) and "to relieve physical pain" was only available as a motive option for barbiturates, tranquilizers, and other opioids (but not for marijuana or heroin). In addition, barbiturates, as measured in Johnston and O'Malley's (1986) study, have been widely replaced in accessibility with benzodiazepines since the late 1950s (López-Muñoz, Ucha-Udabe, & Alamo, 2005), pointing to the utility of developing a contemporary measure.

The Reasons for Using Drugs Survey (RUDS) also explored motives across several substances: nicotine, alcohol, marijuana, and "other drugs," which combined amphetamines, codeine, heroin, inhalants, PCP, and psychedelics into a single category (Novacek, Raskin, & Hogan, 1991). This study revealed a five-factor structure with content similar to the five-factor MMQ such that a *belonging* factor (i.e., "conformity"), *coping* factor, *pleasure* factor (i.e., "enhancement") and *creativity* factor (i.e., "expansion") were present, with an *aggression* factor instead of a "social" factor. Here, the *coping* factor included coping with both emotional problems and physical problems (e.g., *to lose weight*; *for physical pain*). Although most content in the *creativity* factor was similar to the e*xpansion* factor in the MMQ, one item (i.e., *to help me do my schoolwork better*) was reflected in the *academic* (PSMS) and *performance* (NMPDMQ) factors in measures of prescription stimulant motives. *Aggression* as a motive has been examined in the anabolic steroid use literature (Petersson, Bengtsson, Voltaire-Carlsson, & Thiblin, 2010), but in the context of using to feel brave and physically aggressive

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rather than using for self-destruction and to emotionally hurt others as described in the RUDS measure.

Several studies have used the scale name "Drug Use Motives Questionnaire" (DUMQ) to describe a substance use motive measure that applies to all substances of use; however, such studies have only used the three-factor and four-factor items of the DMQ and simply changed the instructions to indicate all substance use, instead of alcohol use (Mueser, Nishith, Tracy, DeGirolamo, & Molinaro, 1995; Scott, Hides, Allen, & Lubman, 2013), or used a variation of the DMQ and added an *illness* factor (i.e., related to coping with psychological symptoms such as psychosis and suicidality, or side effects of psychotropic medication) (Spencer, Castle, & Michie, 2002; Thornton, Baker, Johnson, Kay-Lambkin, & Lewin, 2012).

Recently, the Clinical Substance Use Motives Questionnaire (CSUMQ) was developed to address motives for alcohol, cocaine and other stimulants, and opioid use (Blevins, Lash, & Abrantes, 2018). The CSUMQ yields an eight-factor structure. Similar to the five-factor DMQ, the CSUMQ differentiates *coping with anxiety* and *coping with depression* into two separate factors. Unlike the DMQ, social and enhancement content are combined into one factor (*social/enhancement*) and a single item reflects conformity within the *social/enhancement* factor (i.e., *because it is what most of my friends do when we get together*). Other factors derived from this measure include *boredom/energy*, *pain/sleep*, *loneliness*, *other substance use*, and *withdrawal*. The CSUMQ's *other substance use* factor combines the content from the CMMQ's *reduced inhibition related to alcohol use* (but generalizes to being under the influence of "another substance") and content related to managing the effects of other substances, which was considered in

Johnston and O'Malleys (1986) early study and in studies of nicotine use motives (Pederson, Bull, Ashley, & MacDonald, 1996), synthetic cannabinoid use motives (Bonar, Ashrafioun, & Ilgen, 2014), and several opioid use motive analyses (Boyd, McCabe, Cranford, & Young, 2006; McCabe, Cranford, Boyd, & Teter, 2007; Teter, McCabe, Cranford Boyd, & Guthrie, 2005; Teter, McCabe, LaGrange, Cranford & Boyd, 2006). This measure was the first psychometrically evaluated measure, to the author's knowledge, to include using to relieve withdrawal symptoms as a motive.

Incomplete Application of Motives within Measures

Thus far, we have illustrated the inconsistencies in factor labeling and content grouping among existing motive measures. As previously mentioned, many of the psychometrically evaluated motive measures in the literature do not address relevant motivations that are likely applicable to the specific substance measured or miss the opportunity to evaluate additional substances that are expected to be used for the motivations measured.

Altered Perceptions and Experiential Processes Motive Inconsistencies. Content related to altered perceptions and experiential processes motives have been considered in factor analyzed measures of motives for prescription stimulants (Blevins, Stephens, & Abrantes, 2017) and marijuana (Lee, Neighbors, Hendershot, & Grossbard, 2009; Lee, Neighbors, & Woods, 2007; Simons, Correia, Carey, & Borsari, 1998). Unfortunately, the CSUMQ, which aimed to address motives for use of multiple substance classes failed to consider these motives. While the multi-substance RUDS included content related to experiential processes, it lacked motives related to altered perceptions (Novacek, Raskin, & Hogan, 1991). In addition, the MMQ's *expansion* factor for marijuana use includes

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content addressed by the RUDS's *creativity* factor as well as content in the CMMQ's *altered perceptions* factor. Based on the literature, it seems likely that a comprehensive factor of *altered perceptions and experiential processes* would likely extend to other hallucinogenic "mind opening" substance use.

  Coping and Self-Medication Motive Inconsistencies. Coping and variants of s*elf-medication,* as factors, have been inconsistently applied to coping with emotional pain, bodily discomfort and discontent, or both (e.g., Spencer, Castle, & Michie, 2002). Both emotional and physical/physiological discomfort and discontent should be addressed but would likely load on separate factors.

  Affective Coping Motive Inconsistencies. Coping with emotional pain, commonly considered in the context of feelings of depression and anxiety, has always been considered as a fundamental motive for users of a variety of substances. That is one reason why we often see the spiraling nature of addiction in which either using the substance or emotional pain comes first and each influence and perpetuate the other. Although one may consider using to cope with negative emotions as a self-medication motive, this motive is likely differentiated from those related to relieving physical and physiological discomfort and discontent by labeling the hypothesized factor for emotional coping content, *affect reduction/negative arousal*. Many labels have been used to describe this factor in the literature (e.g., *unpleasant emotions*; *emotional escape*) and several have included more nuanced facets of negative emotions (e.g., *loneliness*; *low self-esteem*; *coping with anxiety*; *coping with depression*) that likely aggregate as facets of a single factor.

Functional or Self-Medication Motive Inconsistencies. Motives related to using substances to alleviate or self-medicate physical and physiological discomfort or discontent, on the other hand, would likely load onto a *functional/self-medication* factor. Indeed, several factors emerging on the OPMMQ, PSMS, and NMPDMQ measures appear to cluster into a *functional/self-medication* factor, in that using a substance for its inherit effects or as a self-administered treatment of symptoms would encompass these motives. *Self-medication* was recognized as a motive factor in the NMPDMQ but included items related to both coping with negative emotions (i.e., *because it helps you when you feel depressed or nervous*) and managing physical problems (i.e. pain and sleep) (Milner, 2015). *Performance* (i.e. *to help focus*; *to perform better on schoolwork or on tests*), too, was parsed out as a separate factor; however, we hypothesized that these motives would group under a *functional/self-medication* factor. Although these motive measures were designed to assess prescription drug use, many functional/self-medication motives may be pertinent to their non-prescription drug counterparts (e.g., methamphetamine may similarly be used to help focus as Adderall, and alcohol may be used to help with falling sleep).

Affect Enhancement Motive Inconsistencies. Emotional enhancement motive content has surfaced in many of the existing measures through a single *enhancement* factor, sharing content similar to other measures' *pleasure* and *enjoyment* factors, and in combination with other social and relational content such as in the *social/enhancement* and *social/recreation* factors. Emotional enhancement motive content has also been lumped with coping with negative emotions content in a study comparing motives for cannabis, alcohol, cocaine, LSD, ecstasy, and amphetamine use (Boys, Marsden, &

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Strang, 2001). Based on the literature, emotional enhancement content in the present measure would likely load onto a factor of *affect enhancement/positive arousal*.

Arousal Motive Inconsistencies. One domain of motive content, effects on arousal (e.g., *to get energy*; *to increase alertness*; *to relieve boredom*; *to relax*; *to relieve tension*), has been commonly considered within motives but inconsistently loaded onto *coping*, *enhancement*, and *performance* factors, or has been parsed into its own factor. Although the development of the present measure was exploratory in nature, we hypothesized that arousal motives would load onto both *affect reduction/negative arousal* and *affect enhancement/positive arousal* due to the large association between arousal and emotion (Scherer, 2005). That is, using substances to increase arousal and stimulation was hypothesized to load onto affect e*nhancement/positive arousal*, whereas using to decrease arousal and stimulation was hypothesized to load onto affect *reduction/negative arousal*.

Social Interaction Motive Inconsistencies. Nearly all studies of substance use motivations have measured social and relational motives. Many, such as the four- and five-factor DMQ, MMQ, PSMS, NMPDMQ, and CMMQ, considered enhancing social experience motives (e.g., *to have a good time with others*; *to feel more confident around others*; *to celebrate with others*) separately from motives to use to conform to others (e.g., *to be cool*; *did not want to be the only one not doing it*; *felt pressure from others to do it*). One study examining the prevalence of synthetic cannabinoid use motives, however, addressed these motivations in a double-loaded item: *To have a good time with friends or to fit in* (Bonar, Ashrafioun, Ilgen, 2014). A qualitative study of club drug use motives revealed a *social interaction* theme and the researchers considered this theme to encompass both social facilitation and social acceptance motives (Jerome, Halkitis, &

Siconolfi, 2009). A *social/relational* motive factor would likely emerge from the data and would contain facets of motives influenced by relationships, including social facilitation and social enhancement.

Social Adherence Motive Inconsistencies. Content related to using to rebel against the law, society, and social norms has rarely been examined in the literature. Indeed, the pilot study for the CMMQ revealed rebellion as a self-identified motivation, but the content did not hold in the follow-up study used to factor analyze the original participant self-identified salient content (Lee, Neighbors, Hendershot, & Grossbard, 2009). This content may load onto a bipolar dimensional *conformity/rebellion* factor, such that motives would range from using to follow the crowd (whether an adaptive or maladaptive social circle) to using to deliberately challenge expectation of society at large or proximal others. Conformity and rebellion content would likely be more salient for those in the early stages of substance use than for those with more severe substance use disorders, as conformity motive endorsement has demonstrated a negative correlation with alcohol use frequency and quantity among adolescents (Cooper, 1994); on the other hand, those who endorse more rebellion motives may have more substance use problems, as those who use alcohol to rebel may do so with a socially aggressive conviction according to Alexander (1967).

Relative Low Risk Motive Inconsistencies. Relative low risk has been identified as a motive for synthetic cannabinoid use (Bonar, Ashrafioun, Ilgen, 2014; Loeffler, Delaney, & Hann, 2016), kratom use (a currently-legal gas station- and internet-sold substance with both stimulant and opioid-like effects) (Smith & Lawson, 2017), non-prescribed opioid substitution use (e.g., methadone; Schulte et al., 2013) and several

studies of prescription medication misuse (e.g., Boyd, McCabe, Cranford, & Young, 2006; McCabe, Cranford, Boyd, & Teter, 2007; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005). Surprisingly, a *relative low risk* factor has emerged only in a psychometrically evaluated measure for cannabis use (CMMQ) but was not considered in measures designed to evaluate prescription medication motives (i.e., OPMMQ, PSMS, NMPDMQ). Thus, some substances that may be legal in some contexts (i.e., marijuana, alcohol, prescription medications) or perceived to be more socially acceptable may be perceived as "safer" than other drugs or easier to hide from detection by others (e.g., in the case of a urine drug screen for synthetic cannabinoids) and this may be a motivation for their use. In addition, content related to relative low risk may include using substances because they are viewed as "purer" without unknown contaminants used to cut the product or using a regulated substance because its contents are legitimized. Lastly, using a substance because it causes less side effects, has less health risks, or because one has a better tolerance to the substance at hand compared to another also relates to relative low risk motives. This motive may be under-valued in present psychometrically evaluated measures and may be a relevant motive for several substances, including those that may be medically prescribed, legal to use, or culturally accepted.

Substitution Motive Inconsistencies. Johnston and O'Malley (1986) were among the first to identify the motive to use for substance substitution. Again, only asking participants a limited range of motives per substance, the motive "as a substitute for heroin" was asked only in reference to using "other opiates" (Johnston & O'Malley, 1986, p. 41). Similarly, Schulte and colleagues (2013) found that common motives for use of non-prescribed opioid substitution treatments (e.g., methadone) included to use

something that has better quality than the available heroin, to use one's preferred opioid

substitution treatment medication, and to obtain sufficient substitution medication

dosage. Substitution motives have also been identified in the synthetic cannabinoid

(Loeffler, Delaney, & Hann, 2016) and kratom use (Smith & Lawson, 2017) literature. In

Loeffler and colleagues' review of motives for synthetic cannabinoid use, using to reduce

use of marijuana was cited as a significant motive. Kratom, on the other hand, was found

to be significantly related to the motive of using to substitute heroin or other opioid use.

Arguably, substituting one substance for another may be a motivation for use of all

substances for both those attempting to quit or reduce use of one substance, or to get the

same effects as another substance when it is not available.

Effects of Other Substances Motive Inconsistencies. A common, yet inconsistently

addressed motive domain in the literature involves the effects of other substances. The

CMMQ includes an *alcohol use* motive factor, which includes content related to using

because one is under the influence of alcohol and did not make the decision to use with a

sober mind (Lee, Neighbors, Hendershot, & Grossbard, 2009). This content was also

salient in the nicotine use motives literature (i.e., smoking because drinking; Pederson,

Bull, Ashley & MacDonald, 1996). Other motives concerning the effects of other

substances have related to managing the effects of other substances. Examining motives

for cannabis, alcohol, cocaine, LSD, ecstasy, and amphetamine use, Boys, Marsden, and

Strang (2001) included content related to using a substance to enhance the effects of other

substances and help manage the "after effects" (i.e., the "come down") from other

substances in a *manage effects of other substances* subscale (although the total scale was

not factor analyzed to create this subscale). Looking at synthetic cannabinoid motives,

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Bonar, Ashrafioun, and Ilgen (2014) found that 32 percent of inpatient rehabilitation patients identified using *to increase or decrease the effects of some other drugs* as a motive for their use. Johnston and O'Malley's (1986) early study split this content into an item measuring using *to increase effects of other substances* and an item measuring *using to decrease effects of other substances*. Several studies in the prescription misuse motive literature identified using *to counteract the effects of other substances* as a motive (Boyd, McCabe, Cranford, & Young, 2006; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005; Teter, McCabe, LaGrange, Cranford, & Boyd, 2006). An *other substance use* factor emerged in the factor analyzation of the CSUMQ's factor structure, encompassing both motives to use because one is under the influence of another substance and to counteract the effects of other substances (Blevins, Lash, & Abrantes, 2018). Compared to the CMMQ, the CSUMQ is more comprehensive in its measure of specific motives related to the effects of other substances, both in its generalization of using because one is under the influence of another substance (as opposed to the influence of only alcohol) and its inclusion of using to counteract the effects of other substances; however, a general *effects of other substance* factor would likely emerge by including more nuanced items such as in Johnston and O'Malley's (1986) and Boys, Marsden, and Strang's (2001) studies (e.g., *to reduce the effects of another drug*; *to enhance the effects of another drug*; *to 'come down' off of another drug*) in addition to using because one is under the influence of another substance. Furthermore, we included other relevant motives related to using *to be able to use another drug for a longer period of time*, as well as using *to alleviate side effects of medications*, which have been considered in *illness* factors in variations of the DUMQ (Spencer, Castle, & Michie, 2002; Thornton et al., 2012). *Effects of other*

substances motives would likely be pertinent for use of all substances but would demonstrate a positive relationship with frequency of use, such that those who use substances more often will use to counteract and manage effects of other substances, as well as use because of intoxication with other substances. Indeed, in a study of prescription stimulant use motives the findings suggested that using prescription stimulants to counteract the effects of other substances became a more prominent motive as participants' frequency of prescription stimulant use increased (Teter et al., 2005)

Incomplete Coverage of the Constituents of Motives

To date, the vast majority of studies of motives have used frequency ratings to measure the frequency at which one uses for a given motive. Some measures of substance use motives have assessed motives utilizing dichotomous measures of applicability to the user (i.e., yes/no; e.g., Bailly, Carman, Forslund, 1991), while most used single Likert-type frequency scales (e.g., how often do you drink for this reason – ranging from 1 [almost never/never] to 5 [almost always/always]; Grant et al., 2007). While other constituents of motives will be discussed below and warrant consideration, measuring the frequency at which one uses for a given reason has yielded important concurrent predictions of substance use-related problems, SUD severity, and substance use frequency and quantity.

Affect Enhancement Motives and Predictions. Specifically, using more often for *enhancement/enjoyment* motives has predicted increased alcohol use frequency and quantity (Grant et al., 2007), past 6 month marijuana use (Simons, Correia, Carey, & Borsari, 1998), number of prescription opioid pills taken in the past 3 months, number of prescription opioid pills taken in a typical day, and frequency of prescription opioid use

in the past 3 months (Jones, Spradlin, Robinson, & Tragesser, 2014), and is positively

correlated with past 90-day marijuana use frequency (Lee, Neighbors, Hendershot, &

Grossbard, 2009) and more frequent misuse of prescription opioids (Jones, Spradlin,

Robinson, & Tragesser, 2014). Increased use of marijuana for *enhancement* motives

predicted greater likelihood of abuse/dependence; however, using more often for

enhancement motives has predicted less use-related negative consequences ((Lee,

Neighbors, Hendershot, & Grossbard, 2009). With regard to prescription opioids, on the

other hand, using more often for *enhancement* motives has predicted more use-related

negative consequences (Jones, Spradlin, Robinson, & Tragesser, 2014). With prescription

stimulant use, using more often for enhancement motives was associated with more use-

related negative consequences (Blevins, Stephens, & Abrantes, 2016). Indeed, the

enhancement factor captured in the RUDS positively correlated with frequency of

alcohol, marijuana, and "other drug" use (Novacek, Raskin, & Hogan, 1991).

 Social Interaction Motive Predictions. Some studies have identified factors that

combined enhancement content with social content (i.e., *social/recreation*;

social/enhancement). These studies suggested using more often for these motives

predicted increased frequency of non-medical prescription drug use (Milner, 2015) and

number of SUD symptoms in the context of alcohol, opioid, and stimulant use (Blevins,

Lash, & Abrantes, 2018). More frequent use for *social/recreation* motives is associated

with increased lifetime non-medical prescription drug use and use-related problems

(Milner, 2015). Using alcohol more often for *social* motives has predicted higher

drinking frequency and quantity, but to a lesser extent than using for *enhancement*

motives (Grant et al., 2007). In the context of marijuana use, using more often for social

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reasons predicted higher frequency of marijuana use-related problems when accounting for lifetime use and gender (Simons, Correia, Carey, & Borsari, 1998). While the MMQ does not include a *social* motives factor, per se, using marijuana more often for *celebration* and *social anxiety* motives has yielded significant positive correlations with marijuana use frequency and use-related problems (Lee, Neighbors, Hendershot, & Grossbard, 2009). Using prescription opioids more often for *social* reasons positively predicted the typical number of pills ingested in a day and frequency of use in the past 3 months; however, *social* reasons were not correlated with frequency of misusing prescription opioids (Jones, Spradlin, Robinson, & Tragesser, 2014). Using prescription stimulants more often for *social* reasons was correlated with more use-related negative consequences and higher frequency of use (Blevins, Stephens, & Abrantes, 2016).

  Conformity Motive Predictions. Using substances more often for social *belonging* reasons (i.e., encompassing both *social acceptance* and *conformity* content) has related to less frequently using alcohol, marijuana, and "other drugs." Using for these reasons was found to be more typical for those who use alcohol only and those who use other drugs only, but not those that use both (Novacek, Raskin, & Hogan, 1991). Using alcohol more frequently for *conformity* motives has predicted less frequent drinking and quantity overall (Grant et al., 2007). While accounting for lifetime marijuana use and gender, Simons and colleagues (1998) found increased use for *conformity* motives to predict increased use-related problems. In another study of marijuana use motives, using more frequently for *conformity* motives was positively correlated with use-related problems, but was not related to frequency of marijuana use (Lee, Neighbors, Hendershot, & Grossbard, 2009). For prescription stimulant use, using more for *conformity* reasons

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predicted less use-related consequences (Blevins, Stephens, & Abrantes, 2016). In regard to all non-medical use of prescription medications, increased use for *conformity* reasons demonstrated a small correlation with increased overall use, recent use, and use-related problems, but not lifetime use; however, *conformity* did not significantly predict frequency of non-medical prescription medication use when accounting for race, age, gender, and frequency of other substance use (Milner, 2015). Lastly, the frequency of using for *conformity* motives was found to be higher for marijuana users compared to alcohol users (Spencer, Castle, & Michie, 2002).

       Arousal Motive Predictions. Using marijuana more often to *alleviate boredom* has significantly positively predicted frequency of marijuana use and is associated with more use-related consequences (Lee, Neighbors, Hendershot, & Grossbard, 2009). In addition, using opioids, alcohol, and stimulants more often to *alleviate boredom and get energy* has significantly positively predicted more SUD symptoms (Blevins, Lash, & Abrantes, 2018).

       Affective Coping Motive Predictions. Grant and colleagues' (2007) findings suggested that using alcohol more frequently for *coping with depression* reasons positively predicted drinking quantity while *coping with anxiety* positively predicted use-related problems. Using marijuana more often for *coping* reasons has significantly predicted increased marijuana use in the past 6 months and use-related consequences, and has been correlated with increased past 90-day use and use-related consequences (Simons, Correia, Carey, & Borsari, 1998; Lee, Neighbors, Hendershot, & Grossbard, 2009). Using prescription opioids more often for *coping* reasons has predicted increased number of pills ingested in a day, frequency of use in the past 3 months, and use-related

consequences. In addition, prescription opioid *coping* use was positively correlated with frequency of misuse (Jones, Spradlin, Robinson, & Tragesser, 2014). For opioid, alcohol, and stimulant use, one study found a positive correlation between use for *coping with depression* reasons and SUD symptoms, while use for *coping with depression* and *coping with anxiety* reasons were positively correlated with frequency of alcohol use in a given week. More frequent stimulant use was associated with less use for *coping with anxiety* motives. In this sample, using to *cope with anxiety* was more characteristic of alcohol users than cocaine users, but differences between alcohol users and opioid users were not found (Blevins, Lash, & Abrantes, 2016). Spencer and colleagues (2002) suggested that using substances more often for *coping* reasons positively predicted quantity of use, dependence, and use-related problems. In this study, *coping* motives were more frequent for marijuana users compared to alcohol users. Milner's (2016) NPDMQ measure combined self-medication for the function of substance (e.g., to reduce pain) with affect self-medication (i.e., coping) into a *self-medication* motive factor. Here, non-medical use of prescription medication use for more *self-medication* reasons predicted more frequent use in the past 6 months and use-related problems (after accounting for frequency of use; Milner, 2016).

