Personality and Alcohol, Marijuana, and Simultaneous Polydrug Use in Undergraduate Students

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Acknowledgments

I would like to thank the members of the SURG lab, in particular Ms. Suzanne Chomycz, Ms. Alexandra Kruse, Ms. Nicole Poirier, and Ms. Sarah Sinclair, for their constructive criticism, assistance with data collection, feedback on presentations, draft editing, support, and encouragement throughout the year. I would also like to thank Ms. Kimberly Ongaro and Ms. Allie Popowich for their moral support, advice, and friendship this year. I wish to acknowledge the support and encouragement of my parents throughout these four years and especially this past year. Finally, I would like to offer my special thanks to Dr. Mushquash, for helping me become a better student and researcher through his endless patience, encouragement, and guidance; thank you!

Abstract

This study examined the association between personality traits (i.e., anxiety sensitivity, hopelessness, sensation seeking, and impulsivity), drug use (i.e., alcohol, marijuana, and simultaneous polydrug use), and drug-related consequences in undergraduate students (e.g., academic impairment, being involved in a motor vehicle accident, and interpersonal problems). It was hypothesized that individuals who engage in simultaneous polydrug use (using alcohol and marijuana in close proximity) would have higher levels of sensation seeking and impulsivity compared to individuals who use one substance, and that simultaneous polydrug users would experience more drug-related consequences compared to individuals who use one substance. The sample consisted of 196 undergraduate students (166 females), with a mean age of 21.61 years (*SD* = 4.96), and the mean university level being 3rd year. Sensation seeking and impulsivity were found to significantly predict heavy episodic drinking. Sensation seeking and impulsivity were not found to have a significant relationship with polydrug or marijuana use. Within the past three years, alcohol-related consequences were significantly higher than polydrug-related consequences; marijuana-related consequences were significantly lower than alcohol-related consequences, and polydrug-related consequences were significantly lower than marijuana-related consequences. Within the past seven days, alcohol-related consequences were not significantly higher than marijuana-related consequences, alcohol-related consequences were significantly higher than polydrug-related consequences, and marijuana-related consequences were not significantly higher than polydrug-related consequences. The results from this study have the potential for substance use prevention and early intervention programs that address specific personality and drug use patterns, to be made.

Keywords: heavy episodic drinking, marijuana, personality traits, simultaneous polydrug use

Personality and Alcohol, Marijuana, and Simultaneous Polydrug Use in Undergraduate Students

Alcohol is the most frequently used drug among undergraduate students with 85.7% reporting drinking in the past year and 77.1% reporting drinking over the past 30 days (Adlaf, Demers, & Gliksman, 2005). Differences in drinking behaviour were found over the past year with respect to year level, in that the higher the year level, the greater the number of students drank; 82.3% of first year students compared to 88.9% of fourth year students (Adlaf et al., 2005). It is common for undergraduate students to engage in harmful and hazardous drinking patterns, which is known as heavy episodic drinking (HED). Heavy episodic drinking is defined as the consumption of four or more drinks for women on one occasion and five or more drinks for men on one occasion (Wechsler, Lee, Kuo, & Lee, 2000). For example, 19% of Canadian undergraduate students have reported consuming five or more drinks on a single occasion at least once every two weeks or more, while six percent have reported eight or more drinks on a single occasion, once every two weeks or more (Adlaf et al., 2005). Forty-three percent of undergraduate students report any past-year HED, compared to 38.1% of the general population (i.e., those not attending university or college), and 23.7% of undergraduate students drank heavily more than once a month, compared to 19.8% of the general population (Dawson, Grant, Stinson, & Chou, 2004). Various demographic and social factors are related to an increased risk of engaging in HED, such as being Caucasian, being single, having a parent who drank, or using marijuana and tobacco (Wechsler, Dowdall, Davenport, & Castillo, 1995). Males are also more likely to report this style of drinking compared to females (Adlaf et al., 2005).

Alcohol dependence has also been found among undergraduate students, with 30-40% reporting at least one symptom of alcohol dependence, based on the Diagnostic and Statistical Manual of Mental Disorders fourth edition text revision criteria (DSM-IV-TR; American

Psychiatric Association, 2000; Adlaf et al., 2005; Knight et al., 2002). Risky behaviours that are predictive of future alcohol dependency issues include drinking 10 or more times per month, becoming intoxicated three or more times per month, experiencing alcohol-related issues, and having used marijuana in the past 30 days (Knight et al., 2002).

Negative Consequences Associated with Heavy Episodic Drinking

Individuals who engage in HED are four to 15 times more likely to experience consequences as a result of their drinking compared to individuals who do not engage in HED (Wechsler et al., 2000). There is a relationship between mental health problems and alcohol use in undergraduate students. For example, 29% of males and 31% of females who engaged in HED have reported memory loss (Wechsler & Isaac, 1992). Heavy episodic drinking can also lead to a decreased reaction time (Ontario Public Health Association, 2003). Brain development continues into the 20s, so drinking heavily as an undergraduate can have negative impacts on brain processes such as executive functioning (e.g., paying attention and making decisions), processing emotions, and controlling impulses (Nova Scotia Department of Health and Wellness, 2012).

