

POLYSUBSTANCE USE PATTERNS AND PSYCHOSOCIAL FUNCTIONING
AMONG PARTICIPANTS IN THE ELECTRONIC
DANCE MUSIC SCENE

A Dissertation

Presented to

The College of Graduate and Professional Studies

Department of Psychology

Indiana State University

Terre Haute, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Psychology

by

Danielle D. Alfrey

December 2014

© Danielle D. Alfrey 2013

Keywords: EDM, RAVE, POLYSUBSTANCE USE, DANCE MUSIC, NITROUS OXIDE

VITA

Danielle D. Alfrey

EDUCATION

- 2014 Indiana State University, Terre Haute, Indiana
Psy.D. in Clinical Psychology
- 2011 Indiana State University, Terre Haute, Indiana
M.S. in Clinical Psychology
- 2008 Indiana University Purdue University, Indianapolis
B.S. in Clinical Rehabilitation Psychology

PROFESSIONAL EXPERIENCE

- 2014-2015 Postdoctoral Psychology Fellow
Department of Veterans Affairs Medical Center
Palo Alto, California
- 2013-2014 Predoctoral Psychology Intern
Department of Veterans Affairs Medical Center
Dayton, Ohio
- 2012-2013 Graduate Clinician
Good Samaritan Hospital
Vincennes, Indiana
- 2011-2012 Graduate Clinician
Hamilton Center: Inpatient Psychiatry Unit
Terre Haute, Indiana
- 2010-2012 Graduate Clinician
Psychology Clinic: Indiana State University
Terre Haute, Indiana

ABSTRACT

Electronic dance music (EDM) events are strongly associated with polydrug use, or the use of several substances at one time (Fernandez-Calderon et al., 2011), which has contributed to overall negative stereotypes of the EDM scene. Nitrous oxide use has been documented in EDM research, but mainly in qualitative designs (Hunt, Evans, Moloney, and Bailey, 2009). Qualitative research suggested participants pair nitrous oxide inhalation with use of ecstasy, or MDMA, for feeling an enhanced effect. This EDM study examined nitrous oxide use using a quantitative design and investigated how polysubstance use was related to positive and negative consequences of involvement in the EDM scene.

Electronic music fans completed an Internet-based survey (N=147, 50% female) that assessed for amount of nitrous oxide use, amount of other drug use (i.e., lifetime use), gender, age, and degree of involvement in the EDM scene. Criterion variables included drug related consequences, positive and negative well-being, relationship satisfaction, and self-rated health.

EDM involvement by itself was not significantly predictive of negative psychosocial functioning. However, EDM Involvement was predictive of increased positive affect. Nitrous oxide use and other substance use independently predicted psychosocial functioning. Nitrous oxide use predicted lower levels of positive affect and self-rated health. Moderation analyses testing the hypotheses that nitrous use moderated the effect of EDM involvement on negative outcomes were not supported. However, nitrous oxide use did appear to moderate the relationship between other drug use and positive well-being. For participants reporting lower nitrous oxide use, there was a positive relationship between other drug use and positive well-

being, but for participants reporting higher nitrous oxide use, the relationship was no longer significant. Future research should assess a broader range of nitrous use frequencies as well as ask about drug use during the past month and year in addition to lifetime use.

ACKNOWLEDGMENTS

First, I dedicate this work to those individuals whose lives have been affected by substance use and abuse. Second, to the fans of EDM who were so generous and frank when completing the questionnaire that enabled me to complete this study; without you, this would not have been possible. Third, I give my most genuine thanks to the “Dissertation Dream Team,” as I refer to them. A project of this nature required an open mind and patience with my high level of energy. Thus, Dr. Johnson, Dr. O’Laughlin, and Dr. Bennett, I thank you kindly. Dr. Johnson, without you and your love for various types of music, I would have never been able to study this genre or population of individuals. Your expertise in the area of music and substance use research was critical in the development of this project. Your rock star legacy will continue to live on through your research.

Finally, I thank my wonderful life partner, Kevin Weisman. Your patience, input, support, and willingness to brainstorm with me at all hours of the night have not gone unnoticed. Thank you for all the ways you have supported me during the last several years. Your love and encouragement kept me going time and time again. You have contributed greatly to this project and for that, I could never thank you enough.

TABLE OF CONTENTS

ABSTRACT..... iii

ACKNOWLEDGMENTSv

LIST OF TABLES ix

LITERATURE REVIEW1

 Introduction..... 1

 History of the EDM Scene 4

 Drug Use in the EDM Scene..... 9

 MDMA and Mental Health Disorders 15

 Nitrous Oxide..... 17

 Present Study 22

METHOD24

 Power Analysis 24

 Participants..... 24

 Measures 25

 Creation of Composites..... 31

 Procedure 32

RESULTS34

 Primary Analyses 41

 Hypothesis One and Two..... 41

 Moderation Analyses 52

 Hypothesis Three 52

Hypothesis Four	53
Additional Analyses.....	55
EDM Motives.....	55
DISCUSSION.....	59
Hypothesis One.....	61
Hypothesis Two	66
Hypothesis Three	67
Hypothesis Four	68
Additional Analyses.....	69
Strengths	69
Limitations and Suggestions	70
Summary.....	72
REFERENCES	74
APPENDIX A: CONSENT FORM.....	86
APPENDIX B: DEMOGRAPHIC QUESTIONNAIRE	88
APPENDIX C: EDM QUESTIONNAIRE.....	93
APPENDIX D: THE MEANING IN LIFE QUESTIONNAIRE (MLQ).....	99
APPENDIX E: DRUG ASSESSMENT	100
APPENDIX F: KANSAS MARITAL SATISFACTION SCALE (KMS).....	102
APPENDIX G: DRUG SHORT INDEX OF PROBLEMS (SIP-D).....	103
APPENDIX H: THE POSTIVE AND NEGATIVE AFFECT	
SCHEDULE (PANAS).....	105
APPENDIX I: BRIEF SYMPTOM INVENTORY (BSI).....	106

APPENDIX J: Correlation Matrix for Substances and Primary Variables.....109

LIST OF TABLES

Table 1. Demographics	35
Table 2. Descriptive Statistics for Age, Drug Use Consequences, and EDM Involvement Items	37
Table 3. Frequency of Reported Lifetime and EDM Event Drug Use	39
Table 4. Descriptive Statistics for Main Variables	40
Table 5. Correlations Among Predictor and Criterion Variables	41
Table 6. <i>Regression Predicting Drug Use Consequences from EDM Involvement, Nitrous Oxide Use, and Other Drug Use</i>	43
Table 7. <i>Regression Predicting Positive Well-being from EDM Involvement, Nitrous Oxide Use, and Other Drug Use</i>	45
Table 8. <i>Regression Predicting Negative Well-being from EDM Involvement, Nitrous Oxide Use, and Other Drug Use</i>	47
Table 9. <i>Regression Predicting Self-reported Health from EDM Involvement, Nitrous Oxide Use, and Other Drug Use</i>	49
Table 10. <i>Regression Predicting Relationship Satisfaction from EDM Involvement, Nitrous Oxide Use, and Other Drug Use</i>	51
Table 11. <i>Factor Pattern Matrix for EDM Motives Items</i>	56

CHAPTER 1

INTRODUCTION

Electronic dance music (EDM) events, also known as *raves*, involve loud music, bright flashing lights, and dancing that often lasts till morning. Unfortunately, the EDM scene is also strongly associated with polysubstance use, suggesting that many patrons will either observe or engage in excessive drug use (Barrett, Gross, Garand, & Pihl, 2005; Fernandez-Calderon et al., 2011; Forsyth, 1996). In fact, Forsyth, Barnard, and McKeganey (1997) found that young adults who preferred rave music, compared to other types of music, were more likely to use illegal drugs. Since polysubstance use in the EDM scene is the rule rather than the exception, there is an increased concern for the safety of this population of young adults.

Adolescence and young adulthood is a developmental period when individuals begin to establish their independence by making decisions and preparing for their futures (Kelly, 2000). Attending college, exploring employment opportunities, potential mate selection, and establishing independence are a few examples of important decisions faced by young adults. This developmental transition is also a period of neurological maturation and research has shown that drug use during this critical period is associated with reduced decision-making abilities, impulsive behavior, low motivation, and increased addiction potential (Chambers, Taylor, & Potenza, 2003; Crews & Hodge, 2007). These critical periods may explain how young adults are more likely to try substances and are at higher risk for developing dependence. This is becoming increasingly important because young adults today are experiencing higher levels of stress than

previous generations. In turn, young adults are using more illegal drugs as a method of escape (Aldridge, Measham, & Williams, 2011).

Aldridge et al. (2011) suggested that increased adolescent drug use was due in part to a more technologically advanced society with higher expectations. They further posited that recreational drug use served as an escape from these pressures and has become more accepted among contemporary youths. EDM events have also become widely available and viewed as, not only acceptable, but as earned weekend escapes (Anderson, 2009). Furthermore, the majority of participants at EDM events are between the ages of 18-24 (Hunt, Evans, & Kares, 2007; Verejo-Garcia et al., 2010; Yacoubian & Wish, 2006), which tends to be an age range that shows greater drug use and dependence than other age ranges (Thombs, 2006). Therefore, this group might be at a particular risk for polysubstance use.

Individuals who engage in polysubstance use, or the simultaneous use of more than one substance, experience more negative consequences when compared to individuals using only one substance (Martinotti et al., 2009). Depression, cognitive impairments, and psychotic disorders are just a few examples of polydrug consequences in the EDM population (Parrott, Milani, Parmar, & Turner, 2001). Although monosubstance users may experience negative consequences, the use of several substances increases the risk for experiencing one or more of the consequences associated with each particular substance.

There is concern that studies have not fully captured the extent of the variety of drugs used by electronic music fans. Research assessing polysubstance use often inquires about rave-popular *club drugs*, as defined by the National Institute on Drug Abuse (NIDA, 2008). Club drugs include ecstasy, or MDMA (3, 4-Methylenedioxymethamphetamine), Rohypnol, GHB (gamma-Hydroxybutyric acid), and ketamine (NIDA, 2008). While these drugs are undoubtedly

associated with negative consequences, several studies have restricted their assessments to only these club drugs (Hunt & Evans, 2008; Maxwell, 2005). These restricted measures may be problematic and may not have captured a complete understanding of substance use in EDM culture. Focusing on these predetermined club drugs ignores fluctuations of the availability and popularity of other possible substances (Parker & Egginton, 2002). Newly developed drugs, drugs that were previously unavailable, drugs that become unavailable, and the designation of drugs as classified controlled substances are examples of changes that can, and do, occur and likely contribute to whether a drug is popular at a given time (Aldridge et al., 2011). This underscores the need for studies to extend their assessments to include all drugs (Yacoubian & Peters, 2007). An example for the present study involves a discrepancy between substances reported as rave-popular by researchers and those reported as such by the U.S. Department of Justice. For example, drugs such as DMT (dimethyltryptamine), a cough medicine called DXM (dextromethorphan), PCP (phencyclidine) or *angel dust*, and nitrous oxide have been established as being associated with EDM events in either government documents or toxicology reports (Anguish, 2000; Scott, 2002), but these drugs are seldom mentioned in the empirical literature on EDM culture. One possible explanation is that the majority of the literature examining EDM culture is based outside of the United States and the availability of particular substances varies among countries (Salasuo & Seppala, 2004). However, it is also possible that other studies could have missed endorsements of these drugs because they relied on measuring NIDA's predetermined club drugs. Therefore, studies that are designed with updated drug assessments are needed.

In a recent qualitative study in California, authors Hunt, Evans, Moloney, and Bailey (2009) found that participants used specific combinations of substances in order to achieve a

particular effect. One substance that received several anecdotal reports, but is not a commonly associated club drug was nitrous oxide. Participants reported that inhaling nitrous enhanced the effects of MDMA intoxication. Notably, participants were not asked specific questions about their use of nitrous oxide, but rather they spontaneously mentioned using the drug when talking about their experiences with MDMA. Similar to other EDM-related drugs, the recreational use of nitrous oxide is associated with memory deficits, spinal cord degeneration, and even death (Cartling, 1999; Ng, O'Grady, Pettit, & Frith, 2003; Potocka-Banas et al., 2011). EDM studies designed to assess the use of nitrous oxide are needed.

History of EDM Scene

The emergence of the EDM scene dates back to the 1970s when disco music poured out of the clubs (Sylvan, 2005). Disco music thrived in New York City discotheques, or nightclubs, where disco got its name. In the beginning, the primary audience was within the minority population because discotheques were considered a place of refuge from discrimination and judgment for homosexuals, African Americans, and Latinos (Measham, Aldridge, & Parker, 2001). However, disco music quickly gained popularity and led to the establishment of trendy clubs for the rich and famous. For example, Studio 54 was one of the most famous celebrity discotheques that emerged during this time (Critchler, 2000). With technological advancements in the music industry, the disco era set new club standards by having a prominent DJ meticulously selecting prerecorded music tracks and putting them together seamlessly (Sylvan, 2005). That is, songs with similar beats flow into one another without a disruption of the music. The DJ's job was to assure there was never a break in the energy flow in the room (i.e., the music never stopped). Disco music was the precursor to house music, which many associate with the birth of the rave scene.

House music got its name from a popular club in Chicago, the Warehouse, where resident DJ Frankie Knuckles used creative techniques and mixed sounds with drum machines (Sylvan, 2005). Soon after house music emerged, other scenes, or geographically established cliques, began to develop their own sounds. Detroit DJs Derrick May, Juan Atkins, and Kevin Saunderson recorded songs using drum machines and sounds created by synthesizers and developed the new genre of electronic music known as *techno* (Reynolds, 1998; Sicko, 1999). Although several other genres developed, house and techno remained at the heart of the United States EDM scene.

Frankie Knuckles is often referred to as the “father of house.” House music offered a variety of driving beats that fluctuate in beats per minute (BPM). This variety offers unique alterations in each song that influences different dance techniques. The amplified beats of house music are felt within the body, which catalyzes motivation to dance and provides a feeling of being in a dream state, or *trance*. In a symbiotic fashion, DJs play off the crowd and get them excited by increasing and decreasing the BPM of each track. The beats progressively increase which generates intensity in the crowd. The DJ then lets the beat *drop* (i.e., drastic reduction in beat) and sends the crowd into a frenzy of dance (Ter Bogt, Engles, Hibbel, Van Wel, & Verhagen, 2002). This fervor and simultaneous movement is associated with a feeling of the crowd being one organism in unity. Chicago House DJ Frankie Bones explains:

From my particular end of it, it’s like church. Because, when you’ve got three thousand people in front of you, that’s three thousand different personalities. And when those three thousand personalities become one personality, it’s the most amazing thing (Sylvan, 2005, pp. 20).

This unifying experience goes along with an ideology that developed out of the rave scene known as PLUR (i.e., peace, love, unity, respect). PLUR is a central ethos to EDM culture that many adopt and follow as a guide for how to treat one another (Sylvan, 2005; Weir, 2000). That is, to treat everyone, regardless of demographic attributes, with respect and make friends with strangers. Participants perceive a unified community where attendees can feel safe to express themselves without being judged against social norms (Weber, 1999). These described empathic interpersonal experiences at EDM events are often catalyzed by the recreational use of the drug MDMA, often called *ecstasy*, “e,” or *molly*.

The popularity of both MDMA and house music extended to Europe around 1987 and began the developments of new and unique EDM scenes (Crichter, 2000; Sylvan, 2005). This combination of music and substance also found a home in Spain within the small island of Ibiza. Prior to 1987, Ibiza had a reputation for welcoming everything counterculture that began with the hippie era of the 1960s. Ibiza became a common vacation spot for EDM fans and contributed to the creation of other EDM scenes by visitors who wanted to recreate these experiences back home. Paul Oakenfold, Nicky Holloway, and Danny Rampling translated their Ibiza experiences into clubs in England and established their own subculture, *acid house*, which stemmed from the combination of MDMA use and house music.

The acid house scene in London began to develop a unique sound and fashion that was different than what was seen in the United States. Electronic groups such as Orbital, Underworld, Future Sound of London, and 808 State were emerging and using the latest technological advancements to create their own individualistic sounds (Reynolds, 1998; Sylvan, 2005). Visual effects also advanced from strobe lights and fog machines to lasers that could be programmed as well as wall projections of animations or videos. EDM attendees began to take on their own style

of dress that included anything from excessively baggy pants to neon or psychedelic patterns, as well as accessories such as light gadgets, stuffed animals, and pacifiers (Weber, 1999; Weir, 2000). As acid house grew in popularity, associations were made between the music and the use of psychedelic substances. A popular radio release by D-Mob, “We Call it Acid” generated great concern among the public and police began raiding and shutting down clubs (Sylvan, 2005). However, unwanted attention from the authorities did not stop the events from occurring. Events began being held illegally in abandoned buildings, known as *warehouse parties*, and occurred without interruption for a period of time until police discovered these locations and forbade them from continuing (Sylvan, 2005). This began a period where EDM events had to play hide-and-go-seek with the police. It is this particular time period that is often associated with the term *rave*. The term “rave” became applied to most EDM events that were held in illegal and discreet locations like warehouses, city swimming pools, and large open fields (for the sake of readability, the present study will use the terms “rave” and “EDM event” interchangeably). Due to the illegality and secrecy of the events, organizing a rave required extensive preparation. For example, a phone number would be printed on either purchased tickets or party flyers and a rave promoter would use a computerized voice to communicate the location of a meeting point using the latest technology of the time, the cellular phone. At these meeting points, promoters would be waiting to give directions to another meeting point. Sometimes finding an event involved several stopping points. This was done to evade police intervention. The outdoor events, although still illegal, could attract up to 25,000 attendees and generated a profit for promoters that outweighed the legal risks. With attendance numbers in the thousands, police would have a very difficult time intervening with the events. The secretive nature of these missions fascinated attendees and further contributed to the appeal of the EDM scene. The utopian ideology of PLUR was created

during these massive gatherings, which led many to call the summer of 1988 the “(second) Summer of Love” after the psychedelic counterculture of the late 1960s.

Police responded to these secret events by organizing specialized units and imposing sentences on promoters while confiscating all their earnings. Eventually, this brought a decrease in illegal raves and an increase in legal raves (Sylvan, 2005). At this time, the rave scene in England changed and became more commercialized and, some say, lost the PLUR component. However, PLUR ideology continued to flourish in the rave scene as it slowly permeated the United States.