  Functional or Self-Medication Motive Predictions. Other facets of self-medication motives used to predict substance use patterns include *sleep/rest*, *pain*, *weight loss*, *performance*, *withdrawal*, *illness* and *pain/sleep* motives. Using marijuana more frequently for *sleep/rest* reasons has been positively correlated with frequency of use and use-related problems. *Sleep/rest* motives predicted higher frequency of use and, after accounting for frequency of marijuana use, *sleep/rest* significantly positively predicted

use-related problems (Lee, Neighbors, Hendershot, & Grossbard, 2009). In regard to prescription opioid use, using more often to relieve *pain* positively predicted frequency of use in the past 3 months and use-related problems; however, *pain* motives were not correlated with misuse. Using prescription stimulants more often for *weight loss* purposes was correlated with and predicted more use-related negative consequences; however, *weight loss* motives did not significantly predict frequency of use. Non-medical use of prescription medications for *performance* reasons significantly predicted higher frequency of use in the past 6 months and was correlated with increased frequency, use-related problems, and more recent use (Milner, 2015). Using alcohol, opioids, and stimulants more frequently for relief or avoidance of *withdrawal* symptoms significantly predicted more SUD symptoms. Both *withdrawal* and *pain/sleep* motives were positively correlated with more opioid use. While *withdrawal* motives were found to be more common for opioid users compared to stimulant and alcohol users, alcohol and opioid users used for *withdrawal* purposes at approximately the same frequency. In addition, using for *pain/sleep* reasons was more characteristic of alcohol and opioid use compared to stimulant use (Blevins, Lash, & Abrantes, 2018). Lastly, using substances to relieve the positive symptoms of psychosis or side effects of other medications (i.e., the *illness* motive factor) was found to significantly predict greater likelihood of dependence (Spencer, Castle, & Michie, 2002).

  Altered Perception or Experiential Processes Motive Predictions. Using alcohol, marijuana, and "other drugs" for *creativity* reasons was correlated with less frequent alcohol use but more frequent other substance use (Novacek, Raskin, & Hogan, 1991). Prescription stimulant use for *expansion* (of the mind) motives was correlated with and

predicted more use-related consequences (Blevins, Stephens, Abrantes, 2016). In regard to marijuana use, using more often for *altered perceptions* was significantly positively associated with frequency of use and use-related problems, while using for *experimentation* purposes was negatively associated with frequency of use and not related to use-related problems. Using marijuana for *altered perceptions* motives predicted greater likelihood of substance abuse and dependence, while *experimentation* predicted a lower likelihood of meeting criteria (Lee, Neighbors, Hendershot, & Grossbard, 2009).

Relative Low Risk Motive Predictions. Relationships between *relative low risk* motive measure scores and substance use patterns have only been examined in the context of marijuana use. Using marijuana more frequently for relative low risk reasons was significantly correlated with and predicted higher frequency of marijuana use and was correlated with more use-related problems (Lee, Neighbors, Hendershot, & Grossbard, 2009).

Effects of Other Substances Motive Predictions. Similarly, using in relation to the effects of other substances (i.e., to counteract or enhance the effects, or due to being under the influence of a substance), has only been examined in motive measures for marijuana use (Lee, Neighbors, Hendershot, & Grossbard, 2009) and in the context of alcohol, opioid, and stimulant use (Blevins, Lash, & Abrantes, 2018). Using a substance more often because of the effects of other substances has only demonstrated relationships with substance use patterns for marijuana. Specifically, using marijuana more often because one is under the influence of alcohol was related to more use-related

consequences, but not marijuana use frequency (Lee, Neighbors, Hendershot, &

Grossbard 2009).

     Substitution Motive Predictions. Another motive factor, *availability* (i.e., using

because it's readily available), has been tested in relation to marijuana use patterns, but

was not correlated with frequency of use or use-related problems; however, using more

often for availability purposes negatively predicted frequency of use (Lee, Neighbors,

Hendershot, & Grossbard, 2009). Interestingly, using substances for *substitution* purposes

(i.e., to replace one substance with another) has not been studied in relation to use-related

patterns.

     In summary, different substance use patterns have been differentiated by salient

motives, and those motives primarily have been measured in terms of *frequency* of use in

regard to that motive. Measuring motives in terms of *frequency* of use for a given motive

has demonstrated concurrent validity, primarily with predicting use-related negative

consequences, SUD severity, lifetime and current frequency of use, and frequency of

misuse (i.e., of prescription medications). In addition, the research to date has identified

substance classes that differed in terms of salient motives measured in terms of frequency

of use for a given motive.

     Salient Motives by Substance. Prominent motives for alcohol use have included

coping with both anxiety and depression, affective enhancement, to have a good time

with others, to increase confidence, to sleep, to relax or relieve tension, to relieve

boredom, to improve the effects of other substances, and to manage the after effects (i.e.,

"come down") of other substances (Blevins, Lash, & Abrantes; Boys, Marsden, & Strang,

2001; Johnston & O'Malley, 1986; Mueser, Nishith, Tracy, DeGirolamo, & Molinaro,

1995; Novacek, Raskin, & Hogan, 1991; Thornton, Baker, Johnson, Kay-Lambkin, & Lewin, 2012). Prominent motives for marijuana use have included coping with negative affect, affective enhancement, to conform, to gain social acceptance, to have a good time with others, to relax or relieve tension, to relieve boredom, to enhance an activity, to sleep, to emotive the effects of other substances, and to manage the after effects of other substances (Boys, Marsden, & Strang, 2001; Johnston & O'Malley, 1986; Novacek, Raskin, & Hogan, 1991; Spencer, Castle, & Michie, 2002; Thornton, Baker, Johnson, Kay-Lambkin, & Lewin, 2012). Further, Boys and colleagues' (2001) suggested that marijuana was the predominant substance used for improving effects of other substances and managing the after-effects of other substances compared to alcohol and other substances. Salient motives for LSD use have included using to have a good time with friends, to relieve boredom, to have deeper insights, to experiment, to enhance affect, and to enhance activities (Boys, Marsden, & Strang, 2001; Johnston & O'Malley, 1986). The literature suggests that cocaine is mostly used for having a good time with others, increasing energy, staying awake, increasing one's confidence, and affective enhancement, while it is specifically used less often for coping with anxiety (Blevins, Lash, & Abrantes, 2018; Boys, Marsden, & Strang, 2001; Johnston & O'Malley, 1986). Quite similarly, amphetamines have been found to be predominantly used to increase energy, stay awake, enhance activities, enhance affect, to improve the effects of other substances, to lose weight, and for having a good time with others (Boys, Marsden, & Strang, 2001; Johnston & O'Malley, 1986). Prominent motives for ecstasy use have included using to enhance activities, stay awake, lose weight, and enhance affect (Boys, Marsden, & Strang, 2001). Opioids, in general, have been specifically linked to using to

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alleviate or avoid withdrawal symptoms, to cope with negative affect, to alleviate pain, and to sleep (Blevins, Lash, & Abrantes, 2018; Johnston & O'Malley, 1986). The literature suggests prescription opioids are mostly used to relax or relieve tension, to party, to relieve pain, to sleep, to cope with anxiety, to experiment, to counteract the effects of other substances, and because they are perceived as safer than other substances (Bennett & Holloway, 2017; Boyd, McCabe, Cranford, & Young, 2007; Johnston & O'Malley, 1986). Prescription stimulants have been found to be predominantly used to experiment, lose weight, to increase alertness, to help with studying or help with academics, to concentrate, to stay awake, to party, to enhance sport performance, to counteract the effects of other substance, and because they are perceived as safer than other substances (Bennett & Holloway, 2017; Boyd, McCabe, Cranford, & Young, 2007). Prescription sleep medications have been specifically linked to using to sleep, cope with anxiety, to experiment, to counteract the effects of other substances, and because they are perceived as safer than other substances (Boyd, McCabe, Cranford, & Young, 2007). Sedatives and anxiolytics have been found to be predominantly used to sleep, cope with anxiety, counteract the effects of other substances, and because they are perceived as safer than other substances (Bennett & Holloway, 2017; Boyd McCabe, Cranford, & Younge, 2007). Lastly, salient motives for tranquilizer use have included using to cope with anxiety, sleep, counteract the effects of other substances, and to self-medicate ADHD symptoms (Bennett & Holloway, 2017).

Beyond Frequency

As reviewed above, frequency of use for a particular substance, for a particular motive, is well developed in the literature. However, we posit that motivations to use

substances are far more complex than can be represented by measuring frequency alone

and can be further assessed via conscious cognitive processes and evaluation of one's use

to achieve or satisfy a given motive. Specifically, we aim to provide more rich data than

have been obtained thus far by measuring motives in relation to *wanting*, *liking*, and

satisfaction.

Robinson and Berridge (1993), by way of the Incentive-Sensitization Theory,

established a discrepancy between *liking* and *wanting* substances as distinct reward

mechanisms that a person is not directly aware of: Substance users, in the early stages of

use, experience hedonistic (i.e., liking) motives to use, whereas more experienced users

shift to *wanting*, or craving use even when using results in disappointment or

dissatisfaction. Findings suggest, for some individuals, repeated exposure to a substance

changes the brain's mesocorticolimbic system and results in hypersensitivity to

incentivizing effects (e.g., to feel more social around others; to experience euphoria) and

substance-related stimuli (e.g., paraphernalia; bars; substance-using friends) (see

Berridge & Robinson, 2016 for review). It is understood that Robinson and Berridge's

concepts of *liking* and *wanting* are subconscious, objective processes that differ from the

more cognitive, goal-directed, and subjective *liking* and *wanting* (Robinson, Fischer,

Ahuja, Lesser, & Maniates, 2015). These subconscious *liking* and *wanting* responses are

differentiated by the key role of dopamine stimulation, such that manipulation of

dopamine action influences intensity of *wanting*, but not *liking*. On the other hand,

cognitive *wanting* is proposed to be comparatively unaffected by manipulation of

dopamine (Dickinson, Smith, Mirenowicz, 2000). Although the cognitive and

subconscious processes often accompany one another, the cognitive and subconscious

wanting constructs, at times, conflict (Berridge & Robinson, 2016). This may occur when someone recovering from a severe SUD still craves their substance of choice when presented with triggering cues despite a strong conscious desire not to use and maintain the benefits of sobriety.

The distinction between the *wanting* and *liking* processes, that an individual is not directly aware of, and conscious cognitive processes suggests that more objective measures of subconscious processes (e.g., brain imaging and facial muscle activity) would be preferable in studies testing the Incentive-Sensitization Theory. However, in humans, researchers have often utilized self-report, subjective measures of *wanting* and *liking* derived from the Drug Effects Questionnaire. These constructs were measured by asking participants "do you like the effects you're feeling right now?" (*liking*) and "do you want more of what you consumed, right now?" (*wanting*; Evans et al., 2006; Leyton et al., 2002; Smith, Dang, Cowan, Kessler, Zald, 2016). Acknowledging the division of subconscious and conscious processes, the proposed measure aimed to index individuals' cognitive interpretations of *wanting* substances (i.e., the degree to which one craves or feels compelled to use when thinking about a substance or remembering substance using cues). In addition, the measure collected data on cognitive interpretations of *liking* for specific reasons to use. To the author's knowledge, subjective measures of substance *liking* have only been directed to the actual substance (i.e., how much do you like the effects of this drug) as opposed to the degree that one likes that they use a substance to achieve a given motive. Further, *wanting* substances is often described in the literature as such a salient drive, in the later stages of addiction, that it sometimes prevents actual satisfaction from use (or occurs even when the effects of use no longer meet one's

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expectations; Berridge & Robinson, 2011; Berridge & Robinson, 2016; Robinson &

Berridge, 1993); however, *satisfaction* from substance use has yet to be measured in the

wanting and *liking* context. We aimed to measure *liking* and *satisfaction* in terms of the

degree to which one likes that they use a substance to achieve a given motive and the

degree of satisfaction (i.e., fulfilment) of that motive via use, respectively.

Collecting information beyond simply the frequency at which one uses for a given

motive would potentially better inform identification of intervention points for behavior

change. This allows us to index one's cravings – what is driving them to use. It further

allows examination of information that could be targeted for intervention: For example,

does the individual like that they use alcohol to cope with depression? Responses here

allow us to understand more accurately where they stand on the Stages of Change. Those

in the earlier stages (i.e., precontemplation) may not see a problem with their use and find

it personally acceptable to use for an endorsed reason such as this. These individuals will

likely engage in more sustain talk (i.e., expressing desire to maintain substance use

behavior). On the other hand, those that indicate more dislike with using to achieve this

motive may be in the contemplation or later stages and may be more inclined to engage in

change talk (i.e., expressing desire to change substance use behavior; Arkowitz, Miller, &

Rollnick, 2015). Intervention strategies such as Motivational Enhancement Therapy may

utilize these data, along with *satisfaction* ratings, to guide an individual to notice

discrepancies between reasons to use and not use when the data indicate that motives to

use are not being satisfied by substance use. Looking again at our example of using

alcohol to cope with depression, one could further explore whether alcohol use is actually

helping alleviate symptoms of depression (i.e., satisfying the motive to reduce feelings of

depression) and consider whether there may be more adaptive ways to combat these symptoms. While measuring the *frequency* at which one uses for a given motive may enlighten us about using in general, measuring *liking* and *satisfaction* may relate more to a specific individual's motives for using in the context of their addiction.

The Present Study

In alignment with MI and the MET model, the authors proposed an assessment tool that comprehensively captures the common motives to use substances – assessing the relevance, in terms of relative strength, of each motive factor for any given individual. Several measures of specific motives have been developed and researched previously; however, existing measures have either been limited in their breadth of motivations to use or have been applied to one substance or a narrow list of substance types. Existing measures have also only examined motives for substance use by measuring the frequency at which one uses for a given motive. We intended to include motives that have been selectively included in some measures that are likely applicable to other substances not measured and reduce the inconsistency in item content and factor labeling across measures. Moreover, we expanded the measurement of motives to incorporate additional components of motivation relevant to substance use, allowing a more comprehensive understanding of why people use.

Thus, the purpose of the current study was to develop a self-report measure of motives to use substances, guided by the Addiction Syndrome Model, to capture several components of the comprehensive nature of addiction (i.e., antecedents and manifestations) as well as details necessary to capture nuances and distinctions between different objects of addiction (i.e., specific motivations to use, specific points of contact

with the object, etc.). Implications of this measure were driven by the Stages of Change model and the MI framework, such that, ultimately, data from the measure may direct Motivational Enhancement Therapy dialogue by teasing out unique intervening variables related to use that will be relevant to a given individual, thus guiding treatment, specifically by clearly outlining barriers to change, providing an opportunity to capitalize on client-identified reasons to change, and providing a basis of use history, change history and current status. Findings may expand the current understanding of motivations to use and quit using substances by providing more explanatory data and determining prevalent trends and relationships of motivations by substance type and experience with use.

The present study proposed to extend and integrate the literature on motivations to use substances, and address gaps in the literature, by developing a reasonably comprehensive measure of motivations. The goals of creating the proposed measure were to capture facets of motivation represented in the literature comprehensively, test the factor structure of motivations to use, address gaps in the literature by testing the salience of these motives to several common substances of use (i.e., alcohol, cannabis, opioids, stimulants, sedatives/anxiolytics, hallucinogens/dissociatives), and extend the literature by assessing distinguishable components of motivations (i.e., *frequency*, *wanting*, *liking*, and *satisfaction*) for these substances.

Proposed Motivation Factors

We proposed a nine-factor model of motives to use substances derived from previous measures and the existing literature (see Table 1 for an outline of previous measures of motivations by substance type) as follows:

Affect Reduction/Negative Arousal (ARNA). We hypothesized a factor containing items related to using substances to cope with aversive affect (e.g., loneliness, depression, anxiety, irritability, guilt) and decrease arousal (e.g., stress, tension, restlessness, racing thoughts).

Affect Enhancement/Positive Arousal (AEPA). We hypothesized a factor containing items related to improving one's baseline affective state. Use of substances to celebrate, to feel elated or euphoric, for enjoyment, and to increase feelings of self-confidence or effectiveness were expected to fall within this factor. In addition, this factor was expected to include content related to using to increase arousal (e.g., to relieve boredom, to feel 'alive,' and to perk up or become alert).

Social/Relational (SR). We hypothesized a factor that would encompass items related to social rewards (e.g., acceptance and approval), social problems (e.g., feeling more confident in social situations and during conflicts), social facilitation (e.g., to make friends; improving ability to communicate with others and express one's thoughts and feelings), and social enhancement (e.g., enjoying other's company; improving social situations like parties).

Altered Perceptions/Experiential Processes (APEP). We hypothesized a factor containing items related to using substances to experience the world and one's own perceptions and sensations in a different or novel way. We also expected this theme

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would be related to using for the sake of learning and trying new things. An example of an item hypothesized to tap this factor was *to enhance and change my senses (e.g., see things differently)*.

Relative Low Risk (RLR). We hypothesized a factor that would include items related to using substances because they are perceived as socially, physiologically, or legally "safer" than other substances. Examples of items relating to this factor included using *because it is prescribed to me by a doctor*, *because it has fewer side effects than other drugs*, *because I can use it legally*, and *because it's easier to hide my use from others than for other drugs*.

Functional/Self-Medication (FSM). This factor, overall, was expected to encompass the use of substances to address functional problems. This factor was expected to include motivations to use substances for their neurochemical enhancement of functions: for physical pain, to relax, trouble sleeping, staying awake, enhancing physical performance, focusing attention, and appetite control. We hypothesized using to avoid withdrawal effects would also load on this factor and would include content related to using substances to avoid psychological and physiological symptoms that occur from refraining to use a substance after prolonged use over an extensive period of time.

Substitution (SUB). We hypothesized a factor comprised of items related to using one substance to substitute for another or to supplement another substance. Items hypothesized to load onto this factor included using *to get the same effects as something I'm prescribed when I run out of the prescription*, *to use a drug that is more powerful than one I've gotten used to*, and *to help me stop or decrease my use of another drug*.

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Conformity/Rebellion (CR). We hypothesized a factor that would encompass the use of substances to rebel or conform to norms and expectations on a bipolar dimension. Conformity-related content would include items such as *using to follow what my friends are doing* and *to not be the only one not doing it*. Rebellion-related content would include items such as using *to experience the thrill of doing something I'm not supposed to do* and *to rebel against authority or society*.

Effects of Other Substances. We hypothesized a factor containing items related to managing the strength of effects, negative effects, and quality of effects of other substances. Example items included using *to counteract the effects of another drug*, *to enhance the effects of another drug*, *to be able to use another drug for a longer period of time*, and *to 'come down' off of another drug*.

Testing Hypotheses Related to the Validity of the Construct

Hypothesis 1: Factor Structure

We expected the aforementioned 9-factor model to emerge from the data. By testing the factor structure for motives measured by the frequency of using substances for a given reason (i.e., *frequency*), how much one likes that they use substances for a given reason (i.e., *liking*), and the degree to which a given reason is satisfied by use (i.e., *satisfaction*), we anticipated similar factor structures would emerge. While the existing motives measure literature supports motives measured by *frequency* loading as hypothesized, the *liking* and *satisfaction* factor structures were exploratory given the novel measurement method of substance use motives; however, we expected the structure to resemble that for *frequency*. Given the more comprehensive nature of the item content included in the current study, the factor structure was expected to be similar to those in

existing measures, but not exactly the same because we are including content not fully

captured by any one existing measure. In addition, we anticipated the factor structure

may suggest one less, or one more, factor fit the data better.

Hypothesis 2: Wanting, Liking, and Satisfaction Predicting Frequency of Use

By measuring individuals' substance *wanting* ratings and *liking* and *satisfaction*

ratings for a variety of motives, we expected these variables to predict the frequency of

substance use in a consistent pattern, such that as frequency of substance use increases,

the degree of *wanting* increases while *liking* and *satisfaction* decreases. While

exploratory in nature, we aimed to test these relationships for the use of six classes of

substances to determine if the relationships hold across substances.

Hypothesis 3: Wanting, Liking, and Satisfaction Predicting Severity and Change

In addition, we tested whether individuals' substance *wanting* ratings and *liking*

and *satisfaction* ratings for motives predicted DSM-5 SUD severity, consequences of use,

desire for use status, current status on the Stages of Change, and number of reasons for

quitting use. Because frequency of use often accounts for a large amount of variance in

use-related problems (Carey & Correia, 1997; Cooper 1994), we examined whether

wanting, *liking*, and *satisfaction* measures predicted these outcomes over and above

frequency of use. Here, we expected *wanting* to be lower, and *liking* and *satisfaction*

ratings to be higher for those who met less criteria for a SUD, had more perceived

positive consequences of use, wanted to use as much as possible (i.e., desire for use

status), were at earlier Stages of Change, and endorsed less reasons to quit using, whereas

wanting would be higher and *liking* and *satisfaction* would be lower for those who met

more criteria for a SUD, had more perceived negative consequences of use, wanted to

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completely quit using, were further on the Stages of Chance, and endorsed more reasons to quit using.

Hypothesis 4: Incremental Validity Testing of Frequency, Liking, and Satisfaction Motive Measures

While motives measured by *frequency* have consistently predicted use-related patterns and outcomes in the literature, we hypothesized that measuring motives in term of *liking* and *satisfaction* would increase the predictive ability of motives above and beyond that of *frequency* motives. We intended to test for incremental validity by treating *frequency* motives as a covariate and entering *liking* and *satisfaction* motives in the second block, accounting first for the variance *frequency* measures capture in substance use-related patterns and substance use severity in the model.

Hypothesis 5: Motives by Drug of Choice

In congruence with the literature, we aimed to investigate whether motives vary by individuals' drug of choice. To the extent that previous studies have identified salient motives for particular substances of use, we proposed some predictions as follows:

1. Alcohol use would predominantly be for motives captured in the Affect Reduction/Negative Arousal (coping with negative affect; relax; relieve tension), Affect Enhancement/Positive Arousal, Social/Relational (confidence; celebration), Relative Low Risk (socially acceptable; legal in some contexts), Functional/Self-Medication (sleep; pain; black out; avoid withdrawal), and Conformity/Rebellion (towards conformity) factors.

2. Cannabis (or synthetic cannabinoid) use would predominantly be for motives addressed in Affect Reduction/Negative Arousal (coping with negative affect and

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decreasing arousal with more relaxing strains), Affect Enhancement/Positive Arousal (increasing arousal with more activating strains), Social/Relational (celebration), Altered Perceptions/Experiential Processes, Relative Low Risk (socially acceptable; legal in some contexts; [synthetic cannabinoids] does not show up on drug test), Functional Self-Medication (sleep; pain; increase appetite), and Conformity/Rebellion (towards rebellion) factors.

3. Stimulant (cocaine, methamphetamine, or prescription stimulant) use would predominantly be for motives addressed in Affect Reduction/Negative Arousal (coping with depression [but not coping with anxiety or decreasing arousal]), Affect Enhancement/Positive Arousal (feel alive; perk up), Social/Relational (celebration), Relative Low Risk (legal in some contexts; confidence in purity; prescribed by a doctor), and Functional/Self-Medication (concentration; stay awake; study; enhance performance; decrease appetite) factors.

4. Opioid (heroin or prescription opioid) use would predominantly be for motives addressed in Affect Reduction/Negative Arousal (coping with anxiety; relax; release tension), Affect Enhancement/Positive Arousal (pleasure; euphoria), Social/Relational (celebrate; lose inhibitions), Relative Low Risk (legal in some contexts; confidence in purity; prescribed by a doctor), and Functional/Self-Medication (pain; sleep; avoid withdrawal) factors.

5. Sedative/anxiolytic (benzodiazepine and prescription sleep aid) use would predominantly be for motives addressed in Affect Reduction/Negative Arousal (coping with anxiety; decreasing arousal), Affect Enhancement/Positive Arousal (feel at peace), Relative Low Risk (legal in some contexts; confidence in purity;

prescribed by a doctor), and Functional/Self-Medication (sleep; black out; avoid withdrawal) factors.

6.   Hallucinogen and/or dissociative (e.g., LSD, psilocybin, ecstasy, MDMA, molly, 2-CE, ketamine, and synthetic cathinone) use would predominantly be for Affect Enhancement/Positive Arousal (feel euphoric; have fun; reduce boredom; feel alive; have energy), Social/Relational (celebrate; relate to others), and Altered Perceptions/Experiential Processes (experience a blending of senses; perceive things differently; be more creative) factors.