Heavy episodic drinking is also associated with physical harms, which can range from suffering a hangover, being a passenger with a driver who is under the influence, to being involved in a motor vehicle accident (Comeau, Stewart, & Loba, 2001; Paglia-Boak, Adlaf, & Mann, 2011; Perkins, 2002). Other physical consequences related to HED can include "black-outs", nausea, vomiting, and alcohol poisoning (Perkins, 2002). Since alcohol decreases an individual's inhibition, engaging in sexual relations after consuming alcohol is also common among undergraduate students. For example, one third of male and one quarter of female undergraduates have reported unplanned sexual activity after engaging in HED (Wechsler & Isaac, 1992). The risk of contracting a sexually transmitted disease is also increased for students

who consume alcohol prior to engaging in intercourse, with 70% of undergraduate students reporting that they were less likely to use condoms after consuming alcohol and then engaging in intercourse (Poulson, Eppler, Satterwhite, Wuensch, & Bass, 1998).

Undergraduate students may also experience social harms, which include school-related harms. Eighteen percent of students in university reported that they missed class due to a hangover, 24% missed class due to drinking, and 20% reported falling behind in schoolwork because of drinking (Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998). Other consequences related to HED include legal repercussions, for example, five to 15% of those who engaged in HED reported getting into trouble with campus or local police, and 60% have reported damaging property (Wechsler & Isaac, 1992; Wechsler et al., 1998). Undergraduate students also experience interpersonal problems, for example 12.9% of undergraduate students reported social problems related to alcohol use, such as fighting with friends and family (Hagman & Cohn, 2011).

Marijuana Use

While alcohol is the most commonly used legal drug among undergraduate students, marijuana is the most commonly used illegal drug; 51% of undergraduates reported lifetime use, 32% used during the past 12 months, 16% used during the past 30 days, and 14% reported daily marijuana use (Adlaf et al., 2005; Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007). Differences in marijuana use have been found with regards to sex, with 34.5% of men reporting marijuana use compared to 30.1% of women (Adlaf et al., 2005). First year undergraduate students who had never tried marijuana prior to attending university, have reported a 25% marijuana initiation rate (Pinchevsky et al., 2012). Reasons for initiating use during the first year

of university include peers, the widespread availability of marijuana, and increased autonomy from parents (Suerken et al., 2013).

Negative Consequences Associated with Marijuana Use

Consequences associated with marijuana use include mental health harms, such as increased rates of depression, anxiety, and insomnia (Hathaway, 2003; Patton et al., 2002). Individuals who started using marijuana at a later age (after age 20) have an increased risk of developing major depression in adulthood (Caldeira, O'Grady, Vincent, & Arria, 2012). Memory impairment and decreased motivation are short-term mental health consequences associated with marijuana use (Paglia-Boak et al., 2011). Another common consequence of marijuana use among undergraduate students is difficulty concentrating. For example 40% of first-year undergraduate students reported difficulty concentrating as the most prevalent consequence (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008).

Marijuana use has also been linked to psychotic symptoms and schizophrenia (Degenhardt & Hall, 2002). Marijuana use has been linked to the onset of psychotic symptoms in individuals who are vulnerable to developing schizophrenia and even those who are not vulnerable (Kuepper et al., 2011; van Os et al., 2002). There is a six-fold increased risk of developing psychosis in frequent marijuana users compared to controls (Miller et al., 2002). There is also an association between early-onset of psychotic symptoms and early marijuana use in sibling pairs (McGrath et al., 2010). Individuals with schizophrenia who use marijuana are more likely to experience psychotic symptoms (Degenhardt & Hall, 2002). For example, those with schizophrenia who used marijuana experienced more hallucinations, delusions, and hospitalizations than those who did not use marijuana (Degenhardt & Hall, 2002). Even after controlling for psychotic symptoms occurring before marijuana use, individuals who used

marijuana had an increased risk of exhibiting symptoms of schizophrenia (Arseneault et al., 2002). The earlier marijuana use begins (by age 15), the greater the chance of developing schizophrenia compared to later use (by age 18; Arsenault et al., 2002). This may be due to the fact that younger individuals use marijuana for a longer period of time (Arsenault et al., 2002). The risk for developing schizophrenia is specifically related to marijuana, not other drugs (Arseneault et al., 2002).

