

**FIVE-FACTOR MODEL, LIFE SATISFACTION, AND DRUG USE REFUSAL SELF-  
EFFICACY: EXAMINATION OF A MEDIATION AND MODERATION MODEL  
AMONG INDIVIDUALS IN RECOVERY**

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**ABSTRACT**

An abundance of literature has shown the five-factor model personality traits can influence current and lifetime substance use. Life satisfaction, although less clearly, has also demonstrated a significant contribution to substance use behaviors and outcomes. Still, little is known about how life satisfaction influences the relationship between personality and substance use measures pertinent to recovery like drug use refusal self-efficacy. The goal of this study was to advance the current literature on substance use by examining the mechanisms influencing the relationship between personality and life satisfaction and drug use refusal self-efficacy for a sample diagnosed with at least one substance use disorder (SUD) and/or alcohol use disorder (AUD). Data was analyzed using deidentified information from a large diverse SUD client pool (n = 348) who were recruited from the general population and from two Midwest SUD treatment centers for a larger parent study. A series of mediation and moderation analyses were tested. The relationships between both neuroticism and conscientiousness with drug use refusal self-efficacy were significantly mediated by life satisfaction. Life satisfaction significantly moderated the relationship between extraversion and drug use refusal self-efficacy. These findings suggest life satisfaction may be a novel modifiable treatment target to reduce negative effects of personality on SUD drug refusal self-efficacy, and that life satisfaction may influence and change how extraversion relates to risks among those in recovery.

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**GENERAL AUDIENCE ABSTRACT**

Substance misuse costs the United States healthcare system billions each year, but substance use disorder treatment reduces these costs. Unfortunately, only a small percentage of individuals seek treatment in part because it is notoriously difficult, and relapses are common. Factors like personality traits and life satisfaction influence current and lifetime substance use. The goal of this study was to advance the current literature on substance use by examining the mechanisms influencing the relationship between personality and life satisfaction and the ability for an individual to refuse drugs or alcohol (drug use refusal self-efficacy). Data was analyzed using information from a large diverse substance use disorder client pool ( $n = 348$ ) who were recruited from the general population from two Midwest treatment centers. A series of mediation and moderation analyses were tested. Life satisfaction influenced the relationships between both neuroticism and conscientiousness with drug use refusal self-efficacy. The relationship between extraversion and drug use refusal self-efficacy differed based on the individual's life satisfaction. These findings suggest modifying life satisfaction may reduce negative effects of personality on drug refusal self-efficacy, and that life satisfaction may influence and change how extraversion relates to risks among those in recovery.

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## INTRODUCTION

Substance misuse costs the United States healthcare system nearly \$600 billion each year (NIDA, 2020). Fortunately, substance use disorder (SUD) treatment reduces these costs: each dollar invested into SUD treatment programs can save up to \$7 in “reduced drug-related crime, criminal justice costs, and theft” (NIDA, 2020). However, according to the 2019 National Survey on Drug Use and Health, of the 20.4 million people aged 12 or older who had a past year SUD, only 1.5% (306,000 people) sought treatment (Substance Abuse and Mental Health Services Administration, 2020). On the positive side, of the nearly 28 million adults who reported having an alcohol or drug problem at some point in their lives, 75.5% identified as either being in recovery or as recovered from their SUD (SAMHSA, 2020), making those in recovery a prevalent and important group to empirically study and clinically support. SUD recovery is often nonlinear and is characterized by multiple relapses and treatment admissions (Kelly et al., 2019); thus, identifying factors related to recovery outcomes can, in the long term, help researchers and healthcare professionals better understand, implement, and streamline important practices to aid individuals in recovery. An important substance use outcome, related to relapse, abstinence, and recovery, that has yet to be examined in this proposed study’s context is drug use refusal self-efficacy (e.g., Choi et al., 2013; Ehret et al., 2013; Foster et al., 2014; Jang et al., 2013; Oei & Jardim, 2007). Drug use refusal self-efficacy refers to one’s belief they can refuse alcohol or drugs across multiple social and personal contexts. The goal of this study is to understand how two constructs, personality and life satisfaction, might relate to drug use refusal self-efficacy (i.e., how confident one feels in their ability to refuse using drugs and alcohol) in a sample of individuals in recovery from SUD.

### **The Five-Factor Model and Trait Theory**

Personality has long been studied as a risk factor for substance use and SUD. The five-factor model (FFM) (also referred to as big five personality traits) is a taxonomy of personality traits with five dimensions of traits that occur on a continuum: extroversion (E), conscientiousness (C), agreeableness (A), openness to experience (O), and neuroticism (N) (McCrae & John, 1992). High scores on E describe gregarious, social, energetic, and high-spirited characteristics, while low scores on E describe withdrawn, passive, and indifferent characteristics. High scores of N represent impulsive, hostile, apprehensive, and pessimistic characteristics, while low scores on N relate to more optimistic, even-tempered, and relaxed attributes. High scores on C represent reliability, self-discipline, thoughtfulness, and efficiency, and lower scores on C represent more lax, pleasure-seeking, and casual mannerisms. High scores on A refer to generous, cooperative, empathetic, and trusting qualities, and low scores on A describe confident, callous, oppositional, and exploitative characteristics. Lastly, high scores on O represent imaginative, artistic, eccentric, and broad-minded attributes, and lower scores on O relate closely to practical, habitual, and traditional facets. Trait Theory, rooted in the five-factor model, emphasizes the role of stable traits that have biological and genetic underpinnings, which serve as the fundamental attributes to one's personality and, in turn, influence how they think, behave, and respond to life situations (McCrae & Costa, 2008). The FFM is generalizable across age, gender, and culture (Church & Katibak, 1989; Digman, 1990; McCrae & Allik, 2002).

## **Personality and SUD**

### *Relationships between personality and SUD*

Meta-analyses concerning the relationship between personality traits and SUD have some notable patterns that inform the current study. One meta-analysis found effect sizes for the relationships between five-factor traits and SUD diagnoses as follows: C ( $d = -.74$ ,  $p = .00$ ), N

( $d = .54, p = .00$ ), A ( $d = -.43, p = .00$ ) E ( $d = -.19, p = .21$ ), and O ( $d = .07, p = .65$ ) (Malouff et al., 2005). Another meta-analysis had a similar finding, showing that a moderate level of N and low levels of A and C best represented the most common personality profile for individuals with SUD (Ruiz et al., 2008), which was in part supported by a later meta-analysis that found that the most common personality profile for people with SUDs included high disinhibition (note: Disinhibition is synonymous with impulsivity which is a primary component of N (Kocka & Gagnon, 2014)), low C, and low A (Kotov et al., 2010). Calculated weighted mean correlation effect sizes ( $MES$ ) showed C to have the largest effect ( $MES = -.46$ ) and the remaining relevant factors were as follows: N ( $MES = .42$ ), A ( $MES = -.26$ ), and E ( $MES = -.15$ ) (Ruiz et al., 2008). Unsurprisingly, although trait themes were consistent across groups, Ruiz & colleagues found trait scores were elevated across the SUD clinical sample relative to the SUD community sample (Ruiz et al., 2008).

Despite previous meta-analyses finding some common and distinct personality profiles in SUD, some discrepancies exist for the E factor (e.g., Dubey et al., 2010; Flory et al., 2002; Hakulinen et al., 2015; Hokm et al., 2018; Kornør & Nordvik, 2007; Sanja et al., 2013; Shanmugam, 1979; Walton & Roberts, 2004; Zilberman et al., 2018; Zilberman et al., 2020). However, this discrepancy appears to be driven by the qualification requirements used in these studies. For example, most studies looking at individuals with SUDs tend to find lower levels of E (e.g., see Zilberman et al., 2020 for AUD sample; see Kornør & Nordvik, 2007 for opioid use disorder (OUD) sample; see Anderson et al., 2007 for SUD sample). However, studies defining substance use or misuse more generally (e.g., “moderate or heavy use”) tend to show higher levels of E in their samples (e.g., Dubey et al., 2010; Flory et al., 2002; Hakulinen et al., 2015; Sanja et al., 2013; Shanmugam, 1979; Walton & Roberts, 2004). Another possibility for mixed

findings for E in substance use could be substance use type; higher E, relative to other drug types, was found in individuals with stimulant or alcohol dependence (Grekin et al., 2006; Hokm et al., 2018). In other words, methods of substance use might show disparate traits (e.g., Crum et al., 2008; Grekin et al., 2006; Flory et al., 2002; Hokm et al., 2018; Terracciano et al., 2008).

### *Temporal Precedence of Personality and SUD*

Temporal precedence is an essential component necessary to establish a cause-and-effect relationship, and it's an important factor in determining the strength of that causal relationship. Previous research has sought to determine the temporal precedence of personality traits and substance use, and an abundance of literature supports personality traits preceding substance use (e.g., Ball, 2002; Friedman et al., 1995; Sher et al., 2000; Turiano et al., 2012). Specifically, there exists a plethora of literature showing that personality traits not only develop early in infancy and childhood (e.g., De Clercq & De Fruyt, 2012; Hagekull 1994; Hampson et al., 2007; Rogosch & Cicchetti, 2004), but are in place prior to substance use onset (e.g., Ball, 2002; Conrod & Nikolaou, 2016; McCrae, 2009), and predict substance use onset (e.g., Friedman et al., 1995; Rogers et al., 2018; Sher et al., 2000; Turiano et al., 2012).

For example, teachers' ratings of C during childhood, later predicted drinking behaviors as adults, such that lower C predicted greater consumption of alcohol in mid-adulthood (Friedman et al., 1995; Hampson et al., 2006). In a prospective study, N at baseline predicted SUD diagnosis at year 1 and year 7 follow-ups (Sher et al., 2000). After parsing out SUD diagnoses, N remained a significant predictor for both AUD and drug use disorder (DUD) (Sher et al., 2000). Furthermore, longitudinal data spanning over a decade, identified high N and low C as significant predictors of substance use and substance use endorsed problems (Turiano et al., 2012). Importantly, changes in personality overtime (increases in O and N) were also predictive

of increasing likelihood of engagement in substances (Turiano et al., 2012). Lastly, a longitudinal study following young adolescents into adulthood found high C and A during adolescence to be associated with reduced odds of initiating substance use in adulthood (LaSpada et al., 2020). Conversely, high N was associated with increased odds of initiation (and continued use) in adulthood (LaSpada et al., 2020).

As further evidence of personality as a contributor to SUD, personality-targeted interventions have effectively delayed the onset of drinking and decreased the frequency of binge drinking among adolescents (Conrod et al., 2008). This suggests that personality doesn't just precede drinking but might have a causal role in such behaviors. In fact, personality-based interventions also show effectiveness for people with AUD and SUD (e.g., Conrod, 2016; Magidson et al., 2014), suggesting that personality might serve as a modifiable risk factor and key intervention target.

There is some evidence exploring “normative age-related drinking reductions” as they are partially explained by age-related personality trait maturation or change (Lee & Sher, 2018; Littlefield et al., 2009; Littlefield et al., 2010). That is, longitudinal data have shown a reduction in problem drinking between the ages of 18 and 35 corresponding with a decrease in neuroticism and an increase in conscientiousness. Another study found that women seeking recovery for substance misuse had significant changes in their levels of N post treatment relative to baseline scores prior to entering treatment (Borman et al., 2006). Thus, although personality plays a causal role in substance use and SUD, it is also correlated with recovery outcomes. Whether such personality changes predict recovery (Domino et al., 2005; Fisher et al., 1998; Hanif et al., 2019) or are a side effect of recovery (Borman et al., 2006, Bozkurt et al., 2014) is yet to be seen. Some research has suggested that personality might be a factor predicting recovery outcomes. Higher N

and lower C seem to be the most robust personality trait predictors of relapse (Domino et al., 2005; Fisher et al., 1998; Hanif et al., 2019). Other literature has identified higher A and C among abstinent (vs non-abstinent) individuals at one year follow up (Batkowska-Korpała, 2012). A recent study utilizing mortality data found N and E to be positively associated with fatal opioid overdoses and A to be negatively associated (Tacheva & Ivanov, 2021). Given this, several researchers have advocated for a greater emphasis on personality traits in recovery and SUD treatment designs (Craig, 1995; Hershberger et al., 2017; Lackner et al., 2013; Staiger et al., 2007; Watt et al., 2008).

In summary, the research literature suggests that people with SUD have higher N and lower C (Kotov et al., 2010; Malouff et al., 2005; Ruiz et al., 2008), these personality factors precede the onset of substance use and SUD (Ball, 2002; Friedman et al., 1995; Sher et al., 2000; Turiano et al., 2012), personality changes correlate with changes in substance use (Lee & Sher, 2018; Littlefield et al., 2009; Littlefield et al., 2010), and N and C might predict SUD treatment outcomes (Domino et al., 2005; Fisher et al., 1998; Hanif et al., 2019). However, many of these relationships are small at best, suggesting the presence of moderators or mediators in this relationship (Dash et al., 2019).

### **Drug Use Refusal Self-Efficacy**

The SUD outcome examined in this study will be drug use refusal self-efficacy ratings, which has long been established as an important aspect in substance use literature and SUD recovery (e.g., Choi et al., 2013; Ehret et al., 2013; Foster et al., 2014; Jang et al., 2013; Oei & Jardim, 2007). Drug use refusal self-efficacy refers to one's perceived self-efficacy that they can refuse drugs (or alcohol) in a variety of contexts and situations. It is especially important in this study, as drug use refusal self-efficacy is considered a significant predictor of SUD outcomes,

such as abstinence, relapse, and future drug use, for those in recovery (e.g., Hayaki et al., 2011; Hayaki et al., 2021; Oei & Morawska, 2004).