Because no single study has examined the salience of motives related to content hypothesized to load onto the Effects of Other Substances factor in the presence of all substance classes we will address (i.e., alcohol, illicit substances, and prescription substances), it was unclear which substances this factor would be most prominent for. We did not have any hypotheses for the salience of the hypothesized Substitution factor given the lack of literature regarding the relationship of related content to substance classes.

CHAPTER II – METHODOLOGY

IRB Statement

Collection of data was initiated after approval by The University of Southern Mississippi's Institutional Review Board (see Appendix A for IRB approval letter).

Participants

We aimed to collect data from adults who use or have used alcohol, cannabis, stimulants, opioids, sedatives / anxiolytics, or hallucinogens / dissociatives. We aimed to obtain a sample of 600 participants, with at least 100 participants who use or have used each of the six substance classes. Many adults in the U.S. currently use alcohol (ages 18-25 = 56.3%; ages 26 or older = 55.8 percent) and cannabis (ages 18-25 = 22.1 percent; ages 26 or older = 7.9 percent), while much fewer use stimulants, opioids, sedatives / anxiolytics, and hallucinogens / dissociatives (ages 18-25 = .2 to 2.1 percent; ages 26 or older = .1 to 1.1 percent; Substance Abuse and Mental Health Services Administration, 2018). Our intention to adequately represent use of each substance class, despite low base rates, was to aid in the external validation of the proposed questionnaire.

Participants were recruited from an undergraduate research pool at a medium-sized Southeastern university, in which participation was compensated in course credit or extra credit. We also recruited participants from a medium-sized Midwestern university via their psychology department listserv. We recruited participants through flyer announcements posted at coffee shops and bars in the southern Mississippi region. In addition, we recruited participants through Facebook and Reddit social media outlets. All participants recruited through sources outside of the undergraduate research pool were entered for a drawing of six $25 Amazon gift cards for completing the survey.

Individuals 18 years of age or older who had past or current experience with any of the substances of interest were invited to participate.

Materials

Frequency of Substance Use

Participants were given an extensive, but not exhaustive, list of common substances of use. Each substance was accompanied by a use history scale in which participated indicated whether they have never used, used to use but no longer use, currently use, or preferred not to say. Those who indicated past or current use also completed a frequency of use scale in which participants indicated their typical use pattern or, if no longer in use, their typical use pattern prior to quitting. Response options ranged from *never use* to use *multiple times per day* (see Appendix B).

Drug(s) of Choice History

Following completion of the previous section, participants were asked to rank their top three drugs of choice from the substances they had previously endorsed. For participants' drug(s) of choice, we collected additional data regarding participants' history of use, including how long the individual has (had) been using the substance, age of initial use, and route(s) of administration. We also asked participants to indicate their perception of their consequences and experiences from using their drug(s) of choice on two 7-point Likert-type scales ranging from *always negative* to *always positive* (see Appendix C).

Exposure to Substance

Although appearing obvious, a crucial component of the precursors to an

addiction syndrome is that the individual must (a) be exposed to the substance and (b)

interact with the substance (Shaffer et al., 2004). We explored these antecedents to

addiction by asking participants the modality in which they first heard about their drug(s)

of choice (e.g., through television, music, a family member, friends, a drug dealer, a

doctor, etc.), who they were with when they first saw their drug(s) of choice firsthand,

and who they were with when they first used their drug(s) of choice. A shared

manifestation among all substances of addiction is a social drift that may manifest in

delinquency, criminal activity, maladaptive relationships, spending time with others who

use, or using in isolation (Shaffer et al., 2004). As such, participants indicated the

frequency at which they acquire(d) each substance from a wide-ranging list of sources

and the frequency at which they use the substance with persons of varying relationships

to the participant (e.g., by myself, a drug dealer, siblings, etc.) (see Appendix D).

Quitting or Reducing Status and Treatment History

Participants indicated their ideal drug(s) of choice intake status (i.e., decrease,

increase, or continue current use) for their drug(s) of choice. Responses ranged from

completely quit using to *use as much as possible*. Following the ideal status ratings,

participants specified their current status regarding continuing to use the drug(s) of

choice. Responses for this item ranged from *I have not quit or reduced use, and do not*

intend to, to *I've successfully quit or reduced use for more than 2 years*. The current

status endorsement options were designed to (a) reflect the Transtheoretical Model for

Stages of Change and (b) map participants' statuses onto the motivations to use and

reasons for quitting or reducing use. Participants also provided data on their treatment history, including number of treatments, type of treatment (12-step, outpatient, inpatient), and whether they were currently in treatment (see Appendix E).

SUD Diagnostic Criteria

Substance Use Disorder severity was assessed by asking participants to indicate the extent to which the eleven Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5; American Psychiatric Association, 2013) criteria applied to their use of their drug(s) of choice. Each criterion was rated on a 6-point Likert-type scale (1 = *not at all true of me*; 2 = *minimally true of me*; 3 = *a little true of me*; 4 = *moderately true of me*; 5 = *very much true of me*; 6 = *completely true of me*; see Appendix F).

Motivations for Quitting or Reducing

We assessed the extent to which participants wanted to quit or reduce their drug(s) of choice use from an extensive list of potential intrinsic and extrinsic motivations. Individuals who had already quit or reduced their use rated items based on past reasons for quitting or reducing use. Several motivations were derived from the 20-item Reasons for Quitting Scale (Curry, Wagner, & Grothaus, 1990; RFQ) which includes two facets of intrinsic motivation (health concerns and self-control) and extrinsic motivation (immediate reinforcement and social pressure). We expanded this measure by including items related to improving memory, productivity, and clarity in thinking, quitting or reducing before a more negative consequence occurs (e.g., to stop before progressing to a "harder" drug; to stop before endangering someone), and quitting or reducing because a negative consequence occurred (e.g., an embarrassing behavior due to intoxication; see Appendix G). The original RFQ factor structure for intrinsic and

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extrinsic motivations has been validated with tobacco smokers (Curry, Grothaus, McBride, 1997) and demonstrated adequate reliability (intrinsic alpha = .83; extrinsic alpha = .75).

Motivations to Use

We generated 112 motivations for both global- and specific-substance use that reflected the proposed 9-factor model based on motivations previously established in the literature (See Appendix H). Participants responded to the full 112-item measure for any endorsement of current or past substance use falling under six substance classes: alcohol, cannabis, stimulants, opioids, sedatives/anxiolytics, and hallucinogens/dissociatives.

Wanting. Participants were provided with an operational definition of *wanting* (i.e., craving), and subsequently rated their overall level of wanting intensity. Participants responded to two *wanting* items: "When you think about alcohol and/or drugs how intense are your cravings?" and "When you encounter a reminder about alcohol and/or drugs (e.g., people, places, things) how intense are your cravings?" The two *wanting* questions were answered on 6-point Likert-type scales (1 = *not at all*; 2 = *minimally*; 3 = *a little;* 4 = *moderately*; 5 = *very much*; 6 = *extremely).* We calculated a mean total *wanting* score from the two items.

Frequency, Liking, and Satisfaction. Participants responded to each motivation item three times: *"How frequently you use alcohol and/or drugs for that reason or motive," How much you like using alcohol and/or drugs for that reason or motive"* and *"How much that reason or motive is satisfied when you use alcohol and/or drugs."* The *frequency* measure was answered on a 6-point Likert-type scale (1 = *Never*; 2 = *Rarely*; 3 = *Occasionally*; 4 = *Often*; 5 = *Almost Always*; 6 = *Always*). The *liking* and *satisfaction*

questions were answered on 6-point Likert-type scales (1 = *not at all*; 2 = *minimally*; 3 = *a little;* 4 = *moderately*; 5 = *very much*; 6 = *extremely*). Lower ratings on the *wanting* scale indicated the individual felt less compelled to use substances, while higher ratings indicated the individual felt more compelled to use substances. Low ratings on the *frequency* scale indicated the individual used substances for a given motive less often, whereas higher ratings indicated the individual used substances for a given motive more often. Lower ratings on the *liking* scale indicated the individual did not like that they used the substance for that motive (i.e., to achieve that goal), whereas higher ratings indicated the individual liked that they used for that motive. Lower ratings on the *satisfaction* scale indicated a specific motivation to use was less satisfied by way of substance use, while higher ratings indicated the given motivation was satisfied to a greater degree from use. Items were presented under a heading of their hypothesized factor loading label to provide further semantic clarity. After responding to the *frequency*, *liking* and *satisfaction* measures for each presented set of items, participants were asked to indicate which substances they use, or used, for this set of reasons. These motivations formed the Motivations to Use Substances Questionnaire (MUSQ).

<div align="center">Design and Procedure</div>

Participants recruited from the Southeastern university registered for the study through the undergraduate research participation system (SONA) and subsequently received an email with a web link to complete the online questionnaire generated through Qualtrics. Those recruited from flyers, social media, and the Midwestern university's psychology department listserv were prompted to copy the posted web link into an internet browser to complete the online questionnaire.

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Participants accessed the questionnaire through the provided web link. The beginning prompt was an informed consent page detailing the anonymity of responses, voluntary nature of participation, and local mental health addiction counseling services' contact information (in both the Midwestern and Southeastern regions). Consenting participants identified their recruitment source to inform the generalizability of findings. Participants responded to general demographic questions (e.g., gender identity, age, race/ethnicity, years of education, etc.) and reported their frequency of use (or past use) for several classes of substances. Indication of any past or present use of substances prompted the individual to indicate their top three drugs of choice. Participants were given the option to provide less than three drugs of choice if applicable. For the three (or less) drugs of choice, participants were asked to provide additional data for each endorsed substance regarding the duration of their use, routes of administration, experiences and consequences of use, age of onset of use, sources of exposure to the substance, treatment history, and ideal and current quit status. Participants were then prompted to complete the SUD diagnostic criteria questionnaire and the Reasons for Quitting (revised) questionnaire. Following collection of this descriptive data, participants who indicated any past or present use of alcohol, cannabis (or synthetic cannabinoids), stimulants (cocaine, methamphetamine, or prescription stimulants), opioids (heroin or prescription opioids), sedatives/anxiolytics (benzodiazepines and prescription sleep aids), or hallucinogens and/or dissociatives (ecstasy, MDMA, molly, hallucinogens, dissociatives, and synthetic cathinones) were prompted to complete the Motivations to Use Substances Questionnaire (MUSQ) in reference to their overall use or past use of any of the six classes of substances. Following completion of the MUSQ, participants that did not

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participate for research or extra credit were prompted to enter their email to be entered into the drawing for six $25 Amazon gift cards. The present study, given the nature of Exploratory Factor Analysis (EFA), was an exploratory design (Costello & Osborne, 2005).

<div align="center">Statistical Analyses</div>

Date Preparation

We began the analysis process by first screening the data for values outside of the range (e.g., a value of 7 on a motivation item) in frequencies analyses of our variables of interest to exclude any participants with out-of-range values. Additionally, we examined the frequency of missing data for each item to determine if the frequency of missing data for an item was high (i.e., 10 percent or higher). Data missing at a high frequency was investigated for trends of random or systematically missing values. Data missing randomly did not warrant exclusion or imputation, while data missing systematically is addressed in the discussion. The test statistic of skewness and kurtosis for the item responses was examined to determine univariate normality of the distribution. Finally, we created z-scores for the motivation items to identify any outliers that warranted exclusion from the analysis with a criterion of +/- 3 standard deviations.

Hypothesis 1: Factor Structure

We planned to conduct Exploratory Factor Analyses (EFAs) on participants' responses to the *frequency*, *liking,* and *satisfaction* scales for the 112 motivation items; however, all motive *liking* and *satisfaction* items were missing more than ten percent of data, with the majority missing between 50 and 85 percent of data. Therefore, EFAs for MUSQ *liking* and *satisfaction* items were not run. For the *frequency EFA*, we used

principal axis factoring and direct oblimin rotation. We used the principal axis factoring extraction because we aimed to determine shared variance, and assumed imperfect reliability, among scores to explore the underlying latent constructs (Costello & Osborne, 2005). Direct oblimin rotation was used to allow the factors to correlate and explore those relationships. Because we had a theoretical basis for the factor structure, we fixed the number of factors to extract to 9, suppressing small coefficients below .35 as our predetermined cut-off criterion for relationship strength. To explore alternative factor structures and supporting evidence for the hypothesized factor structure, we utilized scree tests and parallel analyses (Horn, 1965; O'Connor, 2000).

Examination of the scree plots assisted in determining the number of factors; that is, visualizing a line through the eigenvalues beginning from right to left of the graph and determining the first change in slope (i.e., "bend") to indicate the number of factors as identified on the x-axis. We anticipated the 9-factor model would emerge from this test, but also tested alternative models at +/- 1 factor (i.e., an 8- and 10-factor model). We also employed parallel analyses using the actual data permutation approach (O'Connor, 2000) to allow for eigenvalue comparisons for the present data to eigenvalues for a random dataset that yields equivalent statistical properties (i.e., means, standard deviations, and distributions). Using this approach, parallel analyses call for the factor analyzation of the randomized dataset and can be used to determine the number of factors to retain for which the present-data eigenvalue was greater than the randomized-data eigenvalue. When results from a parallel analysis are inaccurate, they tend to overestimate the number of factors to retain. Glorfeld (1995) suggests using the parallel analysis result as a starting point, but also considering one or two less factors. As such, we tested models for

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the identified number of factors from the parallel analysis as well as those with within the range of our lowest expected number of factors to arrive at both a theoretically sound and simple factor structure.

We examined the Kaiser-Meyer-Olkin analyses to ensure sufficient variability to examine the EFA, with a value criterion of at least .70. In addition, Bartlett's Test of Sphericity was examined to confirm the legitimacy of the factor structure through a statistically significant value of $p < .05$. Communalities were assessed for potentially weak-loading items that fall below .20.

When examining the pattern matrix, we considered removal of items that had weak loadings with coefficients below .35 or double loadings (i.e., items loading on more than one factor with coefficients at or above .35) to ultimately arrive at a simple factor structure. The same removal process was utilized for the alternative models. Once the simplest factor structures were determined for the proposed and alternative models, we determined which model should be used consonant with theoretical justification. Similarly, after determining the final factor structure with the appropriate items, we named the factors based on content and theory.

Once we had the final factor structure, we conducted reliability analyses utilizing Cronbach's alpha to determine internal consistency for scores within each factor. We considered alphas of .70 or higher to indicate sufficiently reliable dimension scores. If reliability was improved by deletion of an item in item analysis, we considered the item's utility within the factor and considered removal if reliability was greatly improved before aggregation of items. Lastly, we reviewed the factor correlations and MUSQ scale score

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correlations for strength and directionality to determine whether the relationships among

factors make theoretical sense.

Hypothesis 2: Wanting, Liking, and Satisfaction Measures

To test the hypothesized relationships between *wanting*, *liking*, and *satisfaction*,

we planned to conduct a multiple regression using each of the motive factor scaled scores

(*liking* and *satisfaction*) and total *wanting* scores to predict the variance for the six

substance class use frequency scales. However, it was later determined that this statistical

plan would call for as many as 72 multiple regressions (i.e., the number of factors

multiplied by six substance classes). For a more parsimonious interpretation, we

conducted multiple regressions using each of the motive factor scaled scores for *liking*

and *satisfaction* and total *wanting* scores to predict the variance in participants' maximum

frequency score for their most frequently used substance (i.e., using one dependent

variable versus six). To correct for Type I error, we used a Bonferroni correction by

dividing .05 by the number of analyses run.

Hypothesis 3: Wanting, Liking, and Satisfaction Predicting Severity and Change

We planned to conduct five hierarchical regressions, accounting for substance use

frequency in Block 1, using each of the motive factor scaled scores (*liking* and

satisfaction) and total *wanting* scores in Block 2 to predict the variance in severity of

DSM-5 SUD, perception of consequences from use, desire for use status (ranging from

wanting to quit to wanting to use as much as possible), current status on the Stages of

Change, and number of reasons to quit using measured on the revised RFQ. Again, upon

collecting the data, it was determined that this statistical plan did not fit the data because

we: (a) did not collect an overall substance use frequency score (although we could have

used the variable created for hypothesis 2 for participants' maximum frequency score for their most frequently used substance); (b) did not consider that there would be multiple *liking* and *satisfaction* factor scaled scores intended for Block 2 and were unable to index a single *liking* and *satisfaction* score by calculating the mean due to very small and variable sample sizes per factor scaled score; and (c) did not consider that the dependent variables were collected in relation to participants' drug(s) of choice and therefore participants' may have had one, two, or three DSM-5 SUD scores per substance. Calculating mean scores for the dependent variables would not have made theoretical sense, as someone could have no DSM-5 severity for one substance and high DSM-5 severity for another, averaging out to moderate severity. Further, given the number of factors determined for the MUSQ and the fact that regressions can only enter one dependent variable into the model, this statistical plan would have called for a minimum of 60 regressions (i.e., assuming we went with participants' maximum frequency score for their most frequently used substance for Block 1 and averaged participants' scores across the dependent variables by their drug(s) of choice). To test these multivariate relationships, we instead conducted canonical correlation analyses by considering the aforementioned independent variables as one variable set and the severity and change variables as another variable set. To work around the non-existent substance use frequency variable and possibility of multiple severity and change sets by substance classes, we examined frequency of use and severity and change variables only in relation to alcohol and cannabis use, as there was a disproportionally higher endorsement of these substances as drugs of choice compared to others.

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Hypothesis 4: Incremental Validity Testing of Frequency, Liking, and Satisfaction Motive

Measures

Similarly, we aimed to test whether this novel method of assessing substance use motives (i.e., *liking* and *satisfaction*) would increase the predictive ability beyond that of the status quo *frequency* measures of motives, by conducting a series of five hierarchical regressions to predict the variance in severity of DSM-5 SUD, perception of consequences from use, desire for use status, current status on the Stages of Change, and number of reasons to quit using measured on the revised RFQ. Here, we planned to account for *frequency* motive scaled scores in Block 1 and enter *liking* and *satisfaction* motive scaled scores in Block 2. We ran into the same problems here as we did with the statistical plan for hypothesis 3, as we did not consider the fact that we would ultimately need to run an unreasonable number of analyses due to having multiple *frequency*, *liking*, and *satisfaction* factor scaled scores and multiple values for the dependent variables by participants' drug(s) of choice. Again, we instead tested these multivariate relationships through more parsimonious canonical correlations by focusing only on alcohol and cannabis use-related variables.

Hypothesis 5: Motives by Drug of Choice

Lastly, we explored whether motives differed by drug of choice using a MANOVA, with drug of choice as the independent variable and the motive factors identified with the *frequency* scale serving as the dependent variables. We tested the assumption of homogeneity of covariance matrices with Box's M test. If the assumption of homogeneity of covariance matrices was violated, we planned to examine Pillai-Bartlett trace to determine statistical significance of the omnibus test; however, if the

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assumption was not violated, we planned to examine Wilks's lambda. We planned to

conduct subsequent discriminant analyses to determine where differences in motives

differ by drug of choice; however, we later determined this analysis would not answer the

research question given that the functions would compare where combinations of

substances differed by patterns of significant motives rather than where a given motive

was more or less salient by participants' drug of choice. As such, we followed up the

MANOVA with post-hoc ANOVAs.

CHAPTER III – RESULTS

Data Preparation

Of the total sample ($N = 440$), seventy-three participants were removed due to random responding (i.e., responding all "1s" to all *frequency* motive items) or not responding to the MUSQ questionnaire at all. Although participants were to be excluded based on responding "never used" and/or "prefer not to say" to all substances of interest, no additional participants needed to be excluded after excluding the aforementioned 73 participants. A number of substance-specific responses were removed from analyses due to participants responding despite indicating in "Other (specify)" spaces that they had never used the substances in question. We excluded one participant's cannabis- and prescription stimulant-related, three participants' prescription stimulant-related, two participants' prescription opioid-related, and one participant's hallucinogen-related responses. These participants' lack of a use history with these substances was confirmed through examination of their substance use pattern and frequency history responses. All other responses from these participants were retained. Thus, the final dataset consisted of 367 participants (see Table 2 for demographic characteristics).

Table 2

Demographics

	n	%	Min	Max	*M*	SD
Age	367		18	81	23.29	7.84
Gender						
Female	272	74.1				
Male	84	22.9				
Prefer not to say	3	.8				
Cisgender	3	.8				
Transman	2	.5				
Transwoman	1	.3				

Table 2 Continued

Gender queer	1	.3
Other	1	.3
Marital Status		
Single	296	80.7
Married	27	7.4
Engaged	21	5.7
Divorced	12	3.3
Prefer not to say	6	1.6
Separated	3	.8
Widowed	2	.5
Race / Ethnicity		
White	241	65.7
Black	78	21.3
Biracial / Multiracial	25	6.8
Hispanic / Latinx / Spanish	9	2.5
Prefer not to say	5	1.4
East Asian / Asian American	3	.8
South Asian / Indian American	3	.8
Middle Eastern / Arab American	2	.5
Other	1	.3
Recruitment Method		
USM	269	73.3
Reddit	52	14.2
Facebook	32	8.7
SIUE	6	1.6
Flyer	6	1.6

Next, we examined frequencies for all variables of interest (Tables 4 and 5). No

MUSQ motive *frequency* items had ten percent or more missing data; however, as

mentioned previously, all *liking* and *satisfaction* items were missing a substantial amount

of data, with the majority missing between 50 and 85 percent of data. Although we were

unable to run EFAs for MUSQ *liking* and *satisfaction* items, *liking* and *satisfaction* factor

scale scores were calculated based on the final resulting *frequency* factor items for subsequent analyses. Specifically, we calculated the mean value for items within a given *frequency* factor for corresponding *liking* and *satisfaction* factors. We examined frequencies for each of the 14 substance classes (i.e., alcohol, cannabis, prescription stimulants, prescription opioids, prescription benzodiazepines, heroin, cocaine, methamphetamine, MDMA, hallucinogens, dissociatives, prescription sleep aids, synthetic cannabinoids, and synthetic cathinones) that fell within participants' top three substances of choice. There were significantly more individuals who endorsed alcohol (48 percent; n = 328) and cannabis (34.8 percent; n = 238) in their top three substances of choice than the other substances, which ranged from n = 2 to 68 (.3 to 10 percent; see Table 4). We created a variable for frequency of substance use for participants' most frequently used substance to serve as the dependent variable for hypothesis 2 to allow for: (a) a larger sample size and (b) *wanting*, *liking*, and *satisfaction* variables, which were related to participants' overall substance use regardless of substance class, to better align with frequency of substance use in general. This variable was not missing any data. Therefore, with the exception of hypotheses 1 and 2, all subsequent analyses focused only on alcohol and cannabis use and use-related variables.