Physical, acute consequences related to marijuana use include increased risk for motor vehicle accidents and other accidental injuries (Caldeira et al., 2012). For example, driving while high was reported by one in five "at-risk" first-year undergraduate students (i.e., those who used marijuana at least five times in the past year; Caldeira et al., 2008). Long-term consequences related to marijuana use include respiratory problems and cancers in adulthood (e.g., respiratory tract cancers, such as lung, mouth, and throat; Fox, Towe, Stephens, Walker, & Roffman, 2011; Paglia-Boak et al., 2011; Tashkin, 1990). Social consequences related to marijuana use include poor interpersonal relationships (e.g., fighting with friends; Hathaway, 2003). Marijuana is also associated with school dropout, poor school performance, and academic impairment (Fox et al., 2011; Lynskey & Hall, 2000).

Simultaneous Polydrug Use

Simultaneous polydrug use is common among undergraduate students. Those who use drugs are more likely to use multiple substances compared to using a single substance (Barrett, Darredeau, & Pihl, 2006). Simultaneous polydrug use refers to when an individual administers two or more substances on one occasion and concurrent polydrug use refers to when an individual administers several drugs on separate occasions (Barrett et al., 2006; Earleywine & Newcomb, 1997; Flagler, Hughes, & Kovalesky, 1997). Theories behind simultaneous polydrug

use include additive and synergistic effects. Additive effects of polydrug use occur when the effect of one drug doubles the effect of the other (Schensul, Convey, & Burkholder, 2004). Synergistic effects of drugs used in combination occur when one drug enhances the effect of the other (Pape, Rossow, & Storvoll, 2009). Individuals may also use multiple substances to reduce undesirable effects of other drugs (Barrett et al., 2006).

Alcohol is the most commonly co-administered substance and usually precedes the administration of other drugs, while marijuana is frequently co-administered with other substances (especially proceeded by alcohol; Barrett et al., 2006). Individuals who use marijuana are more likely to co-administer with alcohol and vise versa (Barrett et al., 2006). On average, alcohol use increases when taken with marijuana (4.3 drinks when no other drug is involved compared to 6.8 drinks when marijuana is also consumed; Adlaf et al., 2005). Sex differences have also been found with males being more likely than females to use alcohol and marijuana simultaneously (Pakula, MacDonald, & Stockwell, 2009). There are also significant differences between polydrug users and single drug users. Polydrug users have been found to be significantly younger, have less education, and were more likely to be unemployed (Martinotti et al., 2009). These individuals compared to single drug users were also more likely to have experienced childhood physical neglect (Martinotti et al., 2009).

Negative Consequences Associated with Simultaneous Polydrug Use

Consequences associated with simultaneous polydrug use include mental health harms, physical harms, and social harms. Undergraduate students who engage in polydrug use have shown risky decision-making and slower reaction time (Hammers & Suhr, 2010). Individuals who use alcohol and marijuana simultaneously are also more likely to experience depressive symptoms (Midanik et al., 2007). The combination of alcohol and marijuana has been found to

pose greater health and safety risks, such as traffic accidents and overdoses, compared to when these substances are used in isolation (Earleywine & Newcomb, 1997; Martin, Clifford, & Clapper, 1992; Pakula et al., 2009). Simultaneous polydrug use can increase intoxication since combining drugs can produce unique metabolites and increase risk for injury to both the self and others (Earleywine & Newcomb, 1997). It can be difficult to predict the consequences for each individual since many factors, such as genetics, sex, and environment, are implicated. Social consequences also occur among simultaneous polydrug users. For example, the most common illegal activity among simultaneous polydrug users is stealing (Brache et al., 2012). Relationship problems also occur among polydrug users, with examples including, not being around, lying to their significant other, and hiding their substance use from their partner (Brache et al., 2012).

Personality Traits

Four personality traits (anxiety sensitivity, hopelessness, sensation seeking, and impulsivity) have been found to be related to substance misuse, particularly alcohol, but are also related to marijuana (Conrod, Castellanos-Ryan, & Strang, 2010). Anxiety sensitivity is the fear of arousal-related sensations (e.g., increase in heart rate) and beliefs that these sensations are related to physical, psychological, and social consequences (e.g., interpreting this as a heart-attack; Bonn-Miller, Zvolensky, & Bernstein, 2007; Zvolensky et al., 2009). Hopelessness is defined as having depressive and pessimistic cognitions (Conrod, Stewart, Pihl, & Dongier, 2000). Hopelessness is characterized by negative expectancies (a key feature of depression) and has been found to play a role in suicide ideation (Chioqueta & Stiles, 2004). Sensation seeking individuals have the desire for intense and novel experiences, such as riding a roller coaster, and skydiving (Comeau et al., 2001). These individuals seek thrills and strong stimuli (Magid, MacLean, & Colder, 2007). Impulsivity is defined as a lack of planning, rapid-decision making,

and having a carefree nature (Magid et al., 2007). These individuals have difficulty with delaying behavioural responses and self-regulation (Conrod et al., 2000). These personality traits have been shown to be risk factors for substance-related disorders and are associated with motives for alcohol, marijuana, or simultaneous polydrug use (Comeau et al., 2001). Therefore it is important to understand the relationship between personality traits and various substances, as this can aid with prevention, education, and treatment.

