3-2020

Examining the Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence

Lauren Natalie Stroker

Examining the Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence

By

Lauren Natalie Stroker

Bachelor of Science
Psychology
Temple University
2014

Master of Science
Applied Behavior Analysis and Organizational Behavioral Management
Florida Institute of Technology
2016

Master of Science
Clinical Psychology
Florida Institute of Technology
2018

A doctoral research project proposal
submitted to the School of Psychology of Florida Institute of Technology
in partial fulfillment of the requirements
for the degree of

Doctor of Psychology

Melbourne, Florida
March, 2020

We the undersigned committee hereby approve the attached doctoral research project in partial fulfillment for the degree of Doctor of Clinical Psychology, "Examining the Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence,"
by
Lauren Natalie Stroker, M.S., BCBA

_____
Patrick J. Aragon, Psy.D.
Assistant Professor, School of Psychology
Doctoral Research Project Chair

_____
Victoria M. Follette, Ph.D.
Professor, School of Psychology

_____
A. Celeste Harvey, Ph.D., BCBA-D
Associate Professor, School of Behavior Analysis

_____
Lisa A. Steelman, Ph.D.
Professor and Dean
College of Psychology and Liberal Arts

Abstract

Title: Examining the Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence

Author: Lauren Natalie Stroker, M.S., BCBA

Committee Chair: Patrick J. Aragon, Psy.D.

The ever-increasing rates of prescription drug utilization in the United States, coupled with the high rates of non-adherence to psychotropic medications by patients, makes this area of research an increasingly important field of study. Previous studies have elucidated the critical factor medication adherence plays in the effectiveness of treatment and overall clinical outcomes for patients and the deleterious effect of non-adherence; one of them being substance (ab)use. The present study was conducted in an effort to add to the existing literature examining medication nonadherence and substance use. The current study looked to expand the research examining the relationship between substance use and non-compliant medication behavior, as well as evaluate the effect of intensity of substance use on non-adherence among a community mental health setting. Results of our study found 73 percent of participants engaged in illicit drug and alcohol use, and 50.3 percent of participants reported being non-adherent to medications. Contrary to the previous research, the current study found substance use had no significant effect on medication non-adherence, $t(195) = -.64$, $p = .57$. Additionally, intensity (frequency) of substances used had no significant effect on non-adherence to psychotropic medication, $t(163) = 1.18$, $p = .24$. Lastly, no relationship was found

between the intensity (frequency) of substances used and non-adherence to psychotropic medication, $r(163) = -.11$, $p > .05$. Results obtained in this study continue to highlight the high frequency of patients utilizing substances concurrently with prescribed medications. Although the current study did not find substance use and intensity of use to have a statistically significant effect on medication non-adherence, the information gathered throughout this study remains important not only for medical professionals but also clinicians. Gaining a greater understanding of the factors influencing non-adherence is advantageous in the development of strategies to increase adherence in patients and improve overall patient outcomes.

Table of Contents

Acknowledgement

First and foremost, I would like to thank my family and my friends who offered me so much unconditional love and support throughout this journey.

I would also like to take this opportunity to express my sincerest and deepest appreciation to Dr. Patrick Aragon. His invaluable advice and guidance have helped me in ways I don't think I could ever adequately express.

I would, of course, be remiss if I did not express my genuine thanks and appreciation to my committee members Dr. Celeste Harvey and Dr. Victoria Follette for their patience, time, constructive criticism and input. Thank you all for making this experience so valuable and enriching.

Examining the Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence

Prevalence

Recent research has noted a significant growth in prescription drug use amongst adults in the United States (Kantor et al., 2015). An evaluation of prescription drug use in the United States, conducted by Kantor and colleagues (2015), showed a 9% increase in the use of prescription drugs from 1999-2012. Specifically, they indicated that in 1999-2000, 51% of US adults reported using a prescription drug, which increased to approximately 59% in 2011–2012. According to research conducted within the Mayo Clinic (2013), 7 in 10 Americans were found to use prescription drugs. Their research indicated that approximately 70 percent of individuals in the United States were taking at least one prescribed medication (Mayo Clinic, 2013). The Center for Disease Control and Prevention reported that in 2015, approximately 3.7 billion prescriptions were ordered by physicians. These billions of prescriptions highlight the "epidemic" levels of prescription drug use noted by McHugh and colleagues (2014).