Table 3

Descriptives for Variables of Interest

	n	%	Min	Max	*M*	SD	α	Skewness	Kurtosis
Frequency of Most Frequently Used Substance	367	100	1	7	4.21	1.81		.395	-1.10
Drugs Fall within Top 3 Drugs of Choice									
Alcohol	300	81.7							
Cannabis	224	61							
Rx Stimulants	63	17.2							
Rx Opioids	47	12.8							
Hallucinogens	46	12.5							
Rx Benzodiazepines	29	7.9							
Cocaine	26	7.1							
Rx Sleep Aids	25	6.8							
Heroin	23	6.3							
MDMA / Molly / Ecstasy	23	6.3							
Methamphetamine	16	4.4							
Synthetic Cannabinoids	4	1.1							
Dissociatives	3	.8							
Synthetic Cathinones	1	.3							
Alcohol Use-Related Variables									
Frequency of Use	296		1	7	3.32	1.28		1.12	1.39
Ideal Use	291		1	7	3.25	1.27		-.42	-.60

Table 3 Continued

Stage of Change	300	1	12	4.79	4.05		.45	-1.40
DSM-5 AUD Severity	289	1	5.91	1.81	1.15	.96	2.01	3.38
Consequences / Experiences	299	1.5	7	4.69	1.13	.76	-.09	-.19
RFQ	273	33	165	61.02	30.81	.97	1.39	1.58
Cannabis Use-Related Variables								
Frequency of Use	210	1	7	3.72	1.96		.47	-.96
Ideal Use	214	1	7	2.95	1.80		.50	-.79
Stage of Change	223	1	12	5.93	4.18		.06	-1.58
DSM-5 CUD Severity	217	1	6	1.79	1.08	.94	1.81	2.97
Consequences / Experiences	224	1	7	5.27	1.45	.88	-.96	.68
RFQ	205	33	165	58.76	32.07	.98	1.55	1.83

Table 4

Descriptives for Motivations for Using Substances Questionnaire (MUSQ)

Variables of Interest	*n*	%	Min	Max	*M*	SD	α	Skew.	Kurt.
Frequency of Most Frequently Used Substance	367	100	1	7	4.21	1.81		.395	-1.10
Drugs Fall within Top 3 Drugs of Choice									
Alcohol	300	81.7							
Cannabis	224	61							
Rx Stimulants	63	17.2							
Rx Opioids	47	12.8							
Hallucinogens	46	12.5							
Rx Benzodiazepines	29	7.9							
Cocaine	26	7.1							
Rx Sleep Aids	25	6.8							
Heroin	23	6.3							
MDMA / Molly / Ecstasy	23	6.3							
Methamphetamine	16	4.4							
Synthetic Cannabinoids	4	1.1							
Dissociatives	3	.8							
Synthetic Cathinones	1	.3							
Alcohol Use-Related Variables									
Frequency of Use	296		1	7	3.32	1.28		1.12	1.39
Ideal Use	291		1	7	3.25	1.27		-.42	-.60
Stage of Change	300		1	12	4.79	4.05		.45	-1.40
DSM-5 AUD Severity	289		1	5.91	1.81	1.15	.96	2.01	3.38
Consequences / Experiences	299		1.5	7	4.69	1.13	.76	-.09	-.19
RFQ	273		33	165	61.02	30.81	.97	1.39	1.58
Cannabis Use-Related Variables									
Frequency of Use	210		1	7	3.72	1.96		.47	-.96
Ideal Use	214		1	7	2.95	1.80		.50	-.79
Stage of Change	223		1	12	5.93	4.18		.06	-1.58

Table 4 Continued

DSM-5 CUD Severity	217	1	6	1.79	1.08	.94	1.81	2.97
Consequences / Experiences	224	1	7	5.27	1.45	.88	-.96	.68
RFQ	205	33	165	58.76	32.07	.98	1.55	1.83

Next, we examined frequencies for the variables of interest focused on alcohol and cannabis use. All variables of interest in relation to alcohol and cannabis use were examined (i.e., frequency of use, DSM-5 alcohol/cannabis use disorder severity, consequences and experiences from use, RFQ alcohol/cannabis, ideal use status, and stage of change status). All variables of interest were missing more than ten percent of data, with the percentage of missing data ranging from 18.3 to 42.8 percent. However, when re-examining the frequencies for these variables by only calculating for those who endorsed alcohol or cannabis as a substance in their top three substances of choice, all percentages of missing data for the variables of interest fell below ten percent.

We also calculated z-scores to identify outliers greater than +/- 3 standard deviations, rounding to the nearest whole number. Although there were several outliers for the MUSQ motive *frequency* items, none were deleted because these outliers are part of our population of interest (i.e., those who use very often and never for that reason). Looking at the other variables of interest (i.e., drug of choice frequency, DSM-5 severity, consequences and experiences from use, RFQ, ideal use, and stage of change), we excluded two participants' DSM-5 alcohol (Zs = 3.56) and three participants' DSM-5 cannabis (Z-score range = 3.80 – 3.88) severity scores from relevant analyses. We also

excluded 26 participants' MUSQ motive *frequency* factor scaled scores from relevant analyses (Z-score range = 3.70 – 6.06).

Finally, we examined skewness and kurtosis for all variables of interest, including MUSQ factor scaled scores. Skewness for MUSQ motive *frequency* factor scaled scores ranged from .43 to 3.34, *liking* factor scaled scores ranged from -.44 to .75, and *satisfaction* factor scaled scores ranged from -.30 to .75. Kurtosis for MUSQ motive *frequency* factor scaled scores ranged from -.76 to 11.84, *liking* factor scaled scores ranged from -1.14 to .27, and *satisfaction* factor scaled scores ranged from -1.10 to -.02. For all other variables of interest, skewness ranged from -.96 to 2.01 and kurtosis ranged from -1.58 to 3.38.

<div align="center">Hypothesis 1: Factor Structure of the Frequency Items</div>

To account for missing data for *frequency* motive items, we imputed the missing data using linear trend at point. We first examined the data using principal axis factoring without extracting a set number of factors. With a Kaiser-Meyer-Olkin (KMO) result closer to 1 (at least .70 or above) indicative of better ability of our data to create a factor structure, our result of .931 was ideal. Bartlett's Test of Sphericity was also significant (*p* < .001), suggesting the variables were related and could create a factor structure. Examination of communalities did not identify any items for potential deletion (lowest communality value = .78). We hypothesized a 9-factor solution, but also examined +/- 1 of the hypothesized factor solution. Parallel analysis suggested as many as 14 potential factors. Specifically, the eigenvalues for the first 15 factors were 35.39, 6.40, 5.77, 4.54, 4.28, 3.09, 2.59, 2.26, 2.13, 1.76, 1.44, 1.36, 1.30, 1.18, and .99. The random data permutation eigenvalues at the 95th percentile were 1.74, 1.64, 1.57, 1.49, 1.45, 1.39,

1.35, 1.32, 1.27, 1.23, 1.20, 1.17, 1.14, 1.11, and 1.08. Therefore, to test the range of possible solutions, we examined 8-, 9-, 10-, 11-, 12-, 13-, and 14-factor models to ultimately arrive at a simple factor solution that was theoretically sound.

9-Factor Model

Thirteen items were deleted due to factor loadings below .35 and 10 items were deleted due to double loadings (i.e., items loading at or above .35 on more than one factor, beginning with deletion of items with double loadings of the lowest values in the pattern matrix). Based upon the content of the items with salient pattern coefficients, the resulting factors were given the following labels: (Factor 1) Affect Reduction/Negative Arousal; (Factor 2) Relative Low Risk/Substitution/Effects of Other Substances; (Factor 3) Conformity; (Factor 4) Altered Perceptions/Experiential Processes; (Factor 5) Relative Low Risk in Comparison to Other Substances; (Factor 6) Rebellion; (Factor 7) Increasing Positive Affect; (Factor 8) Performance; (Factor 9) Positive Social Interactions. Factor 1 contained 24 of the 25 items hypothesized to load on the Affect Reduction/Negative Arousal factor, with one item (i.e., *to feel more in control of my life*) deleted due to a weak loading. Factor 2 contained 12 items and combined several items from the hypothesized Relative Low Risk, Substitution, Functional/Self-Medication, and Effects of Other Substances factors. Two items hypothesized to load on the Relative Low Risk factor (i.e., *because I can use it legally*; *because it is prescribed by a doctor*) loaded with items related to managing effects of other substances (e.g., *to counteract the effects of another substance*) and substitution (e.g., *to use a drug more powerful than the one I have gotten used to*) in this single factor. In addition, one item hypothesized to load on a Functional/Self-Medication factor (i.e., *to avoid drug or alcohol withdrawal symptoms*)

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loaded on this factor. Factor 3 contained seven items. All six conformity-related items

expected to load onto a Conformity/Rebellion factor were retained, and one item (i.e., *to

avoid hurting someone's feelings*) hypothesized to load onto a Social/Relational factor

loaded on this factor. Factor 4 retained all seven items hypothesized to load onto the

Altered Perceptions/Experiential Processes factor. Factor 5 retained eight of the 11 items

hypothesized to load onto the Relative Low Risk factor. As previously mentioned, two

items loaded on Factor 2 while one item (i.e., *because I can get high without screening

positive on a drug test*) was deleted due to a weak factor loading. Factor 6 retained all

seven rebellion-related items expected to load onto a Conformity/Rebellion factor. Factor

7 retained 12 of the 14 items hypothesized to load on the Affect Enhancement/Positive

Arousal factor. The other two items (i.e., *to perk up or become alert*; *to feel like I have

energy*) were deleted due to double loadings on this factor and Factor 8. Factor 8 retained

six of the 13 items hypothesized to load on a Functional/Self-Medication factor. As

previously mentioned, one item (i.e., *to avoid drug or alcohol withdrawal symptoms*)

loaded on Factor 2 while the other six items were deleted due to weak factor loadings.

The final factor yielded a *Performance* factor likely tied to the characteristics of stimulant

use. Factor 9 retained six of the 17 items hypothesized to load onto a Social/Relational

factor. Again, one item (i.e., *to avoid hurting someone's feelings*) loaded onto Factor 3.

Four items were deleted due to weak factor loadings, while six items were deleted due to

double loadings. Specifically, two items (i.e., *to celebrate with others*; *to make social

gatherings/parties more fun*) loaded on both Factor 7 and 9, while four items (i.e., *to help

me relate to others better*; *to feel accepted by others*; *to have a sense of belonging to a*

social group; *to enhance my social status, or be perceived as "cool" by others*) loaded on Factor 3 and 9.

8- and 10-Factor Models

For the 8-factor model, 12 items were deleted due to factor loadings below .35 and seven items were deleted due to double loadings. The resulting factors were (Factor 1) Affect Reduction/Negative Arousal; (Factor 2) Substitution/Effects of Other Substances; (Factor 3) Conformity; (Factor 4) Relative Low Risk in Comparison to Other Substances; (Factor 5) Altered Perceptions/Experiential Processes; (Factor 6) Rebellion; (Factor 7) Increasing Positive Affect/Positive Social Interactions; (Factor 8) Performance. Factor 1 contained all 25 items hypothesized to load onto the Affect Reduction/Negative Arousal factor plus one item hypothesized to load onto the Functional/Self-Medication factor (i.e., *to black out or blot out awareness*). Factor 2 contained ten of the items that loaded onto Factor 2 for the 9-factor model. It also retained three additional items hypothesized to load onto an Effects of Other Substances factor that were deleted during the solution process for the 9-factor model and did not include the two items retained for Factor 2 for the 9-factor model that were related to Relative Low Risk. Factor 3 mirrored the Conformity Factor 3 for the 9-factor model, minus one item (i.e., *to avoid hurting someone's feelings*). Factor 4, Factor 5, and Factor 6 contained the same items as Factor 5, Factor 4, and Factor 6, respectively, of the 9-factor model. Factor 7 retained 20 items. Eight items were retained from the 14 items hypothesized to load onto the Affect Enhancement/Positive Arousal factor, while 12 items were retained from the 17 items hypothesized to load onto the Social/Relational factor. Three items (i.e., *to improve my self-esteem; to feel euphoric/at peace; to feel content with life*) from the hypothesized

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Affect Enhancement/Positive Arousal factor and one item (i.e., *to avoid or manage conflict with others*) from the hypothesized Social/Relational factor were deleted due to weak factor loadings. One item (i.e., *to feel more pleasure*) double loaded on Factor 1 and Factor 7, while one item (i.e., *to avoid hurting someone's feelings*) double loaded on Factor 3 and Factor 8. Three items (i.e., *to feel accepted by others; to have a sense of belonging to a social group; to enhance my social status, or be perceived as "cool" by others*) double loaded onto Factor 3 and Factor 7. Finally, Factor 8 contained the same items as Factor 8 in the 9-factor model. Compared to the 9-factor solution, the 8-factor model essentially combined two theoretically distinct motive domains (i.e., increasing positive affect and positive social interactions) into one factor. Therefore, the 8-factor solution was deemed less theoretically sound as the 9-factor model.

For the 10-factor model, nine items were deleted due to factor loadings below .35 and eight items were deleted due to double loadings. The resulting factors were (Factor 1) Affect Reduction/Negative Arousal; (Factor 2) Substitution/Effects of Other Substances; (Factor 3) Conformity; (Factor 4) Relative Low Risk in Comparison to Other Substances; (Factor 5) Positive Social Interactions; (Factor 6) Rebellion; (Factor 7) Altered Perceptions/Experiential Processes; (Factor 8) Performance; (Factor 9) Affect Enhancement/Positive Arousal; (Factor 10) Self-Medication. Factor 1 retained 23 of the 25 items hypothesized to load onto the Affect Reduction/Negative Arousal factor. One item (i.e., *to feel more in control of my life*) was deleted due to a weak factor loading, while one item (i.e., *to reduce unpleasant physical sensations*) loaded on both Factor 1 and Factor 10. Factor 2 contained nine items – two items (i.e., *to have something to use when my preferred substance is not available; to help me stop or reduce my use of*

another drug) which were hypothesized to load onto a Substitution factor and all seven items hypothesized to load onto an Effects of Other Substances factor. Factor 3 contained the same Conformity items as Factor 3 in the 9-factor model. Factor 4 contained the same Relative Low Risk items as Factor 5 in the 9-factor model, minus one item (i.e., *because it is easier to hide my use from others than for other drugs*) which was deleted due to a double loading on this factor and Factor 10. Factor 5 contained 14 of the 17 items hypothesized to load onto the Social/Relational factor. One item (i.e., to avoid or manage conflict with others) was deleted due to a weak factor loading, while two items (i.e., *to avoid hurting someone's feelings; to enhance my social status, or be perceived as "cool" by others*) were deleted due to double loadings on Factor 2 and Factor 10, and Factor 3 and Factor 5, respectively. Factor 6, Factor 7, and Factor 8 retained the same Rebellion, Altered Perceptions/Experiential Processes, and Performance items retained in Factor 6, Factor 4, and Factor 8, respectively, of the 9-factor model. Factor 9 contained 10 of the 14 items hypothesized to load onto the Affect Enhancement/Positive Arousal factor. One item (i.e., *to improve my self-esteem*) was deleted due to a weak factor loading. Again, two items (i.e., *to perk up or become alert; to feel like I have energy*) were deleted due to loading on Factor 8 and Factor 9. The last item (i.e., *to feel more self-confident or effective*) was deleted due to double loading on Factor 5 and Factor 9. Lastly, Factor 10 contained six items – two items (i.e., *because I can use it legally; because it is prescribed by a doctor*) hypothesized to load onto a Relative Low Risk factor, three items (i.e., *to get the same amount of the drug I think I need when my doctor wont prescribe enough to me; to use a drug that is more powerful than one I have gotten used to; to get the same effects as something I'm prescribed when I run out of the prescription*) hypothesized to load

onto a Substitution factor, and one item (i.e., *to avoid drug or alcohol withdrawal symptoms*) hypothesized to load onto a Functional/Self-Medication factor.

Taken together, the 8-factor solution combined two distinct substance use motives (increasing positive affect and enhancing social interactions) into a single factor. While the 9- and 10-factor models parsed this content apart, several factors combined content in other domains. For example, the 9-factor model combined motives related to the relative low risk of use, using to substitute one substance for another, and using to manage the effects of other substances in Factor 2. The 10-factor model also combined content related to using to substitute one substance for another and using to manage the effects of other substances in Factor 2, and combined motives related to the relative low risk of use and using to substitute one substance for another in Factor 10. It thus appeared appropriate to examine additional alternative models suggested by parallel analysis to determine if emerging factors would appear more distinct.

11-, 13-, 12- and 14-Factor Models

We expanded the factor solutions to look at alternative models with up to 14 factors based on the parallel analysis. After completing item removal based on our set weak loading and double loading criteria, the last factor cells for the 11-, 13-, and 14-factor models did not contain any items and thus did not warrant interpretation. The 12-factor model yielded the most definition and coherent, clean factors in comparison to the 8-, 9-, and 10-factor models.

12-Factor Model

The interpretation of the final 12-factor model changed slightly (i.e., the number of items retained and clarity of defined factors) based on item analyses (see Page 78 below). The resulting factors were: (Factor 1) Reduce Anxiety/Unpleasant Arousal; (Factor 2) Conformity; (Factor 3) Effects of Other Substances; (Factor 4) Relative Low Risk; (Factor 5) Positive Social Interactions; (Factor 6) Rebellion; (Factor 7) Altered Perceptions/Experiential Processes; (Factor 8) Performance/Arousal Enhancement; (Factor 9) Increase Positive Affect; (Factor 10) Manage Negative Social Interactions; (Factor 11) Reduce Negative Affect; (Factor 12) Substitution. See Table 5 for the *frequency* factor scaled score descriptives and Table 6 for the pattern matrix.

In arriving at a simple factor solution, eight items were deleted due to weak loadings and 13 items were deleted due to double loadings. Factor 1 contained 12 of the 25 items hypothesized to load onto an Affect Reduction/Negative Arousal factor. Two items (i.e., *to feel more in control of my life; to be less inhibited*) were deleted due to weak factor loadings. Four items (i.e., *to reduce feelings of anger or frustration; to avoid or blot out my emotions; to forget, escape, or avoid my problems; to reduce feelings of sadness or depression*) were deleted due to double loading on Factor 1 and Factor 11. One item (i.e., *to reduce unpleasant physical sensations*) was deleted due to double loading on Factor 1 and Factor 8. Ultimately, Factor 1 appeared to contain content from the hypothesized Affect Reduction/Negative Arousal factor solely related to reducing anxiety and unpleasant arousal. Factor 2 retained all six conformity-related items originally hypothesized to load onto a Conformity/Rebellion factor. Factor 3 retained all seven items hypothesized to load onto an Effects of Other Substances factor. Factor 4

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retained seven of the 11 items hypothesized to load onto a Relative Low Risk factor. Two items (i.e., *because I can use it legally; because it is prescribed by a doctor*) loaded, instead, on Factor 12. One item (i.e., *because I can get high without screening positive on a drug test*) was deleted due to a weak factor loading, while the other item (i.e., *because it is easier to hide my use from others than for other drugs*) was deleted due to a double loading on Factor 4 and Factor 12. Factor 5 retained 13 of the 17 items hypothesized to load onto a Social/Relational factor. Two of the items (i.e., *to avoid hurting someone's feelings; to avoid or manage conflict with others*) loaded onto Factor 10, while the other two items (i.e., *to enhance my social status, or be perceived as "cool" by others; to help me express myself to others*) were deleted due to double loadings on Factor 5 and Factor 2, and Factor 5 and Factor 10, respectively. Factor 6 retained all seven rebellion-related items originally hypothesized to load onto a Conformity/Rebellion factor. Factor 7 retained all seven items hypothesized to load onto an Altered Perceptions/Experiential Processes factor. Factor 8 retained the same six performance- and arousal enhancement-related items from the hypothesized Functional/Self-Medication factor as was found in the 8-, 9-, and 10- factor alternative models. Factor 9 retained 12 of the 14 items hypothesized to load onto an Affect Enhancement/Positive Arousal factor. The two items that were not retained (i.e., *to perk up or become alert; to feel like I have energy*) were deleted due to double loading on Factor 8 and Factor 9. Factor 10 contained two items originally hypothesized to load onto a Social/Relational factor. Of note, these items appeared to relate to managing negative social interactions, as opposed to the content in Factor 8 that related to enhancing positive social interactions. Factor 11 contained six of the 25 items originally hypothesized to load onto an Affect Reduction/Negative Arousal

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factor. These motives specifically address negative affect (e.g., *to reduce feelings of hopelessness; to feel less lonely; to feel less ashamed*), as opposed to addressing the anxiety and negative arousal motives that were contained in Factor 1. Finally, Factor 12 retained the same six items that were retained in Factor 10 of the 10-factor model; however, three items were deleted based on item analysis (see below) to further solidify the content within the factor and remove content hypothesized to load onto Functional/Self-Medication and Relative Low Risk factors. The final factor thus yielded a discrete Substitution factor.

9-Factor Model Versus 12-Factor Model

Compared to the 9-factor model, the 12-factor model created cleaner motive factors that further distinguished item content compared to what was originally hypothesized. The 12-factor model cleaned up the large Factor 1 from the 9-factor model by dividing Affect Reduction/Negative Arousal into a negative affect factor and an anxiety-related factor. It further cleaned up Factor 2 from the 9-factor model by parsing apart the combined Relative Low Risk/Substitution/Effects of Other Substances content into separate Relative Low Risk, Substitution, and Effects of Other Substances factors. Lastly, the 12-factor solution revealed an additional factor that comprised motives related to using substances to manage negative social interactions. Ultimately, the 12-factor model final solution captured 67.99 percent of the variance in motivations for substance use, whereas the 9-factor model captured 60.31 percent of the variance.

12-Factor Model Item Analysis

We conducted reliability analyses utilizing Cronbach's alpha to determine internal consistency for scores within each factor (see Table 5). Cronbach's alphas for the 12-

factor simple solution ranged from .818 to .950. We conducted alpha-if-item-deleted

analyses to determine if alphas would greatly improve through deletion of any additional

items. We deleted one item (i.e., *because it has greater purity than other drugs*) from

Factor 4 to improve alpha from .929 to .938. We deleted one item (i.e., *to be different*)

from Factor 6 to improve alpha from .910 to .915. We deleted two items (i.e., *to enhance*

or facilitate physical [or sport] performance; *to decrease my appetite*) from Factor 8 to

improve alpha from .883 to .892, and from .892 to .915. Lastly, we deleted three items

(i.e., *because I can use it legally*; *because it is prescribed by a doctor*; *to avoid drug or*

alcohol withdrawal symptoms) from Factor 12 to improve alpha from .818 to .830, to

.836, and finally to .868, respectively. In addition, the deletion of these latter three items

allowed for more consistent content within the factor. The inter-item correlations for the

deleted items by alpha ranged from .456 to .566 and were relatively weaker compared to

the final inter-item correlations which ranged from .600 to .872. Cronbach's alpha for the

final 12-factor model ranged from .854 to .950.