Initially, rave scenes began in the 1990s in New York, San Francisco, and Los Angeles (Reynolds, 1998, Sylvan, 2005). DJ Frankie Bones began throwing “Stormraves,” which started the New York rave scene, Toontown represented the scene in San Francisco, and Steve and Jon Levy organized the events in Los Angeles. During this time, fans had to travel to these areas if they wanted to attend EDM events. Shortly thereafter, most major U.S. cities had a rave scene characterized by use of MDMA. Similar to what occurred in London during the birth of acid house subculture, Americans too, developed their own unique fashions and methods of communication, especially because EDM fans had access to the Internet. At this time, the ideology of PLUR and community was still present in the U.S. scene; however, the EDM scene increased in popularity, expanding to include the mainstream population, which led to a decrease in the genuine following of PLUR similar to that witnessed in the London EDM scene. Several components contribute to this decline, but a common explanation is that business-savvy companies began throwing commercialized large-scale events at accommodating stadiums (Anderson, 2009). However, some groups of EDM fans were resistant to this commercialism and established underground scenes that still exist today (Fernandez-Calderon et al., 2011).

In 1986, a small summer solstice gathering happened at Baker Beach in San Francisco (Sylvan, 2005). In 1990, it moved to Black Rock Desert in Nevada and became a large festival characterized by unique counterculture artistic expressions presented in a variety of forms. The annual event, Burning Man, continues to thrive today with over fifty thousand people attending each year. Similar EDM events range from large scale to small scale. For example, an event that has flourished while retaining its underground flavor is the Movement Festival in downtown Detroit, also known as the Detroit Electronic Music Festival (DEMF). DEMF is a three-day outdoor event that often has a focus on techno music. Indeed, underground events still hold their place in EDM culture and come with unique subculture attributes.

Drug Use in the EDM Scene

In the late 1970s MDMA, or *ecstasy*, emerged and was initially used by some mental health professionals during counseling and psychotherapy with clients as a therapeutic tool (Reynolds, 1998; Sylvan, 2005). MDMA has long been associated with rave culture (Forsyth et al., 1997). The atmosphere of an EDM event overwhelms attendees with lasers, bright colors, and blinking lights or glow sticks (Weir, 2000). Thus, rave attendees have an inclination to seek out psychedelic or hallucinogenic effects of particular drugs to amplify that experience. Many users under the influence of MDMA report a stimulant effect as well as a mild hallucinogenic component. These effects are a result of the substance's impact on the serotonin system, which causes an unnecessary release of the chemical in the brain. Serotonin is involved the regulation of sleep, pain, mood, and appetite (Kalant, 2001; NIDA, 2009). The stimulant effects of MDMA enable participants to stay active for the duration of the events, which can range from 6-hour parties to three-day festivals (Reynolds, 1998). Consistent with the ideology of PLUR, recreational MDMA users have reported experiencing an increased sense of belonging, elation,

and empathic expression (Schwartz & Miller, 1997). In fact, the experience of connectedness is reportedly so profound that some have even called MDMA an *empathogen* (Sylvan, 2005). Indeed, MDMA produces subjective feelings of euphoria, empathic warmth, time distortion, enhanced tactile experiences, and increased energy (NIDA, 2009).

Initially, in the early 1980s, MDMA was available only to a select few who could afford it and at that time, were considered part of an elite group (Sylvan, 2005). In the mid-1980s, Michael Clegg coined the term ecstasy and began distributing the drug throughout Texas. It was then that MDMA surged in popularity in Dallas and quickly spread to New York and Chicago. Rave attendees soon discovered that they were able to dance until morning while amplifying the experience of oneness within the entire rave atmosphere. Obtaining MDMA was reported to be as easy as buying a pack of cigarettes, until 1985, when MDMA was declared a controlled substance (Reynolds, 1998). Rave attendees viewed news reports about the dangers of MDMA as dramatic. For instance, EDM participants felt that MDMA-related deaths in popular media as amplified and blown out of proportion (Critcher, 2000). Although the news reports made the sale and exchange of MDMA illegal and secretive, it by no means halted the proliferation of the substance within EDM culture (Reynolds, 1998; Sylvan, 2005). For some, the characteristic experience of attending a rave became contingent on using mind-altering substances. Therefore, as the popularity of raves increased, so did the use of MDMA.

Hunt and Evans (2008) gathered data from 300 participants in the San Francisco Bay-Area EDM scene. In their sample, 92% reported having used MDMA and, although some endorsed negative effects, the reports of perceived benefits seemed to override any consequences. Participants reported that they took MDMA to experience fun, transcend everyday experiences, heighten their senses, feel extreme happiness, have the freedom to act openly,

connect with others, experience self-enlightenment, and spiritual awakening. One respondent described how simple physical contact is experienced as more euphoric and deep:

I was just sitting against the wall with my girlfriend laying against me. It felt so good. It feels good to have human contact. Like...you feel a warmth. Not just from physical but also like...you feel...emotionally warm (Hunt & Evans, 2008, pp. 338).

Recreational MDMA users often report their drug experiences as euphoric and enlightening (Hunt & Evans, 2008). Many participants also report that they consider their drug use safe since they only take drugs on the weekends (Bahora et al., 2007). However, there are short and long-term side effects associated with MDMA use that adolescents may or may not be aware of.

Research suggests that some rave attendees may be skeptical or uninformed about the potential negative side effects of using MDMA. Bahora et al. (2007) found that participants were skeptical of media reports about MDMA-related deaths because they had never experienced such an emergency within their local scene. Parker and Egginton (2002) suggested that the lack of confirming evidence led EDM fans to view intense media warnings about the dangers of MDMA use as a scare tactic, thus these fans tended to disregard safety warnings. However, other findings have suggested that some information is reaching this population.

Hunt et al. (2009) found that participants reported specific examples of harm-minimalization techniques. These strategies may serve as justifications for their continued use. As noted above, many participants report believing that using MDMA only on the weekends is okay, or less harmful than daily use or every other day use (Hitzler, 2002). This concept of harm minimalization is seen across global studies of EDM culture (Aldridge et al., 2011; Hunt et al., 2007; Vervaeke & Korf, 2006). Polydrug users described how they set restrictions on the number

of times they may use substances in a certain time frame (i.e., only on weekends, once a month, etc.) and that they strategize to prepare the body before and after the experience. For example, some participants stated that, prior to the EDM event, they increased their protein and carbohydrate intake, drank juice, and took nutritional supplements. One particular nutritional supplement mentioned was 5-HTP, which is a dietary supplement taken by MDMA users in order to mitigate depressive symptoms from alleged serotonin depletion (Hunt et al., 2009). Given that such elaborate preparations exist, it appears that at least some information on the consequences of MDMA use is available and reaching some portion of this population (Kelly, 2005). In addition, participants report taking extra precautions based on their drug knowledge and it is likely that those who take the time to become informed on drug information establish these harm minimizing techniques and pass their knowledge to other attendees (Parker & Egginton, 2002). Sharing information about harm reduction techniques may influence perceptions that risks have been considered and accounted for, thus contributing to the acceptance of use. Indeed, high levels of social acceptance, the wide availability, and perceptions of safety all contribute to increased use of substances at EDM events (Schwartz & Miller, 1997). It appears that these harm-minimalization techniques provide a sense of safety that participants feel justifies drug use.

MDMA intoxication can produce confusion, anxiety, nausea, involuntary jaw clenching, dehydration, blurred vision, muscle cramping, chills, hyperthermia, high blood pressure, kidney failure, heart failure, seizures, and arrhythmia (NIDA, 2009). Common side effects like dehydration, muscle cramping, and jaw clenching are often anticipated and prepared for by MDMA users by drinking extra fluids, giving massages, and using either candy or pacifiers to alleviate jaw tightening (Scott, 2002). Aside from the described harm minimalization techniques,

it appears that some MDMA users also discredit the potential for harm from the drug because they have not personally experienced or witnessed these more serious, yet less common, side effects (Bahora et al., 2007). It is also possible that MDMA users do not associate negative consequences with MDMA use if it does not occur during intoxication.

Post-intoxication effects of MDMA include sadness, irritability, impulsivity, aggression, restlessness, anxiety, sleep disturbances, decreased appetite, reduced libido, and significant short term deficits in mental functioning (Parrott, 2001). MDMA use can have a lasting impact on memory and information-processing abilities (McCann et al., 2008) with stronger consequences seen with long-term use (Parrott & Lasky, 1998). It is especially alarming that memory deficits can persist even after prolonged abstinence (Morgan, McFie, Fleetwood, & Robinson, 2002). Given the aforementioned consequences, it is likely that memory impairments will have a detrimental impact on work and school performance.

Curran and Travill (1997) compared weekend MDMA users to alcohol-only users and found that weekend MDMA users experienced more depression and lower cognitive performance during the week following their MDMA use. Although the MDMA group was more alert and clear-minded than the alcohol group on the first day following intoxication, these findings were reversed two days after intoxication, as the MDMA group reported more mental confusion than the alcohol group. Overall, the MDMA group saw consequences that presented no sooner than two days following intoxication and several of which persisted as long as five days after consumption. Ratings of irritability, depression, anxiety, and agitation increased over the five-day study; impaired concentration was significantly higher on day two and still elevated on day five. Findings such as these refute those participant reports that weekend use is harmless

and does not have a negative impact on their ability to function throughout the work or school week.

Although literature on EDM culture tends to focus on MDMA, it is well documented that many drug users in this population are considered polysubstance users (Barrett et al., 2005; Forsyth, 1996; Llopis et al., 2008). In fact, the prevalence of polydrug use in the EDM culture is often cited as a limitation in most studies that seek to isolate the negative effects of MDMA (Schifano, 2000). This is cause for concern because each drug has its own unique chemical properties and adverse effects and it is difficult to determine the interactional effects of the variety of substances that polydrug users consume (Maxwell, 2005). Recent studies have moved from simply focusing on MDMA to assessing other drugs and explaining polysubstance use in the EDM scene (Hunt et al., 2009).

Verdejo-Garcia et al. (2010) found that polysubstance users scored significantly higher on impulsivity scales and performed significantly worse in executive functioning tasks as well as tasks measuring working memory, processing speed, time estimation, inhibition errors, analogical reasoning, and decision making. Hammers and Suhr (2010) also found that polysubstance users performed worse on decision-making and executive functioning tasks. A similar finding regarding decision-making deficits suggested that polysubstance users have a tendency to go for short and fast rewards without acknowledging the long-term losses (Grant, Contoreggi, & London, 2000). Polysubstance use has also been associated with deficits in abstract reasoning and visual and verbal memory that can persist for at least a year (Medina, Shear, Schafer, Armstrong, & Dyer, 2004). Polydrug users in EDM culture often use MDMA, which has also been associated with cognitive consequences, thus it is not surprising that polysubstance EDM studies also find significant levels of cognitive impairment (Schifano,

2000). As noted, research that has focused primarily on MDMA use often cite polydrug use as a confound in drawing causal connections between MDMA alone and the subsequent consequences. That being said, it is expected that polydrug studies would find similar, if not more, pronounced deficits in psychosocial functioning.

MDMA and Mental Health Disorders

Schifano's (2000) study of 150 polydrug users revealed that 53% of their sample was diagnosed with at least one psychological disorder, often either depression or a psychotic disorder. To account for the possibility that polydrug users might take substances to self-medicate their undiagnosed disorders, they specifically asked their participants if they had experienced any psychological disturbances prior to their use of MDMA and excluded those indicating previous disturbances unrelated to MDMA. They found that high quantities of MDMA use while drinking alcohol predicted later mood disturbances.

Simultaneous use of MDMA with substances other than alcohol increases risks for experiencing anxiety, aggression, and depressed moods, which suggests that participants who use multiple substances have more consequences. Indeed, a study comparing polysubstance users to single substance users found that polydrug users reported more suicide attempts, self-harm, and behavioral aggression (Martinotti et al., 2009). Furthermore, polydrug ecstasy users report more obsessive-compulsive behavior, anxiety, phobic anxiety, psychoticism, physical complaints, and decreased sexual interest (Parrott et al., 2001). Whether EDM fans are only using MDMA or are engaging in polydrug use at EDM events, the evidence consistently associates EDM drug use with decreased moods and cognitive abilities. How do mood and cognitive deficits from EDM drug use manifest in the lives of EDM fans? More specifically, what impact does polydrug drug

use have on everyday functioning in areas such as health, work, school, financial, and interpersonal relationships?

Concerns regarding the impact of polydrug use are amplified by finding that the majority of EDM attendees are young adults who are often either in high school or college, or young adults just starting their careers. Adolescents and young adults deciding to take MDMA could potentially reduce their focus and concentration to make important decisions since MDMA use is associated with negative effects on daily life functioning. Measham, Aldridge, and Parker (2001) surveyed British EDM drug users to assess their perceptions of the negative impact their drug use had on their work and school performance. Of 317 respondents, 41% reported that either drug use or the time they spent recovering from drug use had negatively affected work or school performance. More specifically, participants reported that their daily functioning was impacted by decreased concentration, irregular mood, fatigue, decreased work performance, and missing work or school days. Further, Topp, Hando, Dillon, Soche, and Solowij (1999) found similar results in their study in Australia. They found that, among 329 participants who engaged in EDM events, the majority were polydrug users and had tried, on average, ten different drugs. Participants in their study also attributed their recent drug use to reduced work and/or school performance. Furthermore, relationship problems were reported in 40% of their sample and 38% reported experiencing financial problems as a result their drug use.

The association between polydrug use and negative consequences is clear. That most EDM participants who use drugs engage in the use of a variety of substances, often including MDMA, is cause for concern. This is especially true since many of the drug users in the EDM scene may be unaware of the risks associated with multiple drug use or have established certain strategies in an attempt to account for these risks, thus justifying continued use.

Nitrous Oxide

More commonly known as *laughing gas*, nitrous oxide (N₂O) is an anesthetic used in surgery or dentistry that produces pleasant experiences of intoxication when inhaled (NIDA, 2009). Nitrous oxide comes in the form of whipped cream canisters, also known as *whippets*, or in cylindrical tanks and is inhaled by filling a plastic bag or a balloon with the gas (Anguish, 2000). Inhaling nitrous oxide deprives the brain of oxygen. This oxygen deprivation is known as hypoxia, which can cause problems with memory. More specifically, repeated inhalation of nitrous oxide can impair the user's ability to carry on simple conversations or retain new information. In the brain, nitrous oxide interferes with consolidation of memories by blocking the binding of glutamate to NMDA receptors (Cartling, 1999). Nitrous oxide also breaks down important fatty tissue in the brain known as myelin. Myelin wraps around the length of the neuron cell and speeds up signal transduction to the next neuron. When these cells are damaged by long-term inhalation of nitrous oxide, the result can range from tremors or muscle spasms to difficulties walking and talking (NIDA, 2009). Recreational use of nitrous oxide is consistently linked with vitamin B₁₂ deficiency that can result in myelopathy, or subacute spinal cord degeneration (Ng et al., 2003; Pema, Horak, & Wyatt, 1998). Furthermore, habitual use of nitrous oxide can lead to cardiorespiratory failure, resulting in death (Potocka-Banas et al., 2011). An especially alarming finding from Ng et al.'s (2003) study revealed that, when compared to non-users, participants reporting use of nitrous oxide were five times more likely to view the use of nitrous oxide as safe.

Nitrous oxide belongs to a category of drugs often called solvents or inhalants, which several EDM studies have included in their measures, although they found small percentages of reported use (Forsyth, 1996; Lim, Hellard, Hocking, & Aitken, 2008; Parker & Egginton, 2002;

Parker & Measham, 1994; Shildrick, 2002). However, some research findings suggest that nitrous oxide may be categorically different than other solvents or inhalants. For example, abuse of nitrous oxide has been independently associated with memory and attention problems, psychosis, and depression (Brouette & Anton, 2001; Garland, Howard, & Perron, 2009). Beckman et al. (2006) separated the experience of nitrous intoxication from other inhalants in regard to the drug's unique ability to produce euphoric psychedelic experiences, which suggests that nitrous oxide should be assessed separately from other inhalants.

Polysubstance users reported that inhaling nitrous oxide created a dissociative experience, along with auditory hallucinations and body tingling, that reminded them of their previous experiences with psychedelic drugs (Atkinson & Green, 1983). Further, Whalley and Brooks (2009) demonstrated that using nitrous oxide increased the user's suggestibility and imagination. These experiential differences between nitrous and other inhalants may lead EDM research participants to not endorse nitrous oxide use when it is grouped into a general category such as solvents or sniffers because they do not view it as belonging to this particular category.

Early studies that examined solvent use did not clearly articulate which substances fell under the category of solvents. For example, some studies solely relied on terms such as *sniffers*, which typically refer to household items like glue, paint, and aerosol (Forsyth et al., 1997). Ambiguous terminology like solvents and sniffers could have possibly confused participants and potentially reduced endorsements of nitrous oxide. More specifically, participants may have skipped questions that used the word *sniff* if they inhaled nitrous oxide. Recent research that used the word *inhalants* found that small percentages of participants endorsed these substances (Lim et al., 2008). Thus, there does not appear to be a significant association between nitrous oxide

and EDM culture on the surface. However, several lines of evidence outside of the empirical literature suggest otherwise.

In order to explore the relationship between nitrous oxide and EDM culture, the words “nitrous oxide rave” were entered into a simple Google search on October 5, 2011. The search generated 704,000 responses ranging from informational websites to public forums that were specifically created for the purpose of discussing nitrous oxide inhalation at raves. The first link connected to the Minnesota Poison Control website and the opening page presented an article about raves and drugs. This article included all the typical club drugs, but also associated nitrous oxide as a common rave drug (Bottei, 2004). The second website was eNotes.com, which was quite informative about the risks associated with nitrous oxide inhalation and informed readers that drug dealers sell nitrous oxide at raves or concerts (Cengage, 2006). For the sake of brevity, this search engine review will stop with two examples although several similar websites followed the two mentioned. The second line of evidence linking EDM culture to nitrous oxide was found in documents created by state health departments and the U.S. government that published reports that nitrous oxide is a drug commonly used at EDM events.

The U.S. Department of Justice printed a thorough and informative guide for police officers that specifically addressed the issue of rave events (Scott, 2002; 2004). In their report, they identified the standard club drugs as defined by NIDA as well as other drugs associated with rave culture, with one of those drugs being nitrous oxide. A case study written by the Central New York Poison Control Center (Anguish, 2000) described ecstasy as being the popular drug for the U.S. EDM scene, but also included nitrous oxide in their list of other drugs used at a rave. What is more interesting is that nitrous oxide was the only drug listed that was not previously outlined by NIDA’s list of club drugs (i.e., Ketamine, GHB, and LSD; NIDA, 2008). This

certainly raises questions about past EDM research that solely focused on NIDA's club drugs in their assessments. More specifically, it is possible the lack of ability to document nitrous oxide use in the EDM scene may be due to restricted measures.

Hunt et al., (2009) conducted a qualitative study in California and found that participants used specific combinations of substances in order to achieve a particular enhanced effect. Although use of nitrous oxide was not directly assessed, anecdotal reports revealed that several participants used nitrous oxide. Participants provided detailed explanations for their planned polydrug use patterns such as enhancing the effects of MDMA when they inhale nitrous oxide at certain points of their intoxication. Thus, nitrous oxide use was reported in EDM polydrug users without even being asked.