Alcohol and Personality Traits

Anxiety sensitivity is associated with increased drinking levels and problem drinking behaviour (Comeau et al., 2001). Individuals who are high in hopelessness benefit from the analgesic (pain-reducing) properties of alcohol (Conrod et al., 2000). Sensation seeking is associated with heavier drinking and drinking related consequences (Comeau et al., 2001). It is also related to increased risk taking among young adults, such as drinking and driving, unprotected sex, and experimenting with drugs (Comeau et al., 2001). Individuals who are high in sensation seeking drink to experience the euphoric and intoxicating effects of alcohol (Conrod et al., 2000). Impulsive individuals have an elevated risk for alcohol use (Conrod et al., 2000). Individuals who are heavy drinkers or alcohol dependent have increased rates of impulsive decision-making (Courtney et al., 2012).

Marijuana and Personality Traits

There is mixed literature regarding anxiety sensitivity and marijuana use. For example, one study found that individuals who are high in anxiety sensitivity use marijuana to cope with their distressing symptoms (Zvolensky et al., 2009). Using marijuana to cope has been found to be associated with marijuana-related consequences as well as dependence (Fox et al., 2011). Other studies have noted that there is a negative correlation between marijuana use and anxiety

sensitivity, suggesting that those who are high in anxiety sensitivity will be less likely to use marijuana (Stewart, Samoluk, & MacDonald, 1999). Hopelessness is associated with lifetime marijuana use and dependence problems (Fox et al., 2011; Jaffee & D'Zurilla, 2008). Marijuana users scored higher on four subscales (thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility) of a measure of sensation seeking compared to non-users (Satinder & Black, 1984). Impulsivity has been found among frequent marijuana users and is related to marijuana-related problems (i.e., procrastination, lower energy, and medical problems; Day, Metrik, Spillane, & Kahler, 2013; Hogan, Mankin, Conway, & Fox, 1970). It has been suggested that individuals high in impulsivity may use marijuana because it is easily available and to relieve negative affect quickly by coping with these feelings in a short-term manner (Hecimovic, Barrett, Darredeau, & Stewart, 2013). This is consistent with evidence that suggests that individuals who are impulsive have difficulty in delaying gratification and enjoy immediate rewards.

Simultaneous Polydrug Use and Personality Traits

Literature with regards to anxiety sensitivity and simultaneous polydrug use is extremely sparse. There is an association between polydrug use and hopelessness (Malmberg et al., 2010). For example, individuals who are high in hopelessness are more likely to start using marijuana and alcohol together at an earlier age (Malmberg et al., 2010). Simultaneous polydrug abusers have been shown to have increased levels of impulsivity and sensation seeking (Conway, Kane, Ball, Poling, & Rounsaville, 2003). There is an association between sensation seeking and simultaneous polydrug use among undergraduate students as well, suggesting that these individuals find using and combining multiple substances a novel experience (Malmberg et al., 2010; Martin et al., 1992). These individuals are at an increased risk because individuals high in

sensation seeking experience more pleasure and reinforcement when they combine drugs, compared to other individuals (Martin et al., 1992). Impulsivity has been shown to be a predictor for substance use (Conrod et al., 2010). Individuals who are impulsive are more likely to use substances that effect dopaminergic activity, such as administering alcohol and marijuana together (Conrod et al., 2010).

Gaps in Literature

Most studies have also only focused on adolescents or substance dependent adults, and not undergraduate students (Comeau et al., 2001; Conway et al., 2003; Cooper, 1994). Most studies have solely looked at single substance use; however, substances are often co-administered (Pakula et al., 2009). Few studies have examined the consequences related to simultaneous polydrug use (Earleywine & Newcomb, 1997). Some studies have also only focused on motives and not personality (Arbeau, Kuiken, & Wild, 2011).

Current Study

The current study will help clarify the relationship between single drug use (using solely alcohol or marijuana), polydrug use (co-administering alcohol and marijuana), and personality traits. It is hypothesized that simultaneous polydrug users will report higher sensation seeking and impulsivity compared to single drug users, and that polydrug users will report more substance-related consequences compared to single drug users.

Method

Participants

The sample consisted of 196 undergraduate students (166 females) from Lakehead University. Participants were required to be fluent in English and be at least 18 years old. The

mean age of this sample was 21.61 (*SD* = 4.96), and with the mean university level being 3rd year. The mean age of students' first drink was 14.88 (*SD* = 2.18).