The previous findings denoted not only a statistically significant increasing trend in prescription drug use within the United States, but also pinpointed an important area for further research. With the high and ever-increasing rates of prescription drug utilization within the United States, research has been conducted to examine specifically, the type of drugs most utilized. Research within the Mayo

Clinic has also elucidated the most prevalently prescribed medications within the US. Through their research, they discovered the most frequently prescribed medication to be antibiotics and medications related to heart disease and diabetes. Notably, is the report that the second and third most popularly prescribed medication was found to be antidepressants and opioids, respectively (Mayo Clinic, 2013). Similarly, the Substance Abuse and Mental Health Services Administration, using the Survey on Drug Use and Health in 2016, found approximately 37.1% of US adults with a mental illness reported taking prescribed medications (Substance Abuse and Mental Health Services, 2012).

Prescription Drug Use

Moore and Mattison (2017) utilized data from the 2013 Medical Expenditure Panel Survey to examine more thoroughly the percentage of adults who used antidepressant, anxiolytics, sedatives, hypnotics and antipsychotics within the United States. The results of their study showed 16.7% of individuals who were surveyed, had indicated filling one or more prescriptions for one of the aforementioned drugs in 2013. That is, of the 242 million people participating within the Medical Expenditure Survey, 1/6 had utilized a psychiatric drug obtained through prescription. More specifically, 12% of individuals reported the antidepressant use and 8.3% indicated the use of either an anxiolytic, sedative or hypnotic (Moore & Mattison, 2017). And finally, results of the study indicated that

an estimated 1.6% of individuals surveyed reported the use of antipsychotic medications (Moore & Mattison, 2017).

Whereas one might assume an increase in psychotropic medication use is suggestive on an increase in mental health diagnoses across the country, this may not be the case. In fact, research conducted by Olfson and Marcus (2009) indicated the opposite to be true.

Olfson and Marcus (2009) examined the national trends surrounding antidepressants prescription use. Utilizing data obtained from the household component of the 1996 and 2005 Medical Expenditure Panel Surveys (MEPSs), the authors looked to examine the overall rate of antidepressant use along with socio-demographic and clinical features such as age, sex, race, and self-perceived mental health. Their study demonstrated that overall, there was a 4.28% increase in the prescription of antidepressant medications, from 1996-2005 (Olfson & Marcus, 2009). This 4.28% is representative of an increase from 13.3 million to 27 million people utilizing antidepressants (Olfson & Marcus, 2009).

The study also revealed an important piece of information regarding the rate of mental health diagnoses. The authors reported that although the rate of antidepressant medication prescription has increased, the number of individuals receiving a depression diagnosis did not show a significant increase overall. Specifically, the study reported 26.25% of patients in 1996 were being treated for depression, which was found to be comparable to 26.85% in 2005 (Olfson &

Marcus, 2009).

As such, the study highlights the fact that psychotropic medication use is increasing, irrespective of an increase in psychiatric diagnoses. It notes an increase of 13.7 million individuals utilizing antidepressant medication from 1996-2005 with a negligible change in diagnostic rates during that time. Therefore, it can be suggested that prescription drugs are now being prescribed more frequently as a treatment method for previously diagnosed mental health patients. As this method of treatment gains popularity, so too does the study of these medications and the effects of their proper and improper use.

Medication Adherence and Non-Adherence

Cramer et al., (2008) defined medication adherence as, "the act of conforming to the recommendations made by the provider, with respect to timing, dosage and frequency of medication taking." The World Health Organization defines medication adherence as "the degree to which a person's behavior corresponds with the agreed recommendations from a health care provider." Conversely, additional studies identify non-adherence simply as a failure to take medication as prescribed (Jimmy & Jose, 2011). Another factor of non-adherence, elucidated by the literature, is the behaviors ability to be differentiated into covert or undisclosed or overt non-adherence.

Mitchell and Selmes (2007), in their review of previous literature on non-adherence, define covert and overt non-adherence *Covert non-adherence* is defined

as undisclosed discontinuation of medication. In other words, this form of non-adherence is out of the awareness of the clinician or provider. *Overt non-adherence* alternatively occurs at the onset of treatment and can be better defined as a patient's refusal to engage in treatment prescribed by the medical provider. Haddad, Brain, and Scott (2014) note that covert non-adherence can lead clinicians to a false conclusion that the medications are simply not effective for the individual, which in fact, may not be the case (Haddad et al., 2014). It is also noted that covert non-adherence is usually the result of a clinician not making sufficient effort or taking an adequate amount of time to assess, in a non-judgmental way, the patients past and current medication adherence (Haddad et al., 2014).

Jawad, Watson, Haddad, Talbot and McAllister-Williams (2018) reported that the category of non-adherence can be divided further into *non-adherence, which is deliberate*, and *non-intentional non-adherence*. Research conducted by the World Health Organization regarding medication non-adherence also makes this distinction.