The third line of evidence examining nitrous use at raves is not as overt as the previous two. Because MDMA users are often polydrug users, a study developed a research design in order to separate the effects of MDMA by comparing MDMA polydrug users and non-MDMA polydrug users (Fox et al., 2002). Although the study's results were reported under the general category of solvents and the sample size was small (i.e., 20 participants per group), the MDMA group had 5 reports of solvent use compared to one report in the control group. Notably, the study did not define solvents or whether participant's drug histories were obtained through interviews or self-report questionnaires.

A similar observation was found in a study describing three different subtypes of MDMA users based on their combinations of drug use (i.e., Class 1 = ecstasy-polydrug, Class 2 = ecstasy-marijuana-stimulant, Class 3 = ecstasy-marijuana; Wu, Parrott, Ringwalt, Yang & Blazer, 2009). In this study, data from the 2001-2002 National Epidemiological Survey on Alcohol and Related Conditions (NESARC) was collected for 43,093 participants. Among the

participants in the study that reported MDMA use, 25% also reported inhalant use, with ecstasy-polydrug users reporting a higher prevalence of inhalant use (11%) than ecstasy-marijuana users (0%). Furthermore, ecstasy-polydrug users had higher ratings of mania, antisocial personality disorder, and histrionic personality disorder compared to non-ecstasy users.

Considering the presented evidence, it is surprising that more studies have not examined the use of nitrous oxide in the EDM scene. Especially when the U.S. Department of Justice has been continuously documenting the use of nitrous oxide at raves since 2001. One possible explanation is that a substantial portion of the literature is concentrated outside the United States and nitrous oxide use may be unique to American rave culture. As previously mentioned, other explanations include the use of ambiguous terminology, such as sniffers, or broad categories, like solvents. Finally, studies that only assessed for NIDA's club drugs might have missed opportunities to document the use of nitrous oxide.

It appears that EDM research could benefit from specific measures that directly assess for the use of nitrous oxide. For instance, Garland et al. (2009) asked adolescent participants questions such as "Have you ever inhaled or 'huffed' nitrous oxide ('laughing gas') through your nose or mouth in an effort to get high" and "Have you ever inhaled or 'huffed' whippets (i.e., carbon dioxide canisters containing nitrous oxide) through your nose or mouth in an effort to get high" (p. 339). Use of specific questions such as these would reduce ambiguity and make it more difficult to disregard nitrous use. In order to account for variability in the popular terminology of nitrous oxide use, a measure that reduces confusion about which substances are being endorsed would better assess for the prevalence of nitrous oxide use in the EDM scene.

Present Study

Previous research has demonstrated that polysubstance use has a detrimental impact on cognitive functioning. However, we are interested in how polysubstance use interferes with the lives of EDM fans. The present study assessed self-reported levels of EDM involvement along with positive and negative consequences of drug use (i.e., days of work/school missed, psychological well-being, adverse health, interpersonal relationships, etc.). Predictor variables include amount of nitrous oxide use, amount of other polysubstance use (i.e., lifetime use), gender, age, and degree of involvement in the EDM scene. Criterion variables include drug related consequences (measured by the Drug Short Index of Problems, SIP-D), positive and negative well-being (measured by the Brief Symptom Inventory, BSI; the Meaning in Life Questionnaire, MLQ; and the Positive and Negative Affect Schedule, PANAS), perceived health (2 items were adapted from the RAND-36) and relationship satisfaction (measure by the Kansas Marital Satisfaction scale, KMS).

Specific hypotheses included:

1. EDM involvement, by itself, will not be significantly predictive of psychosocial functioning
2. Both nitrous oxide use and other substance use will independently predict psychosocial functioning
3. Nitrous oxide use will moderate the effect of EDM involvement on psychosocial functioning. Specifically, EDM involvement will only predict impaired psychosocial functioning in individuals using high amounts of nitrous oxide.
4. If nitrous oxide use is not confounded with other substance use, nitrous oxide use will moderate the effect of other substance use on psychosocial functioning. Specifically, individuals who are high in both nitrous oxide use and other substance use will show greater impairments in psychosocial functioning than

individuals high in either type of drug use alone and individuals low in drug use.

CHAPTER 2

METHOD

Power Analysis

Currently, there is no available research specifically examining nitrous oxide use in the EDM population. This lack of research complicates predicting an effect size for the present study. However, for the purposes of this study, power calculations were based on $p < .05$ with five predictor and five criterion variables. Therefore, using a medium effect size ($f^2 = .15$) and power estimation of 80%, the present study required a total sample size of 127. To account for incomplete data, this study aimed for a sample size between 140-155 to allow for sufficient power.

Participants

Participants were recruited using the advertisement feature on the social networking website Facebook. For the purpose of confidentiality, the advertisement was established so that viewers could not see any social activity associated with the advertisement (e.g., John Doe likes EDM Research Survey). Facebook settings for the advertisement restricted the target audience to participants who were least 18 years of age in the United States who expressed interest in EDM and EDM affiliated Facebook pages. A total of 199 persons logged in to take the survey. However, two participants identified that they were under 18 years old and, due to the nature of the questions in the survey, were automatically redirected to the end of the survey. No data was collected from these two participants. Out of the remaining participants, 135 completed the entire survey, and an additional 11 completed all of the survey except the last set of questions (i.e., the

Brief Symptom Inventory, see below), yielding a final N of 146 for most analyses. The mean age of the final sample was 27.42 years ($SD = 6.4$), and the distribution of ethnicity was primarily Caucasian (77%) and Hispanic/Latino (5.6%).

Measures

Demographic information. Participants completed questions requesting demographic information (e.g., age, gender, race, employment, education, SES, sexual preference, etc.). This information allowed for characterization of the sample and tests for the effects of age and gender (See Appendix B).

EDM assessment. Participants answered questions regarding their involvement in the EDM scene (e.g., How long have you been a fan of electronic music; How many electronic music events have you attended; Do you think the EDM scene has changed for the better; Do you think the EDM scene has changed for the worse) (See Appendix C). Dillman (2000) suggested that using Internet surveys poses a unique challenge of keeping the participant interested and from easily being distracted. Thus, some of the questions (e.g., Do you think the EDM scene has changed for the better) were intended primarily to maintain participant interest. Additionally, we assessed participant motives for EDM involvement using a set of questions adapted from Ter Bogt and Engels' (2005) study that assessed EDM participants' motives for using MDMA (e.g., I go to raves/EDM events to have less worry, I got to raves/EDM events to dance all night).

EDM involvement. Eleven relevant EDM items were entered into a principle components analysis using orthogonal rotation with varimax solution extracted two factors. The first factor included 8 items: time spent at EDM events in a typical week, time spent working at EDM events in a typical week, how many events attended in one's lifetime, number of events

attended in the past year and month, number of hours listening to EDM, number of roles in the EDM scene, and percentage of friends involved in EDM scene. This factor was labeled “EDM Involvement” and was a primary predictor variable in hypotheses one and three.

The second factor included 3 items measuring distance traveled and money spent on attending EDM events. There was wide variability in the expenses and distances reported by participants. It is possible that a participant may have attended only one EDM event, but traveled or spent more than other participants. This variability would be especially true for participants employed within the EDM scene and actually make money at EDM events as oppose to spending money. Thus, for the purposes of measuring EDM Involvement, the first factor was used and the second factor was not included in analyses in the present study. Alpha coefficient (Cronbach, 1951) for the EDM Involvement items supported the high reliability of the items ($\alpha = .81$).

EDM importance. To determine participants overall report of how important EDM has been to their life, the mean of four items from the EDM measure was computed (i.e., “EDM has changed my life”, EDM has helped create my identity”, EDM has facilitated my personal growth”, “EDM has made me who I am”). The EDM importance composite had excellent internal consistency ($\alpha = .91$).

Drug use assessment. Items assessing participant’s frequency of drug use are similar to questions used in the Indiana Prevention Resource’s annual survey of Alcohol, Tobacco and other Drug use (ATOD, 2012) and the Monitoring the Future Study (Johnston, O’Malley, Bachman, & Schulenberg, 2013). Participants responded to items measuring lifetime use of substances including tobacco products, alcohol, marijuana, cocaine, crack, inhalants, nitrous oxide methamphetamines, heroin, steroids, ecstasy, hallucinogens, prescription medicines, and over-the-counter drugs (e.g., cough medicine). Items were endorsed with responses from one

(“Never”) to five (“40 Times or more”). Further, participants also indicated their use of these substances at EDM events.

For the purposes of this study, we separated other inhalants from nitrous oxide use, including slang terms adapted from Garland et al. (2009), such as *laughing gas* and *whippets* (i.e., carbon dioxide canisters containing nitrous oxide) as well as the U.S. Department of Justice’s (2004) reference to their observed use of *balloons* as a method of inhalation. Due to the variability in drug slang (Fendrich et al., 2003), we provided at least two available street slang names for each drug item with the anticipation that participants may endorse more appropriately if they recognized familiar terms (See Appendix E).

Drug use consequences. The Drug Short Index of Problems (SIP-D; Alterman et al., 2009) is a 15-item questionnaire adapted from the Short Index of Problems (SIP). The SIP-D is a replicated version of the SIP with the terms expanded to include both alcohol and drug use assessment. The SIP was modified from the Inventory of Drug Use Consequences (InDUC; Tonigan & Miller, 2002), which is a 50-item self-report measure of negative consequences associated with polydrug use built from its parent scale that measures alcohol consumption, the Drinker Inventory of Consequences (DrInC; Miller, Tonigan, & Longabaugh, 1995). The InDUC items cover five domains: impulse control (e.g., “I have taken foolish risks when I have been drinking or using drugs”), social responsibility (e.g., “I have missed days of work or school because of my drinking or drug use”), physical (e.g., “My physical appearance has been harmed by my drinking or drug use”), interpersonal (e.g., “A friendship or close relationship has been damaged by my drinking or drug use”), and intrapersonal (e.g., “I have felt bad about myself because of my drinking or drug use”). Three items from each of the InDUC’s five domains were retained in the SIP-D based on their favorable correlations with the total scores for each

particular subscale. However, recent factor analyses of the 15 SIP-D items only yield one factor and not five (Alterman et al., 2009). Thus, the independent domains are not supported for the SIP-D, but are still used in research along with the total score. Items on the SIP-D are endorsed with responses from zero “Never” to three “Daily or almost daily” and ask participants to refer to the past three months of their life. The SIP-D has demonstrated excellent internal reliability with an alpha coefficient of .97 as well as adequate concurrent validity when compared to the Addiction Severity Index (ASI-6). Although there is no psychometric information available regarding the SIP-D, this measure has been used in research on drug/alcohol consequences (Alterman et al., 2009; See Appendix G). Internal reliability for drug consequences in the present study was excellent with an alpha coefficient of .93.

Relationship satisfaction. The relationship satisfaction measure is a 3-item questionnaire that has been adapted from the Kansas Marital Satisfaction scale (KMS; Schumm et al., 1983). For the purpose of this study terminologies indicating marriage were adjusted to relationship-based terms in order apply to both married and unmarried participants (e.g., “Are you currently involved in a romantic relationship?”, “How satisfied are you with your current romantic relationship?”). Items were endorsed with responses either “Yes” or “No” or from one (“Extremely dissatisfied”) to seven (“Extremely satisfied”).

The Kansas Marital Satisfaction scale has demonstrated excellent internal consistency reliabilities (.84-.91) as well as convergent and divergent validity (Schumm et al., 1986; See Appendix F). Internal consistency for the KMS in the present study was excellent ($\alpha = .91$).

Health assessment. Following the demographic questionnaire, two questions assessed current general health perceptions as well as current general health in comparison to the previous year (e.g., “In general, would you say your health is___,” and “Compared to one year ago, how

would you rate your health in general now?” The 2 items were adapted from the RAND-36 measure of health-related quality of life (Hayes & Morales, 2001) and were endorsed with responses from one (“Excellent”) to five (“Poor”) and from one (“Much better”) to five (“Much worse”), respectively.

MLQ. The Meaning in Life Questionnaire (Steger, Frazier, Oishi, & Kaler, 2006) is a 10-item questionnaire that measures an individual’s search for and sense of the presence of meaning in life. Having meaning in life is regarded as a form of psychological well-being that is thought to promote coping abilities and facilitate personal growth. The MLQ uses a 7-point scale with potential responses ranging from one (“Absolutely untrue”) to seven (“Absolutely true”). Two subscales, Presence of meaning (MLQ-P; e.g., “I understand my life’s meaning.”) and Search for meaning (MLQ-S; e.g., “I am always searching for something that makes my life feel significant.”), are each composed of five items and have demonstrated good internal consistencies (.86-.88). Additionally, the MLQ subscales possess satisfactory convergent and divergent validity despite the relative brevity of the measure (See Appendix D). Reliability (Cronbach’s alpha) for the MLQ-Presence in the present study was .88 and .89 for MLQ-Search. Given the focus of the current study, only the MLQ-Presence was included in creating a well-being composite (see below).

PANAS. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item measure examining the recent experience of both positive (PA; e.g., “Interested,” “Excited”) and negative affective (NA; e.g., “Distressed,” “Guilty”) states. Items responses ranged from one “Very slightly or Not at all” to five “Extremely.” Research investigators can modify the instructions for the PANAS to order to assess different periods of time (e.g., in general, in this moment, during past few days, etc.). The current study assessed

participant affective states for the previous three weeks. Since we expected that a significant portion of our population will be polydrug users with possible memory deficits, we wanted to keep recollections of the past somewhat recent. Furthermore, research examining the internal consistency for the past three weeks demonstrated excellent reliability with coefficients of .87 for both the PA and NA scales (See Appendix H). The PANAS yielded high reliabilities for subscales PANAS-Positive ($\alpha = .91$) and PANAS-Negative ($\alpha = .83$).

BSI. The Brief Symptom Inventory (Derogatis & Melisaratos, 1983) is a 53-item questionnaire taken from its parent instrument, the Symptom-Checklist-90-R (SCL-90-R). The BSI incorporates a 5-point scale that assesses psychological distress during the preceding week by asking “How much were you distressed by:” followed by a list of symptoms (e.g., “Feeling easily annoyed or irritated,” “Poor appetite.”). Potential responses for the items can range from zero “Not at all” to four “Extremely.” BSI administration time, with the survey instructions considered, takes approximately ten minutes. In order to increase survey readability for test takers, the test items require only a sixth grade reading level by the standards of American education.

The BSI uses forty-nine questions to assess nine dimensions of symptoms in the areas of obsessive-compulsive problems (O-C), depression (DEP), somatization (SOM), anxiety (ANX), interpersonal sensitivity (I-S), hostility (HOS), psychoticism (PSY), phobic anxiety (PHOB), and paranoid ideation (PAR). Four items make up three indexes of distress: the Positive Symptom Total (PST), the number of items with responses greater than zero, the Positive Symptom Distress Index (PSDI), a measure of the average magnitude of the response greater than zero, and the General Severity Index (GSI), which is a measure of the average magnitude of all 53 items.

Psychometric findings suggest that the BSI is acceptable as an abbreviated form of the SCL-90-R as demonstrated by high correlations (.92 PSY to .99 HOS) of symptom dimensions between the two tests. The 9 symptom dimensions have good reliability with internal consistencies ranging from .71 (PSY) to .85 (DEP) and test-retest coefficients ranging from .68 (SOM) to .91 (PHOB). Global indexes also had high test-retest reliability coefficients for GSI (.90), PSDI (.87), and PST (.80). Regarding validation, convergent validity was good between BSI dimensions and similar scales on the MMPI and internal structure demonstrated good construct validity. To examine participants on each of the 9 dimensions is beyond the scope of this analysis. Therefore, the present study applied the GSI score, which yielded high reliability of .96 (See Appendix I).

Creation of Composites

Positive and negative well-being. The aforementioned dependent measures (MLQ, BSI, PANAS) were entered into a principle components analysis using orthogonal rotation with varimax solution and two factors were extracted: Positive Well-being and Negative Well-being. Measures loading on the positive well-being factor were the MLQ-Presence (.82) and the PANAS-Positive (.76). Thus, calculating the mean of the z-scores for MLQ-Presence and the PANAS-Positive created the positive well-being composite. Measures loading on the negative well-being factor were the BSI-Total (.66) and the PANAS-Negative (.71). Calculating the mean of the z-scores for BSI-Total and the PANAS-Negative created the negative well-being composite. Internal consistency for the established positive well-being composite was good ($\alpha = .70$) and for the negative well-being composite was fair ($\alpha = .56$).

Procedure

All procedures for the present study were approved by the Indiana State University Institutional Review Board (IRB). An online survey was created using the Qualtrics web survey program. As noted, participants responded to an advertisement that appeared on a social networking website (e.g., Facebook). Dillman (2000) suggested that researchers using Internet surveys should set a date by which participants have to complete the survey in order to generate participant motivation so they will be more likely to take the survey when it is presented rather than putting it off and potentially forgetting. This may be especially pertinent for participants that use several substances, as memory deficits are frequently endorsed by polydrug users in the EDM population (Parrott et al., 2001).

First, each participant read the informed consent that explained the nature of the study, risks and potential benefits of participating, the right to withdraw from the study at any given time, and the right to refuse to respond to any question (Appendix A). The informed consent on the computerized website provided two print buttons/links, one on the top and the bottom of the page. These buttons allowed participants to print a copy of the informed consent for their records. Participants were required to indicate their understanding and the desire to participate by clicking the provided “yes” or “no” response options. Information regarding how to contact the Institutional Review Board was provided as well as information for contacting the principle investigator and co-investigator.

Second, participants completed a demographic questionnaire as well as two questions regarding their current perceptions of general health. Participants then answered questions regarding their associations within the EDM scene along with filler questions to generate interest (Dillman, 2000). Participants answered the remaining questionnaires in the following order:

MLQ, the drug assessment, the relationship measure, SIP-D, the PANAS, and the BSI. Participants were given the option of being entered into a drawing for a \$100 online gift certificate in exchange for their participation (see research incentive below), and all data collection was anonymous.

Research incentive. In order to offer a participation incentive while minimizing risk and maintain participant confidentiality, participants were provided an email address when they completed the survey. Participants were instructed to send an anonymous email (not including their name) indicating a desire to be entered in a random drawing for two winners who each received a \$100 gift certificate to be redeemed online at GiftCertificates.com. This website allowed two winners to select a \$100 gift certificate from hundreds of popular stores, airlines, hotels, theaters, restaurants and more. Participant protection and confidentiality was thoroughly explained in the consent form before participants take the survey (See Appendix A).

CHAPTER 3

RESULTS

General Data Analytic Strategy

Hierarchical linear regression analyses were used to evaluate the unique effects of EDM involvement and substance use on psychosocial functioning. Psychosocial functioning included the following criterion variables: drug consequences, positive well-being, negative well-being, self-rated health, and relationship satisfaction. Primary predictor variables were EDM involvement, nitrous oxide use, and use of other drugs. The SPSS 21.0 statistics package was used for data analyses.