Measures

Demographic information was collected from participants, which included age, sex, ethnicity, as well as relationship status, occupation, family income, and year of study in university.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA; NIAAA, 2003). The National Institute on Alcohol Abuse and Alcoholism is a five-item measure that assesses the participant's consumption of alcohol. This measure includes information that defines one drink as one 12 ounce bottle of beer, one five ounce glass of wine, a half ounce shot of liquor, or one 12 ounce glass of a mixed drink or cocktail. The NIAAA assesses whether the participant has ever had a drink of alcohol in their life, how often during the past 12 months they consumed alcohol, the maximum number of drinks that they drank in a 24-hour period in their lifetime, the number of alcoholic drinks consumed on a typical day during the past 12 months, and how often they consumed five or more drinks (if they are male), or four or more drinks (if they are female) within a two-hour time-frame during the past 12 months.

The National Institute on Alcohol Abuse and Alcoholism-Heavy Episodic Drinking (NIAAA-HED; NIAAA, 2003). The National Institute on Alcohol Abuse and Alcoholism-Heavy Episodic Drinking was developed from the original NIAAA measure and asks how often during the past seven days an individual consumed four or more drinks (female) or five or more drinks (male) during a two-hour period, rated on a 12-point scale ranging from 1 (*0 times*) to 12 (*eleven or more times*).

Heavy Episodic Drinking Severity (HED-S; Mushquash et al., 2013). The Heavy Episodic Drinking Severity is a single item measure that asks "What is the greatest number of drinks you consumed in a two-hour period in the past seven days?"

The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). The Rutgers Alcohol Problem Index is a 23-item questionnaire that measures consequences associated with drinking. This questionnaire measures consequences within the past three years and within the past seven days. Questions measure such consequences as "Not able to do your homework or study for a test", "Caused shame or embarrassment to someone", "Tried to cut down or quit drinking", and "Passed out or fainted suddenly". Response options range from 0 (none) to 4 (three or more times), and a total RAPI score is calculated by adding all items responses. There is a moderate correlation between the RAPI and use intensity, providing good convergent validity (White & Labouvie, 1989). Internal consistency scores range from .98 at time one and .97 the second time administered (White & Labouvie, 1989).

The National Institute on Alcohol Abuse and Alcoholism-Marijuana (NIAAA-M; NIAAA, 2003). The National Institute on Alcohol Abuse and Alcoholism-Marijuana scale was developed from the original NIAAA. This measure includes information that defines cannabis as marijuana, grass, pot, hashish, bubble hash, oil, resin, weed, and chronic. The NIAAA-M assesses whether the participant has ever used marijuana, how often during the past 12 months the individual usually engaged in marijuana use (ranging from "not engaging in marijuana use in the past year, but engaging in marijuana use in the past" to "every day"), and how much marijuana was consumed on a typical day during the past 12 months.

The Rutgers Marijuana Problem Index (RMPI; White & Labouvie, 1989). The Rutgers Marijuana Problem Index was developed from the original RAPI and is a 23-item

questionnaire that measures consequences related to marijuana use. This questionnaire measures consequences within the past three years and within the past seven days. Questions measure such consequences as "Wanted to stop using marijuana but couldn't", "Felt you were going crazy", "Noticed a change in your personality", and "Neglected your responsibilities". Response options range from 0 (none) to 4 (three or more times), and a total RMPI score is calculated by adding all items responses.

The National Institute on Alcohol Abuse and Alcoholism-Simultaneous Polydrug Use (NIAAA-SPU; NIAAA, 2003). The National Institute on Alcohol Abuse and Alcoholism-Simultaneous Polydrug Use scale was developed from the original NIAAA. The NIAAA-SPU assesses whether an individual has co-administered marijuana during a session in which alcohol was used (same time or close proximity) in the past 12 months, how often marijuana was co-administered with alcohol over the past 12 months, the typical order of administration in the past 12 months, and the typical time span of simultaneous polydrug (marijuana and alcohol) use in the past 12 months.

The Simultaneous Polydrug Use Problem Index (SPUPI; White & Labouvie, 1989). The Simultaneous Polydrug Use Problem Index was developed from the RAPI and is a 23-item questionnaire that measures the consequences associated with the co-administration of alcohol and marijuana. This questionnaire measures consequences within the past three years and within the past seven days. Questions measure such consequences as "Got into fights with other people (friends, relatives, strangers)", "Relatives avoided you", and "Felt that you needed more alcohol and marijuana than you used to in order to get the same effect".

The Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009). The Substance Use Risk Profile Scale is a 23-item scale that measures risky personality traits for substance

misuse. The SURPS contains four subscales (i.e., anxiety sensitivity [five items; e.g., "It's frightening to feel dizzy or faint"], hopelessness [seven items; e.g., "I feel that I'm a failure"], sensation seeking [six items; e.g., "I would like to learn how to drive a motorcycle"], and impulsivity [five items; e.g., "I often don't think things through before I speak"]). Responses are rated on a five-point Likert-type scale, ranging from "strongly agree" to "strongly disagree". The SURPS has proven to have good internal reliability, producing correlations of .68 (anxiety sensitivity), .85 (hopelessness), .88 (sensation seeking), and .75 (impulsivity; Woicik et al., 2009). The SURPS has also shown good convergent validity (i.e., .73 correlation between the hopelessness subscale of the SURPS and hopelessness from the Beck Hopelessness Scale), and discriminant validity (i.e., .16 correlation between hopelessness subscale of the SURPS and anxiety sensitivity from the Addiction Severity Index; Woicik et al., 2009).