### *Drug use refusal self-efficacy and personality*

One study found C and substance-related self-efficacy (operationalized with a 10-point single item scale evaluating confidence one can manage potential problems related to alcohol, or drug use) to both be negatively correlated with alcohol consumption (Schnell & Krampe, 2015). To date literature on drug use refusal self-efficacy and the five-factor traits is limited; however, associations between general self-efficacy and personality may shed light on the relationship. For example, in a meta-analysis on general self-efficacy and the five-factor model, low N and high E, O, A, and C were associated with greater general self-efficacy (Barańczuk, 2021). In sum, five-factor traits relate to general self-efficacy, but it is unclear how personality traits associate with drug use refusal self-efficacy, in particular.

### **Life Satisfaction**

In this thesis, I propose that life satisfaction might be a factor that moderates or mediates the relationship between personality factors and drug use refusal self-efficacy. Life satisfaction is defined as “the degree to which a person positively evaluates the overall quality of his/her life as a whole. In other words, how much the person likes the life he/she leads” (Veenhoven, 1996). Life satisfaction has been theorized as related to, but distinct from, constructs such as well-being, quality of life, and happiness, life satisfaction (Casas et al., 2013; Cummins, 2005; Huebner et al., 2006; Lyubomirsky et al., 2006; Maddux, 2018). Although life satisfaction has been theorized to be more stable and broader than well-being and happiness and more subjective than quality of life, these factors influence, but don’t determine, one’s life satisfaction (Lambert et al., 2015; Maddux, 2018; Pinto et al., 2017). How one interprets their satisfaction with life often

goes beyond their thoughts and feelings towards singular events or situations (Lambert et al., 2015; Maddux, 2018; Veenhoven, 1996).

### *Life Satisfaction and SUD*

Life satisfaction is negatively related with substance misuse, dependency, and addiction severity (Aditi & Arunjyoti, 2018; Koivumaa-Honkanen et al., 2012; Kronenberg et al., 2015; Plant et al., 2016; Swain et al., 2012; Zullig et al., 2001). Most research examining life satisfaction and SUD does so after SUD treatment, specifically looking at how factors like quality of life, happiness, subjective well-being, and life satisfaction are impacted after long-term recovery (e.g., Brown et al., 2017; Drake et al., 2006; McHugo et al., 2012; Pasareanu et al., 2015). Abstinence after treatment has been linked to increased life satisfaction (Drake et al., 2006; Hagen et al., 2017). In a sample of outpatient individuals with SUD, the majority reported being dissatisfied with their life, but 38% reported being at least slightly satisfied with their life, suggesting other factors may influence the relationship between life satisfaction and SUDs (Aditi & Arunjyoti, 2018). Importantly, life satisfaction tends not to differ significantly as a function of age and gender (Laudet & Stanick, 2010; Markowitz, 2001).

### *Temporal Precedence of Life Satisfaction and SUD*

Before evaluating mediation and moderation models, it's important to evaluate temporal precedence of the mediator and moderator variable (i.e., establishing the direction of the relationship). There is some evidence that life satisfaction precedes substance use. A study in Swiss males found that life satisfaction at age 21 was negatively related to problematic cannabis use at age 25 (Deligianni et al., 2019). In one longitudinal study of people with schizophrenia and a co-occurring SUD, 62.5% were actively maintaining remission from substance use and 58.3% reported satisfaction with their lives at 10-year follow-up (Drake et al., 2006).

Furthermore, a longitudinal study on life satisfaction and problematic cannabis and alcohol use found those with SUD reported 7% lower life satisfaction than individuals without SUD (Swain et al., 2012). This association is not alcohol nor cannabis specific, as individuals currently in treatment for OUD were shown to have lower levels of life satisfaction compared to the general population (Luty & Arokiadass, 2008).

In another longitudinal study, baseline life dissatisfaction (but not satisfaction) predicted individuals' onset of binge drinking years later and those who reported some dissatisfaction with life at baseline were at higher risk for binge drinking at follow-up (Koivumaa-Honkanen et al., 2012). Importantly, the relationship between life satisfaction and substance use appears to be reciprocal: This same study found that heavy alcohol use at baseline significantly predicted life dissatisfaction at follow-up, with the association becoming stronger as the level of alcohol consumption increased (Koivumaa-Honkanen et al., 2012). Furthermore, alcohol and drug use before the age of 13 has been associated with reduced life satisfaction in white and black females and males (Zullig et al., 2001). In sum, SUD is associated with lower life satisfaction and maintaining recovery at follow-up is associated with higher life satisfaction relative to those not currently maintaining recovery at that time (e.g., Brown et al., 2017; Drake et al., 2006; McHugo et al., 2012; Murphy et al., 2005; Pasareanu et al., 2015; Sæther et al., 2019; Swain et al., 2012).

#### *Life Satisfaction and Drug Use Refusal Self-efficacy*

Little is known about how drug use refusal self-efficacy and life satisfaction associate; however, an extensive literature exists concerning the positive association between general self-efficacy and life satisfaction (e.g., Azizli et al., 2015; Moksnes et al., 2019). Most of the literature to date has studied how self-efficacy influences life satisfaction (e.g., Azizli et al., 2015; Çakar, 2012; Caprara, G. V., & Steca, P, 2005). Furthermore, higher self-efficacy predicts

higher life satisfaction at a five-year follow-up (Vecchio et al., 2007). No research, to date, has examined how life satisfaction can influence self-efficacy. However, life satisfaction and drug use refusal self-efficacy are both important concepts related to recovery outcomes, and one's satisfaction with life at the beginning of their recovery may influence their self-efficacy related to their future recovery outcomes. Thus, assessing these variables in the context of recovery is a reasonable avenue to explore that may shed light into an otherwise unknown relationship. In sum, self-efficacy is positively associated with life satisfaction, but less is known about how life satisfaction influences drug use refusal self-efficacy (e.g., Azizli et al., 2015; Çakar, 2012; Caprara, G. V., & Steca, P, 2005; Moksnes et al., 2019).

### *Life Satisfaction and Personality*

Changes in life satisfaction are related to changes in personality traits (Specht et al., 2013). However, relations between personality traits and life satisfaction differ in strength and direction. In a meta-analysis of subjective well-being and personality, O was significantly related to quality of life and positive affect, but it was not significantly related to life satisfaction (Steel et al., 2008). However, E was a strong predictor of positive affect, happiness, and overall affect while N was the strongest negative predictor of subjective well-being across the five traits (Steel et al, 2008). When evaluating personality and life satisfaction amongst two groups, researchers found those with high life satisfaction tend to have significantly lower levels of N and higher levels of E, A, and C (Ramanaiah et al., 1997). Other literature has also linked E, positively, and N, negatively, to life satisfaction (e.g., Schimmack et al., 2004).

### *Life satisfaction as a potential mediator of the relations between personality and SUD outcomes*

Life satisfaction might mediate the relationship between personality and SUD outcomes (see proposed theoretical model in Figure 1). This is supported by evidence showing

relationships between five-factor model traits and life satisfaction (e.g., Chen et al., 2008; Joshanloo & Afshari, 2011; Onyishi et al., 2012; Schimmack et al., 2004; Specht et al., 2013) and relationships between life satisfaction and SUD outcomes (e.g., Aditi & Arunjyoti, 2018; Koivumaa-Honkanen et al., 2012; Kronenberg et al., 2015; Plant et al., 2016; Swain et al., 2012). Although much of the evidence linking personality and life satisfaction is cross-sectional (e.g., Furler et al., 2013; Lounsbury et al., 2005; Onyishi et al., 2012), precluding a determination of temporal precedence, there is good evidence that life satisfaction does precede SUD (Deligianni et al., 2019; Koivumaa-Honkanen et al., 2012) and contributes to SUD outcomes (Brown et al., 2017; Drake et al., 2006; McHugo et al., 2012; Murphy et al., 2005; Pasareanu et al., 2015; Sæther et al., 2019; Swain et al., 2012), although there may be a feedback loop wherein SUD and substance use also impact later life satisfaction (Zullig et al., 2001). There is also theory supporting that personality precedes both life satisfaction (Benet-Martínez & Karakitapoglu-Aygün, 2003; Hong & Giannakopoulos, 1994) and SUD (Ball, 2002; Friedman et al., 1995; Sher et al., 2000; Turiano et al., 2012), suggesting that personality might contribute to life satisfaction and subsequent SUD outcomes. Given the viability of these pathways, life satisfaction could serve as a mechanism of how personality contributes to drug use refusal self-efficacy. If it does, it could be a prime modifiable risk factor to reduce the impact of personality on SUD.

#### *Life satisfaction as a potential moderator*

Alternatively, there is some evidence that life satisfaction may moderate the relationship between personality and substance use factors (see proposed theoretical model in Figure 2). For instance, the small size of the relationship between personality and SUD might occur because there are moderators that affect the size of this relationship and, thus, when the effect sizes are averaged, the moderators mask or water down meaningful relationships. There is a substantial

literature on unchangeable moderators (e.g., race/ethnicity) for SUD populations; however, less research has examined potential moderators (like life satisfaction) that can alter with intervention and treatment (*see* metadata; Bachrach & Chung, 2020). Furthermore, as of September 2021, no published literature exists on positive psychology factors, like life satisfaction and related constructs, functioning as a moderator of the relationship between personality and substance use outcomes. Life satisfaction is most often treated as an outcome in both mediation and moderation analyses (e.g., Cao & Zhou, 2021; Di Maggio et al., 2021; Laudet et al., 2006; Yang et al., 2020). This is not completely surprising, as life satisfaction is considered an important outcome for SUD populations, and an essential part of recovery (Laudet, 2011).

However, given the abundance of literature linking personality and SUD and the importance of life satisfaction as it pertains to SUD recovery, it is plausible life satisfaction is one potential moderator influencing the mixed relationship between personality five-factor traits and drug use refusal self-efficacy (e.g., Azizli et al., 2015; Çakar, 2012; Caprara, G. V., & Steca, P, 2005; Moksnes et al., 2019). I expect that, as life satisfaction decreases, the relationship between personality and drug use self-efficacy will increase. This is supported by conflicting reports of how personality is related to drug use self-efficacy (e.g., Barańczuk, 2021; Schnell & Krampe, 2015) and the fact that life satisfaction relates to self-efficacy broadly but varies in its relationship with personality. Theoretically, how satisfied individuals are with their lives is an important construct for this study, but how individuals internalize that satisfaction (or dissatisfaction) may depend on their personality trait tendencies which in turn, can affect their self-efficacy, and agency thinking. For example, those who are unhappy tend to lack agentic (self-efficacious) thinking and thus, are less likely to meet their goals (i.e., refusing drugs or alcohol in tempting situations) (Snyder et al., 2004).

## The Current Study

The goal of this study is to better understand the role life satisfaction plays in the relationship between personality and drug use refusal self-efficacy. Given the existing literature, I will test competing, although not mutually exclusive models, one where life satisfaction is a mediator of the relationship between specific FFM personality traits and drug use refusal self-efficacy and one where it is a moderator of the relationship between specific FFM personality traits and drug use refusal self-efficacy. These models will be tested in a sample of individuals in recovery from SUD.

The following specific hypotheses tested will be:

*Hypothesis 1* (see Figure 3). The relationship between N, C, A, E, and O personality traits and drug use refusal self-efficacy will be partially mediated by life satisfaction such that:

- a) N, E, and O will be negatively correlated with drug use refusal self-efficacy and C and A will be positively correlated drug use refusal self-efficacy (path c),
- b) N will be negatively correlated with life satisfaction and E, O, C, and A will be positively correlated life satisfaction (path a),
- c) Life satisfaction will be negatively correlated with drug use refusal self-efficacy (path b), and
- d) The relationship between N, E, O, C, and A and drug use refusal self-efficacy will be significantly mediated by life satisfaction, but the direct pathways will remain significant while controlling for life satisfaction in the model (path c').

*Hypothesis 2*. The relationship between N, E, O, C, and A and drug use refusal self-efficacy will be moderated by life satisfaction such that:

a) As life satisfaction decreases, the relationship between N and drug use refusal self-efficacy will be stronger.

b) As life satisfaction decreases, the relationship between C and drug use refusal self-efficacy will be stronger.

c) As life satisfaction decreases, the relationship between A and drug use refusal self-efficacy will be stronger.

d) As life satisfaction decreases, the relationship between E and drug use refusal self-efficacy will be stronger.

e) As life satisfaction decreases, the relationship between O and drug use refusal self-efficacy will be stronger.

## **METHODS**

### **Participants**

Data for the current analysis were taken from participants ( $N = 348$ ) who were recruited from the general population and from two Midwest SUD treatment centers for a larger parent study. The majority of participants was recruited from a center located in an urban, metropolitan area that serves predominantly insurance-covered patients, and some were recruited from a more rural location that serves mostly low-income patients. The goal was to recruit 125 participants with OUD from each location and an additional 100 participants with other AUD/SUD diagnoses from the urban-located center. Due to limitations with recruitment secondary to the COVID-19 pandemic, recruitment was expanded to the general community of people in recovery. To be eligible for the study, participants had to be at least 18 years old, self-identify as an individual in recovery, and have English language proficiency.

### **Procedures**

This project is part of a parent study examining barriers and facilitators to long-term recovery from OUD. The Indiana University Institutional Review Board approved all study procedures. Fliers were placed in both treatment centers and research assistants attended introductions prior to the start of group meetings to provide information to potential participants. Interested individuals completed a short telephone screening where they were assessed for inclusion criteria and introduced to the study. Successful screenings for individuals who were 18 years or older and currently in treatment for OUD, AUD, or another SUD, and were then scheduled to meet with a research assistant via phone, telehealth video conferencing, or in person to complete informed consent and receive an introductory interview. Participants completed a contact form to facilitate follow-up and consented to providing deidentified electronic medical records. After completing the introductory interview, participants were compensated \$40 in the form of cash or gift card. Participants were then asked to complete a series of interview questions every 3 or 6 months for up to 3 years following their initial introductory interview. For the purposes of the current study, only baseline data obtained from the introductory interview are included.