Descriptive Statistics

Table 1 presents demographic variables gender, ethnicity, and marital status for the final sample in the present study. The final sample had an equal distribution of males and females and was primarily Caucasian. Considering ethnicity, 90% of participants identified as White, 3% as Hispanic/Latino, 3% Asian/Pacific Islander, and 1% African-American. Five participants responded “other” in response to the item on ethnicity. More than half of the respondents reported being single/never married.

Table 1

Demographics (n=147)

Variable	N	%
Gender		
Female	73	50.0
Male	73	50.0
Ethnicity		
White/Caucasian	132	89.8
Other	5	3.4
Hispanic/Latino	5	3.4
Asian/Pacific Islander	4	2.7
Black/African-American	1	.7
Relationship Status		
Single, never been married	88	59.9
Cohabiting with a partner (but not married)	31	21.1
Married	23	13.1
Divorced	8	5.4
Separated (but not divorced)	2	1.4

In regards to education level, 84.4% reported at least some college experience, 33.3% obtained an undergraduate degree, and 10.9% reporting graduate education or higher. Thirty-seven participants reported current enrollment in school with most enrolled as undergraduates (78.4%) followed by graduate school (16.2%). Four of the 37 students reported missing 10 or more days of school in the current academic school year. Participants completed the survey

during the summer and it is likely that these numbers reflect absences for the entire previous school year. There was an interesting difference between participant reported levels of religiousness and spirituality. More than half of the participants reported they do not consider themselves religious by indicating they are not at all religious (53.7%), but 85.7% reported being at least slightly to very spiritual. Thus, the overall sample was generally more spiritual than religious.

Table 2 presents the means, standard deviations, skewness, and kurtosis for age, drug use consequences, and EDM-related variables. Measures involving substance use and drug-related problems tend to yield non-normal distributions. In order to account for the kurtosis in the drug use consequences in the present sample, square root transformations were calculated (Kline, 2005). Please refer to Table 4 for the transformed drug use consequences statistics. Of note, 41% of the present sample attended 3 or more EDM events in the past month. In addition, please see Appendix J for the intercorrelations of the most frequently reported substances.

Table 2

Descriptive Statistics for Age, Drug Use Consequences, and EDM Involvement Items

Variable	<i>N</i>	Mean	<i>SD</i>	Skewness	Kurtosis	Range Minimum	Range Maximum
Age	147	27.76	5.87	0.78	0.83	18	50
Drug Use Consequences	141	1.37	0.45	2.56	28.50	1	3.50
Hours spent at EDM Events (past week)	146	3.05	1.36	0.51	0.18	1	7
Hours doing EDM-related work	146	3.12	2.07	0.80	-0.30	1	8
EDM events Attended (lifetime)	147	184.47	268.77	2.44	6.05	0	1500
EDM Events Attended (past year)	147	22.42	32.21	2.98	10.59	0	200
EDM Events Attended (past month)	145	2.76	3.05	1.45	2.01	0	15
Hours Acquiring/Listening to EDM (past month)	145	5.88	2.03	-0.37	-1.37	1	8
Proportion of Friends in EDM Scene	144	53.60	28.60	-0.28	-1.26	1	97
Number of EDM Roles	147	0.24	0.15	1.01	1.51	0	0.85

Table 3 presents the frequencies and percentages of reported lifetime drug use and use of drugs at EDM events. The nine most commonly used drugs, endorsed by over half of the participants in the sample were alcohol, marijuana, tobacco, MDMA, hallucinogens, powder cocaine, nitrous oxide, prescription stimulants, and prescription depressants. It is interesting that more participants reported using marijuana than tobacco. The Monitoring the Future Study reports that cigarette smoking is on a downward trend over the past four decades with rapid declines in 2013

(Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2014). A provided explanation for this downward trend was the increasing alteration in youth attitudes and behaviors toward cigarettes smoking such as perceived harmfulness and willingness to date or befriend a smoker.

The National Survey on Drug Use and Health (NSDUH) collects information on substance use in the general U.S. population age 12 and older. In 2012, NSDUH reported that 82.3% of the U.S. population aged 12 and over had ever used alcohol, 66.8% used tobacco, 42.8% used marijuana, 14.6% used hallucinogens, 14.5% used cocaine, 8.1% used inhalants, and 6.2% had used MDMA (SAMSHA, 2012). The present sample had somewhat similar, yet higher, estimates for lifetime alcohol and tobacco use. In contrast and as expected, the present sample had much higher lifetime estimates for MDMA, hallucinogens, nitrous oxide, and cocaine.

Table 3

Frequency of Reported Lifetime and EDM Event Drug Use

Drug	Lifetime Use		Use at EDM Events	
	N	%	N	%
Alcohol	142	96.6	133	90.5
Marijuana	135	91.8	112	76.2
Tobacco	127	86.4	106	72.1
MDMA	119	81.0	116	78.0
Hallucinogens	119	81.0	90	61.2
Powder Cocaine	111	75.5	73	49.7
Nitrous Oxide	101	68.7	73	49.7
Prescription	95	64.6	46	31.3
Stimulants				
Prescription	89	60.5	31	21.1
Depressants				
Synthetic Drugs	62	42.2	22	15.0
Methamphetamine	55	37.4	23	15.6
Over the Counter	49	33.3	1	.7
Other Inhalants	47	32.0	8	5.4
Crack Cocaine	27	18.3	1	.7
Heroin	18	12.2	3	2.0
Steroids	2	1.3	0	0.0

Table 4 presents the means, standard deviations, skewness, and kurtosis for the main variables in the study. Skewness and kurtosis values were within acceptable limits.

Table 4

Descriptive Statistics for Main Variables

Variable	<i>n</i>	Mean	<i>SD</i>	Skewness	Kurtosis
Drug Consequences (transformed)	141	1.56	0.17	.01	4.94
Positive Well-Being	142	-0.01	0.84	-0.32	-0.16
Negative Well-Being	139	0.02	0.91	1.00	0.51
Relationship Satisfaction ^a	82	5.93	1.23	-1.31	1.43
Self-Rated Health	147	3.64	0.82	-0.16	-0.07
EDM Involvement	147	0.04	0.66	0.83	0.83
Drug Use (Without Nitrous)	142	13.19	7.14	0.58	0.50
Nitrous Oxide Use	142	13.83	16.02	0.80	-1.09

^aRelationship satisfaction measure only completed by participants who identified as currently being in a relationship.

Table 5 provides intercorrelations between predictor and criterion variables of the study. As expected, positive well-being was negatively correlated with negative well-being and drug use consequences were negatively correlated with positive well-being and positively correlated with negative well-being. Nitrous oxide use and use of other drugs were positively correlated with age in that older participants reported more use of all drugs. Consistent with past substance use literature, men reported more drug use and therefore gender was negatively correlated with drug consequences showing that men experienced more negative consequences from using substances. In contrast to other drug use, women reported more use of nitrous oxide ($r = .21, p < .01$). As anticipated, nitrous oxide use correlated positively with drug use consequences and the

use of other drugs and negatively correlated with self-rated health. The constructed EDM involvement composite was positively associated with positive well-being, nitrous oxide use and other drug use and negative associated with self-rated health. There was also a negative correlation with gender such that more men reported a high level of EDM involvement than women. Finally, participant self-reported health was negatively correlated with negative well-being and drug consequences.

Table 5

Correlations among Predictor and Criterion Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Positive Well Being	--									
2. Negative Well Being	-.40**	--								
3. Relationship	.04	-.01	--							
4. Drug Consequences	-.26**	.43**	-.03	--						
5. Age	.10	-.08	.02	.03	--					
6. Gender	.06	-.03	.03	-.18*	-.32**	--				
7. Nitrous Use	-.04	.04	-.06	.34**	.30**	.21**	--			
8. Drugs (w/o Nitrous)	.07	.08	-.02	.41**	.30**	.29**	.66**	--		
9. EDM Involvement	.16†	-.10	-.03	.15	.13	-.16*	.39**	.38**	--	
10. Self-Rated Health	.19	-.20*	-.02	-.23**	-.05	-.19	-.24**	-.16†	-.11	--

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Primary Analyses

Hypothesis One and Two

Hypothesis one was that EDM involvement, by itself, will not be significantly predictive of psychosocial functioning. Hypothesis two was that both nitrous oxide and other substance use

will independently predict psychosocial functioning. Hypothesis 1 and 2 were tested together by running five separate multiple regression analyses, one for each of five indicators of psychosocial functioning (drug use consequences, positive well-being, negative well-being, relationship satisfaction, and self-reported health). For each regression, age and gender were entered at step one, with EDM involvement entered at step two, use of drugs other than nitrous oxide was entered at step three, and nitrous oxide use was entered at step four. Thus, step two tested hypothesis one (EDM involvement would not predict functioning) and step four tested hypothesis two (both nitrous use and other drug use would predict functioning). At each step, F values were computed to determine whether the additional variable significantly increased the proportion of variance accounted for in the model. To identify the unique variance in the criterion variables accounted for by each predictor, squared semi-partial correlations (sr^2) are reported (See Tables 6-10) (Hoyt, Imel, & Chan, 2008; Hoyt, Leierer, & Millington, 2006).

Table 6 presents results from the four-step regression predicting drug use consequences from age, gender, EDM involvement, nitrous use, and other drug use. As predicted (hypothesis one), EDM involvement was not significantly predictive of drug use consequences (step two). Other drug use significantly increased the proportion of variance accounted for in the model, and use of drugs other than nitrous significantly predicted drug use consequences (step three). However, nitrous use did not independently predict drug use consequences, nor did adding nitrous use to the model increase the overall variance explained (step four). For drug use consequences, hypothesis two was only partially supported.

Table 6

Regression Predicting Drug Use Consequences from EDM Involvement, Nitrous Oxide Use, and Other Drug Use

Predictor	<i>B</i>	<i>SE B</i>	<i>B</i>	<i>t</i>	<i>sr</i> ²
Step 1: $R^2=.03$; ($F\Delta(2,141) = 2.25, p = .11$)					
Age	-.00	.00	-.02	-0.26	.00
Gender	-.06	.03	-.18	-2.10*	.03
Step 2: $R^2=.05$; ($F\Delta(1,140) = 2.03, p = .16$)					
Age	.00	.00	-.03	-0.40	.00
Gender	-.05	.03	-.16	-1.82	.02
EDM Involvement	.03	.02	.12	1.43	.01
Step 3: $R^2=.19$; ($F\Delta(1,139) = 24.50, p < .001$)					
Age	.00	.00	-.13	-1.56	.01
Gender	-.03	.03	.10	-1.16	.01
EDM Involvement	.00	.02	-.02	-0.19	.00
Drugs (Not Nitrous)	.01	.00	.43	4.45***	.14
Step 4: $R^2=.20$; ($F\Delta(1,138) = 2.00, p = .16$) ($F(5,143) = 6.88, p < .01$)					
Age	.00	.00	-.14	-1.74	.02
Gender	-.03	.03	-.10	-1.19	.00
EDM Involvement	-.01	.02	-.04	-0.46	.00
Drugs (Not Nitrous)	.01	.00	.35	3.33***	.06
Nitrous	.00	.00	.15	1.41	.01

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 7 presents results from the four-step regression predicting positive well-being from age, gender, EDM involvement, nitrous use, and other drug use. Contrary to hypothesis one, EDM involvement was significantly predictive of positive well-being (step two), with higher levels of EDM involvement being associated with greater positive well-being. Other drug use did not significantly predict positive well-being (step three), but higher levels of nitrous use were predictive of lower levels of positive well-being (step four). For positive well-being, hypothesis two was only partially supported.

Table 7

Regression Predicting Positive Well-being from EDM Involvement, Nitrous Oxide Use, and Other Drug Use

Predictor	<i>B</i>	<i>SE B</i>	<i>B</i>	<i>t</i>	<i>sr</i> ²
Step 1: $R^2=.02$; ($F\Delta(2,142) = 1.24, p = .29$)					
Age	.02	.01	.12	1.38	.01
Gender	.16	.15	.10	1.12	.01
Step 2: $R^2=.04$; ($F\Delta(1,141) = 3.89, p < .05$)					
Age	.02	.01	.10	1.19	.01
Gender	.21	.15	.13	1.46	.01
EDM Involvement	.21	.11	.17	1.97 [†]	.03
Step 3: $R^2=.04$; ($F\Delta(2,140) = 0.03, p = .87$)					
Age	.01	.01	.10	1.12	.01
Gender	.22	.15	.13	1.46	.01
EDM Involvement	.20	.11	.16	1.81 [†]	.02
Drugs (Not Nitrous)	.00	.01	.02	0.16	.00
Step 4: $R^2=.07$; ($F\Delta(2,139) = 4.18, p < .05$) ($F(5,144) = 2.14, p = .06$)					
Age	.02	.01	.12	1.39	.01
Gender	.22	.15	.13	1.51	.02
EDM Involvement	.25	.11	.20	2.19*	.03
Drugs (Not Nitrous)	.02	.01	.15	1.29	.01
Nitrous	-.01	.01	-.23	-2.04*	.03

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 8 presents results from the regression predicting negative well-being from age, gender, EDM involvement, nitrous use, and other drug use. As predicted (hypothesis one), EDM involvement was not significantly predictive of negative well-being (step two). Other drug use was associated with a marginally significant increase of the proportion of variance accounted for in the model, and use of drugs other than nitrous significantly predicted negative well-being (step three). Nitrous use did not independently predict negative well-being, nor did adding nitrous use to the model increase the overall variance explained (step four). However, in steps 3 and 4 EDM Involvement was a marginally significant predictor of negative well-being. When controlling for other drug use, higher levels of EDM Involvement predicted lower levels of negative well-being. For negative well-being, hypothesis two was only partially supported.

Table 8

Regression Predicting Negative Well-being from EDM Involvement, Nitrous Oxide Use, and Other Drug Use

Predictor	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>sr</i> ²
Step 1: $R^2=.01$; ($F\Delta(2,139) = 0.70, p = .50$)					
Age	-.02	.01	-.10	-1.12	.01
Gender	-.11	.16	-.06	-0.72	.00
Step 2: $R^2=.02$; ($F\Delta(1,138) = 1.34, p = .25$)					
Age	-.01	-.01	-.09	-0.99	.01
Gender	-.15	.16	-.08	-0.91	.01
EDM Involvement	-.13	.12	-0.10	-1.56	.01
Step 3: $R^2=.04$; ($F\Delta(1,137) = 2.76, p < .10$)					
Age	-.02	.01	-.12	-1.35	.01
Gender	-.11	.16	-.06	-0.67	.00
EDM Involvement	-.20	.12	-.15	-1.66†	.02
Drugs (Not Nitrous)	.02	.01	.16	1.66†	.02
Step 4: $R^2=.04$; ($F\Delta(1,136) = 0.05, p = .82$) ($F(5,136) = 1.12, p = .36$)					
Age	-.02	.01	-.12	-1.36	.01
Gender	-.12	.16	-.06	-0.67	.00
EDM Involvement	-.21	.13	-.16	-1.67†	.02
Drugs (Not Nitrous)	.02	.02	.14	1.24	.01
Nitrous	.00	.01	.03	0.23	.00

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 9 presents results from the regression predicting self-reported health from age, gender, EDM involvement, nitrous use, and other drug use. As predicted in hypothesis one, EDM involvement was not significantly predictive of self-reported health (step two). Contrary to hypothesis two, other drug use did not significantly predict self-reported health (step three). However, higher levels of nitrous oxide use predicted lower levels of self-reported health (step four). For self-reported health, hypothesis two was partially supported.

Table 9

Regression Predicting Self-reported Health from EDM Involvement, Nitrous Oxide Use, and Other Drug Use

Predictor	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>sr</i> ²
Step 1: $R^2=.01$; ($F\Delta(2,142) = 0.32, p = .72$)					
Age	-.01	.01	-.07	-0.80	.00
Gender	-.01	.14	.00	-0.05	.00
Step 2: $R^2=.01$; ($F\Delta(1,141) = 0.86, p = .35$)					
Age	-.01	.01	-.06	-0.69	.00
Gender	-.03	.15	-.02	-0.21	.00
EDM Involvement	-.10	.11	-.08	-0.93	.01
Step 3: $R^2=.03$; ($F\Delta(1,140) = 2.55, p = .11$)					
Age	.00	.01	-.03	-0.33	.00
Gender	-.07	.15	-.04	-0.48	.00
EDM Involvement	-.04	.11	-.03	-0.36	.00
Drugs (Not Nitrous)	-.02	.01	-.15	-1.60	.02
Step 4: $R^2=.06$; ($F\Delta(1,139) = 4.42, p < .05$) ($F(5,144) = 1.72, p = .13$)					
Age	.00	.01	-.01	-0.05	.00
Gender	-.07	.14	-.04	-0.47	.00
EDM Involvement	.01	.11	.01	0.05	.00
Drugs (Not Nitrous)	.00	.01	-.02	-0.14	.00
Nitrous	-.01	.01	-.24	-2.10*	.03

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 10 presents results from the regression predicting relationship satisfaction from age, gender, EDM involvement, nitrous use, and other drug use. As predicted (hypothesis one), EDM involvement was not significantly predictive of relationship satisfaction (step two). Contrary to hypothesis two, other drug use did not significantly predict relationship satisfaction (step three) nor did nitrous oxide use (step four). For relationship satisfaction, hypothesis two was not supported.

Table 10

Regression Predicting Relationship Satisfaction from EDM Involvement, Nitrous Oxide Use, and Other Drug Use

Predictor	<i>B</i>	<i>SE B</i>	β	<i>T</i>	sr^2
Step 1: $R^2=.00$; ($F\Delta(2,83) = 0.07, p = .94$)					
Age	.01	.03	.03	0.27	.00
Gender	.16	.31	.04	0.33	.00
Step 2: $R^2=.00$; ($F\Delta(1,82) = 0.07, p = .79$)					
Age	.10	.32	.04	0.32	.00
Gender	.01	.03	.04	0.29	.00
EDM Involvement	-.06	.22	-.03	-0.27	.00
Step 3: $R^2=.00$; ($F\Delta(1,81) = 0.01, p = .91$)					
Age	.01	.03	.04	0.31	.00
Gender	.09	.32	.04	0.29	.00
EDM Involvement	-.05	.23	-.03	-0.22	.00
Drugs (Not Nitrous)	.00	.02	-.01	-0.11	.00
Step 4: $R^2=.01$; ($F\Delta(1,80) = 0.23, p = .64$) ($F(5,85) = 0.08, p = .99$)					
Age	.01	.03	.04	0.29	.00
Gender	.09	.32	.04	0.27	.00
EDM Involvement	-.04	.24	-.02	-0.16	.00
Drugs (Not Nitrous)	.01	.03	.03	0.19	.00
Nitrous	-.01	.01	-.07	-0.48	.01

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Moderation Analyses

In order to test the third and fourth hypotheses, a series of regressions were ran as proposed by Baron and Kenny (1986). First, multicollinearity effects were eliminated by subtracting the sample mean from the all the individual scores on each variable, which centered the predictor and moderator variables. Second, interaction terms were computed by multiplying the variables. Simple slopes analysis was used to probe significant interactions for determining the magnitude of the interaction effect (Aiken & West, 1991). Two separate regressions were then run to test for significant relationships above and below the mean.