Procedure

Participants were recruited by placing posters throughout the Lakehead University campus and emails were sent to classes with relevant information regarding the online survey (SurveyMonkey). Students had the opportunity to earn one bonus point towards their psychology course or be entered into a draw to win $100 in exchange for their participation. The consent form indicated that participation was voluntary and that information would remain anonymous (their name would not be linked to their survey responses). The consent form also informed participants that they could withdraw from the study at any point. Once the survey was completed, a debriefing form was provided for participants, which was linked to a separate page to obtain their contact information (for their bonus point or be entered into the draw). Participants' contact information was on a separate page so it was not linked to their questionnaire responses.

Results

Heavy Episodic Drinking

One hundred and eighty nine participants reported that they have had a drink in their lifetime (with two missing responses). The average age of first drink of alcohol was 14.88 (*SD* = 2.18), ranging from two to 19 years old, however only 116 participants reported their age of first drink. The reported average amount of times any type of alcohol was consumed in the past year was two to three times per month (*M* = 6.19, *SD* = 2.06). The average maximum amount of drinks consumed in a 24-hour period during their lifetime, was eight to 11 drinks. The mean number of drinks consumed during a typical day of drinking within the past 12 months was five to six drinks (*M* = 7.61, *SD* = 1.69). Participants reported engaging in HED an average of one day per month (*M* = 7.19, *SD* = 1.84). The average amount of times that a female engaged in HED during the past seven days was 0 times (*M* = 1.43, *SD* = .82). The average amount of times that a male engaged in HED in the past seven days was one time (*M* = 1.74, *SD* = 1.48).

Marijuana Use

One hundred and twenty participants have used marijuana in their lifetime. The average age of initial marijuana use was 16.24 (*SD* = 2.02), ranging from 12-21 years old; however only 89 participants reported initial marijuana use. The reported average amount of times marijuana was used in the past year was once a week (*M* = 5.68, *SD* = 2.01). The average maximum amount of marijuana used in a 24-hour period during their lifetime was 2.67 grams or joints (*SD* = 3.16). The average amount of marijuana consumed on a typical day in the past year was once or twice a week (*M* = 4.58, *SD* = 2.53).

Simultaneous Polydrug Use

Fifty-seven participants (with 73 missing responses) reported that they, on average, rarely co-administered marijuana during a session in which alcohol was used and in close temporal proximity during the past year ($M = 4.17$, $SD = 1.13$). Participants reported that, on average, they have co-administered alcohol and marijuana in the past 12 months once a month ($M = 2.72$, $SD = 1.24$). Forty-five participants reported that they first drank alcohol then smoked marijuana, and eight individuals reported that they smoked marijuana first then consumed alcohol.

Personality Traits

Anxiety sensitivity, hopelessness, sensation seeking, and impulsivity were measured among participants. The mean score of the anxiety sensitivity subscale was 14.73 ($SD = 3.56$). The mean hopelessness score was 15.72 ($SD = 3.63$); the mean score for the sensation seeking subscale was 16.14 ($SD = 4.71$). Lastly, the mean impulsivity score was 17.65 ($SD = 3.68$), making this the most prevalent of the personality traits among this sample.

Personality Traits and Drug Use

Linear regression analyses were performed to predict the relationship between personality traits, specifically sensation seeking and impulsivity, and simultaneous polydrug users in comparison to single drug users. For the models, sensation seeking and impulsivity, along with sex, were entered and compared to type of drug user (alcohol, marijuana, and polydrug). Results of the analyses are displayed in Table 1. Sensation seeking and impulsivity were found to significantly predict HED. Sensation seeking and impulsivity were not found to have a significant relationship with marijuana use or polydrug use.

Drug-related consequences

One sample t-tests were performed to examine the relationship between drug use (i.e., single drug and polydrug) and drug-related consequences. With regards to the past three years, marijuana-related consequences were significantly lower than alcohol-related consequences, $t(119) = -4.32$, $p < .001$, $d = -3.79$, 95% CI [-5.52, -2.05]. Alcohol-related consequences within the past three years were significantly higher than polydrug-related consequences, $t(187) = 8.52$, $p < .001$, $d = 5.69$, 95% CI [4.38, 7.01]. Polydrug-related consequences within the past three years were significantly lower than marijuana-related consequences, $t(116) = -3.66$, $p < .001$, $d = -1.91$, 95% CI [-2.94, -.88]. With regards to the past seven days, alcohol-related consequences were not significantly higher than marijuana-related consequences, $t(186) = 1.23$, $p = n.s.$, $d = .58$, 95% CI [-.35, 1.50]. Alcohol-related consequences within the past seven days were significantly higher than polydrug-related consequences, $t(186) = 2.92$, $p < .001$, $d = 1.37$, 95% CI [.45, 2.29]. Marijuana-related consequences within the past seven days were not significantly higher than polydrug-related consequences, $t(119) = 1.59$, $p = n.s.$, $d = .79$, 95% CI [-.19, 1.78].