Jawad and collogues (2018) indicated that non-intentional non-adherence can be the result of forgetfulness, difficulty seeing the prescription, difficulty with obtaining the medication due to financial means, and poor description of the instructions from the prescriber. Non-adherence, which is deliberate, is a result of the patient making "a conscious decision to utilize less than the prescribed amount

of a medication," or otherwise decided change or avoidance to the prescription plan (Jawad et al., 2018).

Medication adherence can be further broken down into degrees of non-adherence. Jawad and colleagues (2018) stated that patient adherence with medication lies on a spectrum, ranging from total adherence to zero adherence with varying degrees of partial adherence lying between. Notably they also indicated that adherence should be viewed as more of a dynamic factor, which has the likelihood to change across time. The authors noted that patient's behavior may change and that those who "adhere well at one time may adhere poorly at another time."

Across studies of medication adherence, there has been significant variability in the definition used to evaluate non-adherence (Jawad et al., 2018). This variability has been identified as a significant limitation within the research (Brown & Bussell, 2011). Non-adherence to medication, however, regardless of the distinction of deliberate or unintentional, and the definition used to evaluate the behavior, has been shown to affect not only the patient's overall well-being, but also his/her treatment outcome and associated medical costs.

Effect of Non-Adherence

With the increase in prescription drug use by patients, comes the need for further research on medication-related behaviors; specifically, adherence to these prescribed medications. The importance of medication adherence cannot be

understated, as research indicates non-adherence to medication, especially psychiatric medications, results in several negative outcomes for both the patient as well as the overall health care system.

Non-adherence with medication has been shown to be associated with higher rates of mortality and suicide (Chapman & Horne, 2013; De Las Cuevas et al., 2017; Magura et al., 2014). Additionally, non-adherence with treatment has been shown to result in higher rates of relapse, suicidality and hospitalization (Jaward et al., 2018; Zivin et al., 2009). In addition to the negative effect that non-adherence has been shown to have on patient outcome, non-adherence with medication has also be shown to be associated with higher medical costs as well.

Joe and Lee (2016) examined the effect of medication non-adherence in individuals with schizophrenia; on both psychiatric and non-psychiatric medical care costs. Data was gathered through the Health Insurance Review and Assessment Service-National Patients Sample, a Korean insurance database. The authors placed selected individuals into two groups: the first an adherent versus non-adherent group and the second a persistent versus non-persistent group, with participants being 5,548 individuals and 3,912, respectively (Joe & Lee, 2016). The authors also noted that they used a matching method to address any possible effects of insurance plan or time of follow up on service utilization costs. The differences of service utilization costs between groups were then compared. The authors found higher non-psychiatric service utilization in patients who were non-compliant with

their psychotropic medications. The authors cited a tendency toward poor self-care and unhealthy lifestyle choices common in individuals with severe mental illness (Joe & Lee, 2016). Additionally, the results indicated higher health care costs for non-compliant individuals with schizophrenia and suggested this may be due to the high rate of medical comorbidities associated with this. Furthermore, the authors noted that compliant individuals used psychiatric services significantly more than non-compliant patients. The authors hypothesized that this difference may be due to the fact that individuals who have a tendency toward non-adherence with medication, also are more likely to avoid utilization of these services (Joe & Lee, 2016).

Similar data was gathered for individuals with Bipolar Disorders as well. A study conducted by Gianfrancessco, Sajativic, Rajagopalan and Wang (2008) found a relationship between non-adherence to medication and health care expenditure. They reported improved adherence to medication resulted in lower overall outpatient mental healthcare cost. Specifically, they examined medical expenditure in two groups of individuals; those diagnosed with bipolar disorder for whom had either predominantly manic symptoms or those diagnosed with bipolar disorder for whom were diagnosed with predominantly depressive symptoms. During the study medication adherence was evaluated using a medication possession ratio (MPR). The ratio is obtained by dividing the number of pills indicated on the prescription by the number of days before the prescription was refilled (Gianfrancessco et al.,

2008). This gives the experimenters an idea of how compliant patients are with taking their prescribed medication. A larger MPR is reflective of greater adherence. These measurements were conducted in 4-month treatment segments across 15 months to examine an additional variable of consistency with treatment (Gianfrancessco et al., 2008).