Hypothesis Three

Hypothesis three was that nitrous oxide use will moderate the effect of EDM involvement on psychosocial functioning. To test hypothesis 3, the main effects for EDM Involvement and nitrous oxide use were entered in step 1 along with age and gender. In step 2, the interaction of EDM Involvement and nitrous oxide use was entered. Five separate regressions were conducted, one for each of the five indicators of psychosocial functioning. The overall regression predicting drug consequences was significant ($F(5,138) = 4.32, p < .001$). The main effect of nitrous oxide use on drug consequences was significant ($\beta = .35, p < .001$), but the interaction of nitrous oxide use and EDM involvement was not significant ($\beta = -0.02, t = -0.25, p = .80$). The overall regression predicting positive well-being was not significant ($F(5,139) = 1.74, p = .13$). Similar to the finding in hypothesis one, EDM involvement had a significant main effect on positive well-being ($\beta = .20, p < .05$), but the interaction with nitrous oxide use was not significant ($\beta = -0.07, t = -0.67, p = .51$). The overall regression predicting negative well-being was not significant with no significant main effects and the interaction of nitrous oxide use and EDM Involvement on negative well-being was not significant ($\beta = 0.05, t = 0.46, p = .64$). Regarding

self-rated health, the overall regression was not significant. There was a main effect for nitrous oxide use on self-rated health ($\beta = -.27, p < .05$), but the interaction effect of nitrous oxide use with EDM Involvement was not significant ($\beta = 0.04, t = 0.35, p = .73$). The overall regression predicting relationship satisfaction was not significant with no main effects and the interaction of nitrous oxide and EDM Involvement on relationship satisfaction was not significant ($\beta = -0.13, t = -0.98, p = .33$). Thus, hypothesis three was not supported for any of the indicators of well-being. Nitrous Oxide use did not moderate the effect of EDM involvement on psychosocial functioning.

Hypothesis Four

Hypothesis four was that if nitrous oxide use is not confounded with other substance use, nitrous oxide use will moderate the effect of other substance use on psychosocial functioning. The overall regression predicting drug consequences was significant ($F(5,143) = 6.97, p < .001$). There was a main effect of use of other drugs on drug use consequences ($\beta = .34, t = -0.33, p < .01$), but the interaction of other drug use with nitrous oxide was not significant ($\beta = 0.07, t = 0.77, p = .44$).

The overall regression predicting positive well-being was not significant. There was a marginally significant main effect of use of other drugs on positive well-being ($\beta = 0.20, t = 1.79, p < .10$), and the interaction of other drug use with nitrous oxide was marginally significant ($\beta = -0.17, t = -1.80, p < .10$). In the initial analysis, without the interaction term (Model 2) nitrous oxide use and other drug use have opposite main effect relationships of similar magnitude on positive well-being (for nitrous use, $\beta = -.18$; for other drug use, $\beta = .18$).

Simple slopes analyses were used to probe the direction of the interaction. The standard regression provides estimates of the relationship between the predictor (e.g., other substance use)

and the criterion (e.g., positive well-being) when participants are at the sample mean on the moderator (e.g., nitrous use). To test the relationship between other drug use and positive well-being for participants above the mean, the standard deviation is added to the centered Nitrous use variable, and the regression is run again. To test the relationship between other drug use and positive well-being for participants below the mean, the standard deviation is subtracted from the centered Nitrous use variable, and the regression is run a third time. From the moderation analyses, for participants with higher levels of nitrous use, the relationship between positive well-being and other drug use was not significant ($\beta = 0.04, t = 0.28, p = .78$). However, there was a significant relationship between other drug use and positive well-being for participants below the mean on nitrous oxide use ($\beta = 0.37, t = 2.42, p < .05$).

The overall regression predicting negative well-being was not significant with no significant main effects ($F(5,144) = 1.81, p = .12$), and the interaction of other drug use with nitrous oxide was not significant ($\beta = 0.10, t = 1.07, p = .29$). The overall regression predicting self-rated health was not significant. There was a main effect of nitrous oxide use on self-rated health ($\beta = -.26, t = -2.24, p < .05$), and the interaction of other drug use and nitrous oxide use on self-rated health was not significant ($\beta = 0.06, t = 0.66, p = .51$). The overall regression predicting relationship satisfaction was not significant with no significant main effects, and the interaction of other drug use with nitrous oxide use was not significant ($\beta = 0.03, t = 0.26, p = .80$). Thus, hypothesis four was not supported for drug use consequences, negative well-being, self-rated health, or relationship satisfaction. For the aforementioned variables, nitrous oxide use did not moderate the effect of other drug use on psychosocial functioning. However, hypothesis four was partially supported for nitrous oxide use moderating the effect of other drug use on positive well-being.

Additional Analyses

EDM Motives

To better understand EDM Involvement and what motivates participants to attend EDM events, fourteen EDM motive items were entered into a principle components analysis and are presented in Table 11. An orthogonal rotation with varimax solution extracted four factors with eigenvalues of 1.0 or higher, and accounted for 62.61% of the variance. A four-component extraction was consistent with an examination of the scree plot and promoted ease of interpretability. Three items were included in the first component (eigenvalue = 4.08; 29.16% of variance). This factor appears to describe emotional regulation reasons and was labeled as such. Four items were included in the second component (eigenvalue = 2.05; 14.63% of variance). This factor appears to describe reasons that involved dance and music and was labeled as such. The third factor included three items (eigenvalue = 1.48; 10.54% of variance). This factor appears to describe social reasons and was labeled as such. Four items were included in the fourth component (eigenvalue = 1.16; 8.28% of variance). This factor appeared to describe reasons related to sensation seeking and was labeled accordingly.

Table 11

Factor Pattern Matrix for EDM Motives Items

Items	Factor Loadings			
	Emotion Regulation	Music and Dance	Social	Sensation Seeking
To forget my problems.	.87			
To have less worry.	.78	--		
To feel good.	.69	.31	--	
To get totally into the music.	--	.73	--	--
To dance all night long.	--	.67	--	--
To get to know myself better.	.45	.59		
For a spiritual experience.	.51	.56	--	--
Because I'm more likely to meet new people.	--	--	0.56	.56
Because my friends go.	--	--	0.85	--
Because my friends ask me to go.	--	--	0.85	--
For drug-related experiences.	--	--	--	0.78
Because it makes me feel cool.	.33	--	--	0.68
To feel sexy.	--	--	--	0.62
Because it is easier to flirt with other people	--	--	--	0.58

Note. $N = 143$

Factor scores for each factor were created from the factor loadings in the principal components analysis. To test whether EDM motives were related to outcomes, separate two-step multiple regression analyses were ran for each of five indicators of psychosocial functioning (positive well-being, negative well-being, drug use consequences, relationship satisfaction, and

self-reported health). For each regression, EDM Involvement, EDM Importance, and gender were entered at step one, with Emotional Regulation Reasons, Music and Dance Reasons, Social Reasons, and Sensation Seeking Reasons entered at step two. However, none of the EDM reasons significantly predicted positive well-being, relationship satisfaction, or self-reported health therefore details of the analyses are not reported here.

The overall regression predicting drug consequences was significant ($F(7,138) = 2.24, p < .05$). In step 1, EDM Involvement, EDM Importance, and gender were not significantly predictive of drug use consequences. However, in step 2, sensation seeking significantly predicted drug use consequences ($\beta = .21, t = 2.56, p < .05$).

The overall regression predicting negative well-being was not significant ($F(7,136) = 1.60, p = .14$). In step 1, EDM Involvement, EDM Importance, and gender were not significantly predictive of negative well-being. However, in step 2, emotional regulation reasons significantly predicted negative well-being ($\beta = .22, t = 2.38, p < .05$) and social reasons was a marginally significant predictor ($\beta = .14, t = 1.64, p < .10$).

The overall regression predicting nitrous oxide use was significant ($F(7,138) = 4.44, p < .001$). In step 1, EDM Importance and gender were not significantly predictive of nitrous oxide use. However, EDM Involvement was a significant predictor of nitrous oxide use ($\beta = .35, t = 3.77, p < .001$). In step 2, sensation-seeking reasons significantly predicted nitrous oxide use ($\beta = .17, t = 2.08, p < .05$).

Sensation seeking was the best predictor of drug use consequences while controlling for EDM Involvement and EDM Importance. Emotional regulation reasons, followed by social reasons were the best predictors of negative well-being. In addition, sensation-seeking reasons were significant for predicting nitrous oxide use. That is, participants who go to EDM events seeking a

drug-related experience, to feel “cool” or “sexy,” or to flirt with others reported more use of nitrous oxide.

CHAPTER 4

DISCUSSION

EDM events are increasing in popularity as evidenced by the increasing availability of events and presence in mainstream society (Anderson, 2009). EDM events are known for the wide availability of multiple substances that are ingested in effort to enhance the experience of the EDM event. As a result, individuals who frequently attend EDM events are at increased risk for engaging in polydrug use and experiencing the consequences of polydrug use. As reviewed in the introduction, previous quantitative EDM research that only assessed for NIDA's specified club drugs may have underestimated the use of nitrous oxide in this population of music fans (NIDA, 2008). This study found that EDM Involvement was significantly associated with nitrous oxide use ($r = .39, p < .01$). A possible explanation for this finding is that the present study included slang terms for nitrous oxide such as "whippets" and "balloons." In addition, survey questions separated nitrous oxide use from use of other inhalants. Although nitrous oxide belongs to the inhalant/solvent drug category, previous research suggested separating nitrous oxide from other inhalants and solvents (Brouette & Anton, 2001; Garland, Howard, & Perron, 2009). More specifically, nitrous oxide inhalation differs from other inhalants in its ability to produce euphoric psychedelic experiences (Beckman et al., 2006). EDM events are known for creating an atmosphere with flashing lights, lasers, loud music, and dancing that is reported to amplify a psychedelic drug experience. Thus, drugs with psychedelic qualities such as MDMA and hallucinogens are often popular among participants in this population.

Research suggests that, historically, MDMA is the popular drug of choice for EDM events, but lists of popular “club drugs” now consider that many substances are used at EDM events (NIDA, 2008). In addition, qualitative studies have revealed that particular participants may mix certain substances in order to amplify their psychedelic experience and obtain a euphoric effect (Hunt et al., 2009). For instance, participants time their nitrous oxide inhalation to occur during specific times of the MDMA intoxication in order to produce an out-of-body experience (Whalley & Brooks, 2009). Thus, it appears that use of nitrous oxide enhances the experience of psychedelic drugs. Indeed, the present study found that nitrous oxide use was significantly associated with use of MDMA ($r = .59, p < .01$) and hallucinogens ($r = .56, p < .01$). See Appendix J for a table presenting the intercorrelations of this study’s most frequently reported substances.

Consequences of prolonged nitrous oxide inhalation are both similar to and different from those seen in MDMA-only studies. Consequences are similar in the areas of decreased moods and issues with memory (Cartling, 1999). However, recreational use nitrous oxide inhalation can cause a serious deficiency in vitamin B₁₂ that can lead to anemia, myelopathy, or spinal cord degeneration (Ng et al., 2003). Further, chronic nitrous oxide use breaks down the myelin sheath and interferes with neuronal signal transduction. A signal interference of this nature can cause muscle spasms or tremors and limb paralysis as well as difficulties talking and walking (NIDA, 2009). Given that these substances are often paired together in polydrug users, nitrous oxide use may have consequences similar to other drugs as well as experience unique consequences that, taken together, impact psychosocial functioning. Thus, the present study investigated both the presence and impact of nitrous oxide use and whether participants who use drugs and inhale nitrous oxide experience more negative outcomes than those who do not use nitrous oxide.

The broad goal of this study was to examine the impact of EDM involvement and nitrous oxide use on the well-being of electronic dance music fans. The following discussion is broken down by hypotheses with an exploration of participant motives for attending EDM events. Strengths and limitations of the present study as well as suggestions for future research are provided.

Hypothesis One

Hypothesis one was that EDM involvement, by itself, will not be significantly predictive of psychosocial functioning. In other words, merely being involved in the EDM scene will not be associated with problems in psychosocial functioning or other negative outcomes. The hypothesis was partially supported and revealed an unexpected finding described below.

Drug use consequences. Previous research has suggested that fans of electronic music genres should be considered part of a “problem pop culture” in that they smoke more cigarettes and drink more alcohol when compared to fans of other genres of music (Forsyth et al., 1997; North & Hargreaves, 2007). The overall social reaction to the electronic music scene has been described as a “moral panic,” which is largely attributed to reports of drug overdoses in the media (Critchler, 2000). In addition, theories of “normalization” of drug use have been attributed to the EDM scene, which portrays EDM events and fans in a negative light. That is, EDM events provide a social outlet that accommodates drug use and cultivates a perception of low-risk that ultimately normalizes drug use in young adults (Bahora et al 2007). However, Shildrick (2002) argues against this theory and warns that, while parts of the concept can undoubtedly be useful, authors must be careful to avoid pathologizing drug use in young adults. That is, research focused entirely on the risks and danger of drug use limit the understanding of how drug use occurs in a social context (Moore & Miles, 2004). Although the use of substances increases risk

of consequences, the social environments in which substances are used may serve as a buffer to consequences.

In the current sample, degree of EDM involvement did not predict drug use consequences. Thus, participants who were more involved as fans of electronic dance music and attended more EDM events were not significantly more likely than those less involved to have negative outcomes as a result of drug use.

Negative well-being. EDM involvement was not significant for predicting negative well-being. That is, EDM involvement was not significantly predictive of negative affect and psychopathology. The bulk of EDM research focuses on the repercussions of substance use on mental health, especially MDMA (Schifano, 2000; Topp et al., 1999). Therefore, it was beneficial to separate these associations and examine the relationship between EDM involvement and negative well-being. In the present study, no specific substances significantly correlated with negative affect or mental health symptoms, but consequences of drug use were significantly associated with negative affect ($r = .36, p < .01$) as well as items on the brief symptom inventory ($r = .38, p < .01$). Thus, it appears that, in this sample, negative well-being was largely attributed to the consequences of the drugs overall as opposed to the use of one particular substance or being a fan of EDM music. However, when controlling for other drug use, higher levels of EDM Involvement predicted lower levels of negative well-being. Thus, it appears that EDM Involvement may serve as a protective factor against the impact of drug use on negative well-being. It could also be that a third variable associated with EDM events contributed to less negative well-being, such as social support. Ter Bogt et al. (2002) argues that use of drug use in the context of dancing and clubs contributes to increased socialization and actually enhances well-being. This concept is further explored below.

Relationship satisfaction. EDM involvement did not predict relationship satisfaction. Studies have shown that popular club drugs, namely MDMA, are associated with relationship problems (Topp et al., 1999) and that electronic music is associated with difficult interpersonal relationships (North & Hargreaves, 2007). Vervaeke and Korf (2006) conducted a qualitative study in an older group of EDM attendees and found that participants reported that MDMA use had both positive and negative effects on their relationships during their years of MDMA use. In their study, participants with a current steady partner were more likely to report that their partner also used MDMA and participants without a steady partner were more likely to attribute MDMA use as having a negative impact on their previous relationships. Given this finding, it appears important to assess relationship satisfaction for participants involved as well as those not currently involved with a romantic partner. The survey in the present study used an exclusionary rule (i.e., yes or no) that moved participants who reported not currently being involved to the next set of questions. Thus, no relationship satisfaction data was gathered for participants who answered that they were not currently involved in a romantic relationship. Perhaps participants who have had unsuccessful relationships as a result of EDM Involvement or substance use are unable to sustain a relationship? Although, EDM Involvement in this study was significantly associated with use of MDMA ($r = .48, p < .01$), Nitrous oxide ($r = .39, p < .01$), and Hallucinogens ($r = .37, p < .01$), EDM involvement was not significantly predictive of better or worse relationships.

Self-rated health. EDM involvement did not predict perceptions of general health. One possible explanation for this finding could be that self-ratings of health are not an accurate indicator of health. Participants may not have an accurate perception of adequate or “normal” health. Perhaps participants are comparing themselves to other fans of EDM and responses to

this question were comparative. Although all participants in the current study reported being a fan of EDM music, an interesting idea for future research would be to compare health ratings between groups of EDM fans and non-EDM fans.

In 2007, North and Hargreaves expressed their concern that members of the “problem pop culture,” which included electronic music genres, had lower levels of health and identified this as an alarming finding given the relative age difference (i.e., younger) of EDM fans. However, in their discussion, they reported the “problem pop culture” as a group by combining electronic music fans with other music genres such as hip-hop and R&B music because these genres shared some, but not all, correlates. Therefore, the reader does not get a clear understanding of the association between health issues and electronic music. In fact, a table in the results section suggests that fans of DJ-based music exercised more than all other types of music fans in their study, but this information was not presented or contrasted in the discussion. They also used reported alcohol and nicotine use as a measure of health. Similarly, EDM Involvement in the present study was also significantly associated with involvement in sports and exercise ($r = .20, p < .05$). In addition, self-ratings of health were significantly associated with nitrous oxide use ($r = -.24, p < .01$), drug use consequences ($r = -.23, p < .01$), and other drug use ($r = -.16, p < .10$). Thus, in order to delineate the association between EDM and the health of EDM fans, it is important to separate drug use and EDM Involvement. That is, lower health ratings may be attributed to substance use rather than being a fan of a particular genre of music.

Positive well-being. The final finding relating to the hypothesis that EDM Involvement would not independently predict psychosocial functioning examined the relationship between EDM Involvement and positive well-being. However, EDM Involvement was found to

significantly predictive of positive well-being. Due to this finding, the first hypothesis was only partially supported. This is an interesting finding given the abundance of literature focused on the negative outcomes of attending EDM events or descriptions of EDM fans as a problem culture.

One possible explanation for this finding may be the underlying ethos and attitude that branded the early EDM scene: PLUR. That is, going to a place where peace, love, unity, and respect are expected allows the participant to comfortably express themselves and explore their identity, which may provide a sense of meaning or a means of coping that increases positive affect (Malbon, 1998). In fact, the UNITY component of the PLUR ethos indicates an appreciation for social bonding. Indeed, EDM Involvement in the present study was positively associated with ratings of the importance of PLUR ($r = .27, p < .01$).

Positive well-being was significantly associated with socializing ($r = .16, p < .10$) and exercising ($r = .30, p < .01$). Therefore, another potential explanation is that attending EDM events increases time spent with friends and more opportunities to meet new friends. Previous research suggests that EDM events provide a social outlet that allow participants a break from stress and that, independent of substance use, counterbalance the hassles experienced in daily life (Malbon, 1999; Moore & Miles, 2004; Ter Bogt et al., 2002). Further, EDM events are known for prolonged hours of dancing, which is a form of aerobic exercise. Not surprisingly, EDM Involvement in the present study was significantly associated with more time spent involved in sports and exercise ($r = .20, p < .05$). Perhaps the relationship between EDM Involvement and positive well-being is partially due to EDM events being an outlet for high-energy dance?