Table 5

Means, Standard Deviations, Corrected Item-Total Correlations, and Alpha if Deleted

	M	*SD*	r_t	Cronbach's Alpha	Alpha if Deleted
1. Reduce Anxiety / Unpleasant Arousal				.949	
18. To calm down	2.82	1.59	.837		.942
13. To stop worrying	2.62	1.55	.794		.943
22. To feel less stressed	3.08	1.72	.830		.942
23. To release tension	2.67	1.61	.804		.943
20. To feel less on edge	2.63	1.64	.810		.943
11. To reduce feelings of anxiety or nervousness	2.87	1.63	.799		.943
15. To slow down racing thoughts	2.18	1.55	.744		.945
19. To relax, loosen up, or unwind	3.44	1.56	.695		.947
5. To feel less irritable	2.34	1.51	.719		.946
14. To reducing feelings of fear	1.84	1.29	.716		.946
25. To decrease restlessness	1.99	1.46	.674		.947
24. To feel like nothing can bother me	2.27	1.61	.675		.947
2. Conformity				.885	
103. To not be the only one not doing it	1.42	.95	.736		.858
100. To satisfy social pressure to use	1.36	.84	.753		.856
104. To be just like everybody else	1.34	.87	.674		.868
101. To follow what my friends are doing	1.64	1.08	.758		.857
102. To avoid being made fun of	1.26	.77	.639		.874
105. To avoid being rejected	1.29	.76	.655		.872
3. Effects of Other Substances				.914	
111. To counteract the effects of another drug	1.39	.93	.799		.897
112. To reduce the effects of, or "come down" off of another drug	1.46	.95	.779		.897
108. To enhance the effects of another drug	1.67	1.24	.814		.895

Table 5 Continued

110. Because I am under the influence of another drug	1.50	1.05	.797		.894
109. To be able to use another drug for a longer period of time	1.42	1.05	.726		.903
106. To reduce the effects of another drug	1.33	.83	.692		.906
107. To help with the side effects of a medication	1.26	.76	.600		.915
4. Relative Low Risk				.938	
67. Because it has fewer side effects than other drugs	2.25	1.71	.872		.919
66. Because it is not as bad for you as other drugs	2.42	1.81	.825		.925
68. Because it does not cause me as many problems as other drugs	2.33	1.80	.829		.924
65. Because I can handle the high better than with some other drugs	2.14	1.70	.808		.927
64. To get high / intoxicated with something I think is safer than other drugs	2.43	1.76	.817		.926
69. Because it is more socially acceptable than other drugs	2.29	1.71	.737		.936
5. Positive Social Interactions				.950	
46. To help me feel sociable or friendly	2.72	1.66	.817		.944
44. To make social gathering and parties more fun	3.23	1.68	.753		.946
41. To lose my inhibitions in social situations	2.41	1.55	.752		.946
45. To feel more confident and sure of myself around others	2.47	1.62	.787		.945
48. To enjoy social interactions	2.83	1.65	.798		.945
43. To have a reason/excuse to socialize	2.24	1.53	.780		.945
54. To celebrate with others	3.23	1.61	.653		.949

Table 5 Continued

42. To feel accepted by others	1.93	1.35	.716		.947
40. To make friends	1.98	1.30	.722		.947
47. To help me relate to others better	2.04	1.48	.785		.945
55. To have a sense of belonging to a social group	1.99	1.46	.745		.946
49. To communicate with others better	2.02	1.49	.729		.947
52. To feel more intimate with, connected to, or closer to others	2.04	1.42	.731		.947
6. Rebellion				.915	
95. To break rules	1.47	.98	.840		.889
96. To rebel against authority or society	1.48	.98	.792		.896
97. To do something risky or dangerous	1.59	1.08	.814		.892
94. To do something illegal	1.43	.94	.688		.910
99. To experience the thrill of doing something I'm not supposed to do	1.72	1.19	.761		.902
93. To do something socially unacceptable	1.49	.98	.689		.910
7. Altered Perceptions / Experiential Processes				.930	
60. To change my understanding of my perceptions (e.g., a spiritual awakening; special understanding of the universe; realizing the meaning in life)	1.87	1.44	.851		.912
61. To experience a blending of senses (e.g., tasting colors; seeing music as colors or patterns)	1.62	1.22	.766		.921
58. To alter how I perceive my environment (e.g., hear music in greater detail or complexity; enhance or dull sensations; drown out distractions)	2.19	1.60	.839		.913

Table 5 Continued

59. To cause me to perceive things that are not present (i.e., to hallucinate; to see patterns or distortions that are not actually present)	1.69	1.27	.742		.923
62. To seek new experiences	2.13	1.53	.824		.915
57. To help me be more creative	1.99	1.44	.752		.922
63. To know what it's like to be under the influence of these substances	2.00	1.48	.685		.928
8. Performance / Arousal Enhancement				.915	
80. To perform better on school (or occupational) work/tests	1.67	1.30	.850		.874
77. To focus or pay attention	1.80	1.37	.859		.871
81. To study better	1.66	1.28	.808		.889
78. To stay awake	1.61	1.18	.712		.920
9. Increase Positive Affect				.936	
30. To feel more joy or happiness	2.83	1.68	.824		.926
39. To help me get into a good mood	2.94	1.70	.798		.927
37. To have fun	3.74	1.73	.688		.932
34. To celebrate	3.33	1.63	.628		.934
32. To feel more pleasure	2.65	1.70	.746		.929
28. To feel more excited	2.46	1.55	.712		.931
35. To feel content with life	2.24	1.60	.756		.929
38. To feel alive	2.3	1.69	.735		.930
29. To feel less bored	2.53	1.60	.678		.932
36. To feel euphoric or feel at peace	2.76	1.81	.709		.931
31. To feel more self-confident or effective	2.68	1.70	.674		.932
33. To improve my self-esteem	2.18	1.49	.637		.933
10. Manage Negative Social Interactions				.854	
50. To avoid hurting someone's feelings	1.40	.94	.756		---
51. To avoid or manage conflict with others	1.55	1.12	.756		---
11. Reduce Negative Affect				.909	

Table 5 Continued

9. To feel less ashamed	1.67	1.24	.739		.895
8. To reduce feelings of helplessness	2.03	1.47	.813		.883
7. To reduce feeling of hopelessness	2.26	1.56	.828		.880
10. To feel less guilty	1.66	1.27	.700		.900
12. To feel less lonely	2.21	1.49	.722		.897
2. To forget, escape, or avoid my memories	2.51	1.63	.710		.900
12. Substitution				.868	
92. To get the same effects as something I'm prescribed when I run out of my prescription	1.29	.86	.821		.747
89. To get the same amount of the drug I think I need when my doctor won't prescribe enough to me	1.27	.82	.744		.821
90. To use a drug that is more powerful than one I have gotten used to	1.35	.96	.693		.874

Table 6

Direct-Oblimin Rotated Factor Pattern Matrix: Motivations for Using Substances Questionnaire

Factor Items	Factor											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Reduce Anxiety / Unpleasant Arousal												
18. To calm down	**.827**	-.006	.009	.044	.042	.055	.017	.066	-.026	.055	-.045	-.021
13. To stop worrying	**.741**	.037	-.057	.015	.070	.051	.049	-.006	-.012	.003	.054	.058
22. To feel less stressed	**.689**	.109	-.016	.060	.030	.067	.067	.096	.118	-.053	-.002	-.041
23. To release tension	**.666**	.091	.036	.122	.016	-.031	.106	.009	.085	.074	-.034	-.062
20. To feel less on edge	**.664**	.035	.097	.044	.047	.005	.043	-.054	.084	-.001	.095	.002
11. To reduce feelings of anxiety or nervousness	**.625**	.058	.006	.015	.166	-.026	.109	.080	-.013	-.113	.148	.011
15. To slow down racing thoughts	**.614**	-.057	.130	.026	-.017	-.013	.048	.058	-.080	.024	.180	.064
19. To relax, loosen up, or unwind	**.579**	.022	-.048	.115	.095	.130	.068	.036	.166	-.052	-.093	-.095
5. To feel less irritable	**.571**	-.008	.103	.087	-.043	-.008	-.027	.075	.035	.124	.115	.005
14. To reducing feelings of fear	**.464**	.005	.122	.057	.013	-.010	-.033	.052	-.008	.094	.301	.025

Table 6 Continued

25. To decrease restlessness	**.441**	.011	.107	.087	-.098	-.161	.066	.001	.086	.188	.205	.113
24. To feel like nothing can bother me	**.430**	-.007	.110	.009	.021	.059	-.003	.035	.207	.105	.105	.024
2. Conformity												
103. To not be the only one not doing it	.125	**.783**	-.055	.044	-.060	.041	.058	-.010	.003	.009	-.072	-.053
100. To satisfy social pressure to use	.002	**.760**	.103	.089	.069	.015	-.016	.038	-.016	.001	-.016	-.062
104. To be just like everybody else	.001	**.755**	-.059	.017	.035	-.082	.017	-.083	.111	-.108	-.009	.137
101. To follow what my friends are doing	-.004	**.751**	-.060	.062	.094	.153	-.016	.064	-.028	-.093	.044	-.011
102. To avoid being made fun of	-.052	**.651**	.075	-.022	-.093	.100	-.063	.048	-.022	.087	.045	-.007
105. To avoid being rejected	.043	**.639**	.024	-.072	.040	.049	-.032	.031	-.031	.202	-.045	.033
3. Effects of Other Substances												
111. To counteract the effects of another drug	.033	.048	**.745**	.004	.094	.029	-.040	.056	-.007	.003	.009	.091

Table 6 Continued

112. To reduce the effects of, or "come down" off of another drug	.096	.043	**.702**	-.083	-.051	-.000	.050	.096	.102	-.030	-.014	.093
108. To enhance the effects of another drug	.007	-.057	**.680**	.097	.053	.058	.141	.058	.052	-.072	-.053	.070
110. Because I am under the influence of another drug	-.010	.005	**.674**	.076	.107	.180	.094	-.002	-.038	-.057	.020	.058
109. To be able to use another drug for a longer period of time	-.087	-.038	**.642**	.071	.139	.066	.015	-.010	.061	-.027	.053	.062
106. To reduce the effects of another drug	.069	-.034	**.610**	.067	.013	.134	.002	.082	-.058	-.063	-.005	.051
107. To help with the side effects of a medication	.130	.058	**.520**	-.026	-.100	-.010	.067	.041	.066	.056	-.060	.122
4. Relative Low Risk												
67. Because it has fewer side effects than other drugs	.010	-.004	-.005	**.907**	-.047	.011	.010	.040	-.014	.045	.003	-.010

Table 6 Continued

66. Because it is not as bad for you as other drugs	-.007	.009	-.058	**.870**	.014	-.006	.021	.049	-.063	-.030	.058	-.026
68. Because it does not cause me as many problems as other drugs	-.065	.034	-.011	**.867**	.004	-.026	.069	.001	.003	-.061	-.002	.010
65. Because I can handle the high better than with some other drugs	.024	-.042	.079	**.807**	-.076	-.010	.015	.013	.073	.060	.021	-.016
64. To get high / intoxicated with something I think is safer than other drugs	.072	-.033	.063	**.802**	.017	.013	.033	-.059	.038	.001	-.048	-.022
69. Because it is more socially acceptable than other drugs	.013	.102	.012	**.728**	.076	-.003	-.087	-.041	-.004	.011	-.010	.152

5. Positive Social Interactions

46. To help me feel sociable or friendly	.109	-.016	.049	.007	**.753**	.014	.050	.042	.041	.012	.007	-.062

Table 6 Continued

Item												
44. To make social gathering and parties more fun	.103	-.060	-.033	.072	**.684**	.075	-.081	.022	.254	-.093	-.060	.089
41. To lose my inhibitions in social situations	.013	-.005	.147	.069	**.661**	-.056	.064	.091	.010	-.065	.109	-.001
45. To feel more confident and sure of myself around others	.071	.064	.160	-.023	**.653**	-.007	.056	.073	.006	.055	.072	-.078
48. To enjoy social interactions	.120	.008	-.025	.031	**.639**	.085	.045	.003	.162	.042	-.027	.027
43. To have a reason/excuse to socialize	.016	.094	.125	.020	**.635**	-.015	-.023	.005	.070	.107	.026	.054
54. To celebrate with others	.036	-.047	-.165	.123	**.591**	.163	-.007	.078	.201	-.026	-.141	.063
42. To feel accepted by others	.016	.338	.030	-.011	**.581**	-.096	-.002	-.045	-.041	.079	.185	.038
40. To make friends	.032	.098	.065	.034	**.562**	.043	.063	.077	-.058	.128	.075	-.046
47. To help me relate to others better	-.004	.147	.125	.045	**.536**	-.094	.124	-.003	-.001	.291	.107	-.036

Table 6 Continued

55. To have a sense of belonging to a social group	-.057	.317	-.009	.003	**.507**	.031	.050	.006	-.012	.215	.165	.057
49. To communicate with others better	.062	-.038	.019	.072	**.502**	-.041	.135	.067	.022	.336	.023	-.028
52. To feel more intimate with, connected to, or closer to others	.009	.017	.116	.059	**.438**	.104	.087	.065	.073	.266	.064	-.020

6. Rebellion

95. To break rules	-.007	-.013	.001	-.010	-.000	**.861**	-.002	.009	-.036	.077	.072	.043
96. To rebel against authority or society	-.041	-.019	.137	-.015	-.057	**.800**	.008	.003	.073	.031	.015	-.012
97. To do something risky or dangerous	.032	-.004	.121	-.051	.050	**.788**	.093	-.018	.001	.010	.009	.015
94. To do something illegal	.064	.001	-.016	.034	-.026	**.696**	-.052	.035	.006	.043	-.011	.074

Table 6 Continued

99. To experience the thrill of doing something I'm not supposed to do	.010	.135	.000	.051	-.003	**.686**	.075	.014	.051	-.034	.060	.036
93. To do something socially unacceptable	-.008	.194	.036	.043	.007	**.610**	.084	.003	-.024	-.033	.046	.008

7. Altered Perceptions / Experiential Processes

60. To change my understanding of my perceptions (e.g., a spiritual awakening; special understanding of the universe; realizing the meaning in life)	-.003	.010	.018	-.075	-.029	-.014	**.897**	.039	.033	.010	-.047	.064

Table 6 Continued

61. To experience a blending of senses (e.g., tasting colors; seeing music as colors or patterns)	-.035	.041	.001	-.009	-.040	.035	**.829**	-.043	-.020	.100	.046	-.057
58. To alter how I perceive my environment (e.g., hear music in greater detail or complexity; enhance or dull sensations; drown out distractions)	.092	-.015	.035	.037	.056	-.053	**.814**	.031	.001	-.048	-.046	.004
59. To cause me to perceive things that are not present (i.e., to hallucinate; to see patterns or distortions that are not actually present)	-.022	-.021	.073	-.021	-.001	.054	**.776**	-.047	-.003	-.065	.005	.027

Table 6 Continued

62. To seek new experiences	-.026	-.029	-.014	.085	.070	.107	**.775**	.029	-.005	.022	-.012	.031
57. To help me be more creative	.075	-.068	.025	.028	-.041	-.137	**.687**	.144	.101	.004	-.007	.032
63. To know what it's like to be under the influence of these substances	.044	-.001	-.081	.141	-.006	.089	**.635**	.008	.004	.007	.036	.012

8. Performance / Arousal Enhancement

80. To perform better on school (or occupational) work/tests	-.011	.007	-.041	.038	.010	-.043	-.045	**.930**	-.016	-.004	-.009	.052
77. To focus or pay attention	.028	-.001	-.022	-.007	-.047	.023	.002	**.898**	.029	.006	.004	.023
81. To study better	.060	-.041	-.020	.025	-.007	.016	.003	**.862**	-.042	.031	-.048	.002
78. To stay awake	-.114	.054	.140	-.074	.050	-.002	.093	**.669**	.015	-.068	.083	.028

9. Increase Positive Affect

30. To feel more joy or happiness	-.005	.035	.050	.060	-.051	-.091	.077	.025	**.760**	.044	.197	-.028
39. To help me get into a good mood	.115	.020	-.043	.075	.029	.043	-.010	-.001	**.709**	.029	.065	.029
37. To have fun	.076	-.007	-.113	.085	.145	.149	.015	.010	**.673**	-.122	-.127	-.039

Table 6 Continued

34. To celebrate	.054	-.008	-.046	.033	.137	.124	.049	-.041	**.625**	-.067	-.160	-.008
32. To feel more pleasure	.128	-.047	.149	.075	-.036	.014	.023	.036	**.605**	-.019	.118	-.024
28. To feel more excited	-.026	.074	.105	-.002	.085	-.052	.130	.100	**.592**	.025	-.036	-.047
35. To feel content with life	.051	.054	.079	-.020	-.032	-.037	.064	.061	**.587**	.213	.127	.091
38. To feel alive	-.104	-.029	.038	.013	.103	.083	.092	-.005	**.578**	.181	.148	.044
29. To feel less bored	.028	.003	.099	.071	.007	.054	.002	.076	**.557**	.099	.007	.003
36. To feel euphoric or feel at peace	.137	.002	.007	.104	-.051	.015	.215	.005	**.501**	-.027	.065	.116
31. To feel more self-confident or effective	.057	.038	.091	-.063	.289	-.097	.064	.131	**.375**	.067	.142	-.008
33. To improve my self-esteem	-.021	.168	.087	-.060	.190	-.003	.079	.110	**.353**	.075	.213	-.055

10. Manage Negative Social Interactions

50. To avoid hurting someone's feelings	.022	.081	-.105	.028	.086	.076	.069	.020	.023	**.773**	-.040	.038
51. To avoid or manage conflict with others	.103	-.018	-.080	.005	.096	.093	.002	.085	.103	**.665**	-.038	.101

11. Reduce Negative Affect

9. To feel less ashamed	-.024	.028	.047	.054	.020	.070	.033	.092	.049	.026	**.732**	-.070

Table 6 Continued

8. To reduce feelings of helplessness	.193	-.029	-.080	.022	.055	.044	.037	.068	.014	-.044	**.697**	.089
7. To reduce feeling of hopelessness	.229	-.083	-.016	.055	.077	.002	.040	.019	.090	-.092	**.637**	.114
10. To feel less guilty	.042	.040	.042	.079	-.060	.142	-.021	.094	.087	.110	**.588**	.013
12. To feel less lonely	.343	.008	-.056	-.014	.112	.114	.069	-.016	.038	-.053	**.455**	.094
2. To forget, escape, or avoid my memories	.328	-.022	.002	-.010	.166	.093	-.005	.012	.065	-.108	**.401**	.080
12. Substitution												
92. To get the same effects as something I'm prescribed when I run out of my prescription	-.023	.007	.031	.020	-.019	.012	.062	-.014	-.041	-.014	.046	**.908**
89. To get the same amount of the drug I think I need when my doctor won't prescribe enough to me	-.071	.026	.046	-.003	.021	.067	.013	.132	-.077	-.048	.018	**.751**

Table 6 Continued

90. To use a drug that is more powerful than one I have gotten used to	-.007	-.013	.167	.076	-.054	.028	-.009	.041	.057	-.008	-.072	**.622**

12-Factor Model Factor Correlations

The correlations among the rotated factors are presented in Table 7. The largest correlation was between Reduce Negative Affect and Reduce Anxiety/Unpleasant Arousal ($r = .479$) and the smallest correlation was between Relative Low Risk and Manage Negative Social Interactions ($r = .055$). The correlations among the factor scaled scores are presented in Table 8. We observed strong positive correlations between Reduce Anxiety/Unpleasant Arousal and Reduce Negative Affect ($r = .757$) and Increase Positive Affect ($r = .663$). This finding made sense given that symptoms of anxiety and affective disturbances are highly interrelated and are distressing to the point of feeling a need to increase positive affect. There was also a strong positive correlation between Positive Social Interactions and Increase Positive Affect ($r = .675$), which also made theoretical sense given how closely self-esteem and happiness are socially tied. The weakest correlations were observed in relationships with Conformity, specifically with Effects of Other Substances ($r = .198$), Altered Perceptions/Experiential Processes ($r = .122$), Performance/Arousal Enhancement ($r = .145$), and Substitution ($r = .161$). Lastly, we observed a weak relationship between Relative Low Risk and Manage Negative Social Interactions ($r = .194$). Indeed, none of these factors were hypothesized to be related.

Table 7

Factor Correlation Matrix

Factor	1	2	3	4	5	6	7	8	9	10	11	12
1	---											
2	.121	---										
3	.215	.118	---									
4	.433	.155	.159	---								
5	.311	.319	.200	.254	---							
6	.202	.271	.250	.271	.201	---						
7	.354	.085	.365	.374	.264	.238	---					
8	.303	.106	.413	.206	.262	.197	.342	---				
9	.434	.099	.211	.352	.435	.240	.422	.263	---			
10	.151	.273	.123	.055	.258	.094	.182	.244	.174	---		
11	.479	.159	.303	.162	.242	.119	.206	.293	.226	.217	---	
12	.156	.113	.424	.244	.064	.274	.189	.327	.112	.113	.188	---

Note: Factor 1 (Reduce Anxiety / Unpleasant Arousal); Factor 2 (Conformity); Factor 3 (Effects of Other Substances); Factor 4 (Relative Low Risk); Factor 5 (Positive Social Interactions); Factor 6 (Rebellion); Factor 7 (Altered Perceptions / Experiential Processes); Factor 8 (Performance / Arousal Enhancement); Factor 9 (Increase Positive Affect); Factor 10 (Manage Negative Social Interactions); Factor 11 (Reduce Negative Affect); Factor 12 (Substitution)

Table 8

MUSQ Scale Score Correlation Matrix

Factor	1	2	3	4	5	6	7	8	9	10	11	12
1	---											
2	.252***	---										
3	.447***	.198***	---									
4	.509***	.213***	.303***	---								
5	.575***	.439***	.431***	.372***	---							
6	.354***	.377***	.442***	.316***	.364***	---						
7	.495***	.122*	.479***	.416***	.425***	.332***	---					
8	.399***	.145**	.485***	.214***	.380***	.260***	.371***	---				
9	.663***	.242***	.456***	.444***	.675***	.387***	.559***	.385***	---			
10	.368***	.338***	.207***	.194***	.514***	.272***	.293***	.302***	.416***	---		
11	.757***	.233***	.448***	.359***	.534***	.360***	.387***	.398***	.567***	.317***	---	
12	.256***	.161**	.557***	.283***	.203***	.370***	.273***	.395***	.236***	.219***	.307***	---

Note: Factor 1 (Reduce Anxiety / Unpleasant Arousal); Factor 2 (Conformity); Factor 3 (Effects of Other Substances); Factor 4 (Relative Low Risk); Factor 5 (Positive Social Interactions); Factor 6 (Rebellion); Factor 7 (Altered Perceptions / Experiential Processes); Factor 8 (Performance / Arousal Enhancement); Factor 9 (Increase Positive Affect); Factor 10 (Manage Negative Social Interactions); Factor 11 (Reduce Negative Affect); Factor 12 (Substitution)
*$p < .05$; **$p < .01$; ***$p < .0$

Hypothesis 2: *Wanting*, *Liking*, and *Satisfaction* Predicting Frequency of Use

We conducted eight multiple regressions with participants' mean *wanting* score and paired *liking* and *satisfaction* scale scores as independent variables and participants' maximum frequency score for their most frequently used substance serving as the dependent variable. For example, the scale score for Factor 1 *liking* responses was analyzed with the scale score for Factor 1 *satisfaction* responses. We conducted regressions for *liking* and *satisfaction* scale scores for Factors 1, 4, 5, 7, 8, 9, 10, and 11 to allow for adequate sample sizes. For the models, the sample size ranged from 56 to 85. All models were significant with a Bonferroni correction of $p < .006$ and accounted for 15 to 42.8 percent of the variance in substance use frequency scores; however, contrary to our hypotheses, *satisfaction* and *liking* were not significant predictors of frequency of use in any of the models. At the individual variable level, *wanting* was a significant predictor of frequency of use in all models, such that greater intensity of *wanting* predicted more frequent substance use. Standardized betas for *wanting* ranged from .415 to .654 (See Table 9).