Results of this study indicated that within the manic group, higher MPR across these segments resulted in a total health care expenditure reduction of between $123 and $439. Individuals with predominantly depressive symptoms showed a statistically significant reduction of total expenditure of $714 at 10-12 months. Data indicated increased medication adherence in both groups resulted in a statistically significant decreased in their medical expenditure across 15 months (Gianfrancessco et al., 2008). Additionally, the authors noted a $468 decrease in expenditure in the area of outpatient mental health, specifically. Outpatient mental health was reported to be a measure of mental health care costs for individuals outside of prescribed antipsychotics. Results indicated that at baseline, the medical expenditure for the manic group in this area was $2,757 and the depressive group was $2,687 (Gianfrancessco et al., 2008). The authors noted that individuals who showed higher MPR scores (higher adherence with medication) were more stabilized and therefore, required fewer health care resources.

Rates of Non-Adherence

Much of the previous research has focused on examining rates of medication adherence among specific populations. Jimmy and Jose (2011) indicated that across several studies, which were found to have examined adherence behavior, the percentage or rate of medication adherence varied drastically from a very low 10% to up to 92 % (Jimmy & Jose, 2011). The authors noted that medication adherence for individuals, with more chronic illnesses, were especially low. The authors stated that these individuals had a tendency to take their prescribed medication only 50% of the time.

Patients with psychiatric disorders have been shown to be least likely to comply with medication: including frequency, duration, and initial acceptance of the medication. Research on adherence, across psychiatric disorders, has found variable rates of non-adherence. Although variable, these rates of non-adherence have been shown to be significant and illuminate the treatment challenges faced by both clinicians and providers.

Sansone and Sansone (2012) conducted a literature review to examine documented rates of no adherence in psychiatric populations; specifically, individuals who were prescribed antidepressant medication. The literature review identified five studies, which were conducted in the United States and Asia. After examining the previous literature, authors discovered non-adherence rates ranging

from 13 to 55.7 percent. Additionally, they found the average non-adherence rate, across the studies, to be 52 percent overall (Sansone &Sansone, 2012).

Eticha, Teklu, Ali, Solomon and Alemayehu (2015) investigated adherence with medication in individuals with schizophrenia. The cross-sectional study was conducting using patients with a diagnosis of schizophrenia receiving services across two hospitals in Ethiopia. Three hundred and ninety-three patients met inclusion criteria and were interviewed using a questionnaire eliciting information regarding sociodemographic variables, insight, and beliefs about treatment, medication adherence, side effects and medication satisfaction. In regard to medication adherence, the study found 26.5% of participants were non-adherent with prescribed antipsychotic medication (Eticha et al., 2015).

A study conducted by Kamali et al., (2006) also noted a high rate of non-adherence to medication among participants diagnosed with schizophrenia. The study indicated of the 100 patients included within their study, one third were found to be non-compliant with antipsychotic medications.

Chakrabarti (2017) conducted a met analysis of 132 articles examining medication non-adherence in individuals with Bipolar disorder. This examination found mean rates of non-adherence across all studies to be 41.5-43 percent. The authors noted that medication non-adherence was found in approximately one third of patient's diagnosed with Bipolar disorder (Chakrabarti, 2017).

Stein, Cantrell, Sokol, Eaddy and Sah (2006) utilized a manage care database

to examined rates of adherence by patients prescribed with a selective serotonin reuptake inhibitors (SSRIs) for management of an Anxiety Disorder. The authors indicated that of the 13,085 patients included in the study, 57 percent of these individuals were non-adherent to their prescribed medication. These high percentages of non-adherence to medication reflect a significant area in need of improvement and therefore, important areas for further research.

Factors Associated with Non-Adherence

Julius, Novitsky and Dubin (2009) conducted a literature review to elucidate factors consistently identified within the previous research to be risk factors for medication non-adherence. The authors then categorized these factors into 4 main areas; patient-related, psychological, medication-related and social/environmental. They noted patient-related factors, such as the individual being: young for his/her age, unmarried, and with a lower education level; all served as barriers to psychiatric medication non-adherence. Having little insight, experiencing denial, and negative attitudes toward medication; was identified as psychological barriers (Julius et al., 2009). Additionally, medication related barriers included factors such as possible negative side effects, frequency of dosage, and perceived efficacy of the medication by the patient. It was also noted that factors such as the quality of the therapeutic alliance, support from family members and supervision of the medication's administration, could also function as possible barriers to medication adherence (Julius et al., 2009). In addition, Gellad, Grenard, and Marcum (2011)

found patient's limited overall knowledge of their disease and basic health information also functioned as a barrier to medication adherence.

Chandra, Kumar, and Reddy (2014) studied patients diagnosed with schizophrenia and factors contributing to medication non-adherence. They found, like the previous authors, that younger age and poor insight into their illness were factors associated with non-adherence in patients (Chandra et al., 2014, Eticha et al., 2015). Additionally, their study indicated unemployment and negative attitudes toward medication were also significant predictors for non-adherence. Similarly, Chapman and Horne (2013) identified practical reasons such as resources and affordability to be additional factors influencing an individual's adherence ability. Another crucial barrier indicated by previous research, and the one that will be focused on within the current research is polypharmacy (Gellad et al., 2012).