Hypothesis Two

Hypothesis two was that both nitrous oxide use and other substance use will independently predict psychosocial functioning. In this study, nitrous oxide use predicted lower levels of positive wellbeing and self-reported health, while other drug use predicted more drug use consequences and higher levels of negative well-being. Neither nitrous oxide use nor other drug use predicted levels of relationship satisfaction. Thus, hypothesis two was partially supported as nitrous oxide and other drug use predicted different aspects of functioning psychosocial functioning.

In regards to positive well-being, other drugs were not predictive of positive well-being. However, nitrous oxide use predicted lower levels of positive well-being. That is, participants that used more nitrous oxide reported less understanding of their life's meaning and fewer experiences of positive affect. Either people with less positive affect are using nitrous or people that use nitrous have less positive affect as a result of their nitrous oxide use. One possible explanation for this finding is the contribution of drug use consequences to one's life experience. The drug consequence measure assessed feelings of guilt, unhappiness, failure, regret, and irresponsibility due to drug use. Positive well-being was significantly associated with drug use consequences ($r = -0.27, p < .01$) and nitrous oxide was significantly associated with drug use consequences ($r = .34, p < .01$). Therefore, it appears that lower positive well-being may be partially explained by the association of nitrous oxide with drug use consequences.

In regards to participant perceptions of their general health, other drug use did not significantly predict self-rated health. In contrast, nitrous oxide significantly predicted lower levels of self-reported health. That is, participants who reported higher nitrous oxide use had

significantly lower perceptions of their health. A likely explanation for lower self-reported health in nitrous oxide users is the previously discussed unique health issues that have been reported in studies examining chronic nitrous oxide use (Brouette & Anton, 2001). Prolonged inhalation of nitrous oxide is consistently linked with vitamin B₁₂ deficiency (Chanarin, 1980; Ng et al., 2003). Vitamin B₁₂ deficiency reduces red blood cell production and, without discontinued use, can result in pernicious anemia, paresthesias, degenerated spinal cord, mild memory impairment/dementia, depression, psychosis, irritability, and changes in personality (Oh & Brown, 2003). The aforementioned health repercussions are largely associated with documented chronic nitrous oxide abuse. Although the current survey only measured lifetime use and did not adequately assess for chronic abuse, it is possible that nitrous users are experiencing some health repercussions because of reduced vitamin B₁₂.

Hypothesis Three

Hypothesis three that nitrous oxide use will moderate the effect of EDM involvement on psychosocial functioning was not supported. Nitrous oxide use was not a significant moderator of the effect of EDM involvement on drug use consequences, positive well-being, negative well-being, self-rated health, or relationship satisfaction. One possible explanation for this finding could be the imprecise assessment for nitrous oxide use. That is, the difference between 'high nitrous use' and 'low nitrous use' was limiting in that participants grouped into the high nitrous use group could only endorse a lifetime use estimate of 40 or more instances of use whereas those low in nitrous reporting using nitrous less than 40 times in their lifetime. With these low value anchors, both groups could be unlikely to experience repercussions of prolonged nitrous abuse. Suggestions for future research examining nitrous oxide follow below. Another explanation is that EDM Involvement, partly supported by the previous hypotheses, appears to

play some sort of a protective factor in that those who attend more events have better well-being. Thus, perhaps nitrous oxide use does not overpower the positive impact of being highly involved in the EDM scene.

Hypothesis Four

Hypothesis four was that if nitrous oxide use was not confounded with the use of other substances, nitrous oxide use would moderate the effect of other substance use on psychosocial functioning. A marginally significant moderation effect was only observed with positive well-being. For participants reporting high levels of nitrous use, there was no relationship between positive well-being and other drug use. However, for participants who reported low levels of nitrous use, there was a significant relationship between other drug use and positive well-being. Specifically, participants who reported more use of other drugs and lower use of nitrous oxide reported higher positive well-being. A possible explanation for this finding is that participants who engage in less nitrous oxide use are able to use the substance to enhance their well-being, as previously discussed, and not experience significant psychosocial repercussions.

In the initial analysis, without the interaction term (Model 2) nitrous oxide use and other drug use have opposite relationships of similar magnitude on positive well-being (for nitrous use, $\beta = -.18$; for other drug use, $\beta = .18$). Two of the possible interpretations of this are that nitrous oxide use lowers positive well-being and other drug use increases positive well-being or that high positive well-being contributes to other drug use, while low positive well-being increases use of nitrous, perhaps in an effort to enhance well-being. Garland and Howard (2011) found that general inhalant use consequences were related to participant motives to use inhalants in effort to self-medicate ($r = .44, p < .001$). In examining predictors of negative psychosocial outcomes associated with inhalant use, they found that self-medication was the most influential predictor (β

= .26, $p < .001$). However, their study assessed adolescents for general inhalant use, which excluded nitrous oxide use. Although nitrous oxide use in the present study was associated with drug use consequences ($r = .34$, $p < .01$), which can be distressing, it would have been interesting to collect data on motives specific to nitrous oxide use. A discussion of findings from the additional analyses looking at EDM motives follows.

Additional Analyses

Although there are different motives for being involved in the EDM scene, what is most problematic in regards to drug use consequences is when participants go to EDM events for reasons of sensation-seeking. This finding supports that simply being a part of the EDM scene is not problematic except for participants going to EDM events seeking out drug experiences. In terms of prevention, to reach sensation-seeking motivated individuals, it would be helpful to use materials or methods that are exciting and new. One way to do this is to use brightly colored psychedelic pamphlets or fliers to disseminate information about harm-reduction strategies. For those setting up information booths at events (e.g., DanceSafe), you can use edgy music, comedy, novel candies, and bright lights to draw your target audience of sensation-seekers.

Strengths

A strength of this study is the documented prevalence of nitrous oxide use in the EDM population. In contrast to previous research that either did not assess for the use of nitrous or used vague or dated terms such as solvents, this study found that nitrous oxide was the fifth most endorsed illicit substance with 68.7% reporting some lifetime use and almost half reporting use at an EDM event. Thus, future EDM research should consider adding nitrous oxide use to their drug assessments using clear unambiguous language along with a couple common slang terms (i.e., whippets, balloons). Although it is not possible to capture all the street terms for each

substance, adding a common slang term may increase participant identification and reflect more accurate reporting.

A major strength is this study supports that attending EDM events and being involved in the EDM scene may have a positive effect on well-being. That is, EDM Involvement was related to an increase in positive well-being and decrease in negative well-being when controlling for drug use. As research suggests, people appear to be getting something positive out of EDM involvement that may counterbalance the impact of drug use.

A strength and limitation for the present study was the ability to utilize a web-based survey through a social media outlet. The Internet is a major source of communication in this population of music fans as promotions of EDM events are advertised through use of Facebook, websites, forums, and Internet blogs (Hunt & Evans, 2003). However, this also implies that the current survey was limited to participants who have Internet access and use Facebook. In addition, due to the personal nature of the questions, using an Internet based survey may have increased participant perceptions of anonymity and influenced forthrightness in responding to questions that would be difficult to disclose during an interview with an investigator.

Limitations and Suggestions

A major limitation for this study was the method used to inquire about the frequency of nitrous oxide use. That is, nitrous oxide use was assessed along with the other drug use items and the anchors were left unchanged, for purposes of consistency. Thus, those endorsing the highest use of nitrous oxide reported the maximum option of “40 times or more.” Due to the short-lived duration of nitrous oxide intoxication, several administrations must occur in order to maintain a euphoric effect and could easily be used 40 times or more in just one evening, let alone a lifetime. Therefore, participants who engage in chronic nitrous oxide use will report significantly

more lifetime use than was assessed in this study (Pema, et al., 1998). One way to partially address this issue is to assess for past week or past month use in addition to lifetime use. In addition, it may be useful to inquire about the method of inhalation because that changes the amount of administered drug. For example, if a participant stated they consumed nitrous once, that could mean one whip cream cartridge, one bag or balloon, or one large tank containing nitrous oxide. Thus, future assessments should be more specific about how participants are quantifying reported use and measures should provide broad frequency anchors that separate chronic users from casual users.

Another possible limitation for this study is that, by combining all the criterion measures in the same order for all participants, the questions for one measure may affect the responses on the next criterion measure creating spurious correlations (Whitley, 2002). That is, the context of one measure affects the perceptions and responses to questions on the other measures. To lower the probability for these spurious correlations, survey questions could be randomly entered into the questionnaire rather than lumping them together by measure. Another way to reduce this risk is setting the survey so that participants receive varying orders of each measure by counterbalancing the survey.

Future research should distinguish between substance use at the EDM event itself versus pre and post-parties. Pre-gaming is receiving attention among researchers who study college substance use, and pre and post parties are part of the EDM scene (Moore & Miles, 2004). It might also be helpful to indicate on the questionnaire that, for questions regarding use at EDM event, to include both public events as well as private EDM house parties. Future studies should investigate what genres of EDM music are most associated with use of particular substances and with what particular outcomes.

Given that nitrous oxide use was related to positive well-being and self-rated health, it would be informative to examine motives for nitrous oxide use. Studies are needed to determine if EDM participants who use nitrous oxide to self-medicate have lower positive well-being or higher negative well-being? Further, studies are needed to determine how EDM participants perceive the risk or harm of nitrous oxide use (Garland & Howard, 2011). Perhaps participants view nitrous oxide as less harmful than other drugs given the lack of negative media attention as well as the perceived legality of use as nitrous oxide can be purchased legally at local novelty shops or on the Internet.

In regards to relationship satisfaction, future studies should include participants who are currently involved as well as those who are not currently involved in a relationship. In this study almost half identified as being single and only 20% identified as cohabitating with a partner but not married and an additional 13% were married. One way to accomplish this is to alter the language of the KMS to include previous relationship or find alternative measure. It might also be helpful to assess for duration of current and most recent relationship as well as total number of relationships. Not many participants answered that they were divorced, but perhaps it would also be helpful to assess the total number of divorces.

Summary

The present study examined nitrous oxide use in the EDM participants using a quantitative design and investigated polysubstance use and positive and negative consequences in EDM participants. Results support previous literature that EDM Involvement plays a significant role in protecting young adults from negative outcomes. The results of the present study clearly indicate the need to further explore nitrous oxide use in EDM culture. A deeper understanding of how this population uses nitrous oxide and perceptions of nitrous oxide as an

innocuous substance can promote educational programs about how nitrous oxide use can adversely affect well-being. For example, further research could help elucidate the repercussions of nitrous oxide and identify whom, if anyone may be at a higher risk for negative consequences. Findings in the present study set the stage for exciting new areas of EDM research, including examining positive and negative well-being for EDM fans. This area of research will be particularly beneficial in understanding the lives of both young and older adults due to EDM's increasing popularity and media attention that was previously anomalous to the electronic dance music community.

REFERENCES

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park: Sage.
- Aldridge, J., Measham, F., & Williams, L. (2011). *Illegal leisure revisited: Changing patterns of alcohol and drug use in adolescents and young adults*. New York, US: Routledge/Taylor & Francis.
- Alterman, A., Cacciola, J., Ivey, M., Habing, B., & Lynch, K. (2009). Reliability and validity of the Alcohol Short Index of Problems and a newly constructed Drug Short Index of Problems. *Journal of Studies on Alcohol and Drugs*, 70, 304-307.
- Anderson, T. (2009). Understanding the alteration and decline of a music scene: Observations from rave culture. *Sociological Forum*, 24, 307-336. doi: 10.1111/j.1573-7861.2009.01101.x
- Anguish, D. (2000). Update on raves and drugs? *The CNYPCCToxicology Letter*, 4.
- Atkinson, R., Green, J. (1983). Personality, prior drug use, and introspective experience during nitrous oxide intoxication. *International Journal of Addiction*, 18, 717-738.
- Bahora, M., Sterk, C., & Elifson, K. (2009). Understanding recreational ecstasy use in the United States: A qualitative inquiry. *International Journal of Drug Policy*, 20, 62-69. doi: 10.1016/j.drugpo.2007.10.003.

- Baron, R., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology*, *51*, 1173-1182.
- Beckman, N., Zacny, J., & Walker, D (2006). Within-subject comparison of the subjective and psychomotor effects of a gaseous anesthetic and two volatile anesthetics in healthy volunteers. *Drug and Alcohol Dependence*, *81*, 89-95. doi: 10.1016/j.drugalcdep.2005.06.002.
- Boot, B., McGregor, I., & Hall, W. (2000). MDMA (Ecstasy) neurotoxicity: assessing and communicating the risks. *The Lancet*, *355*, 1818-1821.
- Boys, A., Marsden, J., Griffiths, P., Fountain, J., Stillwell, G., & Strang, J. (1999). Substance use among young people: The relationship between perceived functions and intentions. *Addiction*, *97*, 1043-1050.
- Brouette, T., Anton, R. (2001). Clinical review of inhalants. *The American Journal on Addictions*, *10*, 79-94.
- Cartling, B. (1999). Control of resolution and perception in working memory. *Behavioral Brain Research*, *100*, 255-271.
- Chambers, A., Taylor, J., & Potenza, M. (2003). Developmental neurocircuitry of motivation in adolescence: A critical period of addiction vulnerability. *American Journal of Psychiatry*, *160*, 1041-1052.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155-159.
- Crews, F., He, J., & Hodge, C. (2007). Adolescent cortical development: A critical period of vulnerability for addiction. *Pharmacology, Biochemistry, and Behavior*, *86*, 189-199. doi: 10.1016/j.pbb.2006.12.001.

- Critcher, C. (2000). 'Still raving': social reaction to Ecstasy. *Leisure Studies, 19*, 145-162.
- Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.
- Curran, V., & Travill, R. (1997). Mood and cognitive effects of 3,4-methylenedioxymethamphetamine (MDMA, 'ecstasy'): Week-end 'high' followed by mid-week low. *Addiction, 92*, 821-831.
- Derogatis, L., & Melisaratos, N (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine, 13*, 595-605.
- Dillman, D. (2000). *Mail and Internet surveys: The tailored design method*. New York, NY: John Wiley & Sons.
- Engels, R., & Ter Bogt, T. (2004). Outcome expectancies and ecstasy use in visitors of rave parties in the Netherlands. *European Addiction Research, 10*, 156-162. doi: 10.1150/000079836.
- Fendrich, M., Wislar, J., Johnson, T., & Hubbell, A. (2003). A contextual profile of club drug use among adults in Chicago. *Addiction, 98*, 1693-1703.
- Fernandez-Calderon, F., Lozano, O., Vidal, C., Ortega, J., Vergara, E., Gonzalez-Saiz, F., & Bilbao, I. (2011). Polysubstance use patterns in underground rave attenders: A cluster analysis. *Journal of Drug Education, 41*, 183-202.
- Forsyth, A. (1996). Places and patterns of drug use in the Scottish dance scene. *Addiction, 91*, 511-521.
- Forsyth, A., Barnard, M., & McKeganey, N. (1997). Musical preference as an indicator of adolescent drug use. *Addiction, 1317-1325*.

- Fox, H., McLean, A., Turner, J., Parrott, A., Rogers, R., & Sahakian, B. (2002). Neuropsychological evidence of a relatively selective profile of temporal dysfunction in drug-free MDMA ("ecstasy") polydrug users. *Psychopharmacology*, *162*, 203-214. doi: 10.1007/s00213-002-1071-9.
- Garland, E., & Howard, M. (2011). Adverse consequences of acute inhalant intoxication. *Experimental and Clinical Psychopharmacology*, *19*, 134-144.
- Garland, E., Howard, M., & Perron, B. (2009). Nitrous oxide inhalation among adolescents: Prevalence, correlates, and co-occurrence with volatile solvent inhalation. *Journal of Psychoactive Drugs*, *41*, 337-347.
- Gassman, R., Jun, M., Samuel, S., Agle, J., Lee, J., Agle, B., ...Smith, M. (2012). Alcohol, tobacco, and other drug use by Indiana children and adolescents: The Indiana Prevention Resource Center Survey-2012 (IDAP Monograph No. 12-01). Retrieved from Indiana University, Indiana Prevention Resource Center website:
http://www.drugs.indiana.edu/publications/survey/indianaSurvey_2012.pdf
- Grant, S., Contoreggi, C., & London, E. (2000). Drug abusers show impaired performance in a laboratory test of decision making. *Neuropsychologia*, *38*, 1180-1187.
- Hammers, D., & Suhr, J. (2010). Neuropsychological, impulsive personality, and cerebral oxygenation correlates of undergraduate polysubstance use. *Journal of Clinical and Experimental Neuropsychology*, *32*, 599-609. doi: 10.1080/13803390903379599.
- Hayes, J. (1997). What does the Brief Symptom Inventory measure in college and university counseling center clients? *Journal of Counseling Psychology*, *44*, 360-367.
- Hayes, R., & Morales, L. (2001). The RAND-36 measure of health-related quality of life. *Annals of Medicine*, *33*, 350-357.

- Hitzler, R. (2002). Pill kick: The pursuit of “ecstasy” at techno-events. *Journal of Drug Issues*, 32, 459-465.
- Hunt, G., & Evans, K. (2003). Dancing and drugs: A cross-national perspective. *Contemporary Drug Problems*, 30, 779-814.
- Hunt, G., & Evans, K. (2008). ‘The great unmentionable’: Exploring the pleasures and benefits of ecstasy from the perspectives of drug users. *Drugs: Education, Prevention, and Policy*, 15, 329-349. doi: 10.1080/0968763070726841.
- Hunt, G., Evans, K., & Kares, F. (2007). Drug use and meanings of risk and pleasure. *Journal of Youth Studies*, 10, 73-96. doi: 10.1080/1376260600983668.
- Hunt, G., Evans, K., Loloney, M., & Bailey, N. (2009). Combining different substances in the dance scene: Enhancing pleasure, managing risk and timing effects. *Journal of Drug Issues*, 495-522.
- Johnston, L. D., O’Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2013). Monitoring the Future national results on drug use: 2012 overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan.
- Kalant, H. (2001). The pharmacology and toxicology of “ecstasy” (MDMA) and related drugs. *Canadian Medical Association Journal*, 165, 917-928.
- Kelly, B. (2005). Conceptions of risk in the lives of club drug-using youth. *Substance Use & Misuse*, 40, 1443-1459. doi: 10.1081/JA-200066812.
- Kline, R. (2005). Principles and Practice of Structural Equation Modeling (2nd Ed). New York: The Guilford Press.
- Lenton, S., Boys, A., & Norcross, K. (1997). Raves, drugs and experience: Drug use by a sample of people who attend raves in Western Australia. *Addiction*, 92, 1327-1337.