Table 9

Multiple Regression Analyses for Wanting, Liking, and Satisfaction Predicting Frequency of Use for Most Frequently Used Substance

	n	R^2	B	$SE\ B$	β	t	p
Model 1$_a$	72	.255					.000*
(constant)			2.983	.837		3.566	.001*
Wanting			.524	.112	.495	4.677	.000*
MUSQL1			.266	.238	.175	1.115	.269
MUSQS1			-.081	.254	-.050	-.320	.750

Table 9 Continued

	n	R²	B	SE	β	t	Sig
Model 2[b]	81	.150					.001*
(constant)			2.619	.761		3.441	.001*
Wanting			.543	.136	.415	3.985	.000*
MUSQL4			.439	.461	.304	.952	.344
MUSQS4			-.323	.447	-.231	-.721	.473
Model 3[c]	65	.394					.000*
(constant)			1.12	.821		1.363	.178
Wanting			.646	.120	.545	5.378	.000*
MUSQL5			.000	.264	.000	.001	.999
MUSQS5			.455	.310	.253	1.468	.147
Model 4[d]	56	.270					.001*
(constant)			2.077	.802		2.589	.012*
Wanting			.518	.137	.452	3.791	.000*
MUSQL7			-.384	.453	-.312	-.848	.400
MUSQS7			.712	.456	.575	1.562	.124
Model 5[e]	61	.270					.000*
(constant)			2.294	.816		2.81	.007*
Wanting			.665	.151	.502	4.412	.000*
MUSQL8			.030	.344	.022	.087	.931
MUSQS8			.204	.316	.160	.644	.522
Model 6[f]	85	.309					.000*
(constant)			1.434	.837		1.713	.090
Wanting			.597	.112	.494	5.321	.000*
MUSQL9			-.006	.328	-.003	-.019	.985
MUSQS9			.461	.362	.233	1.274	.206
Model 7[g]	64	.427					.000*
(constant)			2.32	.575		4.036	.000*
Wanting			.809	.122	.654	6.623	.000*
MUSQL10			-.272	.224	-.222	-1.21	.231
MUSQS10			.295	.212	.257	1.392	.169
Model 8[h]	65	.428					.000*
(constant)			1.866	.626		2.982	.004*
Wanting			.719	.118	.614	6.111	.000*
MUSQL11			.161	.158	.122	1.017	.313
MUSQS11			.065	.179	.045	.361	.719

Note: Liking and Satisfaction scale scores for: [a] Reduce Anxiety/Unpleasant Arousal; [b] Relative Low Risk; [c] Positive Social Interactions; [d] Altered Perceptions/Experiential Processes; [e] Performance/Arousal Enhancement; [f] Increase Positive Affect; [g] Manage Negative Social Interactions; [h] Reduce Negative Affect; * Significant with Bonferroni correction of $p < .006$

Hypothesis 3: *Wanting*, *Liking*, and *Satisfaction* Predicting Severity and Change

We conducted 16 canonical correlation analyses to examine the extent to which frequency of use, *wanting*, *liking*, and *satisfaction* motive scores, as a set, were predictive of alcohol and cannabis severity and change variables, as a set. Again, we conducted separate analyses for paired *liking* and *satisfaction* motive scaled scores for Factors 1, 4, 5, 7, 8, 9, 10, and 11 to allow for sufficiently large sample sizes and conducted these analyses separately for both alcohol and cannabis variables of interest (i.e., DSM-5 severity, consequences/experiences from use, ideal use, stage of change, and RFQ). Therefore, frequency of use, *wanting*, *liking*, and *satisfaction* motive scores served as one variable set (referred to as "frequency and motivation scores") and alcohol/cannabis variables of interest (referred to as "severity and change scores") served as the second variable set. Although we will interpret some findings here, it should be noted that our sample sizes for the analyses were substantially smaller than what is necessary for reliable interpretations. Stevens (1986) suggests at least 20 cases per variable to interpret the first salient function, while Barcikowski and Stevens (1975) suggest at least 40 cases per variable if more than one function is to be interpreted. Further, functions with canonical correlations at .7 or greater are likely reliable with smaller sample sizes (i.e., around $n = 50$; Stevens, 1986). Sample sizes for these analyses ranged from 30 to 54, with the majority of sample sizes in the 40s. As such, we only interpreted the first functions of the canonicals that consisted of canonical functions that accounted for ten percent or more of the variance (Stevens, 1996), function coefficients with absolute values of .35 or greater (Thompson, 1984) and functions with canonical correlations of at

least .7 (Stevens, 1986). The results of the canonical correlations described below are presented in Tables 10 through 24.

The first canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 1 (Reduce Anxiety/Unpleasant Arousal) with alcohol severity and change variables (Table 10). Based on our criteria for the percentage of variance accounted for by the functions and magnitude of the canonical correlation, the first function was interpreted. Frequency and motivation scores accounted for 78.71% of the variance in severity and change scores (R_c = .89). Examination of salient function coefficients revealed a pattern where the combination of higher frequency of use and less satisfaction of the motive to reduce anxiety/unpleasant arousal predicted greater DSM-5 AUD severity.

Table 10

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Reduce Anxiety / Unpleasant Arousal Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**.774**	**.791**
Consequences/Experiences from Use	-.282	**.851**
Ideal Use	.127	**-.712**
Stage of Change	.283	**-1.167**
RFQ	-.222	**.845**
R_c	.887	.411
R_c^2 (%)	78.71	16.88
Covariates		
Frequency of Use	**.688**	**-.805**
Wanting	.344	**.944**
MUSQL1	.211	**1.20**

Table 10 Continued

MUSQS1	**-.386**	**-.798**

Note: *n* = 41

The second canonical correlation analysis examined the multivariate relationships

between frequency and motivation scores for Factor 4 (Relative Low Risk) with alcohol

severity and change variables (Table 11). The first function accounted for 72.41% of the

variance (R_c = .85). Salient function coefficients revealed a pattern where the

combination of higher frequency of use, more craving, more liking that one uses alcohol

because of its relative low risk, yet less satisfaction in the motive to use because one

believes alcohol is a relatively low-risk substance strongly predicted greater DSM-5

AUD severity.

Table 11

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Relative Low Risk Motives Predicting Alcohol Use Severity and Change Variables

	Function 1		Function 2	
Variable	Coef.		Coef.	
Severity and Change Variables				
DSM-5 AUD Severity	**1.088**		**1.159**	
Consequences/Experiences from Use	-.079		**.740**	
Ideal Use	.020		.143	
Stage of Change	-.150		**-.700**	
RFQ	-.117		**-.542**	
R_c		.851		.410
R_c^2 (%)		72.41		16.78
Covariates				
Frequency of Use	**.750**		.215	
Wanting	**.369**		-.275	
MUSQL4	**.446**		**2.263**	
MUSQS4	**-.645**		**-1.479**	

Note: *n* = 54

The third canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 5 (Positive Social Interactions) with alcohol severity and change variables (Table 12). The first function accounted for 73.76% of the variance (R_c = .86). Salient function coefficients revealed a pattern where less frequent alcohol use predicted lower DSM-5 AUD severity.

Table 12

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Positive Social Interactions Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**-.915**	.322
Consequences/Experiences from Use	.183	**-.371**
Ideal Use	-.029	**.680**
Stage of Change	-.019	.158
RFQ	.126	**-.999**
R_c	.859	.376
R_c^2 (%)	73.76	14.14
Covariates		
Frequency of Use	**-.828**	**.892**
Wanting	-.329	**-1.187**
MUSQL5	.017	**-.547**
MUSQS5	.136	**.576**

Note: *n* = 41

The fourth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 7 (Altered Perceptions/Experiential Processes) with alcohol severity and change variables (Table 13). The first function accounted for 66.65% of the variance (R_c = .82). Salient function coefficients revealed a pattern where the combination of lower frequency of alcohol use, less cravings, and less

satisfaction of the motive to alter one's perceptions and seek new experiences predicted

lower DSM-5 AUD severity.

Table 13

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Altered Perceptions/Experiential Processes Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**-1.01**	.280
Consequences/Experiences from Use	-.104	**-.391**
Ideal Use	-.139	**.696**
Stage of Change	-.205	-.030
RFQ	.057	**-.789**
R_c	.816	.530
R_c^2 (%)	66.65	28.04
Covariates		
Frequency of Use	**-.732**	**.784**
Wanting	**-.478**	**-.910**
MUSQL7	.349	**-.494**
MUSQS7	**-.368**	**.821**

Note: *n* = 30

The fifth canonical correlation analysis examined the multivariate relationships

between frequency and motivation scores for Factor 8 (Performance/Arousal

Enhancement) with alcohol severity and change variables (Table 14). The first three

functions were interpreted, which accounted for 68.55% of the variance (R_c = .83).

Salient function coefficients revealed a pattern where higher frequency of use predicted

greater DSM-5 AUD severity.

Table 14

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Performance/Arousal Enhancement Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2	
Variable	Coef.	Coef.	
Severity and Change Variables			
DSM-5 AUD Severity	**1.103**	**.428**	
Consequences/Experiences from Use	-.023	**.680**	
Ideal Use	.234	**-.483**	
Stage of Change	.167	**-.742**	
RFQ	-.243	**.597**	
R_c		.828	.494
$R_c{}^2$ (%)		68.55	25.39
Covariates			
Frequency of Use	**.880**	**-.420**	
Wanting	.137	**.465**	
MUSQL8	.265	**1.400**	
MUSQS8	-.142	**-1.738**	

Note: *n* = 32

     The sixth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 9 (Increase Positive Affect) with alcohol severity and change variables (Table 15). The first function accounted for 72.72% of the variance (R_c = .85). Salient function coefficients revealed a pattern where the combination of higher frequency of alcohol use, more cravings, more liking that one uses to increase positive affect, but less actual achievement of increasing positive affect predicted greater DSM-5 AUD severity.

Table 15

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Increase Positive Affect Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**.919**	-.026
Consequences/Experiences from Use	-.053	-.238
Ideal Use	-.041	-.062
Stage of Change	.072	**-.498**
RFQ	-.077	**.949**
Adequacy		
R_c	.853	.456
R_c^2 (%)	72.72	20.81
Adequacy		
Covariates		
Frequency of Use	**.714**	**-.628**
Wanting	**.350**	**.406**
MUSQL9	**.483**	**1.09**
MUSQS9	**-.487**	**-1.760**

Note: *n* = 49

The seventh canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 10 (Manage Negative Social Interactions) with alcohol severity and change variables (Table 16). The first function accounted for 64.10% of the variance (R_c = .80). Salient function coefficients revealed a pattern where the combination of higher frequency of alcohol use, more cravings, more liking that one uses to manage negative social interactions, but less actual achievement of managing negative social interactions predicted greater DSM-5 AUD severity.

Table 16

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Manage Negative Social Interactions Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2	
Variable	Coef.	Coef.	
Severity and Change Variables			
DSM-5 AUD Severity	**.831**	**-.482**	
Consequences/Experiences from Use	-.237	-.060	
Ideal Use	-.162	-.340	
Stage of Change	-.038	-.100	
RFQ	-.058	**.935**	
R_c		.801	.422
R_c^2 (%)		64.10	17.77
Covariates			
Frequency of Use	**.514**	-.289	
Wanting	**.596**	.272	
MUSQL10	**.397**	**1.541**	
MUSQS10	**-.471**	**-.878**	

Note: $n = 40$

The eighth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 11 (Reduce Negative Affect) with alcohol severity and change variables (Table 17). The first function accounted for 59.91% of the variance (R_c = .77). Salient function coefficients revealed a pattern where the combination of higher frequency of alcohol use and more cravings predicted greater DSM-5 AUD severity.

Table 17

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Reduce Negative Affect Motives Predicting Alcohol Use Severity and Change Variables

Variable	Function 1 Coef.	Function 2 Coef.	
Severity and Change Variables			
DSM-5 AUD Severity	**1.207**	**.544**	
Consequences/Experiences from Use	.146	**.446**	
Ideal Use	.091	.232	
Stage of Change	-.025	**-.527**	
RFQ	-.260	-.325	
R_c		.774	.648
R_c^2 (%)		59.91	41.94
Covariates			
Frequency of Use	**.603**	**-.645**	
Wanting	**.415**	.209	
MUSQL11	.207	**.522**	
MUSQS11	.132	**.484**	

Note: $n = 41$

The ninth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 1 (Reduce Anxiety/Unpleasant Arousal) with cannabis severity and change variables (Table 18). The first function accounted for 44.06%, of the variance ($R_c = .66$). Salient function coefficients revealed a pattern where the combination of higher frequency of use and greater craving predicted a combination of greater DSM-5 CUD severity and less self-identified reasons to quit.

Table 18

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Reduce Anxiety / Unpleasant Arousal Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**1.131**	.073
Consequences/Experiences from Use	.176	**-.730**
Ideal Use	-.283	**.400**
Stage of Change	.047	**-.543**
RFQ	**-.665**	**.642**
R_c	.664	.527
R_c^2 (%)	44.06	27.79
Covariates		
Frequency of Use	**.578**	**.471**
Wanting	**.717**	-.435
MUSQL1	.024	-.188
MUSQS1	-.258	**-.661**

Note: $n = 41$

The tenth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 4 (Relative Low Risk) with cannabis severity and change variables (Table 19). The first function accounted for 52.03% of the variance ($R_c = .72$). Salient function coefficients revealed a pattern where the combination of higher frequency of use, more craving, more liking that one uses cannabis because of its relative low risk, yet less satisfaction in the motive to use because one believes cannabis is a relatively low-risk substance strongly predicted greater DSM-5 CUD severity.

Table 19

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Relative Low Risk Motives Predicting Cannabis Use Severity and Change Variables

	Function 1		Function 2	
Variable	Coef.		Coef.	
Severity and Change Variables				
DSM-5 CUD Severity	**.989**		**-.740**	
Consequences/Experiences from Use	.271		**-.639**	
Ideal Use	-.057		-.221	
Stage of Change	.139		**-.404**	
RFQ	.085		**.918**	
R_c		.721		.528
R_c^2 (%)		52.03		27.90
Covariates				
Frequency of Use	**.640**		**-.603**	
Wanting	**.713**		**.599**	
MUSQL4	**.386**		**-.361**	
MUSQS4	**-.600**		**-.381**	

Note: $n = 34$

The eleventh canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 5 (Positive Social Interactions) with cannabis severity and change variables (Table 20). The first function accounted for 49.59% of the variance ($R_c = .70$). Salient function coefficients revealed a pattern where the combination of less craving and more satisfaction of the goal of positive social interactions through cannabis use predicted a combination of lower DSM-5 CUD severity, more perceived positive consequences and experiences from use, and being lower on the Stages of Change.

Table 20

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Positive Social Interactions Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**-.739**	**.662**
Consequences/Experiences from Use	**.523**	**.629**
Ideal Use	-.318	**-.505**
Stage of Change	**-.478**	-.210
RFQ	-.014	-.343
R_c	.704	.667
R_c^2 (%)	49.59	44.46
Covariates		
Frequency of Use	-.003	**1.025**
Wanting	**-1.028**	-.112
MUSQL5	-.347	-.120
MUSQS5	**.549**	-.182

Note: *n* = 43

The twelfth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 7 (Altered Perceptions/Experiential Processes) with cannabis severity and change variables (Table 21). The first function functions accounted for 46.62% (R_c = .68). Salient function coefficients revealed a pattern where the combination of more craving, less liking that one uses cannabis to alter their perceptions and seek new experiences, yet more satisfaction of this goal predicted a combination of greater DSM-5 CUD severity and more reasons to quit.

Table 21

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Altered Perceptions/Experiential Processes Motives Predicting Cannabis Use Severity and Change Variables

Variable	Function 1 Coef.	Function 2 Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**-.739**	**.662**
Consequences/Experiences from Use	**.523**	**.629**
Ideal Use	-.318	**-.505**
Stage of Change	**-.478**	-.210
RFQ	-.014	-.343
R_c	.704	.667
$R_c{}^2$ (%)	49.59	44.46
Covariates		
Frequency of Use	-.003	**1.025**
Wanting	**-1.028**	-.112
MUSQL5	-.347	-.120
MUSQS5	**.549**	-.182

Note: *n* = 43

The thirteenth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 8 (Performance / Arousal Enhancement) with cannabis severity and change variables (Table 22). The first function accounted for 50.64% of the variance (R_c = .71). Salient function coefficients revealed a pattern where higher frequency of use predicted a combination of greater DSM-5 AUD severity and more perceived positive consequence and experiences from use.

Table 22

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Performance/Arousal Enhancement Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**1.070**	**-.637**
Consequences/Experiences from Use	**.491**	**.552**
Ideal Use	-.127	**-.617**
Stage of Change	.080	**-.790**
RFQ	-.153	**.407**
R_c	.712	.462
$R_c{}^2$ (%)	50.64	21.32
Covariates		
Frequency of Use	**.875**	**.549**
Wanting	.276	**-.839**
MUSQL8	.051	-.028
MUSQS8	-.349	**.623**

Note: $n = 34$

The fourteenth canonical correlation analysis examining frequency and motivation scores for Factor 9 (Increase Positive Affect) with cannabis severity and change variables was uninterpretable due to a low sample size (n = 5).

The fifteenth canonical correlation analysis examined the multivariate relationships between frequency and motivation scores for Factor 10 (Manage Negative Social Interactions) with cannabis severity and change variables (Table 23). The first function accounted for 56.51% of the variance (R_c = .75). Salient function coefficients revealed a pattern where the combination of higher frequency of cannabis use, more cravings, less liking that one uses to manage negative social interactions, but more actual achievement of managing negative social interactions predicted greater DSM-5 CUD

severity, more perceived positive consequences and experiences from use, wanting to use

cannabis less, and being lower on the Stages of Change.

Table 23

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Manage Negative Social Interactions Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**.851**	**.557**
Consequences/Experiences from Use	**.486**	**-.705**
Ideal Use	**-.552**	.104
Stage of Change	**-.367**	**.540**
RFQ	-.305	-.326
R_c	.752	.544
R_c^2 (%)	56.51	29.55
Covariates		
Frequency of Use	**.562**	**-.462**
Wanting	**.373**	**.924**
MUSQL10	**-1.016**	**.367**
MUSQS10	**.907**	**-.585**

Note: $n = 32$

   Lastly, the sixteenth canonical correlation analysis examined the multivariate

relationships between frequency and motivation scores for Factor 11 (Reduce Negative

Affect) with cannabis severity and change variables (Table 24). The first function

accounted for 69.22% of the variance ($R_c = .83$). Salient function coefficients revealed a

pattern where the combination of higher frequency of cannabis use and more cravings

predicted a combination of greater DSM-5 CUD severity, more perceived positive

consequences and experiences from use, and less self-identified reasons to quit.

Table 24

Canonical Correlation Analysis: Frequency of Use, Wanting, Liking, and Satisfaction for Reduce Negative Affect Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**.954**	-.093
Consequences/Experiences from Use	**.424**	.017
Ideal Use	-.158	**-.453**
Stage of Change	.232	.122
RFQ	-**.418**	**-1.071**
R_c	.832	.620
R_c^2 (%)	69.22	38.43
Covariates		
Frequency of Use	**.686**	**-.843**
Wanting	**.371**	**1.011**
MUSQL11	.035	**.585**
MUSQS11	.114	-.349

Note: *n* = 34

Hypothesis 4: Incremental Validity Testing of *Frequency*, *Liking,* and *Satisfaction*

Motive Measures

We conducted 16 canonical correlation analyses to examine the extent to which

frequency (of use for motive), *liking*, and *satisfaction* motive scores, as a set, were

predictive of alcohol and cannabis severity and change variables, as a set. As before, we

conducted separate analyses for Factors 1, 4, 5, 7, 8, 9, 10, and 11 to allow for sufficient

sample sizes and conducted these analyses separately for both alcohol and cannabis

variables of interest (i.e., DSM-5 severity, consequences/experiences from use, ideal use,

stage of change, and RFQ). Therefore, *frequency* (of use for motive), *wanting*, *liking*, and

satisfaction motive scores served as one variable set (referred to as "MUSQ scores") and

alcohol/cannabis variables of interest (referred to as "severity and change scores") served

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as the second variable set. Sample sizes for these analyses ranged from 30 to 57, with the majority of sample sizes in the 40s. We utilized the same inclusion criteria used for hypothesis 3. Fourteen of the canonical correlation analyses were uninterpretable due to having canonical correlations below .7 (i.e., highest R_c = .646). As such, we interpreted only the first functions of two canonical correlation analyses. The results of all the canonical correlations are presented in Tables 25 through 39.

We examined the multivariate relationships between MUSQ scores for Factor 11 (Reduce Negative Affect) with alcohol severity and change variables (Table 31). The first function accounted for 50.19% of the variance (R_c = .71). Salient function coefficients revealed a pattern where the combination of higher frequency of alcohol use to reduce negative affect, less liking that one uses to reduce negative affect and less satisfaction of this goal through use predicted a combination of lower DSM-5 AUD severity, more perceived negative consequences and experiences from use, and more reasons to quit.

We also examined the multivariate relationships between MUSQ scores for Factor 8 (Enhance Performance/Arousal) with cannabis severity and change variables (Table 36). The first function was interpreted, which accounted for 52.17 percent of the variance (R_c = .72). Salient function coefficients revealed a pattern where the combination of lower frequency of use to enhance one's performance or arousal, less liking that one uses substances to achieve this goal, but greater satisfaction of this motive through cannabis use predicted a combination of greater DSM-5 CUD severity and more perceived positive consequences and experiences from cannabis use.