## **Measures**

*Demographic information.* Age, race, household income, marital status, sex, and gender were obtained during the baseline interview.

*DSM-5 Substance Use Diagnosis.* Participants self-reported the DSM-5 SUD diagnoses.

*Five-Factor Model Rating Form. Appendix A.* The Five-Factor Model Rating Form (FFMRF) (Mullins-Sweatt et al. 2006) is a 30-item self-report measure to assess (1) neuroticism versus emotional stability, (2) extraversion versus introversion, (3) openness versus closedness to one's own experience, (4) agreeableness versus antagonism, and (5) conscientiousness versus

undependability. Individuals are asked to describe themselves on a 5-point Likert scale where 1 represents ‘extremely lower than the average person’ and 5 represents ‘extremely higher than the average person’. Scores are then summed together for each factor with higher scores indicating higher levels of the factor (neuroticism for example) and lower scores representing lower levels of the factor. The max total score for any given trait is 30 and the minimum total score is 6. The FFMRF is well-validated, with good internal consistency, convergent validity, and discriminant validity (Mullins-Sweatt et al., 2006). In this sample, Cronbach’s alphas indicate good internal consistency; neuroticism (6 items;  $\alpha = .85$ ), extraversion (6 items;  $\alpha = .72$ ), openness (6 items;  $\alpha = .76$ ), agreeableness (6 items;  $\alpha = .77$ ), and conscientiousness (6 items;  $\alpha = .87$ ).

*Drug Use Refusal Self-Efficacy Scale. Appendix B.* The Drug Use Refusal Self-Efficacy Scale is a 16-item self-report scale. Participants are asked to report on a 6-point Likert scale where 1 represents a “very strong trigger” for usage and the participant is “very sure” they would use and 6 represents no trigger for usage where the participant is confident they would not use. Question items include emotional states like “When I am angry” and “When I feel happy”, situational circumstances such as “When I’m at a social occasion” and “When I am at a bar or club”, and behaviors like “When I’m celebrating” and “When I’m partying”. Lower scores represent lower drug use refusal self-efficacy with a minimum total score of 16 possible and higher scores represent higher drug use refusal self-efficacy with a maximum total score of 96 representing the highest drug use refusal self-efficacy possible for the scale. The Cronbach’s alpha for this sample indicates excellent internal consistency ( $\alpha = .98$ ).

*General Life Satisfaction – Short Form. Appendix C.* General Life Satisfaction – Short Form is a 5-item self-report measure with some items being “In most ways, my life is close to perfect” and “I am satisfied with my life”. Participants report the extent to which they agree or

disagree with the items on a 7-point Likert scale with 1 representing ‘strongly disagree’ and 7 representing ‘strongly agree’. Scores are summed to give a possible total score between 5-35 with lower scores representing greater dissatisfaction with life. The Cronbach’s alpha for this sample indicates excellent internal consistency ( $\alpha = .89$ ).

### **Data Analysis Plan**

All analyses were conducted using SPSS 28 and Mplus Version 8 statistical software. Descriptive statistics (i.e., means, standard deviations, and frequencies) and variable distributions (i.e., skewness and kurtosis) were assessed with SPSS and hypotheses were tested with separate moderation and mediation models conducted in Mplus. Missing data was handled using maximum likelihood (ML) estimation via Mplus’s default programming (Little & Rubin, 2002). Power analyses conducted prior to analysis indicated that given my sample size ( $n = 375$ ), number of predictors (four for mediation, five for moderation), and an alpha of .05, I have 99% power to detect a medium effect (.15) and 99% power to detect a small effect (.07).

Hypothesis 1 was tested with five separate mediation analyses tested simultaneously in Mplus. Both direct and indirect effects were analyzed. All variables were designated as observed variables. Gender and age were included as covariates (Bausch et al., 2014; Kumar & Lal, 2006). The first path direct analysis regressed drug use refusal self-efficacy onto N as the independent variable, gender and age as the covariates, and life satisfaction as the mediator while controlling for E, O, A, and C. The second direct path analysis regressed drug use refusal self-efficacy onto E as the independent variable, gender and age as the covariates, and life satisfaction as the mediator, while controlling for N, O, A, and C. The third path regressed drug use refusal self-efficacy onto O as the independent variable, gender and age as the covariates, and life satisfaction as the mediator, controlling for N, E, A, and C. The fourth path regressed drug use

refusal self-efficacy onto A as the independent variable, gender and age as the covariates, and life satisfaction as the mediator, controlling for N, E, O, and C. The fifth and final direct path analysis regressed drug use refusal self-efficacy onto C as the independent variable, gender and age as the covariates, and life satisfaction as the mediator, controlling for N, E, O, and A. Life satisfaction was also regressed onto each of the five predictors and gender and age, while controlling for the other four predictors for the given analyses. Lastly, indirect effects were tested for each predictor by regressing drug use refusal self-efficacy onto each predictor through life satisfaction (the mediator). Hypotheses were evaluated using 95% confidence intervals, and if the interval did not contain zero, the indirect effects was deemed significant. Fit of the model was proposed to be evaluated via three indices: the root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). Each index value was proposed to be compared to standard cut-offs; for RMSEA, acceptable fit = 0.05-0.08, close fit = 0.01-0.05, and exact fit = 0.00, for CFI and TLI, acceptable fits > .90, close fits > .95 (Byrne, 1994; Hu & Bentler, 1999; Schumacker & Lomax, 2004; van de Schoot et al., 2012).

Hypothesis 2 was tested with five separate moderation analyses tested simultaneously in Mplus. All variables were designated as observed variables. Gender and age were both included as covariates (Bausch et al., 2014; Kumar & Lal, 2006). Significant interactions were probed manually with the same software at the mean and at +/- 1 SD of the moderator, and was used to determine the conditional effect the independent variable has on the dependent variable at specified values of the moderator. The first path included N as the independent variable, life satisfaction as the moderator, and drug use refusal self-efficacy as the dependent variable. The second path included C as the independent variable, life satisfaction as the moderator, and drug use refusal self-efficacy as the dependent variable. The third path included A as the independent

variable, life satisfaction as the moderator, and drug use refusal self-efficacy as the dependent variable. The fourth path included E as the independent variable, life satisfaction as the moderator, and drug use refusal self-efficacy as the dependent variable. The fifth path included O as the independent variable, life satisfaction as the moderator, and drug use refusal self-efficacy as the dependent variable. Hypotheses were evaluated using 95% confidence intervals, and if the interval did not contain zero, the indirect effects were deemed significant. Fit of the model was proposed to be evaluated via three indices: the root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). Each index value was proposed to be compared to standard cut-offs; for RMSEA, acceptable fit = 0.05-0.08, close fit = 0.01-0.05, and exact fit = 0.00, for CFI and TLI, acceptable fits > .90, close fits > .95 (Byrne, 1994; Hu & Bentler, 1999; Schumacker & Lomax, 2004; van de Schoot et al., 2012).

## **RESULTS**

### **Descriptive Statistics**

Of the total sample ( $N = 348$ ), the majority identified as male ( $N = 173$ ; 49.7%) and the sample's age ranged from 20 to 75 years old, with an average of 43 years of age ( $SD = 10.91$ ). The sample had the following racial breakdown: 85.1% were White ( $N = 296$ ), 8.6% were Black/African American ( $N = 30$ ), 4.6% were Biracial, Multiracial, or Mixed race ( $N = 16$ ), 0.6% were American Indian or Alaskan Native ( $N = 2$ ), 0.3% were Native Hawaiian or Pacific Islander ( $N = 1$ ), and 0.9% of participants did not report their race ( $N = 3$ ). Regarding ethnicity, 82.2% did not identify as Hispanic ( $N = 286$ ), 3.2% did identify as Hispanic ( $N = 11$ ), and 14.7% of the sample did not report their ethnicity ( $N = 51$ ). Additional demographic characteristics can be found in Table 1.

All study variables had acceptable skewness and kurtosis values and significant correlations emerged among the variables (Table 2). Life satisfaction was significantly correlated with drug use refusal self-efficacy and all the five factor traits ( $p$ 's < .01) apart from openness, which was not significantly correlated. Drug use refusal self-efficacy was also significantly correlated with the five traits ( $p$ 's < .01) except for openness. Age was not significantly related to any study variables ( $p$ 's > .05). No variables differed across gender, except for agreeableness ( $F = 3.272, p = .021$ ), which was significantly higher among men as compared to women (Table 3).

### **Model Selection and Revisions to the Data Analysis Plan**

The data analysis plan proposed to examine fit of the mediation and moderation models using CFI, TLI, and RMSEA fit indices. However, all the mediation models were saturated and fit indices could not be estimated. Half of the moderation models were also saturated (see Table 4 for the moderation models) (Brem et al., 2019; Burnham & Anderson, 2004). Because gender and age were not significantly related to drug use refusal self-efficacy (see Table 2; age  $r = .074, p = .200$ , see Table 3; gender  $F(3,297) = 1.339, p = .262$ ), there was a question as to whether including these factors as covariates was appropriate for the current analysis. Thus, four mediation models and four moderation models were tested to determine which covariates to include in the model, if any: the first model included both age and gender (as proposed), the second model included age only, the third model included gender only, and the fourth model did not include either covariate. These models were compared using Akaike Information Criterion (AIC), where lower AIC values indicate better-fit models (Brem et al., 2019; Burnham & Anderson, 2004). The models with the best (i.e., lowest) AIC values were chosen as best fitting and were subsequently reported.

### **Hypothesis 1 Results – Mediation Model**

The mediation model with the best AIC included age as a covariate but not gender (AIC = 4440.518; see Table 5). See Table 6 and Figure 4 for the best fitting mediation model results, as presented below.

### *N*

Results indicated that N had significant relationships with both life satisfaction ( $\beta = .53, SE = .12, \beta^* = 4.58, p < .001$ ) and drug use refusal self-efficacy ( $\beta = .86, SE = .28, \beta^* = 3.05, p < .002$ ), and there was a significant indirect relationship with drug use refusal self-efficacy through life satisfaction ( $\beta = .53, 95\% CI [.26, .86], SE = .15, \beta^* = 3.68, p < .001$ ).

### *E*

Results indicated that E had a significant relationship with life satisfaction ( $\beta = -.32, SE = .16, \beta^* = -1.99, p = .046$ ); however, E was unrelated to drug use refusal self-efficacy ( $\beta = .29, SE = .40, \beta^* = .73, p = .467$ ) and there was not a significant indirect relationship with drug use refusal self-efficacy through life satisfaction ( $\beta = -.32, 95\% CI [-.69, .002], SE = .17, \beta^* = -1.84, p = .065$ ).

### *C*

Result indicated that C was significantly related to life satisfaction ( $\beta = -.44, SE = .15, \beta^* = -2.94, p < .003$ ) but there was no direct relationship with drug use refusal self-efficacy ( $\beta = -.39, SE = .35, \beta^* = -1.14, p = .26$ ). There was a significant indirect relationship between C and drug use refusal self-efficacy through life satisfaction ( $\beta = -.43, 95\% CI [-.82, -.15], SE = .16, \beta^* = -2.65, p = .008$ ).

## **Hypothesis 2 Results – Moderation Model**

The moderation model with the best AIC and fit included both age and gender as covariates (AIC = 2381.666; see Table 7). See Table 8 and Figures 5 and 6 for the best fitting moderation model results, as presented below.

### ***E***

Life satisfaction significantly moderated the relationship between E and drug use refusal self-efficacy ( $\beta = -.08$ ,  $SE = .04$ ,  $\beta^* = -2.41$ ,  $p = .016$ ). Probing the interaction (see Figures 5 and 6) indicated a significant positive relationship between E and drug use refusal self-efficacy at +1 SD of life satisfaction ( $p < 0.001$ ;  $\beta = .44$ , 95% CI[.21, .66],  $SE = .11$ ,  $\beta^* = 3.84$ ), but a significant negative relationship between E and drug use refusal self-efficacy at -1 SD of life satisfaction ( $p < 0.001$ ;  $\beta = -.53$ , 95% CI[-.75, -.32],  $SE = .11$ ,  $\beta^* = -4.79$ ). There was no relationship between E and drug use refusal self-efficacy at the mean of life satisfaction ( $\beta = -.05$ , 95% CI[-.24, .15],  $SE = .09$ ,  $\beta^* = -0.49$ ).

### ***Remaining traits***

Life satisfaction did not significantly moderate the relationship between any of the other four traits (N, O, A, and C) and drug use refusal self-efficacy ( $p$ 's  $> .05$ ; see Table 8).

## **DISCUSSION**

The current study provides insight into the relationships between five factor model traits and drug use refusal self-efficacy and how this relationship might be mediated or moderated by life satisfaction (see Table 10 for a complete summary of the current study). This study adds to our understanding of how baseline personality traits and current life satisfaction ratings relate to an important aspect of recovery and, to my knowledge, is one of the few studies (if not the first) to evaluate life satisfaction as a process of recovery (e.g., mediator or moderator) rather than a result of SUD recovery. The current findings may suggest that life satisfaction can be a

mechanism linking N and C with drug use refusal self-efficacy and that life satisfaction may affect the relationship between E and drug use refusal self-efficacy. A summary of how best to understand these findings, how these findings contribute to the literature, and the research and clinical implications of these findings are discussed below.