- Lim, M., Hellard, M., Hocking, J., & Aitken, C. (2008). A cross-sectional survey of young people attending a music festival: Associations between drug use and musical preference. *Drug and Alcohol Review, 27*, 439-441. doi: 10.1080/09595230802089719.
- Oh, R., & Brown, D. (2003). Vitamin B12 deficiency. *American Family Physician, 67*, 979-986.
- Mackesy-Amiti, M., & Fendrich, M. (1999). Inhalant use and delinquent behavior among adolescents: A comparison of inhalant users and other drug users. *Addiction, 94*, 555-564.
- Malbon, B. (1999). *Clubbing: Dancing, Ecstasy, and Vitality*. London: Routledge.
- Martinotti, G., Carli, V., Tedeschi, D., Giannantonio, M., Roy, A., Janiri, L., & Sarchiapone, M. (2009). Mono- and polysubstance dependent subjects differ on social factors, childhood trauma, personality, suicidal behavior, and comorbid Axis I diagnoses. *Addictive Behaviors, 34*, 790-793. doi: 10.1016/j.addbeh.2009.04.012.
- Maxwell, J. (2005). Party drugs: Properties, prevalence, patterns, and problems. *Substance Use and Misuse, 40*, 1203-1240. doi: 10.1081/JA-200066736.
- McCann, U., Szabo, Z., Vranesic, M., Palermo, M., Mathews, W., Ravert, H., Dannals, R., & Ricaurte, G. (2008). Positron emission tomographic studies of brain dopamine and serotonin transporters in abstinent 3,4-methylenedioxymethamphetamine ("ecstasy") users: Relationship to cognitive performance. *Psychopharmacology, 200*, 439-450. doi: 10.1007/s00213-008-1218-4.
- Measham, F., Aldridge, J., & Parker, H. (2001). *Dancing on drugs: Risk, health, and hedonism in the British club scene*. New York: Free Association Books.
- Measham, F., Newcombe, R., & Parker, H. (1994). The normalization of recreational drug use amongst young people in North-West England. *The British Journal of Sociology, 45*, 287-312.

- Medina, K., Schafer, J., Shear, P., & Armstrong, T. (2004). Memory ability is associated with disagreement about most recent conflict in polysubstance abusing couples. *Journal of Family Violence, 19*, 387-398.
- Medina, K., Shear, P., Schafer, J., Armstrong, T., & Dyer, P. (2004). Cognitive functioning and length of abstinence in polysubstance dependent men. *Archives of Clinical Neuropsychology, 19*, 245-258. doi: 10.1016/S0887-6177(03)00043-X.
- Miller, W., Tonigan, J., & Longabaugh, R. (1995). The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse. Test manual (Vol. 4, Project MATCH Monograph Series). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.
- Moore, K., & Miles, S. (2004). Young people, dance and the sub-cultural consumption of drugs. *Addiction Research and Theory, 12*, 507-523. doi: 10.1080/16066350412331323083.
- Morgan, M., McFie, L., Fleetwood, L., & Robinson, J. (2002). Ecstasy (MDMA): are the psychological problems associated with its use reversed by prolonged abstinence? *Psychopharmacology, 159*, 294-303. doi: 10.1007/s002130100907.
- National Institute on Drug Abuse (2008). NIDA Infofacts: Club Drugs. Retrieved from www.drugabuse.gov/.../drugfacts/club-drugs-ghb-ketamine-rohypnol
- National Institute on Drug Abuse (2009). NIDA Infofacts: Inhalants. Retrieved from <http://www.drugabuse.gov/publications/drugfacts/inhalants>
- National Institute on Drug Abuse (2009). NIDA Infofacts: MDMA. Retrieved from <http://www.drugabuse.gov/publications/drugfacts/mdma-ecstasy-or-molly>
- Ng, J., O'Grady, G., Pettit, T., & Frith, R. (2003). Nitrous oxide use in first-year students at Auckland University. *The Lancet, 361*, 1344-1350.

- “Nitrous Oxide – Effects on the Body.” Encyclopedia of Drugs and Addictive Substances. Ed. Barbara C. Bigelow. Gale Cengage, 2006. eNotes.com. 2006. 18 Oct, 2011
<<http://www.enotes.com/drugs-substances-encyclopedia/nitrous-oxide/effects-body>>
- North, A., & Hargreaves, D. (2007). Lifestyle correlates of musical preference: 3. Travel, money, education, employment and health. *Psychology of Music*, 35, 473-497.
- Parker, H., & Egginton, R. (2002). Adolescent recreational alcohol and drugs careers gone wrong: Developing a strategy for reducing risks and harms. *International Journal of Drug Policy*, 13, 419-432.
- Parker, H., & Measham, F. (1994). Pick ‘n’ Mix: Changing patterns of illicit drug use amongst 1990s adolescents. *Drugs: Education, Prevention, and Policy*, 1, 5-13.
- Parrott, A. (2001). Human psychopharmacology of ecstasy (MDMA): A review of 15 years of empirical research. *Human Psychopharmacology: Clinical & Experimental*, 16, 557-577.
doi: 10.1002/hup.351.
- Parrott, A. (2004). MDMA (3,4-Methylenedioxymethamphetamine) or ecstasy: The neuropsychobiological implications of taking it at dances and raves. *Neuropsychobiology*, 50, 329-335.
- Parrott, A., & Lasky, J. (1998). Ecstasy (MDMA) effects upon mood and cognition: before, during, and after a Saturday night dance. *Psychopharmacology*, 139, 261-268.
- Parrott, A., Milani, R., Parmar, R., & Turner, J. (2001). Recreational ecstasy/MDMA and other drug users from the UK and Italy: Psychiatric symptoms and psychobiological problems. *Psychopharmacology*, 159, 77-82. doi: 10.1007/s002130130100897.
- Pema, P., Horak, H., & Wyatt, R. (1998). Myelopathy caused by nitrous oxide toxicity. *American Society of Neuroradiology*, 19, 894-896.

- Pompili, M., Lester, D., Girardi, P., & Tatarelli, R. (2007). High suicide risk after the development of cognitive and working memory deficits caused by cannabis, cocaine, and ecstasy use. *Substance Abuse*, 28, 25-30. doi: 10.1300/J465v28n01_04.
- Potocha-Banas, B., Majdanik, S., Dutkiewicz, G., Borowiak, K., & Janus, T. (2011). Death caused by addictive inhalation of nitrous oxide. *Human and Experimental Toxicology*, 30, 1875-1877.
- Reneman, L., Booij, J., Majoie, C., van den Brink, W., & den Heeten, G. (2001). *Human Psychopharmacology*, 16, 579-588.
- Reneman, L., Booij, J., de Bruin, K., Reitsma, J., de Wolff, F., Gunning, W., ... van den Brink, W. (2001). Effects of dose, sex, and long-term abstinence from use on toxic effects of MDMA (ecstasy) on brain serotonin neurons. *The Lancet*, 358, 1864-1869.
- Reynolds, S. (1998). *Generation ecstasy: Into the world of techno and rave culture*. New York, NY: Little, Brown, & Company.
- Salasuo, S., & Seppala, P. (2004). Drug use within the Finnish club culture as marks of distinction. *Contemporary Drug Problems*, 31, 213-229.
- Schifano, F. (2000). Potential human neurotoxicity of MDMA ('Ecstasy'): Subjective self-reports, evidence from an Italian drug addiction centre and clinical case studies. *Neuropsychobiology*, 42, 25-33.
- Schumm, W., Paff-Bergen, L., Hatch, R., Obiorah, F., Copland, J., Meens, L., & Bugaighis, M. (1986). Concurrent and discriminant validity of the Kansas Marital Satisfaction Scale. *Journal of Marriage and the Family*, 48, 381-387.

- Schumm, W., Scanlon, E., Crow, C., Green, D., & Buckler, D. (1983). Characteristics of responses to the Kansas Marital Satisfaction scale in a sample of 88 married mothers. *Psychological Reports, 53*, 567-572.
- Schwartz, R., & Miller, N. (1997). MDMA (ecstasy) and the rave: A review. *Pediatrics, 100*, 705-708.
- Scott, M. (2002). Rave parties. Problem-Oriented Guides for Police Series, 14. www.cops.usdoj.gov
- Shildrick, T. (2002). Young people, illicit drug use and the question of normalization. *Journal of Youth Studies, 5*, 35-47. doi: 10.1080/13676260120111751
- Sicko, D. (1999). *Techno rebels: The renegades of electronic funk*. New York, NY: Watson-Guptill.
- Substance Abuse and Mental Health Services Administration, *Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings*, NSDUH Series H-41, HHS Publication No. (SMA) 11-4658. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2011.
- Sylvan, R. (2005). *Trance Formation: The Spiritual and Religious Dimensions of Global Rave Culture*. New York: Taylor & Francis Group.
- Ter Bogt, T., & Engels, R. (2005). "Partying" Hard: Party style, motives for and effects of MDMA use at rave parties. *Substance Use & Misuse, 40*, 1479-1502.
- Ter Bogt, T., Engels, R., Hibbel, B., Van Wel, S., & Verhagen, S. (2002). Dancestasy: Dance and MDMA use in the Netherlands. *Contemporary Drug Problems, 29*, 157-181.
- Thombs, D. (2006). *Introduction to Addictive Behaviors*. Third Ed. New York: Guilford Press.

- Tonigan, S., & Miller, W. (2002). The Inventory of Drug Use Consequences (InDUC): Test-retest stability and sensitivity to detect change. *Psychology of Addictive Behaviors, 16*, 165-168.
- Topp, L., Hando, J., Dillion, P., Roche, A., & Solowij, N. (1999). Ecstasy use in Australia: Patterns of use and associated harm. *Drug and Alcohol Dependence, 55*, 105-115.
- U.S. Department of Justice, Office of Community Oriented Policing Services. (2004). *Rave parties*. Retrieved from www.justice.gov/archive/ndic/pubs/656/656p.pdf
- Van Atta, R. (2004). Cognitive impairment associated with habitual nitrous oxide abuse in a 63-year old health professional. *The Forensic Examiner, 36*-41.
- Verdejo-Garcia, A., Sanchez-Frenandez, M., Alonso-Maroto, L., Fernandez-Calderon, F., Perales, J., Lozano, O., & Perez-Garcia, M. (2010). Impulsivity and executive functions in polysubstance-using rave attenders. *Psychopharmacology, 210*, 377-392. doi: 10.1007/s00213-010-1833-8.
- Vervaeke, H., & Korf, D. (2006). Long-term ecstasy use and the management of work and relationships. *International Journal of Drug Policy, 17*, 484-493. doi: 10.1016/j.drugpo.2006.09.002.
- Watson, D., Clark, L., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.
- Weber, T. (1999). Raving in Toronto: Peace, love, unity and respect in transition. *Journal of Youth Studies, 2*, 317-336.
- Weir, E. (2000). Raves: A review of the culture, the drugs and the prevention of harm. *Canadian Medical Association Journal, 162*, 1843-1848.

Weissman, M., & Bothwell, S. (1976). Assessment of social adjustment by patient self report.

General Psychiatry, 33, 1111-1115.

Whalley, M., & Brooks, G. (2009). Enhancement suggestibility and imaginative ability with

nitrous oxide. *Psychopharmacology*, 203, 745-752. doi: 10.1007/s00213-008-1424-0.

Wu, L., Parrott, A., Ringwalt, C., Yang, C., & Blazer, D. (2009). The variety of ecstasy/MDMA

users: Results from the National Epidemiologic Survey on Alcohol and Related

Conditions. *The American Journal on Addictions*, 18, 452-461. doi:

10.3109/10550490903206049.

Yacoubian, G. (2006). Exploring the validity of self-reported ecstasy use among club rave

attendees. *Journal of Psychoactive Drugs*, 38, 31-34.

Yacoubian, G., Boyle, C., Harding, C., & Loftus, E. (2003). It's a rave new world: Estimating

the prevalence and perceived harm of ecstasy and other drug use among club rave

attendees. *Journal of Drug Education*, 33, 187-196.

Yacoubian, G., & Peters, R. (2007). An exploration of recent club drug use among rave

attendees. *Journal of Drug Education*, 37, 145-161.

APPENDIX A: CONSENT FORM

You have been invited to participate in a research study examining both the positive and negative experiences in the lives of fans of electronic dance music (EDM). This study is being conducted by Danielle Alfrey, M.S., who is a clinical psychology doctoral student from the Psychology Department at Indiana State University. Ms. Alfrey is conducting this study for her doctoral dissertation. Dr. Thomas Johnson is her faculty sponsor for this project. Your participation in this study is entirely voluntary. Please read the information below before deciding whether or not to participate. Print a copy of this form for your records by clicking on one of the two available print buttons located on this page.

If you volunteer to participate in this study, you will be asked to complete a series of questions regarding your health, level of involvement in the EDM scene, reasons for attending EDM events, recent stressful experiences, past use of substances, psychological strengths and meaning of life, relationship satisfaction, and recent experiences with positive and negative moods. Even if you are not a fan of electronic dance music, your answers to the questions are still valuable. Completing this questionnaire should take approximately 20-25 minutes. Following your participation in this survey, you will be offered the opportunity to participate in a random drawing for two winners who will each receive a \$100 gift certificate to be redeemed online at GiftCertificates.com where it can be exchanged for original gift certificates from hundreds of popular stores, airlines, hotels, theaters, restaurants and more.

Risks of participation are minimal and not expected to be greater than you encounter in everyday activities. However, completing this questionnaire may make you think differently about your emotions, substance use, relationships, or other health related concerns. This could potentially lead you to conclude that such behaviors are problematic. While this may be a distressing recognition, such recognition could lead to changes in health-related behaviors. Therefore, participating in this study may provide a slight benefit to you by gaining personal insight into your emotions and behaviors. In addition, benefits to society include the contribution to our understanding of EDM involvement and how that translates into real life variables (both positive and negative).

Your participation and responses will be kept strictly confidential. The primary researcher will be the only person with access to questionnaire data, which will be stored in a password protected electronic format. For your own privacy, complete this survey out of sight of other individuals and do not write your name anywhere on the questionnaire. While absolute anonymity cannot be guaranteed over the Internet, the researchers will be taking extra precautions to ensure participant confidentiality. The questionnaire will not ask for any identification and does not allow for the collection of any personal information, such as an IP address. Should the data be published, no individual information will be disclosed.

Once the survey has been completed, you will be presented with the option of entering a random drawing for one of two \$100 gift certificates. The drawing will take place after data collection is complete. To complete the survey, click the “submit” button. You will then be provided an email address that cannot be traced back to your responses. Send a brief email to this address stating you wish to be entered in the drawing. For your privacy, do not provide your name or any other identifying information in the email. The drawing winners will receive their certificate via email with information to anonymously claim their \$100 gift certificate at GiftCertificates.com.

You must be 18 years of age or older to participate in this study and your participation is voluntary. You may only take this survey once. Please try to answer all questions as honestly and completely as you can. However, there are no right or wrong answers to these types of questions. You may also refuse to answer any questions you do not want to answer. The number of questions you answer will not affect your chances of winning the drawing. You may discontinue your participation at any time by simply closing the browser. However, the offer for participating in optional drawing takes place at the end of the survey. Once your responses are submitted, they cannot be withdrawn since no identifying information is being collected and there will be no way to identify your responses for removal. You can save your responses and return to finish the survey for up to one month from the day you begin. If you do not return to finish the survey within one month, your responses will be submitted and you will no longer be able to access your survey.

If you have any questions about this study and your participation, you may contact:

Danielle Alfrey, M.S.
Principal Investigator
Department of Psychology
Root Hall, B-239
Indiana State University
Terre Haute, IN 47809
812-237-2445
dalfrey1@sycamores.indstate.edu

Thomas Johnson, Ph.D.
Professor
Department of Psychology
Root Hall, B-206
Indiana State University
Terre Haute, IN 47809
812-237-2449
thomas.johnson@indstate.edu

If you have any questions about your rights as a research subject or if you feel you’ve been placed at risk, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN, 47809, by phone at (812) 237-8217, or by e-mail at irb@indstate.edu.

ISU IRBNet ID#: 44151-1
Date of ISU IRB Approval: 6/18/2013
Project Expiration Date: 6/17/2014

APPENDIX B: DEMOGRAPHIC QUESTIONNAIRE

Age: _____

Please mark the number of the relevant response on the lines provided.

Gender: _____

1. Male
2. Female
3. Transgender

Current marital status: _____

1. Single, never been married
2. Legally married
3. Cohabiting with a partner (but not married)
4. Separated but not divorced
5. Divorced
6. Widowed

Years of education: _____

1. 9th Grade or below
2. 10th Grade
3. 11th Grade
4. 12th Grade
5. Undergraduate College: 1 year
6. Undergraduate College: 2 years
7. Undergraduate College: 3 years
8. Undergraduate College: 4 years
9. Undergraduate College: 5 years +
10. Graduate School: 1 year
11. Graduate School: 2 years
12. Graduate School: 3 years

13. Graduate School: 4 years +

Race: _____

(Please select as many as needed)

1. White/Caucasian
2. Black/African American
3. Hispanic/Latino(a)
4. Native American/American
5. Indian Asian/Asian American
6. Mixed/Other (please specify) _____

Are you currently enrolled as a student? _____

1. Yes
2. No

If yes, please indicate the appropriate school setting: _____

1. High School
2. Alternative School
3. Home School
4. College
5. Graduate/Medical School

Please indicate the enrollment status that applied to you this semester/year _____

1. Full time student (i.e., at least 12 credit hours)
2. Part time student (i.e., less than 12 credit hours)

How many days of work/school have you missed in the past 12 months? _____

1. 0-4 days
2. 5-9 days
3. 10-14 days
4. More than 15 days

Religious Denomination - Select the one item that best describes your current religious

identification:

_____ 1) Buddhist

- | | |
|---|----------------------------------|
| _____ 2) Christian - Catholic | _____ 10) Muslim/Islam |
| _____ 3) Christian - Lutheran | _____ 11) Jewish |
| _____ 4) Christian - Methodist | _____ 12) Atheist |
| _____ 5) Christian - Baptist | _____ 13) Agnostic |
| _____ 6) Christian - Other Protestant | _____ 14) Taoist |
| _____ 7) Christian – LDS (Mormon) | _____ 15) Pagan / Wiccan |
| _____ 8) Christian - Other Denomination | _____ 16) Unitarian-Universalist |
| _____ 9) Hindu | _____ 17) Other |

To what extent do you consider yourself a religious person?

- _____ 1. Not religious at all.
- _____ 2. Slightly religious
- _____ 3. Somewhat religious
- _____ 4. Moderately religious
- _____ 5. Very religious

To what extent do you consider yourself a spiritual person?