Discussion

The present study aimed to determine the relationships between the personality traits (specifically sensation seeking and impulsivity) and simultaneous polydrug use in comparison to single drug use. Inconsistent with the first hypothesis (that polydrug users would experience greater levels of sensation seeking and impulsivity compared to single drug users), sensation seeking and impulsivity were not predictive of simultaneous polydrug use among undergraduate students. Sensation seeking and impulsivity were also not predictive of marijuana use, but were predictive of HED.

There are several potential explanations as to why sensation seeking and impulsivity were not predictive of polydrug use. First, fewer individuals engaged in simultaneous polydrug use (co-administering alcohol and marijuana) in comparison to those who engaged in single drug use (administering only alcohol or marijuana). For example, only 57 participants reported that in the past 12 months they have co-administered marijuana during a session in which alcohol was used (i.e., at the same time or in close temporal proximity), whereas 189 participants consumed alcohol and 120 participants have used marijuana in the past 12 months. Participants reported engaging in simultaneous polydrug use less frequently compared to engaging in single drug use. For example, participants reported engaging in polydrug use on average once a month in the past 12 months in comparison to participants who reported using alcohol on average two to three times a month and using marijuana once a week in the past 12 months. This is interesting because research has found that when individuals use substances, they are more likely to use multiple substances compared to just one (Barrett et al., 2006). Another study also found that in about 80% of all events, marijuana and alcohol are used together among young adults (Pape et al., 2009).

Secondly, the reason fewer participants engaged in polydrug use compared to those who solely used alcohol or marijuana may be due to the fact that the sample consisted of mainly females and research has shown that males are more likely than females to engage in simultaneous polydrug use (Pakula et al., 2009). Since the current study consisted of a relatively homogenous group of mostly white females of high socio-economic status in the third year of an undergraduate degree, it was not representative of polydrug users who are more likely to be unemployed, younger, and have less education (Martinotti et al., 2009).

Thirdly, there were 73 missing responses with regards to the co-administration of alcohol and marijuana in the past 12 months. These missing responses may have affected the results. Individuals may have been too embarrassed to report how often they co-administered alcohol and marijuana, were unsure how much they have co-administered in the past 12 months, or skipped the question because they have not co-administered alcohol and marijuana ever or in the past 12 months. Consistent with this, studies have found that students underreport their use of simultaneous polydrug use (Barrett et al., 2006; Pakula et al., 2009).

Fourthly, sensation seeking and impulsivity were not predictive of polydrug use, which may have been because the mean score was greatest for alcohol use and the least for polydrug use, and for the impulsivity subscale the mean score was greatest for marijuana use and lowest for polydrug use. This does not coincide with what other studies have found, showing that polydrug users are more likely to have increased levels of sensation seeking and impulsivity compared to single drug users (Conway et al., 2003; Martin et al., 1992). Consistent with past findings, this study found that alcohol use is associated with sensation seeking and impulsivity. Individuals who are high in sensation seeking drink to experience the euphoric and intoxicating effects of alcohol, and individuals who are heavy drinkers or alcohol dependent have increased rates of impulsive decision-making (Conrod et al., 2000; Courtney et al., 2012). Also consistent with other studies, marijuana use is associated with sensation seeking and impulsivity (Day, Metrik, Spillane, & Kahler, 2013; Hogan, Mankin, Conway, & Fox, 1970; Satinder & Black, 1984).

With regards to the past three years, alcohol-related consequences were significantly higher than both polydrug and marijuana-related consequences. With regards to the past seven days, only alcohol was significantly higher than polydrug-related consequences. Inconsistent with past studies, polydrug users tend to experience more harmful drug related consequences

compared to single drug users. For example, combining drugs can produce unique metabolites and increases the risk for injury to both the self and others (Earleywine & Newcomb, 1997). The combination of marijuana and alcohol is especially dangerous, since it poses unique health and safety risks (Martin et al., 1992). On average, alcohol use actually increases when taken with marijuana (Adlaf et al., 2005). Also inconsistent with past findings is that marijuana poses the least physical and psychological harms in comparison to alcohol and polydrug-related consequences (Pape et al., 2009).