### **Main Findings and Contemporary Integrative Interpersonal Theory**

This study had two primary hypotheses: I hypothesized that life satisfaction would significantly mediate the relationship between the five factor traits (neuroticism, extraversion, conscientiousness, openness, and agreeableness) and drug use refusal self-efficacy, and I predicted that life satisfaction would significantly moderate the relationship between the five factor traits and drug use refusal self-efficacy such that, as life satisfaction decreases the relationship between the five factor traits (N, E, C, O, and A) and drug use refusal self-efficacy would be stronger. Both hypotheses were partially supported; of the five traits, the relationships between N and C and drug use refusal self-efficacy were significantly mediated by life satisfaction, and life satisfaction significantly moderated the relationship between E and drug use refusal self-efficacy. No other mediation or moderation relationships were statistically significant.

This study had several secondary hypotheses for the mediation model pathways. First, I predicted that the five factor traits would differentially relate to life satisfaction and drug use refusal self-efficacy, such that N would negatively correlate with life satisfaction and drug use refusal self-efficacy, C and A would positively relate to life satisfaction and drug use refusal self-efficacy, and E and O would negatively relate to drug use refusal self-efficacy and positively relate to life satisfaction. Of these predictions, one was supported; N negatively correlated with drug use refusal self-efficacy. Of the other (unexpected) relationships that emerged, N

significantly positively correlated with life satisfaction and E and C significantly negatively correlated with life satisfaction. Secondly, I predicted that life satisfaction and drug use refusal self-efficacy would be negatively correlated. This hypothesis was not supported; in the current study, there was a positive relationship between life satisfaction and drug use refusal self-efficacy.

The current study's results can be better explained through a prominent theory in personality research known as the Contemporary Integrative Interpersonal Theory (CIIT) of personality and psychopathology (Pincus, 2005). CIIT "conceptualizes psychological functions as a dynamic interaction between self and others" in which personality traits are not inherently stable nor is psychopathology inherently dynamic, rather the two are linked and both feature stable and dynamic processes that track with one another across time (Hopwood et al., 2021). The CIIT model incorporates attributes of the person, context and dysfunction of the environment, and the patterns of contact between the person and their environment to understand how individuals transact with their environment and the consequences of those interactions (Hopwood et al., 2022). CIIT concludes that interpersonal situations are comprised of two primary components: agentic (e.g., a differentiated individual achieved through power, mastery, and assertion) and communal (e.g., belonging through intimacy, union, and solidarity) behaviors that operate on a spectrum (Pincus et al., 2017). This theory expands upon previous personality and environmental work by assuming interpersonal functioning refers to the way one thinks about their social interactions with others and how those interactions relate to their own self-representation (Pincus, 2005). The theory claims that by integrating an individual's dispositions and interpersonal motives/goals we can understand adaptive and maladaptive behaviors moment-to-moment within a single interaction and that this can inform "how one thinks about oneself and

others, feels about oneself and others, and behaves in interpersonal situations” (Pincus et al., 2017). I will be discussing and applying my findings to CIIT and its components of interpersonal dysfunction, personality disposition, and agentic/communal interaction goals in the subsequent sections below.

***Aim 1: Significant Indirect Relationships for C and N Through Life Satisfaction***

**C Through Life Satisfaction.** The negative relationship between C and drug use refusal self-efficacy was significantly mediated by life satisfaction; C was negatively correlated with life satisfaction and life satisfaction was positively correlated with drug use refusal self-efficacy. Originally, I hypothesized C would correlate positively with both life satisfaction and drug use refusal self-efficacy, alluding to a positive indirect effect on drug use refusal self-efficacy as mediated by a positive effect on life satisfaction. Research supports this hypothesis; for example, a meta-analysis found that C is positively associated with self-efficacy (Barańczuk, 2021), and research indicated there is a positive relationship between C and life satisfaction (Ramanaiah et al., 1997). Neither of those findings were corroborated by the current data or study; however, a majority of personality and positive psychology research is not targeted towards substance use populations, nor are recovery populations largely represented in this research (Lachmann et al., 2017; Skorek et al., 2014). C is often thought of as a protective factor for substance use (Domino et al., 2005; Fisher et al., 1998; Terracciano et al., 2008) and a facilitator of treatment and recovery (e.g., Hanif et al., 2019; Javaras et al., 2012). It’s possible that the relationship between C and life satisfaction and self-efficacy may be different in recovery populations, or that C relates to general self-efficacy differently than drug use refusal specific self-efficacy.

The basis of CIIT theory infers that personality traits (e.g., conscientiousness) influence the long-term life dispositions an individual selects into (e.g., low-risk occupation, low-risk

social group), the moderate fluctuations a person experiences (e.g., specific job/relationship, temporary health and life circumstances), and moment-to-moment fluctuations (i.e., interactions with a single person at a single time point) evoking a pattern of interpersonal interaction and reaction. Those high in C “work hard to achieve their goals, meet expectations of others, avoid giving in to temptations, and uphold norms and rules of life more than others” (Fayard et al., 2012). High C is often indicative of a strong will and desire to perform behaviors well and thoroughly, and individuals high on this trait typically aim for success and strive to control and regulate their impulses (Jackson et al., 2010). Because of this, individuals higher on C may be less likely to develop an addiction (e.g., Domino et al., 2005; Fisher et al., 1998; Terracciano et al., 2008), and high C individuals with addiction may be less motivated to use drugs or alcohol to cope with negative emotions or to enhance their own self view (or how others perceive them) (Loukas et al., 2000). Furthermore, high C individuals with addiction may have stronger performance motives (e.g., improved concentration, memory, clarity, etc.) to limit drinking (Loukas et al., 2000). Despite these protective aspects of C, there are drawbacks to high levels of the trait; for example, high C individuals can be perfectionist, expectations and high standards can engender burnout, and a neurotic adherence to routines can make changes that much more disappointing or stressful (Carter et al., 2016).

According to CIIT, when individuals high in C deviate from their personality values and dispositional preferences, they are less likely to achieve their agentic and communal goals, experience positive transactional interactions, or have positive self-esteem (Findley & Ojanen, 2013; Fritz & Helgeson, 1998; Ghaed & Gallo, 2006). This discrepancy between their personality-driven values and current life state may result in worsened life satisfaction. High C individuals entering recovery may have high standards and expectations for themselves resulting

in feelings of disappointment or failure regarding their life choices, short-term decisions, and current life state. This dissatisfaction may facilitate how they view their past choices (e.g., continued substance use, resentment, risky relationships), and interpersonal behavior (e.g., confrontation, frustration, etc.) further decreasing their life satisfaction and self-efficacy (Hopwood et al., 2022). These past failures may allow high C individuals to accurately judge themselves to be less likely to refuse drugs in the future, and low life satisfaction may further exacerbate this association by making it more difficult to resist drugs or alcohol. Thus, while C may still relate to higher general self-efficacy (as in Barańczuk, 2021), in recovery populations it may negatively relate to drug use refusal specific self-efficacy, since those in recovery may have experienced multiple previous periods of re-emergence of drug use (Kelly et al., 2019) that may lead someone high in C to accurately estimate their ability to resist drug use in the future as low.

Likewise, it could also be possible that additional moderators, not included in the current study, are influencing the relationship between C, life satisfaction, and drug use refusal self-efficacy. Javaras and colleagues evaluated the predictive power of C on emotion regulation at baseline and at follow-up 2 years later, and they found that high C predicts greater recovery from negative emotion but not reactivity to negative emotion stimuli (Javaras et al., 2012). These results are relevant to the current study because 1) C is often labeled as a positive/protective factor for SUD (Domino et al., 2005; Fisher et al., 1998; Terracciano et al., 2008), 2) individuals with substance dependence often experience negative emotion/stimuli frequently (i.e., consequences of drug misuse like interpersonal conflicts, financial instability, and dopamine/serotonin fluctuations), and 3) impulsivity (reactivity to emotion stimuli) is considered a vulnerability factor for substance misuse/dependency (Acton, 2003; Kocka & Gagnon, 2014). From the results of this previous study, we know high C may aid individuals' recovery from

negative emotion but not their immediate reactions to such negative stimuli. In other words, C may serve as a protective factor to substance use by reducing negative affect, but it may also fail to protect individuals from maladaptive coping strategies when reacting to negative stimuli. For example, individuals high in C may experience frequent negative stimuli that decrease their life satisfaction (e.g., if they constantly feel they are falling short of their expectations), which then may contribute to maladaptive coping, such as using drug or alcohol, further decreasing their life satisfaction and self-assessments of their ability to refuse drugs or alcohol in the future.

**N Through Life Satisfaction.** The positive relationship between N and drug use refusal self-efficacy was mediated by life satisfaction; N was positively associated with life satisfaction and life satisfaction was positively associated with drug use refusal self-efficacy. Originally, I hypothesized N would correlate negatively with both life satisfaction and drug use refusal self-efficacy, alluding to a negative indirect effect on drug use refusal self-efficacy as mediated by life satisfaction. Research supports this hypothesis; for example, a meta-analysis showed that N is negatively associated with self-efficacy (Barańczuk, 2021), and an abundance of literature negatively links N and life satisfaction (Ramanaiah et al., 1997; Schimmack et al., 2004; Steel et al., 2008). Neither of those findings are corroborated by the current data or study; it's possible that N is differently related with life satisfaction and drug use refusal specific self-efficacy in an SUD recovery population. Given that N is usually considered a risk factor for substance use (Domino et al., 2005; Fisher et al., 1998; Hanif et al., 2019; LaSpada et al., 2020; Turiano et al., 2012), understanding whether it functions differently within recovery populations has important implications for research and clinical applications.

Endorsements of N are most often thought to be representative of intense and frequent emotional reactions (usually threat, loss, or frustration); however, a high score on N is also

indicative of “little emotional reaction even in the face of significant difficulties” (Lahey, 2009). N appears to be higher, on average, among people with SUD and has often been thought of as a risk factor for SUD (Malouff et al., 2005; Ruiz et al., 2008). However, N may have unique impacts on life satisfaction and self-efficacy for those in recovery, as informed by CIIT. First, it’s possible that those high in N recall and characterize their current life satisfaction in comparison to their life satisfaction prior to entering recovery, being able to better see how their current lives, even if not perfect, may be an improvement as compared to how they functioned prior to entering treatment. Additionally, N may contribute to other mechanisms that foster, instead of impair, SUD recovery, including seeking and receiving essential social support (e.g., Kelly et al., 2010) or seeking new ways to foster positive affect (e.g., Liu et al., 2012) that may improve one’s life satisfaction, especially in comparison to their prior levels of life satisfaction (prior to entering recovery).

Aligning with the CIIT theory, since those high in N tend to be more dissatisfied with life, they may have more room to be benefitted from treatment. For example, a high N individual entering treatment may be more likely to experience positive affect in a recovery environment compared to their previous environment; since they are now surround by individuals with shared commonalities/experiences, they may experience less stigma, increased social support, and an improvement in moment-to-moment affect through interactions within the treatment and recovery environment. Thus, N may lead to a greater improvement in life satisfaction in response to treatment, which then leads to a greater ability to resist drug use in the future. In support of this idea, evidence shows that high N individuals may respond better at the beginning of treatment than low N individuals, but only when they are experiencing negative, rather than positive, affect, suggesting high N individuals may not only be familiar and comfortable with

negative emotion, but may thrive in response to it (Tamir, 2015). Thus, N may be an asset, rather than a risk, in the SUD treatment environment. Understanding the positive effects of N provides a more nuanced appreciation of the negatives and *positives* of this personality disposition for the recovery community.

### ***Null Indirect Relationships for E, A, and O Through Life Satisfaction***

**E Through Life Satisfaction.** The relationship between extraversion and drug use refusal self-efficacy was not significantly mediated by life satisfaction; however, E was significantly negatively related to life satisfaction, such that those high on E reported lower life satisfaction than those low on extraversion. This relationship was in an opposite direction than hypothesized. E is commonly characterized by excitability and sociability, and a tendency to rely on external cues for social engagement so much so that high E individuals experience enhanced motivation by social stimuli relative to individuals with low E (Fishman et al., 2011). E is a well-documented risk factor for substance use (e.g., Dubey et al., 2010; Flory et al., 2002; Hakulinen et al., 2015; Hokm et al., 2018; Kornør & Nordvik, 2007; Sanja et al., 2013; Shanmugam, 1979; Walton & Roberts, 2004; Zilberman et al., 2018; Zilberman et al., 2020); however, how it imparts risk within a recovery community in particular is not well understood.

This relationship can similarly be understood within the CIIT framework. Because high E individuals are motivated by social engagement and a sense of belonging, which often influences their short-term dynamics such as situational selection and interpersonal contact (Wright et al., 2021), entering treatment, which requires significant lifestyle and social life changes (Kelly et al., 2010), may feel isolating and even worse at first (especially for individuals with OUD (Christie et al., 2021). However, these effects have shown to alleviate overtime, such that

individuals in long-term recovery share similar life satisfaction with individuals who have not had an SUD (Christie et al., 2021).

It's important to mention that individuals with conflicting agency and communal goals as a result of different personality dispositions (i.e., high e and low e) often experience interpersonal conflict because their behaviors, values, and goals do not align (Wright et al., 2021). This could have important social implications for how individuals enter the recovery community and who they connect with within the community. It could be that, for individuals in recovery, those high in E may report lower life satisfaction because their needs for exciting social experiences are hampered by being in recovery. Individuals in recovery have to undergo a large lifestyle change in order to facilitate recovery (Davies et al., 2015), often including no longer hanging out with old friends (who they used substance with), no longer participating in nightlife/certain social gatherings, etc. Despite recovery spaces encouraging developing new social support and engagement within the community, individuals may still feel as if they are experiencing a social loss as compared to their life prior to entering recovery. They may also feel limited in who they can hang out with or where they can go; it stands to reason that highly E individuals may be more negatively impacted by these social changes than individuals lower in this trait, which may lead to lower life satisfaction. Thus, for individuals high in E, ensuring the maintenance or improvement of social support and other experiences that can increase life satisfaction may be an important treatment goal.