Table 25

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Reduce Anxiety / Unpleasant Arousal Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	
Variable	Coef.	
Severity and Change Variables		
DSM-5 AUD Severity	-.017	
Consequences/Experiences from Use	**.640**	
Ideal Use	**-.381**	
Stage of Change	.125	
RFQ	**-.697**	
R_c		.626
R_c^2 (%)		39.22
MUSQ Factor 1		
Frequency	**-1.22**	
Liking	-.048	
Satisfaction	**1.25**	

Note: $n = 41$

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Table 26

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Relative Low Risk Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	
Variable	Coef.	
Severity and Change Variables		
DSM-5 AUD Severity	**1.12**	
Consequences/Experiences from Use	**.888**	
Ideal Use	.004	
Stage of Change	**-.732**	
RFQ	-.332	
R_c		.412
R_c^2 (%)		16.97
MUSQ Factor 4		
Frequency	**-.361**	
Liking	**2.55**	
Satisfaction	**-1.40**	

Note: $n = 5$

Table 27

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Altered Perceptions / Experiential Processes Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	
Variable	Coef.	
Severity and Change Variables		
DSM-5 AUD Severity	-.065	
Consequences/Experiences from Use	**-.939**	
Ideal Use	**.795**	
Stage of Change	-.243	
RFQ	-.178	
R_c		.524
R_c^2 (%)		27.43
MUSQ Factor 7		
Frequency	**1.23**	
Liking	**-.856**	
Satisfaction	.312	

Note: *n* = 30

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Table 28

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Performance / Arousal Enhancement Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**.891**	**.854**
Consequences/Experiences from Use	**.746**	.150
Ideal Use	.015	**1.04**
Stage of Change	**-.556**	.211
RFQ	**.559**	**-.558**
R_c	.492	.361
R_c^2 (%)	24.20	13.04
MUSQ Factor 8		
Frequency	-.008	**1.19**
Liking	**1.92**	-.306
Satisfaction	**-2.06**	.034

Note: $n = 32$

Table 29

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Increase Positive Affect Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**.679**	-.264
Consequences/Experiences from Use	**-.554**	.278
Ideal Use	-.134	**.469**
Stage of Change	**-.747**	**.834**
RFQ	**.373**	**.783**
R_c	.532	.357
R_c^2 (%)	28.28	12.72
MUSQ Factor 9		
Frequency	**.791**	**-1.17**
Liking	**.729**	**1.13**
Satisfaction	**-1.69**	**-.655**

Note: *n* = 49

Table 30

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Manage Negative Social Interactions Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**-.670**	-.051
Consequences/Experiences from Use	**-.669**	**-.648**
Ideal Use	-.255	-.313
Stage of Change	.006	.276
RFQ	**.547**	**-.865**
R_c	.480	.335
R_c^2 (%)	23.08	11.23
MUSQ Factor 10		
Frequency	**1.19**	**.819**
Liking	**.946**	**-.471**
Satisfaction	**-1.55**	**-1.17**

Note: $n = 40$

Table 31

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Reduce Negative Affect Motives Predicting Alcohol Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 AUD Severity	**-.921**	**-.736**
Consequences/Experiences from Use	**-.812**	**1.03**
Ideal Use	-.264	**-.537**
Stage of Change	.034	**.922**
RFQ	**.416**	.007
R_c	.708	.366
R_c^2 (%)	50.19	13.36
MUSQ Factor 11		
Frequency	**.551**	**-.972**
Liking	**-.742**	-.107
Satisfaction	**-.604**	.147

Note: $n = 41$

Table 32

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Reduce Anxiety / Unpleasant Arousal Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	
Variable	Coef.	
Severity and Change Variables		
DSM-5 CUD Severity	.124	
Consequences/Experiences from Use	**1.08**	
Ideal Use	-.155	
Stage of Change	-.002	
RFQ	**-.404**	
R_c		.520
R_c^2 (%)		27.05
MUSQ Factor 1		
Frequency	**.507**	
Liking	-.320	
Satisfaction	**.799**	

Note: *n* = 41

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Table 33

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Relative Low Risk Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	.033	**-.392**
Consequences/Experiences from Use	.234	**-.711**
Ideal Use	**-1.19**	-.134
Stage of Change	**-.762**	.243
RFQ	-.152	**.406**
R_c	.492	.348
R_c^2 (%)	24.21	12.10
MUSQ Factor 4		
Frequency	**1.15**	**-1.16**
Liking	**-3.10**	.151
Satisfaction	**1.87**	.032

Note: *n* = 57

Table 34

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Positive Social Interactions Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	-.258	**-.938**
Consequences/Experiences from Use	.214	**.450**
Ideal Use	**.504**	-.986
Stage of Change	-.224	**-.407**
RFQ	**-.241**	.305
R_c	.473	.346
R_c^2 (%)	22.37	11.96
MUSQ Factor 5		
Frequency	**-1.66**	**-.418**
Liking	**1.31**	**-.523**
Satisfaction	**.447**	**1.72**

Note: *n* = 34

Table 35

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Altered Perceptions / Experiential Processes Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	-.268	**-1.05**
Consequences/Experiences from Use	**.493**	**-.711**
Ideal Use	.172	**-.574**
Stage of Change	**.598**	-.037
RFQ	**-.410**	-.058
R_c	.624	.437
R_c^2 (%)	39.00	19.08
MUSQ Factor 7		
Frequency	-.300	.320
Liking	**2.03**	**1.96**
Satisfaction	**-.952**	**-2.77**

Note: *n* = 38

Table 36

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Performance / Arousal Enhancement Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	**.477**	-.105
Consequences/Experiences from Use	**.743**	-.342
Ideal Use	-.115	-.172
Stage of Change	-.117	**-1.18**
RFQ	.037	.269
R_c	.722	.448
R_c^2 (%)	52.17	20.05
MUSQ Factor 8		
Frequency	**-1.08**	**-.615**
Liking	**-1.02**	**2.25**
Satisfaction	**1.51**	**-2.40**

Note: *n* = 30

Table 37

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Increase
Positive Affect Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	
Variable	Coef.	
Severity and Change Variables		
DSM-5 CUD Severity	**.961**	
Consequences/Experiences from Use	.128	
Ideal Use	-.020	
Stage of Change	.018	
RFQ	.024	
R_c		.468
$R_c{}^2$ (%)		21.93
MUSQ Factor 9		
Frequency	**1.65**	
Liking	**-1.41**	
Satisfaction	-.117	

Note: $n = 45$

Table 38

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Manage Negative Social Interactions Motives Predicting Cannabis Use Severity and Change Variables

	Function 1	Function 2
Variable	Coef.	Coef.
Severity and Change Variables		
DSM-5 CUD Severity	.321	-.078
Consequences/Experiences from Use	**.497**	**-.383**
Ideal Use	**-.476**	**.516**
Stage of Change	**-.949**	.037
RFQ	**-.429**	-.005
R_c	.648	.503
R_c^2 (%)	41.99	25.30
MUSQ Factor 10		
Frequency	**-1.20**	**-1.18**
Liking	**-.399**	**2.15**
Satisfaction	**1.93**	**-.920**

Note: *n* = 33

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Table 39

Canonical Correlation Analysis: Motive Frequency, Liking, and Satisfaction for Reduce Negative Affect Motives Predicting Cannabis Use Severity and Change Variables

	Function 1
Variable	Coef.
Severity and Change Variables	
DSM-5 CUD Severity	**-.767**
Consequences/Experiences from Use	**-.394**
Ideal Use	-.157
Stage of Change	-.219
RFQ	**.642**
R_c	.600
R_c^2 (%)	35.97
MUSQ Factor 11	
Frequency	-.309
Liking	-.237
Satisfaction	**-.653**

Note: $n = 35$

Hypothesis 5: Motives by Drug of Choice

We conducted a MANOVA to determine whether salient motives (i.e., frequency of use for motives) significantly differed by one's drug of choice. We examined only four of the six drug of choice classes due to inadequate sample sizes for some categories: alcohol ($n = 207$), cannabis ($n = 82$), stimulants (prescription, methamphetamine, cocaine; $n = 16$), and opioids (prescription, heroin; $n = 32$). The Box's M test indicated the assumption of homogeneity of covariance matrices was violated; therefore, Pillai-Bartlett Trace was used as the test statistic, $M = 629.01$, $F(234, 9843.95) = 2.20$, $p < .001$. The results of the omnibus test revealed significant motive differences between the drugs of choice, Pillai's Trace = .70, $F(36, 972) = 8.20$, $p < .001$.

The MANOVA was followed up with post-hoc ANOVA's to determine where differences in motives varied by drug of choice (see Table 40 for all mean values). The results indicated that frequency of substance use for factors 2 (Conformity; $F[3, 333] = .81$, $p = .49$), 6 (Rebellion; $F[3, 333] = 1.91$, $p = .13$), and 10 (Manage Negative Social Interactions; $F[3, 333] = 1.02$, $p = .38$) did not significantly differ by one's drug of choice. Because there were unequal sample sizes for individuals' drugs of choice, we examined Hochberg's GT2 Post Hoc comparisons for the remaining factors. For factor 1 (Reduce Anxiety / Unpleasant Arousal; $F[3, 333] = 14.48$, $p < .001$), those who identified cannabis and opioids as their drug of choice used to reduce anxiety or unpleasant arousal significantly more frequently than those who identified alcohol as their drug of choice (p < .001). For factor 3 (Effects of Other Substances; $F[3, 333] = 23.07$, $p < .001$), those who reported cannabis (p < .01), stimulants (p < .001), and opioids (p < .001) as their drug of choice reported using to manage the effects of other substances significantly more frequently than those who reported alcohol as their drug of choice. Those with opioids as their drug of choice also used for this reason significantly more frequently than those with cannabis as their drug of choice (p < .001). For factor 4 (Relative Low Risk; $F[3, 333] = 6.48$, $p < .001$), those whose drug of choice was cannabis used because of perceived relative low risk significantly more frequently compared to those whose drug of choice was alcohol (p < .001). Although factor 5 (Positive Social Interactions) demonstrated a significant omnibus test, $F[3, 333] = 3.38$, $p < .05$, drug of choice means did not significantly differ for this motive for the post hoc analysis. For factor 7 (Altered Perceptions / Experiential Processes; $F[3, 333] = 21.14$, $p < .001$), those who identified cannabis ($p < .001$), stimulants, ($p < .05$) and opioids ($p < .001$) as their drug of choice

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used to alter one's perceptions or seek new experiences significantly more frequently

compared to those who identified alcohol as their drug of choice. For factor 8

(Performance / Arousal Enhancement; F[3, 333] = 18.02, $p < .001$), participants who

reported stimulants and opioids as their drug of choice used to enhance their performance

or level of arousal significantly more frequently than those who reported alcohol as their

drug of choice ($p < .001$). Those whose drugs of choice were stimulants ($p < .001$) and

opioids ($p < .05$) also used for these reasons significantly more frequently than those with

cannabis as their drug of choice. Lastly, participants whose drug of choice was opioids

used for this motive more frequently than those with a stimulant drug of choice ($p < .05$).

For factor 9 (Increase Positive Affect; F[3, 333] = 16.08, $p < .001$), those who identified

cannabis ($p < .01$), stimulants ($p < .01$), and opioids ($p < .001$) as their drug of choice all

used to increase positive affect significantly more frequently than those identified alcohol

as their drug of choice. Those with an opioid drug of choice also used more frequently

than those with a cannabis drug of choice for this reason ($p < .05$). For factor 11 (Reduce

Negative Affect; F[3, 333] = 14.13, p < .001), participants who reported cannabis ($p <$

.05) and opioids ($p < .001$) as their drug of choice used to reduce negative affect

significantly more frequently than those who reported alcohol as their drug of choice.

Those with an opioid drug of choice also used more frequently than those with a cannabis

drug of choice for this motive ($p < .01$). For factor 12 (Substitution; F[3, 333] = 19.67, p

$< .001$), those who reported stimulants ($p < .01$) and opioids ($p < .001$) as their drug of

choice used to substitute one substance for another significantly more frequently

compared to those who reported alcohol as their drug of choice. In addition, those with

stimulant (p < .05) and opioid (p < .001) drugs of choice used to substitute another

substance significantly more frequently than those with a cannabis drug of choice.

Table 40

Descriptive Statistics for Post-Hoc ANOVA Variables of Interest

	M	SD	Min	Max
1. Reduce Anxiety / Unpleasant Arousal				
Alcohol	2.26	1.16	1	6.00
Cannabis	2.94	1.29	1	6
Stimulants	2.85	.93	1.33	4.58
Opioids	3.53	1.24	1	5.75
3. Effects of Other Substances				
Alcohol	1.21	.55	1	4.14
Cannabis	1.55	.83	1	4.57
Stimulants	2.04	.90	1	4
Opioids	2.19	1.18	1	5.57
4. Relative Low Risk				
Alcohol	2.09	1.46	1	6
Cannabis	2.95	1.67	1	6
Stimulants	2.19	1.41	1	6
Opioids	2.43	1.39	1	5
5. Positive Social Interactions				
Alcohol	2.31	1.16	1	6
Cannabis	2.42	1.32	1	6
Stimulants	2.99	1.31	1	5.08
Opioids	2.88	1.04	1	5.23
7. Altered Perceptions / Experiential Processes				
Alcohol	1.54	.91	1	5.86
Cannabis	2.50	1.28	1	5.71
Stimulants	2.42	1.18	1	4.57
Opioids	2.53	1.46	1	6
8. Performance / Arousal Enhancement				
Alcohol	1.46	1.06	1	6
Cannabis	1.68	1.00	1	4.75
Stimulants	3.28	1.41	1	6
Opioids	2.29	1.19	1	5

Table 40 Continued

9. Increase Positive Affect

Alcohol	2.42	1.10	1	5.50
Cannabis	3.01	1.31	1	6
Stimulants	3.46	1.40	1	5.50
Opioids	3.74	1.25	1	5.42

11. Reduce Negative Affect

Alcohol	1.81	1.10	1	6
Cannabis	2.24	1.26	1	5.67
Stimulants	2.38	1.27	1	5.67
Opioids	3.17	1.14	1	6

12. Self-Medication

Alcohol	1.15	.56	1	5.33
Cannabis	1.23	.55	1	3.67
Stimulants	1.86	1.40	1	6
Opioids	2.14	1.42	1	5.67

CHAPTER IV – DISCUSSION

Studies of substance use motives have largely focused on a specific substance or a limited set of substances or motives. Further, substance use motivation measures have been limited by only measuring motives by the frequency at which one uses for a given reason. Motives are more complex and can be further explored by measuring additional facets of motivation. The current study aimed to advance the assessment of substance use motives by developing a comprehensive measure of motivations to use problematic substances and providing an initial psychometric analysis of the MUSQ. We created the MUSQ to tap into both a broader range of substances and motives to use and, further, measure additional facets of motivation in terms of wanting, liking, and motive satisfaction.

Hypothesis 1: Factor Structure

The MUSQ motive *frequency* items extend the previous literature by finding a more comprehensive factor structure. The factor analysis of the MUSQ parsed coping with negative affect into both coping with anxiety (Reduce Anxiety / Unpleasant Arousal), and coping with other negative affective states (Reduce Negative Affect), similar to the five-factor Drinking Motives Questionnaire (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007) and Clinical Substance Use Motives Questionnaire (Blevins, Lash, & Abrantes, 2018). We hypothesized that items related to arousal would load with affective items. Although this hypothesis was partially supported with an anxiety and arousal reduction factor, we found that reducing other negative affective states, affect enhancement (Increase Positive Affect), and arousal enhancement (Performance / Arousal Enhancement) loaded separately and comprised separate factors. Contrary to our

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hypothesis, conformity and rebellion items did not load together, but rather loaded onto separate factors (i.e., Conformity and Rebellion). While conformity motive content has been seen in the majority of previously established measures, rebellion content was a relatively novel addition to the measurement of substance use motives. Rebellion content had appeared only as a dimension in a qualitative pilot study for the development of the Comprehensive Marijuana Motives Questionnaire (Lee, Neighbors, & Woods, 2007), but did not emerge as a factor when subjected to a factor analysis (Lee, Neighbors, Hendershot, & Grossbard, 2009). In addition, the valence of social interaction motives also loaded onto separate factors that captured both the drive to experience positive social interactions (Positive Social Interactions) and the motive to mitigate negative social interactions (Manage Negative Social Interactions). As expected, factors pertaining to managing the effects of other substances (Effects of Other Substances), using because of a substance's perceived relative low risk (Relative Low Risk), altering one's perceptions and experiential processes (Altered Perceptions / Experiential Processes), and substituting one substance for another (Substitution) appeared in our data. In addition, the *frequency* subscales of the MUSQ derived from these factors yielded excellent internal consistency, with inter-item correlations ranging from moderate to strong and coefficient alphas in the excellent range.

There were three major limitations of this portion of the study. First, participants were asked to respond to motive *frequency* items regarding their overall substance use. Hypothetically, a participant who only used stimulants responded to all items in relation to their stimulant use, while a polysubstance user responded more broadly. Given that our sample was predominantly comprised of alcohol, cannabis, and prescription stimulant

users, salient motives were likely skewed towards relevance to these substances over others. Had the sample comprised a more even distribution of substances classes, it is quite possible that a Performance / Arousal Enhancement motive may not have emerged. Second, the MUSQ was presented to participants at the very end of a 50-minute survey with several other questionnaires preceding it. Thus, fatigue due to the duration of the survey was likely, which may have contributed to the frequency of missing responses to the second (motive *liking*) and third (motive *satisfaction*) corresponding questions to each motive. Finally, participants completed the survey without direct contact with the researcher (i.e., online), limiting their ability to seek clarification outside of emailing the principal investigator. Questions formatted for addressing frequency (e.g., "How often do you...?") are common in research and are likely familiar and straightforward for the respondent. However, our inclusion of motive *liking* and *satisfaction* questions was novel. The study may have benefitted from in-person data collection to allow participants a greater opportunity for clarification. Indeed, some participants emailed the principal investigator seeking guidance for how to respond to the MUSQ for their overall current and past substance use, as *wanting*, motive *frequency*, *liking*, and *satisfaction*, and motives themselves, had changed over time as their substances and patterns of use changed. While the rationale for seeking responses in relation to current and past use was to widen the net of potential participants, this method may have muddied results given that these concerns may not have been well-defined for the participants. Future studies would find value from a psychometric and participant perspective in seeking responses to the MUSQ in relation to current use. Further, completion of the MUSQ should be in reference to a single substance class and polysubstance users should complete a MUSQ

per problem substance (e.g., once for alcohol, once for stimulants). One is not diagnosed with an overall SUD; rather, specific SUDs are diagnosed and, at times, are observed at different severities (e.g., severe Alcohol Use Disorder with a mild Cannabis Use Disorder). The Incentive-Sensitization Theory would suggest *wanting* and *liking* should also vary in relation to the SUD severity. It appears the other facets of motivation we attempted to capture (i.e., motive *frequency* and *satisfaction*) would likely vary by the severities or absence of specific SUDs too.

Although we were unable to conduct factor analyses of the motive *liking* and *satisfaction* items due to low response rates, we addressed the subsequent research questions of MUSQ validity by creating *liking* and *satisfaction* mean scale scores based on the final motive *frequency* factor structure. Nevertheless, sample sizes for many of the subscales were insufficient for statistical analysis. As such, validity analyses were conducted only for the following scales: Reduce Anxiety / Unpleasant Arousal, Relative Low Risk, Positive Social Interactions, Altered Perceptions / Experiential Processes, Performance / Arousal Enhancement, Increase Positive Affect, Manage Negative Social Interactions, and Reduce Negative Affect.

Hypothesis 2: *Wanting*, *Liking*, and *Satisfaction* Measures

Liking and *satisfaction* did not predict participants' frequency of substance use. Rather, greater *wanting*, or craving, of substances consistently predicted higher frequency of use. This finding is somewhat in line with the Incentive-Sensitization Theory (IST), given that it posits *wanting* is the most salient drive to use. Further, IST suggests *wanting* must increase as addiction severity increases, but *liking* may be either invariable or demonstrate a decrease as addiction worsens (Berridge & Robinson, 2017). Given that

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the theory does not suggest a consistent pattern for *liking* as addiction severity increases, nor does it equate addiction severity to higher frequency of use, per se, our results make sense. Further, IST discusses *liking* in terms of liking the effects of the substance, not necessarily liking that one uses the substance to serve a higher function (e.g., achieve a specific motive). *Satisfaction* of a motive via substance use, moreover, was and still is a hypothesized facet of substance use motivation; however, its theoretical soundness may be more in line with the theory backing Motivational Interviewing than IST. The degree to which a motive is satisfied via substance use may not predict substance use frequency, but it is likely still very relevant as a point of discussion in promoting change talk. This prediction should not be abandoned but should be analyzed with greater precision in future studies. A limitation here was the confounding measurement of these variables in relation to particular substances. Participants responded to *wanting*, *liking*, and *satisfaction* items in regard to their overall substance use, but the dependent variable was the frequency of their most frequently used substance. Thus, a lack of significant findings in this area should not be construed as disconfirming evidence for the theory. Future studies should examine this relationship in regard to a single substance (e.g., alcohol) or class of substances (e.g., opioids) for greater clarity.

Hypotheses 3 and 4: Incremental Validity Testing of the MUSQ

Frequency of substance use has always been a strong predictor of severity and problem variables. In addition, existing substance use motive questionnaires have consistently found that measuring motives in terms of frequency of use for given motives predicts substance use severity and related problems. We attempted to test the incremental validity of the scores from the factor-based subscales of the MUSQ via

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canonical correlations. Our analyses for hypotheses 3 and 4 yielded sample sizes ranging from 30 to 57, with the majority of sample sizes in the 40s. For the first functions, canonical correlations for hypothesis 3 ranged from .664 to .887, while canonical correlations for the first functions in hypothesis 4 ranged from .412 to .722. As such, our inconsistent and, at times, confusing results should be interpreted with utmost caution. As an example, and as further support for the limitations of subsequent functions, we saw incompatible results for the first canonical correlation for hypothesis 3 (see Table 11). The first function demonstrated higher frequency of alcohol use predicted greater DSM-5 AUD severity, while the second function suggested lower frequency of alcohol use predicted greater DSM-5 AUD severity. With a canonical correlation of .411 for the second function and a small sample ($n = 41$), the results for the second function are likely spurious.

We expected higher frequency of substance use and higher motive *frequency* would predict severity and change variables but, in addition to these predictors in a variable set, we expected *wanting*, *liking*, and *satisfaction* to yield additive predictability of these variables. Indeed, in the overwhelming majority of canonical correlation analyses for hypothesis 3, we saw the first function was consistently characterized by higher frequency of substance use predicting greater DSM-5 alcohol and cannabis use disorder severities. These correlations were consistently around .7 or greater, supporting the validity of this conclusion. When *wanting* was a significant predictor, it always predicted greater DSM-5 alcohol and cannabis use disorder severity. When *liking* was a significant predictor, it varied in relation to DSM-5 alcohol and cannabis use disorder severity depending on the motive addressed. This finding mirrors IST, supporting the

inconsistent patterns of *liking* as severity increases. When satisfaction was a significant predictor, six of the first functions demonstrated less *satisfaction* of a given motive via use predicted greater DSM-5 alcohol and cannabis use disorder severity, whereas three of the first functions demonstrated more *satisfaction* predicted greater DSM-5 severity. All other significant problem and change variables were inconsistently predicted, and thus do not warrant interpretation.

For hypothesis 4, two of the first functions in the canonical correlations reached a R_c at or above .7 and were interpretable despite our small sample sizes. The first function of the canonical correlation examining motive *frequency*, *liking*, and *satisfaction* for the Reduce Negative Affect factor predicting alcohol use severity and change variables suggested lower frequency of substance use to reduce negative affective states, more liking that one uses substances to reduce their negative affect, and more satisfaction of this goal via use predicted a combination of greater AUD severity, more perceived positive consequences and experiences from alcohol use, and having less reasons to quit using alcohol. Two comments should be made regarding this pattern. First, as mentioned before, participants responded to the MUSQ for their overall substance use, while the severity and change variable set in this analysis pertained only to participants' alcohol use. Assumptions cannot be made that this MUSQ pattern relates solely to alcohol use – it can only be said that this pattern for substance use in general predicts these alcohol-related problems and personal perceptions regarding alcohol use. Second, although lower frequency of overall substance use to reduce negative affect predicted greater AUD severity, this lower frequency may be explained by participants' averaging their frequency of use for this motive across multiple substances. If, for example, a participant

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uses stimulants, hallucinogens, and benzodiazepines often but used these substances infrequently to reduce negative affect, while they used alcohol more frequently to achieve this motive, they may have given the frequency item a lower overall rating.

The first function of the canonical correlation examining motive *frequency*, *liking*, and *satisfaction* for the Performance / Arousal Enhancement factor predicting cannabis use severity and change variables suggested lower frequency of overall substance use to enhance one's performance or arousal, less liking that one uses to achieve this goal, but more satisfaction of this goal via use predicted a combination of greater DSM-5 CUD severity and more perceived positive consequences and experiences from cannabis use. Given the Performance / Arousal Enhancement factor likely emerged from the data from stimulant users, the substantially low sample size in the analysis given the number of variables in the sets, and the MUSQ addressing overall use as opposed to cannabis use, these results may not be replicable or generalizable.

<div align="center">Hypothesis 5: Motives by Drug of Choice</div>

Finally, we aimed to determine whether salient motives differed by participants' first drug of choice. We had sufficient power to detect differences in motives for those who identified alcohol, cannabis, or opioids as their drug of choice; however, interpretations of differences in salient motives in comparisons with those who identified stimulants as their drug of choice should be interpreted with caution, as we needed at least eight more participants in this group to detect a large effect (G*Power; Erdfelder, Faul, & Buchner, 1996). Further, we conducted follow-up ANOVA's to better answer the research question. With this, however, an increase in the probability of Type I error cannot be ruled out. Regardless, the majority of the results made theoretical sense. For

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example, those with a cannabis drug of choice used more often because of perceived relative low risk compared to those with an alcohol drug of choice. Cannabis lacks the severe withdrawal effects, blackouts, and increased likelihood of aggression (Pihl, Peterson, & Lau, 1993) and death by intoxication (Hall, Room, & Bondy, 1994) seen with alcohol intoxication. Other results, however, were inconsistent with what one would expect. For example, our results suggested those with an opioid drug of choice reported using substances to enhance their performance or arousal more often than those with a stimulant drug of choice. A consistent limitation seen in this study and demonstrated here is that participants did not respond to the motive items in relation to specific substances, nor did they respond in reference to their first drug of choice. We also asked participants to identify their top three drugs of choice and could not assume any particular distance from their first, second, or third drug of choice in terms of personal salience. A participant may have indicated cannabis was their first drug of choice, and therefore cannabis was considered in the analysis, but identified alcohol as their second drug of choice and used alcohol much more frequently and, as such, responded to motive items mostly in terms of their alcohol use.