There are several reasons why polydrug users experienced less drug-related consequences compared to single drug users (especially compared to alcohol use). First, not as many participants co-administered alcohol and marijuana compared to individuals who used only alcohol or marijuana, therefore participants did not experience as many consequences with regards to polydrug use. When individuals did engage in simultaneous polydrug use, they did so less frequently than when engaging in alcohol or marijuana use, which could explain why they experienced less drug-related consequences. Since participants were on average 21 years old, this could explain why they did not engage in simultaneous polydrug use as much, since research has found that experimentation and the combining of drugs begins at an earlier age and year level (i.e., 18 years of age and first year university; Olthuis, Darredeau, & Barrett, 2013; Pinchevsky et al., 2012). On average, many consequences endorsed by the polydrug users were “none” with regards to the past three years and the past seven days. This could be because these individuals are in denial or have under-reported their polydrug-related consequences because of embarrassment, which is common with studies measuring drug use and related consequences (White & Labouvie, 1989).

These findings have important implications for intervention and prevention efforts that target simultaneous polydrug use. Programs designed to reduce drug use and their negative consequences may benefit from taking personality traits into account, especially sensation seeking and impulsivity. These two personality traits have been found to be predictors of alcohol use, and in other studies marijuana, and simultaneous polydrug use (Conrod et al., 2000; Courtney et al., 2012). Efforts to reduce simultaneous polydrug use is crucial since studies have found this type of drug use to be related to more harmful drug-related consequences compared to when drugs are used in isolation (Earleywine & Newcomb, 1997; Martin et al., 1992).

Limitations and Future Directions

One limitation of this study is the cross-sectional design that was employed. This type of design is restricted to a specific time period that might not fully capture the drinking, marijuana, and simultaneous drug use patterns that undergraduate students engage in. However, there were many measures that captured drug-using patterns, for example within the past seven days, during the past 12 months, and within the last three years. Participants might not have engaged in polydrug use as frequently (specifically the last seven days) if they were focused on their studies, therefore a longitudinal design may have captured a more accurate representation of undergraduate students. Another limitation of this study is that the sample was too narrow (i.e., mainly white females) to be generalized to all undergraduate students, especially since males are more likely to engage in simultaneous polydrug use compared to females (Pakula et al., 2009).

The current study only focused on individuals who engaged in the co-administration of marijuana and alcohol (which are the two most likely drugs to be co-administered), however, individuals also co-administer other drugs, such as tobacco, cocaine, amphetamine, and MDMA, therefore, it would be beneficial to examine all types of polydrug use (Barrett et al., 2006).

Future research should also examine the expectancies that undergraduate students have regarding drugs since it has been found to be predictive of drug use (Gaher & Simons, 2007). Investigating the context (i.e., at home alone, with friends, at school or work, and bars) that individuals engage in drug use would be useful as well, since this has been shown to be a good predictor of simultaneous polydrug use (Pakula et al., 2009). Also examining price, availability, accessibility, and the opportunity to use has been shown to be good predictors of simultaneous polydrug use (Pakula et al., 2009).

Conclusion

This study examined the relationships between undergraduate students' personality traits in relation to drug use (i.e., alcohol, marijuana, and simultaneous polydrug) and their drug-related consequences. Results found that sensation seeking and impulsivity were not predictive of marijuana or polydrug use, but were predictive of alcohol use. Polydrug-related consequences were hypothesized to be significantly higher than single drug-related consequences. It was found that polydrug-related consequences (within the past seven days) were significantly lower than alcohol and marijuana-related consequences, and (within the past three years) were significantly lower than alcohol-related consequences but not marijuana-related consequences. These findings could potentially be utilized in clinical or educational settings in order to prevent undergraduates who participate in simultaneous polydrug use and the risks associated with polydrug use and HED.

Table 1

Simple Linear Regression Analyses Predicting Personality Traits (Sensation Seeking and Impulsivity) and Drug Use

Predictors	R^2	*Adj* R^2	β	ΔR^2	ΔF	*df*
HED (NIAAA)						
Sensation Seeking (SURPS)	.045	.034	-.040*	.045	4.016	2, 170
Impulsivity (SURPS)	.058	.047	-.123**	.058	5.277	2, 170
Marijuana (NIAAA-M)						
Sensation Seeking (SURPS)	.050	.033	.217	.050	2.884	2, 109
Impulsivity (SURPS)	.037	.020	.184	.037	2.105	2, 109
Simultaneous Polydrug Use (NIAAA-SPU)						
Sensation Seeking (SURPS)	.030	-.009	-.173	.030	.467	2, 50
Impulsivity (SURPS)	.005	-.035	-.069	.005	.128	2, 50

Note. NIAAA = National Institute on Alcohol Abuse and Alcoholism (National Institute on Alcohol Abuse and Alcoholism, 2003); SURPS = Substance Use Risk Profile Scale (Woicik et al., 2009).

*$p < .05$. ** $p < .01$. *** $p < .001$.

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