**O and A Through Life Satisfaction.** Additionally, the relationships between O and A and drug use refusal self-efficacy were also not significantly mediated by life satisfaction as expected. In part, the findings for A were largely incongruent with existing literature; however, for O, these findings were unsurprising. For example, A, but not O, was found to be a significant

predictor of SUD (Kotov et al., 2010; Malouff et al., 2005; Ruiz et al., 2008), making it surprising that no significant relationships emerged for A. Both A and O are positively related to self-efficacy (Barańczuk, 2021), which again made nonsignificant findings somewhat surprising; however, as mentioned above, A and O may very well be linked to general self-efficacy but not drug or alcohol specific self-efficacy.

A is positively related to aspects of compassion and politeness throughout interpersonal behavior (DeYoung et al., 2013); however, components of A, especially the ones most robustly related to interpersonal behavior, may be less related to life satisfaction and drug use refusal self-efficacy. These components may be influenced more directly by different recovery aspects not included in the current study. As for O, it relates more closely to internalizing rather than externalizing spectra (Hopwood et al., 2022), which could mean it is less robust in person environment transactions and more influential in internal thoughts (e.g., openness to ideas and intellectual processing) rather than externalizing behaviors.

Overall, findings and associations are less robust and inconclusive for O and A traits as they pertain to substance use refusal self-efficacy. This is not to say these traits don't influence the recovery process, but perhaps they are less influential in the specific recovery components tested in this study. For example, perhaps A (i.e., corporation, trust, sympathy, altruism) plays a larger role during treatment and at discharge rather than at the beginning of treatment (Turiano et al., 2012). Perhaps O (i.e., more creative in their problem-solving, less resistant to change, less reliant on routine) plays a larger role in someone's decision to enter treatment but not their specific self-efficacy for drug or alcohol use, nor their life satisfaction (Blonigen et al., 2015).

***Aim 2 Discussion: Significant Moderation of the Relationship Between E and Drug Use Refusal Self-Efficacy by Life Satisfaction***

**E Moderated by Life Satisfaction.** The relationship between E and drug use refusal self-efficacy was significantly moderated by life satisfaction, such that a low levels of life satisfaction, E and drug use refusal self-efficacy have a negative relationship and at high levels of life satisfaction, E and drug use refusal self-efficacy have a positive relationship. There was no relationship between E and drug use refusal self-efficacy at mean levels of life satisfaction. Originally, I hypothesized that as life satisfaction decreases, the relationship between the five factor personality traits, N, E, C, O, and A, and drug use refusal self-efficacy would be stronger and more positive. The current findings did not support this hypothesis and only supported a moderation of the relationship with E. However, it's important to note that there is a large literature documenting discrepancies between E and SUD outcomes (e.g., Dubey et al., 2010; Flory et al., 2002; Hakulinen et al., 2015; Hokm et al., 2018; Kornør & Nordvik, 2007; Sanja et al., 2013; Shanmugam, 1979; Walton & Roberts, 2004; Zilberman et al., 2018; Zilberman et al., 2020) that may be explained in part by a moderator like life satisfaction. Prior research indicates discrepancies of E depending on substance use severity, frequency, and type (e.g., Dubey et al., 2010; Flory et al., 2002; Hakulinen et al., 2015; Sanja et al., 2013; Shanmugam, 1979; Walton & Roberts, 2004). Although most studies looking at individuals with SUDs tend to find lower levels of E (e.g., *see* Zilberman et al., 2020 for AUD sample; *see* Kornør & Nordvik, 2007 for OUD sample; *see* Anderson et al., 2007 for SUD sample), studies defining substance use as moderate or heavy (rather than by diagnosis/disorder) tend to show higher levels of E in their samples. Thus, the significant moderation by life satisfaction can inform a more thorough examination seeking to clarify and characterize how E may have different relationships with SUD outcomes across life satisfaction.

Although only one significant moderation emerged, it did so for the personality trait most robustly related to life satisfaction and like-minded constructs (Ramanaiah et al., 1997; Schimmack et al., 2004; Steel et al, 2008). As CIIT proposes that personality function may vary across moderators, moderation by life satisfaction is consistent with this theory. It may be that for individuals with low life satisfaction, E may lead one to seek out companionship with their old using friends, or they may find solace/connection using with friends, which could drive lower self-efficacy to refuse substances. Thus, those with low life satisfaction may seek out social engagement with their prior support systems, where drug use may still be present and which reduce one's ability to resist drug use, or may have a paucity of social support and engagement that is reducing their ability to resist future drug use. In other words, for an individual in recovery who has low satisfaction with life, the negative relationship between E and drug use self-efficacy may be driven by unfulfilled needs related to social engagement, potentially reflecting lack of engagement with social support in the recovery community. However, among those with high life satisfaction, E may drive seeking out companionship with those also in recovery, facilitating better drug use refusal self-efficacy. For an individual in recovery who has high satisfaction with life, the positive relationship between E and drug use self-efficacy may reflect successful engagement with social support in the recovery community. Those with high life satisfaction may fulfill their social needs through new and more sobriety-supporting friends and experiences, increasing their ability to resist future drug use. In this way, E acts a protective factor when life satisfaction is high and a risk factor when life satisfaction is low.

***Null Moderation of the Relationship Between N, C, A, and O and Drug Use Refusal Self-Efficacy by Life Satisfaction***

Life satisfaction doesn't affect the relationship between the other traits and drug use refusal self-efficacy, and these null relationships with drug use refusal self-efficacy show that these traits function similarly across different levels of life satisfaction. These relationships appear more universal; however, these relationships may be moderated by other constructs (Kling et al., 2003; Lefcourt et al., 1981; Tabak et al., 2009).

### **Covariate Findings**

The best fitting mediation model included age but not gender. In some ways this was unsurprising; although I predicted gender to be included in the final model, prior research was mixed and inconclusive (Bausch et al., 2014; Chapman et al., 2007; Weisberg et al., 2011), and gender did not relate to my outcome variable. Age did not relate to my outcome variable either but did significantly relate to N and O. The best fitting moderation model included both age and gender. This is congruent with what I expected and aligns with previous research showing there are significant associations between age, gender, and the study variables. For example, longitudinal data show a reduction in problem drinking between the ages of 18 and 35 corresponding with a decrease in N and an increase in C (Lee & Sher, 2018; Littlefield et al., 2009; Littlefield et al., 2010). Additionally, life satisfaction tends not to differ significantly as a function of age and gender (Laudet & Stanick, 2010; Markowitz, 2001) and previous literature has reported that men and women entering SUD treatment tend to differ on age, education, employment, and, to some extent, substance use type (Wechsberg et al., 1998). Gender did not relate to the majority of study variables in the current analysis, except women reported higher A than men. This finding is somewhat congruent with other research showing gender differences are identifiable at the facet level, but that these differences are too minimal to be detected at the big five level (Weisberg et al., 2011); for example, Weisberg and colleagues found more

extensive significant age differences across A sub-facet domains compared to differences at the facet level. The field should seek, in the future, more conclusive, clear, and robust understanding of both age and gender as they pertain to personality *and* SUD recovery.

### **Strengths of the Current Study**

This study has a number of strengths that should be emphasized. First, to my knowledge, this is the first study collectively examining personality and life satisfaction in a clinical substance use population. This study advances the current literature on positive psychology constructs and substance use recovery outcomes, which can catalyze future research agendas and can inform future research design through providing effect sizes of the relationships studied here. Second, this study has a relatively large sample, sufficient power to detect effects, and tested two separate models, which allows us to see what works, what doesn't, and which model may best explain the associations between the variables studied, in order to inform future work in this program of research. Third, the sample came from a study of individuals who report being in recovery from SUD across a wide range of sociodemographic groups, rural and urban locations, and specific substances of use, which results in increased ecological validity and generalizability of results. Fourth, the analyses utilized a robust approach by testing multiple relationships in one analysis, reducing the risk of Type I errors.

### **Limitations of the Current Study**

The study findings should be interpreted within some limitations. First, model fit was originally planned to be assessed with RMSEA, CFI, and TLI values; however, because several of the models were saturated, model fit indices could not be estimated. From there, I pivoted to utilizing the AIC value, which may provide a less well-rounded and clear picture of the model and data fit (one index compared to several); however, it is robust, empirical, and shown to

sufficiently assess fit and compare between like models (Brem et al., 2019; Burnham & Anderson, 2004). Second, this study is cross-sectional; as such, temporal precedence and causality cannot be determined. When drawing conclusions from the results, it's important to remember the data have limited racial, ethnic, and gender diversity and may not be generalizable across different identities. Because this study utilizes self-report data, the findings are only as accurate as the openness and accuracy of the participant reporting. The current study only evaluated drug use refusal self-efficacy, which is subjective and confounded by one's confidence in themselves. More so, I only examined the five-factor model at the factor level and there may be specific facet levels that relate to outcomes differently; by only looking at the main factors, relationships at the facet level may be masked. Since the data are cross-sectional, causal inferences cannot be made. These relationships need to be replicated and studied in prospective format; if they are replicated, this work would highlight a new important mechanism of recovery for this at-risk group. Although the current study only utilized baseline data, the parent study is prospective in nature, allowing for the testing of the current study's findings in a longitudinal framework in the near future.

### **Future Research Directions and Clinical Implications**

This study is the first step in a program of research to advance the clinical utility of personality and positive psychology measures in SUD recovery, with the long-term goal of identifying and testing novel modifiable mechanisms influencing the SUD recovery process. By doing this study, I was able to test my hypotheses and investigate which were supported, laying the groundwork for a future more labor-intensive prospective study with these data. First, in order to reach this long-term goal, more research is needed to increase the robustness of the relationships found here. In particular, the current findings suggest that the next important step is

to test, prospectively, the effect of N and C on drug use self-efficacy through life satisfaction, using measurement of these factors at different time points during one's recovery process. Should the current study's findings be replicated, this would mean that fostering C or viewing C as a protective factor may lead to incorrect conclusions and risk profiles among those in SUD recovery. Additionally, it may mean that viewing N as a risk factor or seeking to reduce N may not be helpful in the recovery process. Future studies should explore these interpretations to better understand whether and how C imparts a negative effect, while N imparts a positive effect, on both life satisfaction and drug use refusal self-efficacy for those in SUD recovery. Additionally, this study also highlights the need to test whether E's effect on drug use self-efficacy as moderated by life satisfaction, occurs over time. Should this be replicated, it may mean tailoring treatments for those at differing levels of life satisfaction may be effective for mitigating negative effects of E on SUD recovery outcomes.

Establishing these relationships longitudinally allows for more confidence to consider whether or not personality and life satisfaction can be treatment targets for SUD recovery. By examining these relationships over time (including both pre and post assessments in intervention settings and longitudinal observational work), more robust conclusions can be drawn regarding any treatment recommendations. It would be informative to have a clear, well-rounded understanding of these relationships prior to developing and testing novel intervention targets, so researchers and clinicians can better determine when and how to intervene most effectively.

Should life satisfaction emerge as a key mechanism concerning how personality affects the SUD recovery process, subsequent lines of research could attempt to increase one's life satisfaction experimentally, through acceptance and commitment therapy or mindfulness (e.g., Khashouei et al., 2016), to see if it can result in increases in drug use refusal self-efficacy. For

example, my future studies could execute a between-subjects and within-subjects design to measure the difference between groups' drug use refusal self-efficacy across high and low personality traits (e.g., high and low N, C, E) for those who participated in weekly acceptance and commitment therapy (an intervention shown to improve life satisfaction) and for those who did not (Wicksell et al., 2008). Within-subject components could be assessed routinely after fixed time intervals for each individual where their life satisfaction and drug use refusal self-efficacy would be evaluated. If such a manipulation can increase life satisfaction, this would suggest life satisfaction could be explored for targeting in randomized clinical trials and treatment settings. Personality traits are neither dynamic nor inherently stable (Hopwood et al., 2021) and questions still remain regarding which traits (or aspects of such traits) are less modifiable. Searching for modifiable risk mechanisms and potential treatment targets or interventions can provide us with understanding on what can be changed, how we can effectively change it, and the outcomes of such change/modification; such as in this study, life satisfaction might be a modifiable target that can reduce ill effects of some of these traits on drug use refusal self-efficacy.

Additionally, although drug use refusal self-efficacy is an important factor, documenting the effects of personality and life satisfaction on substance use itself (e.g., re-emergence of use, problems associated with substance use) within the SUD recovery population would further bolster the evidence to suggest that life satisfaction may be a prime modifiable treatment target for SUD recovery. In other words, future research should explore other associations life satisfaction may have on different recovery outcomes at multiple timepoints. By doing so, we can achieve a more wholistic understanding of life satisfaction and its effect on treatment outcomes. For example, if life satisfaction positively impacts relapse but negatively influences

effective coping, this would be important to understand in the context of treatment and recovery so that we can best support and intervene.

Lastly, future studies should explore these relationships within a CIIT adoptive framework and the authors encourage future efforts to include this theory, and components related to person-environment transactions, in SUD work. There is value in incorporating theory from personality into substance use research, not only due to the overlapping nature of substance use and mental health pathology, but also because these theories have empirical foundations containing constructs (e.g., disinhibition) and frameworks (e.g., interpersonal circumplex, interaction goals) that have yet to be evaluated in this context. Not only can CIIT inform SUD work, such as offering foundational ideas on personality's influence on behavior and change, but SUD work can also expand CIIT theory in important ways. For example, in the current study, high C was maladaptive for life satisfaction and self-efficacy. These results were unexpected but also shed light on associations between personality traits in a population not commonly included in CIIT related work. If these findings continued to be replicated in the recovery population, it may offer understanding not yet incorporated into the theory.