- _____ 1. Not spiritual at all
- _____ 2. Slightly spiritual
- _____ 3. Somewhat Spiritual
- _____ 4. Moderately spiritual
- _____ 5. Very spiritual

Please use the scale below to indicate how many hours you spent engaging in the following activities in a typical week:

0=Never/Not at all/Zero

4=Eleven to fifteen hours

1=Less than 1 hour

5=Sixteen to twenty hours

2=One to five hours

6=Twenty to forty hours

3=Six to ten hours

7=Forty or more hours

_____ Studying or preparing for class on your own (e.g., homework assignments, projects, exams) _____ Studying or preparing for class with other students

_____ Socializing with friends

_____ Attending EDM related events

_____ Doing EDM related work

_____ Working at a job (for pay)

_____ Participating in sports or exercising

_____ Attending community events (speakers, plays, sports events, etc.)

_____ Using a computer or the Internet for recreation

_____ Playing video games or watching TV

In general, would you say your health is: _____

1. Excellent

2. Very good

3. Good

4. Fair

5. Poor

Compared to one year ago, how would you rate your health in general now? _____

1. Much better now than one year ago
2. Somewhat better now than one year ago
3. About the same
4. Somewhat worse now than one year ago
5. Much worse now than one year ago

APPENDIX C: EDM QUESTIONNAIRE

Are you a fan of electronic dance music (EDM)? _____

1. Yes
2. No

Please provide an estimate of how many electronic music events have you attended in your lifetime? _____

Please provide an estimate of how many electronic music events have you attended in the last year? _____

How many electronic music events have you attended in the past month? _____

When was the last EDM event you attended? _____

1. Within the past week
2. Within the past month
3. Within the past year

Please indicate the geographical area in which you attend the most EDM events. _____

1. Eastern states/East Coast
2. Western states/West coast
3. Midwestern States
4. Southern States
5. International

How many hours have you spent acquiring/listening to electronic music in the past month? (e.g., downloads, beatport, youtube, etc). _____ Hours

Please indicate your roles in the EDM scene.

(Check as many as needed)

- DJ/Producer
 Promoter
 Owner/Co-owner (e.g., Record label, production company, etc.)
 VJ/lighting/visual art/costuming
 Dancer/stage performer (e.g., GoGo, Hooping, theatrics, etc.)
 Vendor (e.g., clothing, food, art, electronics, toys, etc.)
 Security
 Attendee
 Non-hired dancer

How long have you been involved in the EDM scene?

_____ Months _____ Years

Since you have been in the scene, do you think the EDM scene has changed for the better? _____

1. Not at all
 2. Somewhat
 3. Moderately
 4. Very Much

Do you think the EDM scene has changed for the worse? _____

1. Not at all
 2. Somewhat
 3. Moderately
 4. Very Much

What is the farthest you have traveled to an EDM event?

(Enter values for all that apply) _____ Miles _____ Hours driving _____ Hours Flying

What is the most amount of money you have spent to attend an event?

\$_____ Dollars

What proportion of your friends are involved in the EDM scene? _____

1. 0-20%
 2. 21-40%
 3. 41-60%
 4. 61-80%
 5. 81-100%

Please indicate which genres of EDM you prefer: (Please check all that apply)

- _____ Ambient
- _____ Breaks/Breakbeats
- _____ Chillout
- _____ Dark
- _____ Disco
- _____ Drum and Bass
- _____ Dubstep
- _____ Electro/Electro-House
- _____ Electronica
- _____ Eurodance
- _____ Goa Trance
- _____ Glitch Hop
- _____ Happy Hardcore
- _____ Hard House
- _____ Hardcore
- _____ Hardstyle
- _____ House
- _____ Industrial
- _____ Jungle
- _____ Minimal
- _____ N-RG
- _____ Progressive
- _____ Psy Trance
- _____ Tech House
- _____ Techno
- _____ Trance
- _____ Tribal House
- _____ Turntablism

How important is P.L.U.R.(R.) to you? _____

1. Very Important
2. Moderately Important
3. Somewhat Important
4. Not at all Important
5. I do not know what PLURR means

How important is the use of drugs at an EDM event to you? _____

1. Very Important
2. Moderately Important
3. Somewhat Important
4. Not at all Important

How often do you use drugs at EDM events? _____

1. Never

2. Some of the time
3. About half the time
4. Most of the time
5. Always/Every time

We want to understand a little bit about why you are involved in the EDM scene. For the following questions, please rate the importance of the following experiences at raves/EDM events: Please use the following scale:

- | | |
|--------------|--------------|
| 1=Not at all | 4=Moderately |
| 2=Slightly | 5=Very much |
| 3=Somewhat | |

- I go to raves/EDM events to dance all night.
- I go to raves/EDM events to get totally into the music.
- I go to raves/EDM events to get to know myself better.
- I go to raves/EDM events because it is easier to flirt with others.
- I go to raves/EDM events because I'm more likely to meet new people.
- I go to raves/EDM events to feel sexy.
- I go to raves/EDM events to have less worry.
- I go to raves/EDM events for a drug-related experience
- I go to raves/EDM events to feel good for just one night.
- I go to raves/EDM events to forget my problems/daily hassles.
- I go to raves/EDM events cause it makes me feel cool.
- I go to raves/EDM events because my friends ask me to go.
- I go to raves/EDM events because my friends go.
- I go to raves/EDM events for a spiritual experience.

I've had an extraordinary physical or psychological experience at a rave or EDM event?

- 1. Never
- 2. Occasionally
- 3. Often
- 4. Every time

I have had spiritual experiences at raves/EDM events:

- 1. Never
- 2. Occasionally
- 3. Often
- 4. Every time

I have had transcendent experiences at raves/EDM events:

- 1. Never
- 2. Occasionally

- 3. Often
- 4. Every time

I have had religious experiences at raves/EDM events:

- 1. Never
- 2. Occasionally
- 3. Often
- 4. Every time

I have felt enlightened at raves/EDM events:

- 1. Never
- 2. Occasionally
- 3. Often
- 4. Every time

I have felt blissful at raves/EDM events:

- 1. Never
- 2. Occasionally
- 3. Often
- 4. Every time

Since you began attending raves/EDM events, has your perspectives on religious/spirituality changed?

- 1. Not at all
- 2. Slightly important
- 3. Somewhat important
- 4. Moderately important
- 5. Very important

How important is the DJ performance in how you rate your experience?

- 1. Not at all
- 2. Slightly important
- 3. Somewhat important
- 4. Moderately important
- 5. Very important

How important are the following factors when evaluating a DJ's importance/performance? Please use the following scale to rate your response:

1=Not at all

2=Slightly important

3=Somewhat important

4=Moderately important

5=Very important

_____ Omnipresence (major headliner/well-known/popularity)

_____ Major hits/can recognize tracks

_____ Skill/technique

_____ Ability to affect and change the energy of the crowd

_____ Stage presence (e.g., dances, jumps into crowd, wears costume, theatrics, etc.)

_____ Musical Style/Genre

_____ Appearance (e.g., level of attractiveness, style of dress, etc.)

_____ Eccentricity/Uniqueness

_____ Humbleness/Willing to converse with fans

_____ Social networking presence/attention/promo (e.g., Facebook, Twitter, MySpace, etc.)

Please rate the following statements on their accuracy to your own experience:

EDM has changed my life.

_____ 1. Not at all

_____ 2. Slightly

_____ 3. Somewhat

_____ 4. Moderately

_____ 5. Very Much

EDM has helped create my identity/who I am.

_____ 1. Not at all

_____ 2. Slightly

_____ 3. Somewhat

_____ 4. Moderately

_____ 5. Very Much

EDM has facilitated my personal growth.

_____ 1. Not at all

_____ 2. Slightly

_____ 3. Somewhat

_____ 4. Moderately

_____ 5. Very Much

APPENDIX D: THE MEANING IN LIFE QUESTIONNAIRE (MLQ)

Please take a moment to think about what makes your life feel important to you. Please respond to the following statements as truthfully and accurately as you can, and also please remember that these are very subjective questions and that there are no right or wrong answers.

Please answer according to the scale below:

1=Absolutely untrue 5=Somewhat true

2=Mostly untrue 6=Mostly true

3=Somewhat untrue 7=Absolutely true

1. I understand my life's meaning. _____
2. I am looking for something that makes my life feel meaningful. _____
3. I am always looking to find my life's purpose. _____
4. My life has a clear sense of purpose. _____
5. I have a good sense of what makes my life meaningful. _____
6. I have discovered a satisfying life purpose. _____
7. I am always searching for something that makes my life feel significant. _____
8. I am seeking a purpose or mission for my life. _____
9. My life has no clear purpose. _____
10. I AM SEARCHING FOR MEANING IN MY LIFE. _____

APPENDIX E: DRUG ASSESSMENT

Please answer the following questions as accurately as possible.

1. Have you ever used...?

Never	1-5 Times	6-19 Times	20-39 Times	40 Times or More
1	2	3	4	5

Tobacco Products (cigarettes, cigars, chew, hookah) _____

Alcohol (beer, wine, liquor, wine coolers) _____

Marijuana (pot, hash, weed) _____

Cocaine (blow, powder, snow) _____

Crack _____

Nitrous Oxide (laughing gas, balloons, whippets) _____

Inhalants (duster, canned air, etc.) _____

Methamphetamines (meth, crystal, ice, crank) _____

Heroin (H, smack) _____

Steroids (non-prescribed) _____

Ecstasy (MDMA, X, XTC, Molly, Rolls) _____

Hallucinogens (LSD, Mushrooms, PCP, GHB) _____

Prescription "downers" (OxyContin, pain pills, Xanax) _____

Prescription "uppers" (Ritalin, Adderall, Vyvanse, Concerta) _____

Over-the-counter drugs (such as cough medicine) _____

2. How many times at EDM events have you used...?

Never	1-5 Times	6-19 Times	20-39 Times	40 Times or More
1	2	3	4	5

Tobacco Products (cigarettes, cigars, chew, hookah) _____

Alcohol (beer, wine, liquor, wine coolers) _____

Marijuana (pot, hash, weed) _____

Cocaine (blow, powder, snow) _____

Crack _____

Nitrous Oxide (laughing gas, balloons, whippets) _____

Inhalants (duster, canned air, etc.) _____

Methamphetamines (meth, crystal, ice, crank) _____

Heroin (H, smack) _____

Steroids (non-prescribed) _____
 Ecstasy (MDMA, X, XTC, Molly, Rolls) _____
 Hallucinogens (LSD, Mushrooms, PCP, GHB) _____
 Prescription "downers" (OxyContin, pain pills, Xanax) _____
 Prescription "uppers" (Ritalin, Adderall, Vyvanse, Concerta) _____
 Over-the-counter drugs (such as cough medicine) _____
 Synthetic Drugs (K2, spice, bath salts, etc.) _____

3. How many times in the past year have you used...?

Never	1-5 Times	6-19 Times	20-39 Times	40 Times or More
1	2	3	4	5

Tobacco Products (cigarettes, cigars, chew, hookah) _____
 Alcohol (beer, wine, liquor, wine coolers) _____
 Marijuana (pot, hash, weed) _____
 Cocaine (blow, powder, snow) _____
 Crack _____
 Nitrous Oxide (laughing gas, balloons, whippets) _____
 Inhalants (duster, canned air, etc.) _____
 Methamphetamines (meth, crystal, ice, crank) _____
 Heroin (H, smack) _____
 Steroids (non-prescribed) _____
 Ecstasy (MDMA, X, XTC, Molly, Rolls) _____
 Hallucinogens (LSD, Mushrooms, PCP, GHB) _____
 Prescription "downers" (OxyContin, pain pills, Xanax) _____
 Prescription "uppers" (Ritalin, Adderall, Vyvanse, Concerta) _____
 Over-the-counter drugs (such as cough medicine) _____
 Synthetic Drugs (K2, spice, bath salts, etc.) _____

APPENDIX F: Kansas Marital Satisfaction Scale (KMS)

1. Are you currently involved in a romantic relationship? _____

1=Yes 2=No

This scale is intended to estimate your current happiness with your relationship in each of the areas listed below. Ask yourself the following question as you rate each area:

1=Extremely dissatisfied

5=Somewhat satisfied

2=Very dissatisfied

6=Very satisfied

3=Somewhat dissatisfied

7=Extremely satisfied

4=Mixed

1. How satisfied are you with your current romantic relationship? _____

2. How satisfied are you with your significant other as a romantic partner? _____

3. How satisfied are you with your relationship with your significant other? _____

APPENDIX G: DRUG SHORT INDEX OF PROBLEMS (SIP-D)

Here are a number of events that people sometimes experience. Reach each one carefully, and indicate how often each one has happened to you DURING THE PAST THREE MONTHS:

Response choices:

0=Never

1=Once or a few times

2=Once or twice a week

3=Daily or almost daily

1. I have been unhappy because of my drinking or drug use. _____
2. Because of my drinking or drug use, I have lost weight or not eaten properly. _____
3. I have failed to do what is expected of me because of my drinking or drug use. _____
4. I have felt guilty or ashamed because of my drinking or drug use. _____
5. I have take foolish risks when I have been drinking or using drugs. _____
6. When drinking or using drugs, I have done impulsive things that I regretted later. _____

Now answer the following questions about things that may have happened to you. During the PAST 3 MONTHS, how much has this happened?

Response choices:

0=Not at All

1=A Little

2=Somewhat

3=Very Much

7. My physical health has been harmed by my drinking or drug use. _____
8. I have had money problems because of my drinking or use. _____
9. My physical appearance has been harmed by my drinking or drug use. _____
10. My family has been hurt by my drinking or drug use. _____
11. A friendship or close relationship has been damaged by my drinking or drug use. _____
12. My drinking or drug use has gotten in the way of my growth as a person. _____
13. My drinking or drug use has damaged my social life, popularity, or reputation. _____
14. I have spent too much or lost a lot of money because of my drinking or drug use. _____
15. When drinking or using drugs my personality has changed for the worse. _____
16. Drinking or using one drug has caused me to use other drugs more. _____

For the following questions, please use the following response choices:

0=No

1=Almost

2=Yes, once

3=Yes, more than once

17. I have had an accident while under the influence of alcohol or drugs. _____

18. I have lost a marriage or close love relationship because of my drinking or drug use. _____

APPENDIX H: THE POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

This scale consists of a number of words that describe different feelings and emotions.

Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks.

Use the following scale to record your answers:

1=Very slightly or Not at all

2=A little

3=Moderately

4=Quite a bit

5=Extremely

- _____ Interested
- _____ Distressed
- _____ Excited
- _____ U p s e t
- _____ Strong
- _____ Guilty
- _____ Scared
- _____ Hostile
- _____ Enthusiastic
- _____ Proud
- _____ Irritable
- _____ Alert
- _____ Ashamed
- _____ Inspired
- _____ Nervous
- _____ Determined
- _____ Attentive
- _____ Jittery

APPENDIX I: BRIEF SYMPTOM INVENTORY (BSI)

On the next page is a list of problems people sometimes have. Please read each one carefully, and blacken the circle that best describes how much that problem has distressed or bothered you during the past seven days, including today.

Response choices:

0=Not at all 3=Quite a bit

1=A little bit 4=Extremely

2=Moderately

How much were you distressed by:

1. Nervousness or shakiness inside _____
2. Faintness or dizziness _____
3. The idea that someone else can control your thoughts _____
4. Feeling others are to blame for most of your troubles _____
5. Trouble remembering things _____
6. Feeling easily annoyed or irritated _____
7. Pains in heart or chest _____
8. Feeling afraid in open spaces or on the streets _____
9. Thoughts of ending your life _____
10. Feeling that most people cannot be trusted _____
11. Poor appetite _____
12. Suddenly scared for no reason _____
13. Temper outbursts that you could not control _____
14. Feeling lonely even when you are with people _____
15. Feeling blocked in getting things done _____
16. Feeling lonely _____
17. Feeling blue _____
18. Feeling no interest in things _____
19. Feeling fearful _____
20. Your feelings being easily hurt _____
21. Feeling that people are unfriendly or dislike you _____
22. Feeling inferior to others _____
23. Nausea or upset stomach _____
24. Feeling that you are watched or talked about by others _____
25. Trouble falling asleep _____
26. Having to check and double-check what you do _____
27. Difficulty making decisions _____
28. Feeling afraid to travel on buses, subways, or trains _____
29. Trouble getting your breath _____
30. Hot or cold spells _____
31. Having to avoid certain things, places, or activities because they frighten you _____

32. Your mind going blank _____
33. Numbness or tingling in parts of your body _____
34. The idea that you should be punished for your sins _____
35. Feeling hopeless about the future _____
36. Trouble concentrating _____
37. Feeling weak in parts of your body _____
38. Feeling tense and keyed up _____
39. Thoughts of death or dying _____
40. Having urges to beat, injure, or harm someone _____
41. Having urges to break or smash things _____
42. Feeling very self-conscious with others _____
43. Feeling uneasy in crowds, such as shopping or at a movie _____
44. Never feeling close to another person _____
45. Spells or terror or panic _____
46. Getting into frequent arguments _____
47. Feeling nervous when you are left alone _____
48. Others not giving up proper credit for your achievements _____
49. Feeling so restless you couldn't sit still _____
50. Feelings of worthlessness _____
51. Feeling that people will take advantage of you if you let them _____
52. Feelings of guilt _____
53. The idea that something is wrong with your mind _____

APPENDIX J: Correlation Matrix for Popular Substances and Variable Sub-scales

Correlation Matrix for Substances and Primary Variables *Note.* MLQ: Meaning of Life Questionnaire; PANAS:

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. MLQ-Presence	--														
2. MLQ-Search	-.23**	--													
3. PANAS-Pos	.39**	.05	--												
4. PANAS-Neg	-.26**	.23**	-.22**	--											
5. BSI-Total	-.32**	.19*	-.32**	.54**	--										
6. Self-Rated Health	.04	.07	.17*	-.18*	-.16	--									
7. KMS	.02	-.01	.04	-.02	-.01	-.02	--								
8. Drug Consequences	-.26**	.10	-.18*	.36**	.38**	-.23**	.00	--							
9. Tobacco	-.02	.12	.06	.08	.10	-.12	-.16	.24**	--						
10. Alcohol	.11	-.03	-.05	-.06	-.19*	-.11	-.05	.21*	.34**	--					
11. Marijuana	.15	-.12	.14	-.06	-.07	-.07	.07	.24**	.46**	.31**	--				
12. Nitrous Oxide	-.03	-.06	-.02	-.04	.09	-.24**	-.06	.34**	.29**	.21*	.35**	--			
13. Ecstasy	.00	-.08	-.01	-.03	.05	-.13	.09	.27**	.29**	.22**	.47**	.59**	--		
14. Hallucinogens	.02	-.08	.12	.06	.05	-.18*	.09	.28**	.29**	.17*	.43**	.56**	.63**	--	
15. PLUR	.15	.01	.11	-.09	.04	-.04	.01	.03	.08	-.01	.27**	.14	.28**	.27**	--
16. EDM Inv.	.14	-.04	.13	-.11	-.06	-.11	-.03	.14	.22**	.14	.30**	.39**	.48**	.37**	.27**

Positive and Negative Affect Schedule; BSI: Brief Symptom Inventory; KMS: Kansas Marital Satisfaction; PLUR: Peace, Love, Unity, & Respect.

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$