<center>Strengths, Limitations, and Future Directions</center>

The MUSQ extends the measurement of motivations for substance use by capturing other facets of motivation in addition to frequency of use for a given motive. With the MUSQ, one can assess not only how often one uses substances for a particular reason, but the degree to which an individual likes that they use substances as a means to achieve a goal and the degree to which a goal is actually accomplished via use. If anything, this measure can be used as a point of MI discourse to establish discrepancy

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between wanting to change and not change one's substance-using behavior. For example, a clinician could direct a client to a pattern where they are using substances frequently to reduce feelings of loneliness, despite still feeling lonely or wishing they could cope with loneliness through other means. The MUSQ also captures a wider breadth of motivations to use and more nuanced motivations compared to what is seen in existing substance use motivation measures. Rarely do we see motives related to using a substance to substitute another, to rebel, or to manage negative social interactions in the literature. Further, motives related to using because of perceived relative low risk have appeared sporadically in the substance use motives literature but have never captured all of the facets of relative low risk at once (i.e., in terms of safety, health, legality, tolerance, and social acceptability).

Overall, the added motive content in the MUSQ showed some evidence for incremental validity, though the results are limited by small effects and small sample sizes. Future studies would benefit from collecting data from individuals with more substance use history beyond alcohol and cannabis. Given the length of the questionnaire, the MUSQ should not be combined with too many additional measures in a given study in order to protect against fatigue as a factor in attrition or missing responses. In administering the MUSQ, responses should be collected separately for motives by substance class and responses for polysubstance users should be compared. Finally, the MUSQ should be responded to based solely on current substance use.

The MUSQ requires future psychometric studies utilizing the aforementioned recommendations. The MUSQ should be subjected to invariance testing by drug classes to determine whether the factor structure holds across substances. If this is not the case,

the MUSQ may not be useful as a general substance use motives measure, in which case it would be important to assess motives for different substances separately. Incremental validity testing should be re-analyzed by substance class with a larger sample that includes a wider array of substances than the three that were predominant in the current study. Importantly, future studies may benefit from utilizing existing substance use problem and change measures with strong psychometric properties in order to provide more evidence for the validity of scores from the MUSC. For example, SUD severity should be measured utilizing a gold-standard measure (e.g., the Structured Clinical Interview for DSM-5 – Research Version [SCID-5-RV]; First, Williams, Karg, Spitzer, 2015) and individuals' statuses on the Stages of Change should be measured with the Stages of Change Questionnaire (McConnaughy, Prochaska, & Velicer, 1983).

APPENDIX A – IRB Approval Letter

Office of Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI.

118 COLLEGE DRIVE #5125 • HATTIESBURG, MS | 601.266.6576 | USM.EDU/ORI

Modification Institutional Review Board Approval

The University of Southern Mississippi's Office of Research Integrity has received your notice of modification for your submission The Development and Exploration of a Nine-Factor Model of Motivations for Using Substances (IRB #: IRB-19-25).

Your modification has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-19-25
PROJECT TITLE: The Development and Exploration of a Nine-Factor Model of Motivations for Using Substances
SCHOOL/PROGRAM: School of Psychology, Psychology
RESEARCHER(S): Taylor Altenberger , Bradley Green

IRB COMMITTEE ACTION: Approved

Category 2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

APPROVED STARTING: March 7, 2019

APPENDIX B – Frequency of Use

The following are commonly used substances. Please first indicate your use status (never used, have used but no longer use, or currently use). Then, indicate your typical use pattern for each of the following substances. If you have used a substance, but no longer use, please indicate what your typical use pattern was before you quit

	NEVER USED	HAVE USED BUT NO LONGER USE	CURRENTLY USE	LESS THAN ONCE PER YEAR	1-6 TIMES PER YEAR	1-4 TIMES PER MONTH	1-3 TIMES PER WEEK	ALMOST EVERY DAY	EVERY DAY	MULTIPLE TIMES PER DAY
ALCOHOL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CANNABIS (MARIJUANA, HASH, HASH OIL)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PRESCRIPTION STIMULANTS (E.G., ADDERALL, RITALIN)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PRESCRIPTION OPIOIDS (E.G., HYDROCODONE, VICODIN, OXYCONTIN, PERCOCET, MORPHINE, CODEINE)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
BENZODIAZEPINES (E.G., XANAX, KLONOPIN, VALIUM, ATIVAN, HALCION, RESTORIL)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
HEROIN	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
COCAINE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
METHAMPHETAMINE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
ECSTASY/MDMA/MOLLY	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
HALLUCINOGENS (E.G., LSD, MUSHROOMS, SALVIA, PEYOTE/MESCALINE, DMT, AYAHUASCA) OR OTHER HALLUCINOGENS (E.G., 2-CE)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
DISSOCIATIVES (E.G., KETAMINE, DXM, PCP)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PRESCRIPTION SLEEP AIDS (E.G., LUNESTA, AMBIEN, SONATA)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
SYNTHETIC CANNABINOIDS (E.G., K2, SPICE)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
SYNTHETIC CATHINONES (E.G., BATH SALTS)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Of the following, which substance do you consider to be your drug of choice? If you no longer use substances, indicate which substance was your drug of choice in the past.

- ☐ Alcohol
- ☐ Cannabis
- ☐ Prescription Stimulants
- ☐ Prescription Opioids
- ☐ Benzodiazepines
- ☐ Cocaine
- ☐ Methamphetamine
- ☐ Ecstasy/MDMA/Molly
- ☐ Hallucinogens
- ☐ Dissociatives
- ☐ Prescription Sleep Aids
- ☐ Synthetic Cannabinoids
- ☐ Synthetic Cathinones

In general, how would you describe your experiences <u>while you are (were) intoxicated / high</u> on _____?

Always negative	Mostly negative	More negative than positive	About equally	More positive than negative	Mostly negative	Always positive
1	2	3	4	5	6	7

In general, how would you describe your consequences or outcomes of using _____?

Always negative	Mostly negative	More negative than positive	About equally	More positive than negative	Mostly positive	Always positive
1	2	3	4	5	6	7

In what ways have you used _____? (check all that apply)

- ☐ I swallow it / eat it / drink it
- ☐ I apply it to my tongue / put it under my tongue
- ☐ I smoke it (traditionally)
- ☐ I smoke it (vapor)
- ☐ I ingest it intranasally (through my nose)
- ☐ I inject it
- ☐ I use a patch on my skin

- ☐ Other _____(specify)

Approximately how long have you been using ___?
- ☐ I don't use this substance anymore
- ☐ Less than a month
- ☐ A month
- ☐ A few months (2-3)
- ☐ Several months (4-11)
- ☐ 1 year
- ☐ 2 years
- ☐ 3 years
- ☐ 4 years
- ☐ 5 years
- ☐ 6 years
- ☐ 7 years
- ☐ 8 years
- ☐ 9 years
- ☐ 10 years
- ☐ more than 10 years

Approximately how long did you use ___ before you quit?
- ☐ Less than a month
- ☐ A month
- ☐ A few months (2-3)
- ☐ Several months (4-11)
- ☐ 1 year
- ☐ 2 years
- ☐ 3 years
- ☐ 4 years
- ☐ 5 years
- ☐ 6 years
- ☐ 7 years
- ☐ 8 years
- ☐ 9 years
- ☐ 10 years
- ☐ more than 10 years

How old were you when you first used _____?
*enter whole number

How did you first ever hear about _____?
- ☐ Parents
- ☐ Siblings
- ☐ Other family
- ☐ Friends or others from school or college
- ☐ Friends or others from work
- ☐ Friends or others from other groups (e.g., clubs, organizations, sports)

- ☐ Friends I met through drug use
- ☐ A drug dealer
- ☐ A doctor
- ☐ TV / Movies / Commercials / Advertisements
- ☐ Music
- ☐ Don't remember

When you first saw ___ in real life, who were you with? (Check all that apply)
- ☐ Parents
- ☐ Siblings
- ☐ Other family
- ☐ Friends or others from school or college
- ☐ Friends or others from work
- ☐ Friends or others from other groups (e.g., clubs, organizations, sports)
- ☐ Friends I met through drug use
- ☐ A drug dealer
- ☐ A doctor
- ☐ By myself
- ☐ Don't remember

When you first used ____, who were you with? (Check all that apply)
- ☐ Parents
- ☐ Siblings
- ☐ Other family
- ☐ Friends or others from school or college
- ☐ Friends or others from work
- ☐ Friends or others from other groups (e.g., clubs, organizations, sports)
- ☐ Friends I met through drug use
- ☐ A drug dealer
- ☐ A doctor
- ☐ By myself
- ☐ Don't remember

APPENDIX D – Exposure to Substance

How often do (did) you acquire _____ from…

	NEVER	RARELY	OCCASIONALLY	SOMETIMES	OFTEN	ALMOST ALWAYS	ALWAYS
PARENTS	1	2	3	4	5	6	7
SIBLINGS	1	2	3	4	5	6	7
OTHER FAMILY	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM SCHOOL OR COLLEGE	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM WORK	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM OTHER GROUPS (E.G., CLUBS, ORGANIZATIONS, SPORTS)	1	2	3	4	5	6	7
FRIENDS I MET THROUGH DRUG USE	1	2	3	4	5	6	7
A DRUG DEALER	1	2	3	4	5	6	7
A DOCTOR	1	2	3	4	5	6	7
BUYING IT AT A STORE	1	2	3	4	5	6	7
TAKING OR STEALING IT FROM A STORE	1	2	3	4	5	6	7
BUYING IT ON THE INTERNET	1	2	3	4	5	6	7
A PARTY	1	2	3	4	5	6	7
A BAR	1	2	3	4	5	6	7
TAKING OR STEALING IT FROM MY HOME	1	2	3	4	5	6	7

						ALMOST	
TAKING OR STEALING IT FROM OTHERS' HOMES	1	2	3	4	5	6	7
MAKING IT OR GROWING IT	1	2	3	4	5	6	7

When you use(d) ___, who do(did) you use with?

	NEVER	RARELY	OCCASIONALLY	SOMETIMES	OFTEN	ALMOST ALWAYS	ALWAYS
PARENTS	1	2	3	4	5	6	7
SIBLINGS	1	2	3	4	5	6	7
OTHER FAMILY	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM SCHOOL OR COLLEGE	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM WORK	1	2	3	4	5	6	7
FRIENDS OR OTHERS FROM OTHER GROUPS (E.G., CLUBS, ORGANIZATIONS, SPORTS)	1	2	3	4	5	6	7
FRIENDS I MET THROUGH DRUG USE	1	2	3	4	5	6	7
FRIENDS OR OTHERS I MET AT REHAB, DRUG TREATMENT, OR THROUGH RECOVERY GROUPS (E.G., ALCOHOLICS ANONYMOUS)	1	2	3	4	5	6	7
A DRUG DEALER	1	2	3	4	5	6	7
BY MYSELF	1	2	3	4	5	6	7

APPENDIX E – Treatment History and Change Status

Ideally, how much ___ do you wish to use?

Completely quit using	Use a lot less	Use a little less	Use the same	Use a little more	Use a lot more	Use as much as possible
1	2	3	4	5	6	7

Which of the following best describes your current state regarding continuing to use this drug? (Check one)
- ☐ I have not quit or reduced use, and do not intend to
- ☐ I have not quit or reduced use, but I am thinking about quitting or reducing my use
- ☐ I have not quit or reduced use, but I know I should quit or reduce my use
- ☐ I should quit or reduce use, but I do not want to
- ☐ I want to quit or reduce use, but I am not ready or able to
- ☐ I have thought of some plans to quit or reduce use, but I have not taken action
- ☐ I've successfully quit or reduced use for at least 3 months
- ☐ I've successfully quit or reduced use for up to 6 months
- ☐ I've successfully quit or reduced use for 6 months to a year
- ☐ I've successfully quit or reduced use for 1 to 2 years
- ☐ I've successfully quit or reduced use for more than 2 years

Have you ever received treatment for using this substance?

- ☐ Never
- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ More than three times

Are you receiving treatment for using this substance now?

- ☐ Yes
- ☐ No

Please indicate the degree to which you found your substance use treatment type helpful. If you have not participated in a specific type of treatment, check "not applicable."

1. Informal or non-medical treatment outside of standard mental or medical health
- ☐ Not applicable

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

2. AA/NA/CA or another 12-step group
   ☐   Not applicable

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

3. Detoxification treatment
   ☐   Not applicable

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

4. Outpatient treatment
   ☐   Not applicable

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

5. Inpatient residential treatment
   ☐   Not applicable

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

Given the amount of substance use you've reported, estimate the degree to which the following items apply to you. If you reported no use, indicate "Not at all true of me."

1. I use the substance(s) in larger amounts or over a longer period than was originally intended.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
2. I have a persistent desire to cut down or regulate my substance use, or, I have had multiple unsuccessful efforts to decrease or discontinue use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
3. I spend a great deal of time obtaining the substance(s), using the substance(s), or recovering from the effects of use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
4. I have substance cravings, or times in which I have such strong urges to use that I cannot think of anything else.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
5. I fail to fulfill my obligations at work, school, or home because of my substance use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
6. I continue to use the substance(s) despite having persistent and/or recurrent social or interpersonal problems that are caused or worsened by the effects of substance use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
7. I have given up or reduced important social, occupational, educational, or recreational activities because of substance use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
8. I use the substance(s) in situations in which it is physically hazardous (e.g., driving while intoxicated, using with strangers or in unfamiliar/high-crime neighborhoods).					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
9. I continue to use despite knowing that I have a persistent or recurrent physical (e.g., difficulty breathing; liver failure; tooth decay) or psychological problem (e.g., depression; memory loss) that is likely caused or worsened by substance use.					
Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6
10. I have noticed that I need a greater amount of the substance(s) to get the desired effect, or, have noticed a reduced effect when the usual amount is consumed.					

Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6

11. I experience withdrawal symptoms (e.g., irritability, nausea, shakiness, etc.) if I do not have the substance(s) in my system, so I consume the substance(s) to relieve the symptoms.

Not at all true of me	Minimally true of me	A little true of me	Moderately true of me	Very much true of me	Completely true of me
1	2	3	4	5	6

APPENDIX G – Reasons for Quitting (Revised)

The following are common reasons why people choose to quit or reduce their substance use. Please indicate the degree to which you want to quit or reduce use for each reason. If you have already quit or reduced your use, indicate the degree to which each reason was relevant to you in your transition.

I want to quit or reduce my use of_....	Not at all	A little bit	Moderately	Quite a bit	Very much
1. To show myself that I can quit if I want to	1	2	3	4	5
2. Because I will like myself better if I quit	1	2	3	4	5
3. Because I won't have to leave social functions or other people's houses to use	1	2	3	4	5
4. So that I can feel in control of my life	1	2	3	4	5
5. Because my family and friends will stop nagging me if I quit	1	2	3	4	5
6. To get praise from people I'm close to	1	2	3	4	5
7. Because using this substance does not fit in with my self-image	1	2	3	4	5
8. Because using is socially unacceptable	1	2	3	4	5
9. Because someone has told me to quit or else	1	2	3	4	5
10. Because I will receive a special gift if I quit	1	2	3	4	5
11. Because of potential health problems	1	2	3	4	5
12. Because people I am close to will be upset if I don't quit	1	2	3	4	5
13. So that I can get more things done	1	2	3	4	5
14. Because I have noticed that using this drug is hurting my health	1	2	3	4	5
15. Because I want to save the money I spend on this drug	1	2	3	4	5
16. To prove that I am not addicted	1	2	3	4	5
17. Because there is a drug-testing policy at work, school, or another organization I am in	1	2	3	4	5
18. Because I know others with health problems caused by this drug	1	2	3	4	5

19. Because I am concerned that using this drug will shorten my life	1	2	3	4	5
20. Because of legal problems related to using this drug	1	2	3	4	5
21. Because I don't want to set a bad example for children	1	2	3	4	5
22. Because I want to have more energy	1	2	3	4	5
23. So that my hair, clothes, or home wont smell like the drug	1	2	3	4	5
24. So that I won't ruin clothes or furniture by spilling or burning holes	1	2	3	4	5
25. Because my memory will improve	1	2	3	4	5
26. So that I will be able to think more clearly	1	2	3	4	5
27. So that I don't go on to use harder drugs	1	2	3	4	5
28. Because using is making my other mental health problems worse	1	2	3	4	5
29. So that I don't hurt or endanger someone	1	2	3	4	5
30. Because I am embarrassed about how this reflect on me or my family	1	2	3	4	5
31. Because I am embarrassed or ashamed about things I have done because of using	1	2	3	4	5
32. To perform better in school or at work	1	2	3	4	5
33. Because I am tired of craving this drug	1	2	3	4	5

Craving

Sometimes thinking about a drug you use, or used to use, can make you crave it. Other times, seeing people you have used with, being in places where you have used, or encountering objects (e.g., bongs, pipes, bottle openers, syringes, spoons) or media (e.g., songs, motives, TV shows) that remind you of using can make you crave a drug. Craving can feel like being compelled to use, feeling that you cannot control your behavior, and/or finding yourself preoccupied with thinking about the drug. **Please rate the degree to which you crave drugs you use. If you no longer use alcohol and/or drugs, rate the following items for your craving level before you quit using.**

When you think about alcohol and/or drugs how intense are your cravings?

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

When you encounter a reminder about alcohol and/or drugs (e.g., people, places, things) how intense are your cravings?

1	2	3	4	5	6
Not at all	Minimally	A little	Moderately	Strongly	Extremely

Frequency, Liking, and Satisfaction

Rate the following reasons or motives for your use of alcohol and/or drugs on:

a) How **frequently** you use alcohol and/or drugs for that reason or motive;
b) How much you **like** using alcohol and/or drugs for that reason or motive; and
c) How much that reason or motive is **satisfied** when you use alcohol and/or drugs

If this motive or reason does not apply to your use of alcohol and/or drugs indicate **I don't use for this reason.**
If you no longer use alcohol and/or drugs, rate the items for your use pattern before you quit using.

Before each set of items, indicate which drugs you use for this set of reasons. (Check all that apply)

- ☐ **Alcohol**
- ☐ **Cannabis**
- ☐ **Synthetic Cannabinoids**
- ☐ **Cocaine**
- ☐ **Methamphetamine**
- ☐ **Prescription Stimulants**
- ☐ **Heroin**
- ☐ **Prescription Opioids**
- ☐ **Benzodiazepines**
- ☐ **Prescription Sleep Aids**
- ☐ **Hallucinogens**
- ☐ **Dissociatives**
- ☐ **MDMA/Molly/Ecstasy**
- ☐ **Synthetic Cathinones**

Reasons or Motives to Use a Drug	Frequency, Liking, Satisfaction
To Reduce Negative Feelings	
1. To avoid or blot out my emotions	**A) <u>FREQUENTLY</u>** 1　　2　　3　　4　　5　　6 Never　Rarely　Occasionally　Often　Almost Always　Always
2. To forget, escape, or avoid my memories	**B) <u>LIKE</u>** 1　　2　　3　　4　　5　　6 Not at all　Minimally　A little　Moderately　Strongly　Extremely
3. To forget, escape, or avoid my problems	**C) <u>SATISFIED</u>** 1　　2　　3　　4　　5　　6 Not at all　Minimally　A little　Moderately　Strongly　Extremely

4. To reduce feelings of sadness or depression
5. To reduce feeling irritable
6. To reduce feelings of anger or frustration
7. To reduce feelings of hopelessness
8. To reduce feelings of helplessness
9. To feel less ashamed
10. To feel less guilty
11. To reduce feelings of anxiety or nervousness
12. To feel less lonely
13. To stop worrying
14. To reduce feelings of fear
15. To slow down racing thoughts
16. To feel more in control of my life
17. To reduce feelings of inhibition
18. To calm down
19. To relax, loosen up, or unwind
20. To feel less on edge
21. To reduce unpleasant physical sensations
22. To reduce stress
23. To release tension
24. To feel like nothing can bother me
25. To decrease restlessness
To Increase Positive Feelings
26. To perk up or become alert
27. To feel like I have energy
28. To increase excitement
29. To reduce boredom
30. To increase joy or happiness
31. To increase feelings of self-confidence or effectiveness

32. To increase pleasure
33. To increase my self-esteem
34. To celebrate
35. To feel content with life
36. To increase euphoria or feelings of peacefulness
37. To have fun
38. To feel alive
39. To help me get into a good mood
Social Enhancement
40. To make friends
41. To lose inhibitions when in social situations
42. To feel accepted by others
43. To have a reason/excuse to socialize
44. To make social gatherings and parties more fun
45. To feel more confident and sure of myself around others
46. To help me feel sociable
47. To help me relate to others better
48. To enjoy social interactions
49. To communicate with others better
50. To avoid hurting someone's feelings
51. To avoid or manage conflict with others
52. To feel more intimate with, connected to, or closer to others
53. To enhance my social status, or be perceived as "cool" by others
54. To celebrate with others
55. To have a sense of belonging to a social group
56. To help me express myself to others
Mind Expansion/Creativity/New Experiences
57. To help me be more creative
58. To alter how I perceive my environment (e.g., hear music in greater detail or complexity; enhance or dull sensations; drown out distractions)

59. To cause me to perceive things that are not present (i.e., to hallucinate; to see patterns or distortions that are not actually present)	
60. To change my understanding of my perceptions (e.g., a spiritual awakening; special understanding of the universe; realizing meaning in life)	
61. To experience a blending of senses (e.g., tasting colors; seeing music as colors or patterns)	
62. To seek new experiences	
63. To know what it is like to be high/intoxicated with this substance	

Safer than Other Drugs

64. To get high/intoxicated with something I think is safer than other drugs
65. Because I can handle the high better than with some other drugs
66. Because it is not as bad for you as other drugs
67. Because it has fewer side effects than other drugs
68. Because it does not cause me as many problems as other drugs
69. Because it is socially more acceptable than other drugs
70. Because it's easier to hide my use from others than for other drugs
71. Because I can use it legally
72. Because I can get high without screening positive on a drug test
73. Because it has greater purity than other drugs
74. Because it is prescribed to me by a doctor

Improving Function/Reducing Pain or Illness

75. To reduce physical pain
76. To sleep
77. To focus or pay attention
78. To stay awake
79. To enhance sex or sexual experiences
80. To perform better on school (or occupational) work/tests
81. To study better

82. To enhance or facilitate physical (or sport) performance	
83. To decrease my appetite (eat less)	
84. To increase my appetite (eat more)	
85. To black out or to blot out awareness	
86. To reduce hallucinations or paranoia	
87. To avoid drug or alcohol withdrawal symptoms (e.g., shakiness, sickness, sweating, restlessness)	

Using in Place of Another Drug

88. To have something to use when my preferred substance is not available	
89. To get the amount of the drug I think I need when my doctor won't prescribe enough to me	
90. To use a drug that is more powerful than one I have gotten used to	
91. To help me stop or decrease my use of another drug	
92. To get the same effects as something I'm prescribed when I run out of the prescription	

Defying Norms/Risky Behavior versus Social Conformity

93. To do something socially unacceptable	
94. To do something illegal	
95. To break rules	
96. To rebel against authority or society	
97. To do something risky or dangerous	
98. To be different	
99. To experience the thrill of doing something I'm not supposed to do	
100. To satisfy social pressure or harassment to use	
101. To follow what my friends are doing	
102. To avoid being made fun of	
103. To not be the only one not doing it	
104. To be just like everybody else	
105. To avoid being rejected	

Altering the Effects of Drugs
106. To reduce the effects of another drug
107. To help with the side effects of a medication
108. To enhance the effects of another drug
109. To be able to use another drug for a longer period of time
110. Because I am under the influence of another drug
111. To counteract the effects of another drug
112. To 'come down' off of another drug

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