Should this program of research continue to support the findings from the current study, there are many subsequent clinical implications. First, these findings can help inform health care professionals' screening approaches to SUD treatment/recovery; for example, by using patients reported personality traits, specifically C, N, and E, and life satisfaction, clinicians may be able to identify who is least likely to refuse drugs or alcohol outside of treatment and who may benefit from additional support surrounding alcohol and drug temptation or social support. Most importantly, this additional information enlightens clinical psychologists and other healthcare providers on how best to improve drug use refusal self-efficacy rather than assume a

homogenous approach will effectively improve all individuals' self-efficacy equally. This assessment could be included with intake simply by adding two additional brief measures to gauge personality tendencies and current life satisfaction. This could also be incorporated at discharge from treatment and could help formulate a discharge plan that best accounts for someone's specific risks related to sustained recovery.

This program of research may also provide novel treatment targets (or interventions) in recovery (i.e., interventions to improve life satisfaction and in turn, drug use refusal self-efficacy and abstinence). For example, life satisfaction may be a modifiable risk factor to reduce substance use re-emergence that is more amenable to intervention than personality, which may be equally stable and resistant to change as it is dynamic and malleable (Hopwood et al., 2022). Improving individuals' satisfaction with their life through traditional acceptance and commitment therapy and Cognitive Behavioral Therapy or by increasing their outlook on their current life state (recognizing growth, identifying and recalling past success, comparing their current self to past selves) may improve recovery outcomes. In the future, treatment centers may pivot their efforts (and focus) to improving individuals' quality of life, and in turn satisfaction, by intentionally structuring additional support around seeking and successfully obtaining a stable job, establishing healthy friendships and relationships, improving health outcomes, and so on. This final suggestion aligns with the study's current findings and SUD literature more broadly while gravitating towards a harm-reduction approach to facilitate the most effective and meaningful recovery for all individuals in treatment.

By incorporating personality dispositions and positive constructs like life satisfaction and drug and alcohol specific self-efficacy into SUD work, researchers can better understand the clinical implications of such relationships in the recovery community. Overall, there is an

abundance of research that focuses on recovery and recovery outcomes but significantly less focus placed on the mechanisms related to the start *and* course of SUD treatment recovery in the context of positive and personality psychology constructs. More nuanced work is needed to establish a clearer understanding of these constructs and their implications in recovery. For example, proximal mechanisms like drug use refusal self-efficacy can be measured early in treatment and these assessments can provide more effective understandings (earlier) that serve as preventative markers to treatment setbacks/interruptions. Future efforts should continue to incorporate personality and positive psychology factors into SUD recovery research to further advance scientific understanding and empirically based clinical recommendations. These findings suggest life satisfaction may be a novel modifiable treatment target to reduce negative effects of personality on SUD drug refusal self-efficacy, and that life satisfaction may influence and change how extraversion relates to risks among those in recovery.

**Table 1.** Descriptive Statistics

Variables	Mean (SD)	Percentage (N)	Range
Male	-	49.7% (173)	-
Female	-	48.3% (168)	-
Transgender	-	1.2% (4)	-
White	-	85.1% (296)	-
Black/African American	-	8.6% (30)	-
Bi/Multiracial/Mixed Raced	-	4.6% (16)	-
American Indian/Alaskan Native	-	.6% (2)	-
Native Hawaiian/Pacific Islander	-	.3% (1)	-
Hispanic	-	3.2% (11)	-
Age (years)	43 (10.91)	-	20-75
Employed	-	58.9% (205)	-
High School Degree	-	45.1% (157)	-
Associate Degree	-	16.4% (57)	-
Bachelor's Degree	-	20.4% (71)	-
Master's Degree	-	6.3% (22)	-
Doctorate or Professional Degree	-	2.0% (7)	-
Income \$25,000 or less	-	29.9% (104)	-
Income \$100,000 or more	-	12.6% (44)	-
Used Drugs in Past Year	-	48.0% (167)	-
Belongs to a Faith Community	-	38.8% (135)	-

**Table 2.** Correlation matrix of study variables  $p < .05$ ; \*  $p < .01$ ; \*

	<b>Life Satisfaction</b>	<b>Drug Use Refusal Self-Efficacy</b>	<b>Neuroticism</b>	<b>Extraversion</b>	<b>Openness</b>	<b>Agreeable</b>	<b>Conscientious</b>	<b>Age</b>
<b>Life Satisfaction</b>	1							
<b>Drug Use Refusal...</b>	.47**	1						
<b>Neuroticism</b>	.40**	.37**	1					
<b>Extraversion</b>	-.31**	-.21**	-.31**	1				
<b>Openness</b>	-.005	-.05	.09	.29**	1			
<b>Agreeable</b>	-.22**	-.22**	-.22**	.45**	.27**	1		
<b>Conscientious</b>	-.38**	-.31**	-.35**	.45**	.12*	.59**	1	
<b>Age</b>	-.071	.074	.053	-.057	.039	-.009	-.017	1
<b>M (SD)</b>	42.07 (9.76)	60.12 (26.10)	18.69 (5.66)	16.10 (4.64)	16.56 (4.70)	14.35 (4.54)	14.92 (5.18)	43.18 (10.91)
<b>Range</b>	25-60	16-96	6-30	6-30	6-30	6-30	6-30	20-75
<b>Skewness</b>	-.05	-.02	-.02	.192	.12	.81	.56	.55
<b>Kurtosis</b>	-1.02	-1.37	-.48	-.05	.05	1.09	.31	-.19

**Table 3.** ANOVAs comparing study variables across gender  $p < .05$ ; \*

	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
<b>Life Satisfaction</b>	147.31	3	40.24	.51	.26
<b>Drug Use Refusal</b>	2727.97	3	909.33	1.34	.26
<b>Self Efficacy</b>					
<b>Neuroticism</b>	120.73	3	40.24	1.26	.29
<b>Extraversion</b>	47.26	3	15.76	.73	.54
<b>Openness</b>	12.23	3	4.08	.18	.91
<b>Agreeableness</b>	198.28	3	66.09	3.27	.02*
<b>Conscientious</b>	136.85	3	45.62	1.71	.17

**Table 4.** Measurement Indices for Path Analysis Including and Excluding Age and Gender Covariates

	<b>CFI</b>	<b>TLI</b>	<b>RMSEA</b>	<b>RMSEA 90% CI</b>
<b>Moderation Including Age and Gender</b>	-	-	-	-
<b>Moderation Including Age Only</b>	.95	.34	.14	[.05, .25]
<b>Moderation Including Gender Only</b>	.99	.92	.05	[.00, .18]
<b>Moderation Excluding Age and Gender</b>	-	-	-	-

*Note.* Model fit indices that cannot be estimated are denoted with a -.

**Table 5.** Measurement Indices for Mediation Path Analysis Including and Excluding Age and Gender Covariates Models

	<b>AIC</b>
<b>Mediation Including Age and Gender</b>	14343.17
<b>Mediation Including Age Only</b>	4440.52
<b>Mediation Including Gender Only</b>	14302.41
<b>Mediation Excluding Age and Gender</b>	4567.00

**Table 6.** Path Analysis and Direct Effects with Life Satisfaction as the Mediator

	<i>B</i>	<i>SE</i>	<i>B*</i>	<i>p-level</i>
<b><i>Drug Use Refusal Self-Efficacy on:</i></b>				
Age (years)	.02	.14	.14	.89
Life Satisfaction	.99	.17	5.94	<.01**
Neuroticism	.86	.28	3.05	<.01*
Extraversion	.29	.40	.73	.47
Openness	-.30	.34	-.89	.37
Agreeableness	-.30	.37	-.82	.42
Conscientiousness	-.39	.35	-1.14	.26
<b><i>Life Satisfaction on:</i></b>				
Age (years)	-.04	.05	-.82	.41
Neuroticism	.53	.12	4.58	<.01**
Extraversion	-.32	.16	-1.99	.04*
Openness	.09	.13	.76	.45
Agreeableness	.07	.16	.43	.67
Conscientiousness	-.44	.15	-2.94	<.01**
<b><i>Indirect Effect of Personality Traits Through Life Satisfaction:</i></b>				
Neuroticism	.53	.15	3.63	<.01**
Extraversion	-.32	.17	-1.84	.07
Openness	.09	.13	.75	.45
Agreeableness	.07	.16	.43	.67
Conscientiousness	-.43	.16	-2.65	<.01**

Note. \*Significant at  $p < .05$ ; \*\*Significant at  $p < .01$ ; \*\*

**Table 7.** Measurement Indices for Moderation Analysis Models Including and Excluding Age and Gender Covariates

	<b>AIC</b>
<b>Moderation Including Age and Gender</b>	2381.67
<b>Moderation Including Age Only</b>	2395.43
<b>Moderation Including Gender Only</b>	2459.43
<b>Moderation Excluding Age and Gender</b>	2467.49

**Table 8.** Analysis with Life Satisfaction as Moderator

	<i>B</i>	<i>SE</i>	<i>B*</i>	<i>p</i> -level
<i>Drug Use Refusal Self-efficacy on:</i>				
Life Satisfaction	1.03	.16	6.49	<.01**
Neuroticism	.89	.29	3.09	<.01**
Extraversion	.25	.37	.68	.49
Openness	-.34	.32	-1.08	.28
Agreeableness	-.24	.39	-.59	.55
Conscientiousness	-.34	.37	-.94	.35
Age	-.01	.04	-.26	.79
Gender	-.01	.04	-.26	.7
Neuroticism x Life Satisfaction	.01	.03	.38	.71
Extraversion x Life Satisfaction	-.08	.04	-2.41	.02*
Openness x Life Satisfaction	-.02	.03	-.59	.56
Agreeableness x Life Satisfaction	.04	.04	.90	.37
Conscientiousness x Life Satisfaction	-.01	.04	-.26	.94

*Note.* \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$

**Table 9.** Extraversion and Drug Use Refusal Self-Efficacy at Different Levels of Life Satisfaction.

	<i>B</i>	<i>SE</i>	<i>B*</i>	<i>p</i> -level
<i>Drug Use Refusal Self-efficacy on:</i>				
Extraversion x Life Satisfaction	-.08	.04	-2.41	.02*
Low Levels	-.53	.11	-4.79	<.01**
Mean Levels	-.05	.09	-.49	.3
High Levels	.44	.11	3.84	<.01**

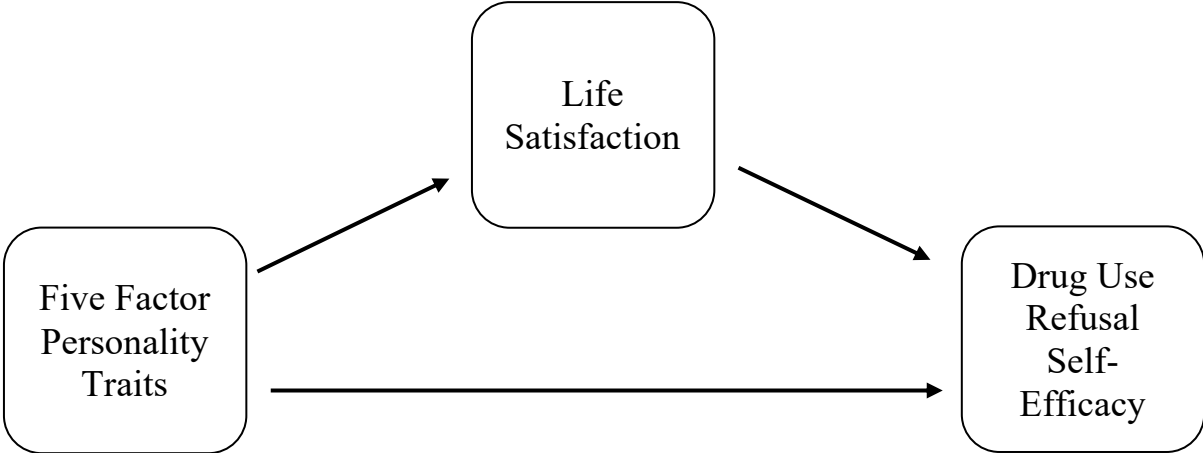
*Note.* \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$

**Table 10.** Summary Table of the Five-Factor Traits and Qualities, Hypotheses, and Findings.

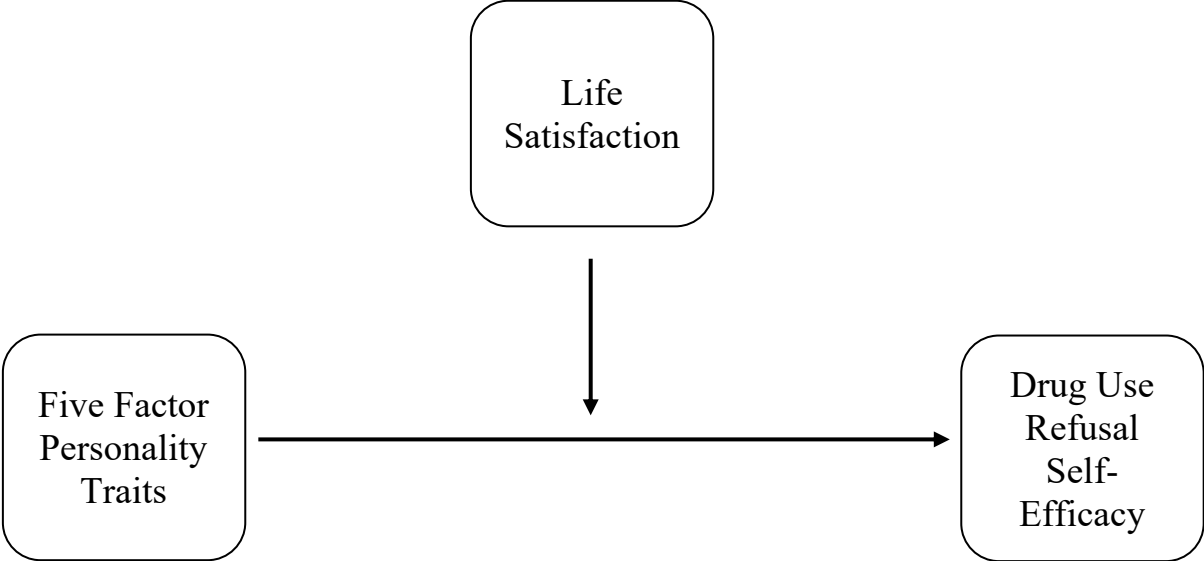
		<b>Neuroticism</b>	<b>Conscientiousness</b>	<b>Extraversion</b>	<b>Agreeableness</b>	<b>Openness</b>	<b>Life Satisfaction</b>
<b>Qualities</b>	High	impulsive, hostile, apprehensive, and pessimistic	reliable, self-disciplined, thoughtful, and efficient	gregarious, social, energetic, and high-spirited	generous, cooperative, empathetic, and trusting	imaginative, artistic, eccentric, and broad-minded	Positive evaluation of one's own life
	Low	optimistic, even-tempered, and relaxed	laxed, pleasure-seeking, and casual mannerisms	withdrawn, passive, and indifferent	confident, callous, oppositional, and exploitative	practical, habitual, and traditional	Negative evaluation of one's own life
<b>Mediation Hypotheses</b>	Path A	negatively correlated with LS	positively correlated with LS	positively correlated with LS	positively correlated with LS	positively correlated with LS	-
	Path B	-	-	-	-	-	negatively correlated with DURSE
	Path C	negatively correlated with DURSE	positively correlated DURSE	negatively correlated with DURSE	positively correlated with DURSE	negatively correlated with DURSE	-
<b>Mediation Findings</b>	Path A	positively correlated with LS	negatively correlated with LS	negatively correlated with LS	-	-	-
	Path B	-	-	-	-	-	positively correlated with DURSE
	Path C	positively correlated with DURSE	-	-	-	-	-
<b>Moderation Hypotheses</b>		As LS decreases, the relationship between the FFM traits and DURSE will be stronger					
<b>Moderation Findings</b>		-	-	LS significantly moderated the relationship between E and DURSE*	-	-	-

*Note.* LS = life satisfaction. DURSE = drug use refusal self-efficacy. FFM = five-factor model. \*At -1 SD (or low levels of life satisfaction), there was a negative relationship between extraversion and drug use refusal self-efficacy. At mean levels of life satisfaction there was not a significant relationship between extraversion and drug use refusal self-efficacy. At +1 SD (or high levels of life satisfaction), there was a positive relationship between extraversion and drug use refusal self-efficacy.

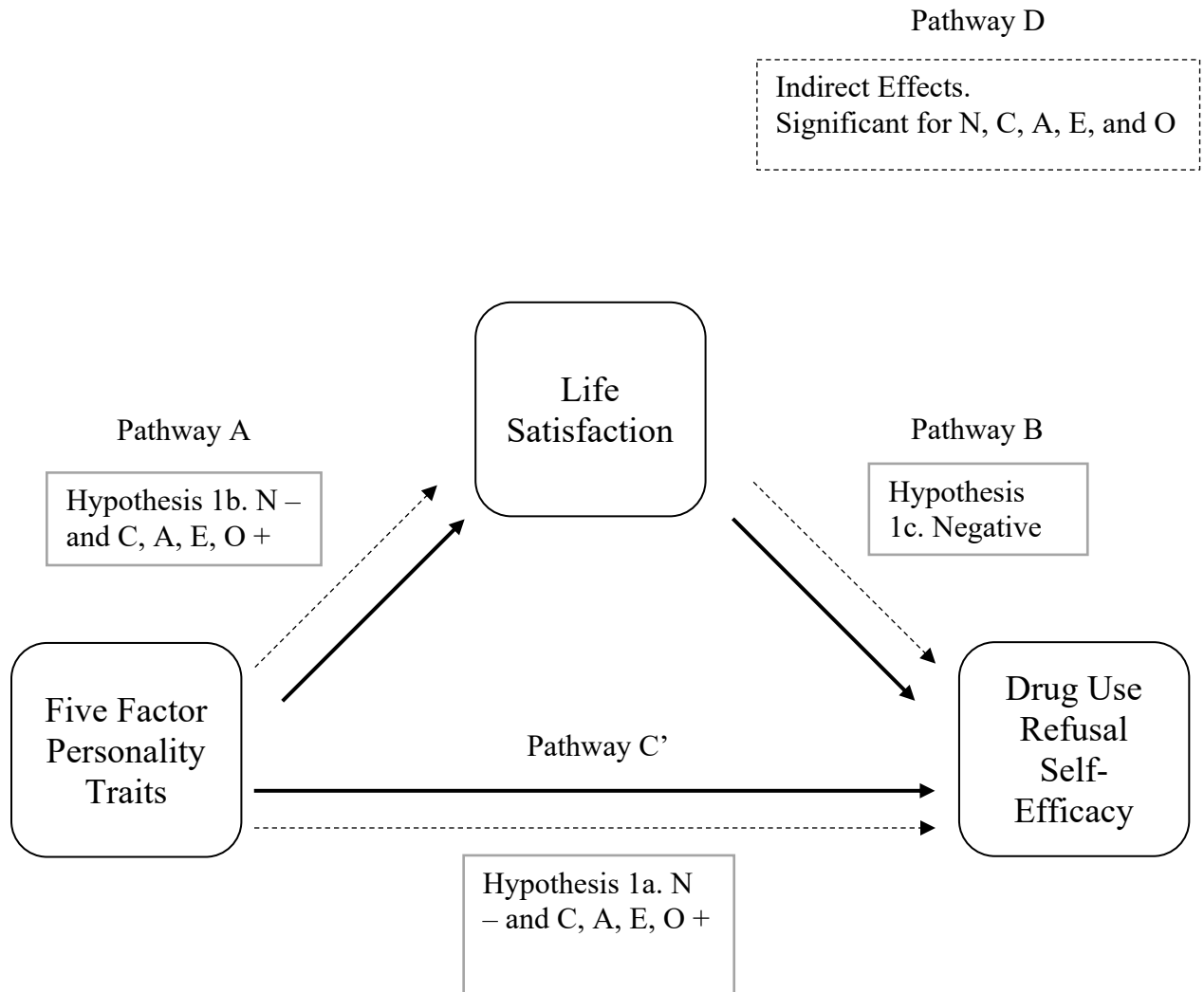
**Figure 1.** Proposed mediation model.



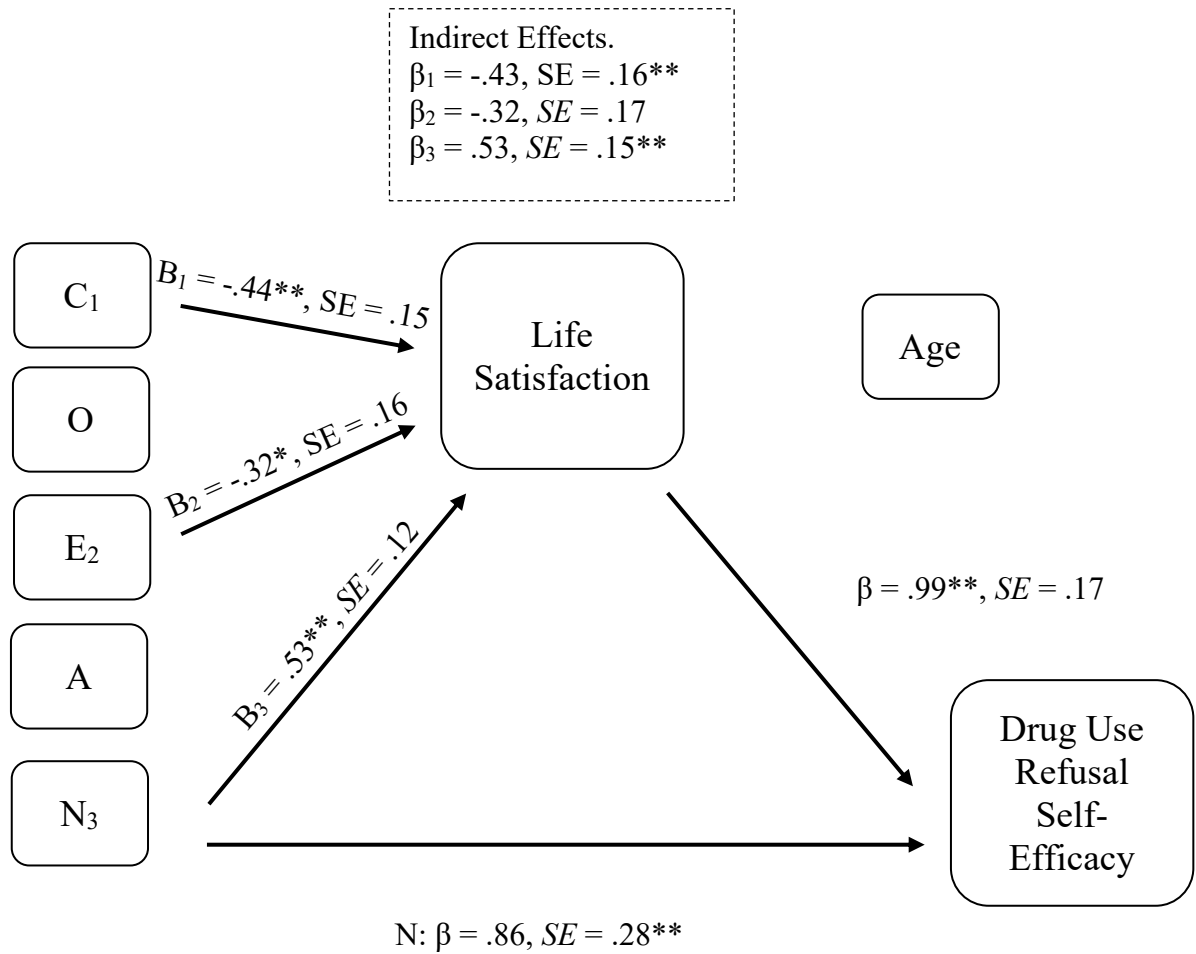
**Figure 2.** Proposed moderation model.



**Figure 3.** Hypothesis 1. Proposed Mediation Model.

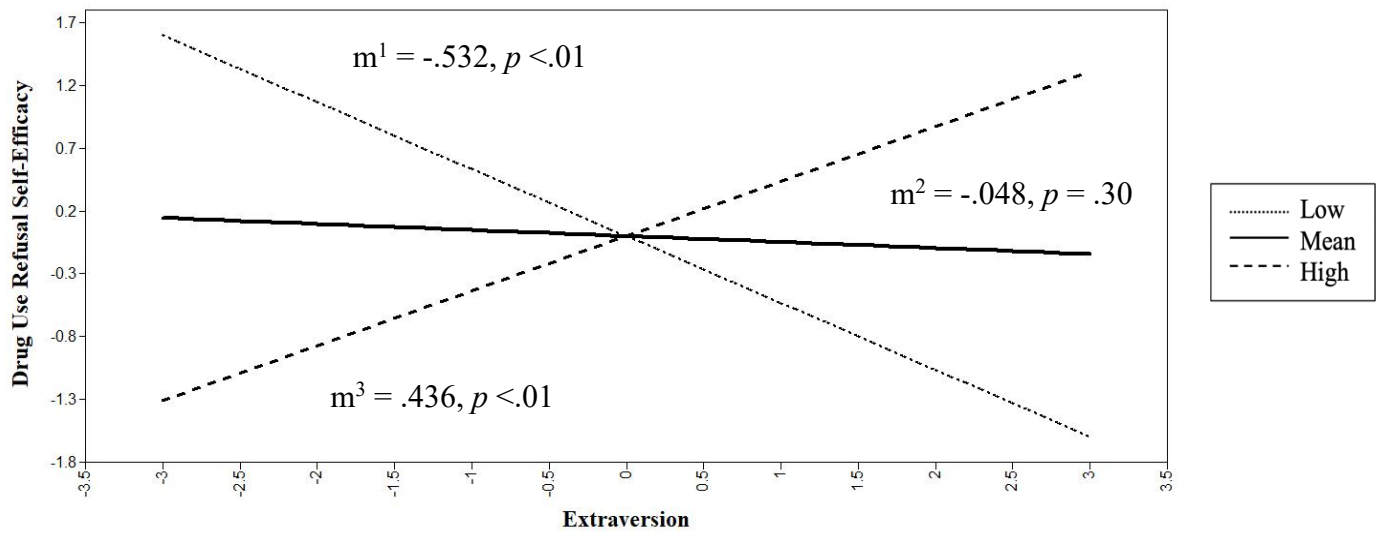


**Figure 4.** Results of Significant Pathways in the Final Mediation Model.



*Note.* All relationships between the independent variables and dependent variable through the mediator are modeled. The direct relationship between age and the dependent variable is also modeled. For clarity, only significant relationships are included in the figure. See table 6 for all significant and non-significant relationships of the mediation model. Dotted lines represent indirect effects. \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$

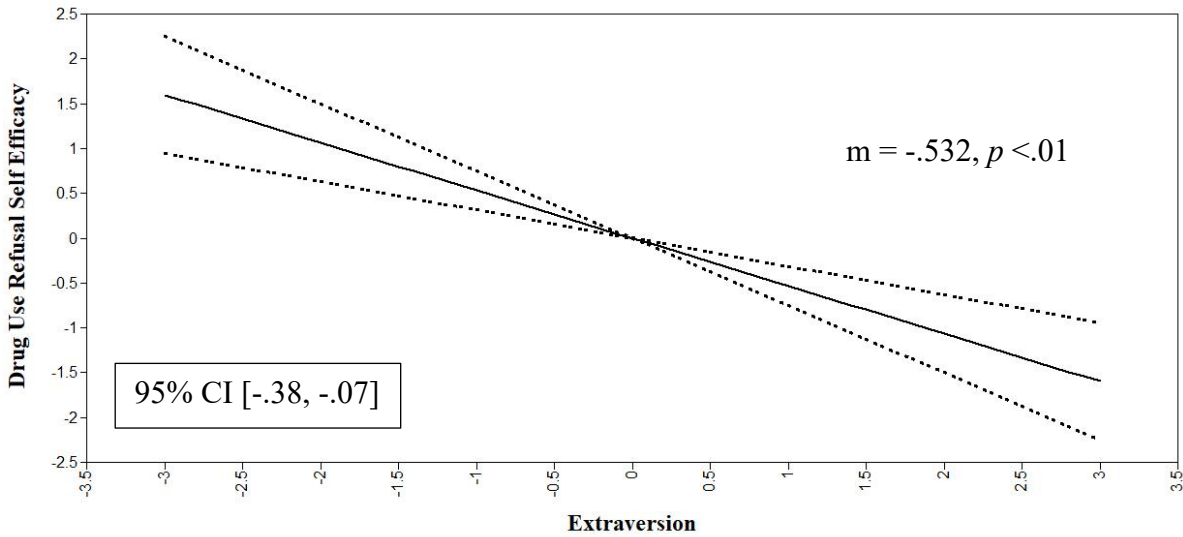
**Figure 5.** Interaction Effect: The Relationship between Extraversion and Drug Use Refusal Self-Efficacy as Moderated by Life Satisfaction



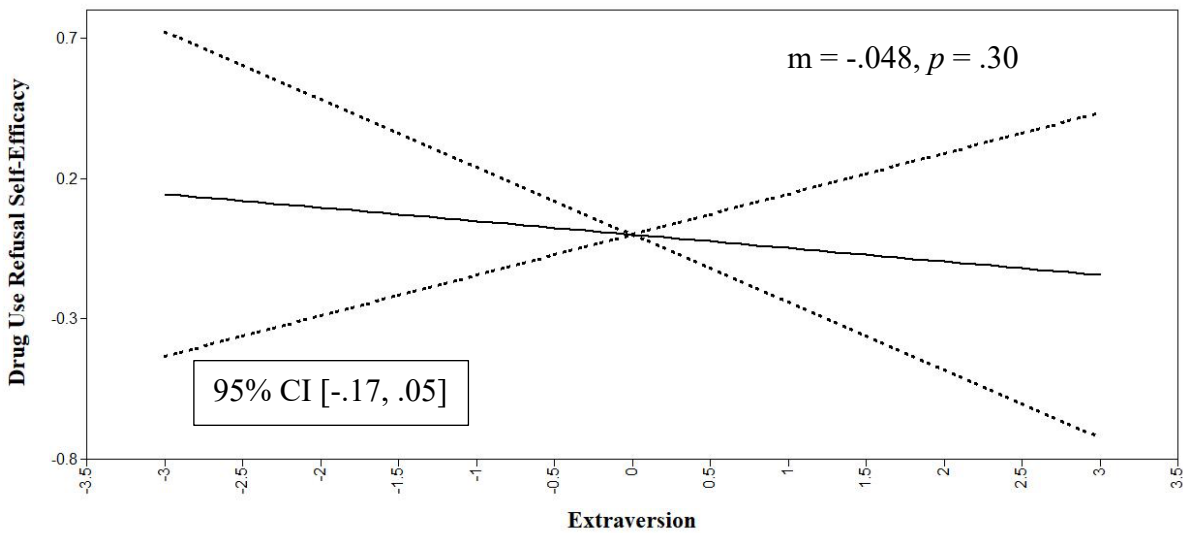
*Note.*  $m$  = slope of the line. This figure represents the moderating effects of life satisfaction on extraversion and drug use refusal self-efficacy at three levels.<sup>1</sup>Represents the relationship between extraversion and drug use refusal self-efficacy at -1 SD life satisfaction. <sup>2</sup>Represents the relationship between extraversion and drug use refusal self-efficacy at mean levels of life satisfaction. <sup>3</sup>Represents the relationship between extraversion and drug use refusal self-efficacy at +1 SD life satisfaction.

**Figures 6.** Interaction Effects for the Relationship between Extraversion and Drug Use Refusal Self-Efficacy across Life Satisfaction by Level with Confidence Intervals

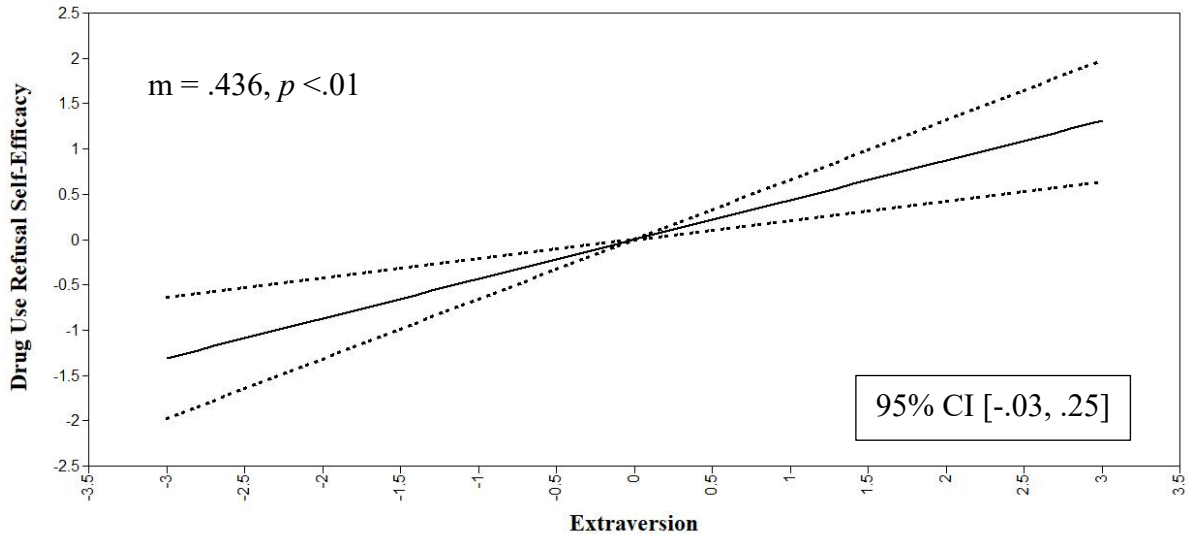
**Figure 6A.** *Low Level (-1 SD) of Life Satisfaction.*



**Figure 6B.** *Mean Level of Life Satisfaction.*



**Figure 6C.** *High Level (+1 SD) of Life Satisfaction.*



*Note.* Dotted lines represent confident intervals (95% CIs). Solid line represents the relationship between extraversion and drug use refusal self-efficacy different levels of life satisfaction. Top panel: at low level (- 1 SD) of life satisfaction, slope of the line = -0.532,  $p < .01$ . Middle panel: at mean levels of life satisfaction, slope of the line = -.048,  $p = .625$ . Bottom panel: at high level (+1 SD) of life satisfaction, slope of the line = .436,  $p < .01$

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## APPENDIX A

### Five Factor Model Rating Form

Please describe yourself on a 1 to 5 scale on each of the following 30 personality traits, where 1 is extremely low (i.e., extremely lower than the average person), 2 is low, 3 is neither high nor low (i.e., does not differ from the average person), 4 is high and 5 is extremely high. Use any number from 1 to 5. Please provide a rating for all 30 traits.

For example on the first trait (anxiousness), a score of 1 would indicate that you think you are extremely low in anxiousness (i.e., relaxed, unconcerned, cool). A score of 2 would indicate that you think you are low in anxiousness (lower than the average person, but not extremely low). A score of 5 would indicate that you think you are extremely high in anxiousness (i.e., fearful, apprehensive); a score of 4 would indicate you think you are higher than the average person in anxiousness, but not extremely high. A score of 3 would indicate that you think you are neither high nor low in anxiousness (does not differ from the average person) or that you are unable to decide.

**5= Extremely high      4= High      3= Neither high nor low      2= Low      1=Extremely Low**

#### Neuroticism versus Emotional Stability:

1. <b>Anxiousness</b> (fearful, apprehensive)	5	4	3	2	1	(relaxed, unconcerned, cool)
2. <b>Angry Hostility</b> (angry, bitter)	5	4	3	2	1	(even-tempered)
3. <b>Depressiveness</b> (pessimistic, sad)	5	4	3	2	1	(optimistic)
4. <b>Self-consciousness</b> (timid, embarrassed)	5	4	3	2	1	(self-assured, glib, shameless)
5. <b>Impulsivity</b> (tempted, impulsive)	5	4	3	2	1	(controlled, restrained)
6. <b>Vulnerability</b> (helpless, fragile)	5	4	3	2	1	(clear-thinking, fearless, unflappable)

#### Extraversion versus Introversion:

7. <b>Warmth</b> (friendly, affectionate, attached)	5	4	3	2	1	(cold, distant, indifferent)
8. <b>Gregariousness</b> (sociable, outgoing)	5	4	3	2	1	(withdrawn, isolated)
9. <b>Assertiveness</b> (dominant, forceful)	5	4	3	2	1	(unassuming, quiet, resigned)
10. <b>Activity</b> (vigorous, energetic, active)	5	4	3	2	1	(passive, lethargic)
11. <b>Excitement-Seeking</b> (reckless, daring)	5	4	3	2	1	(cautious, monotonous, dull)
12. <b>Positive Emotions</b> (high-spirited)	5	4	3	2	1	(placid, few positive emotions)

#### Openness versus Closedness to one's own Experience:

13. <b>Fantasy</b> (dreamer, unrealistic, imaginative)	5	4	3	2	1	(practical, concrete)
14. <b>Aesthetics</b> (unusual interests, artistic)	5	4	3	2	1	(no artistic interests)
15. <b>Feelings</b> (self-aware, emotional)	5	4	3	2	1	(restrained, unaware, unemotional)
16. <b>Actions</b> (unconventional, eccentric)	5	4	3	2	1	(routine, predictable, habitual, stubborn)
17. <b>Ideas</b> (strange, odd, peculiar, creative)	5	4	3	2	1	(pragmatic, rigid)
18. <b>Values</b> (tolerant, broad-minded)	5	4	3	2	1	(traditional, inflexible, dogmatic)

#### Agreeableness versus Antagonism:

19. <b>Trust</b> (gullible, naïve, trusting)	5	4	3	2	1	(skeptical, cynical, suspicious, paranoid)
20. <b>Straightforwardness</b> (confiding, honest)	5	4	3	2	1	(cunning, manipulative, deceptive)
21. <b>Altruism</b> (generous, giving)	5	4	3	2	1	(stingy, selfish, greedy, exploitative)
22. <b>Compliance</b> (obedient, cooperative)	5	4	3	2	1	(oppositional, combative, aggressive)
23. <b>Modesty</b> (meek, modest, humble)	5	4	3	2	1	(confident, boastful, arrogant)
24. <b>Tender-Mindedness</b> (soft, empathetic)	5	4	3	2	1	(tough, callous, ruthless)

#### Conscientiousness versus Undependability:

25. <b>Competence</b> (perfectionistic, efficient)	5	4	3	2	1	(lax, negligent)
26. <b>Order</b> (ordered, methodical, organized)	5	4	3	2	1	(haphazard, disorganized, sloppy)
27. <b>Dutifulness</b> (rigid, reliable, dependable)	5	4	3	2	1	(casual, undependable, unethical)
28. <b>Achievement</b> (workaholic, ambitious)	5	4	3	2	1	(aimless, unfocused)

<b>29. Self-Discipline</b> (dogged, devoted)	5	4	3	2	1	(pleasure-seeking, self-indulgent)
<b>30. Deliberation</b> (cautious, thoughtful)	5	4	3	2	1	(hasty, careless, rash)

## APPENDIX B

### Drug use Refusal Self-efficacy scale

The following items ask you to indicate triggers for drug use. Using the rating scale below, please indicate the number that best describe HOW MUCH YOU COULD RESIST USING in each case.

**1=This is a very strong trigger for me.  
for me.**

**6=This is not at all a trigger**

1	2	3	4	5	6
I am very sure I would use.	I most likely would use.	I probably would use.	I probably would not use.	I most likely would not use.	I am very sure I would not use.

1. When I am angry
2. When I'm really excited
3. When someone offers me a drug/drink
4. When I'm at a social occasion
5. When I feel frustrated
6. When I am worried
7. When I feel upset
8. When I feel happy
9. When I'm partying
10. When I'm tired
11. When my partner/spouse is using
12. When I'm celebrating
13. When I'm overwhelmed
14. When my friends are using
15. When I am by myself
16. When I am at a bar or club

## APPENDIX C

### General Life Satisfaction – Short Form 5a

Please respond to each question or statement by marking one box per row.

Indicate how much you agree or disagree...		Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
PA045m	In most ways, my life is close to perfect .....	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
PA046	If I could live my life over, I would change almost nothing .....	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
PA047	I am satisfied with my life.....	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
PA048	So far I have gotten the important things I want in life.....	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
PA049m	My life situation is excellent .....	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7