Polypharmacy

Polypharmacy or polysubstance use refers to the use of "multiple substances within a specific period of time" (Conway et al., 2013). Polypharmacy can be a result of multiple drugs prescribed by a physician, or multiple physicians, but can also be the result of drug misuse and abuse (Omenka & Green, 2017). Additionally, polypharmacy can include the use of combination of medications used concurrently with illicit substances (Masnoon et al., 2017; Omenka & Green, 2017).

For the mental health population, the study of polypharmacy is especially important, as medication is a common treatment modality for many mental

illnesses and rates of psychotropic mediation prescription are only increasing. The high rate of psychotropic medication use, coupled with the high rate of comorbidity with substance use disorder, lays the groundwork for polypharmacy within this population.

Statistics obtained from a survey conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) in 2016, indicated approximately 8.2 million adults within the United States have co-occurring mental and substance use disorders. It was noted as well that of the population identified by SAMHSA, individuals with comorbid substance use disorders make up 18.5 percent of mental health illnesses (Substance Abuse and Mental Health Services Administration, 2017). Of the population of 2.4 million that SAMHSA identified to have a serious mental illness, 2.4% of those individuals were identified to also meet criteria for a substance use disorder (SAMHSA, 2017). The high comorbidity of mental illness and substance use places this population at a particularly high risk for polypharmacy and in turn for difficulties with medication adherence. Additionally, the study of polypharmacy is important, as drug-drug interactions that result from this behavior can have drastic effects on the individual.

Drug-drug Interactions

Drug-drug interactions can result in two different effects within the body: pharmacodynamics or pharmacokinetics (Cascorbi, 2012; Lindsey et al., 2012). Pharmacodynamics refers to an interaction, which modifies, enhances, or weakens

the effect of a drug. While pharmacokinetic effects modify the, "absorption, distribution, metabolism or excretion of the drug" (Lindsey et al., 2012).

Research has indicated significant interactions between psychotropic and illicit drugs (Lindsey et al., 2012). Individuals who utilized both drugs concurrently can experience numerous adverse side effects such as mental status changes and sleep difficulty (Malik and Kumar, 2012, Morton, 1999). Furthermore, changes in blood pressure and heart rate (Barr et al., 2006), inhibited respiratory function and induce sedation (Pathan & Williams, 2012), heightened effect of a drug (Cheng et al., 2018), CNS depression and coma (Lindsey et al., 2012) and death are all examples of documented medication-related side effects (Jones and McAnich, 2015). In addition to these side effects, the use of concurrent psychotropic medication and illicit drugs also can result in poorer health outcomes and a potential exacerbation of symptoms (Cascorbi, 2012; Lindsey et al., 2012).

Alcohol. Psychotropic medications when used with alcohol can result in several adverse side effects. Alcohol has been shown to affect the enzymes required for prescription drug metabolism (Cheng et al., 2018). As such, acute use of alcohol may result in the drug not being metabolized properly. The medication may then remain in the individual's system for longer, continuing to influence the individual for a prolonged period of time. Cheng and colleagues (2018) indicated that more chronic use of alcohol also effects metabolism of medication, but in an opposing manner. They noted that when alcohol is used in a more chronic fashion, increased

enzymes may be produced which results in the expedited metabolism of medications. As such, the chronic use of alcohol can result in a lessening of the effect of the medication all-together (Cheng et al., 2018).

The authors noted that medications also have the ability to influence the effect of the alcohol as well. Medications may decrease an individual's alcohol threshold resulting in the individual needing to consume less alcohol to reach the point of intoxication; increasing the potential for adverse effects (Cheng et al., 2018). As psychotropic medications often work through an inhibitory effect on the central nervous system, as was previously stated, alcohol can enhance these inhibitory effects, diminishing the individual's ability to function as well (Weathermon & Crabb, 1999). With the numerous negative side effects that come as a result of the concurrent use of alcohol and psychotropic prescription medication, the question of the client's knowledge of these significant consequences is raised.

The study conducted by Cheng, Mithoowani, Ungar and Lee (2018) examined patients with mental health disorders perceptions and knowledge of alcohol drug interactions. When asked whether the participants had received information about the negative side effects of the use of alcohol with medication, 75 percent of patients indicated they had received this information and indicated that it was satisfactory (Cheng et al, 2018). In addition, participants were asked if they follow the prescribed recommendations. The results indicated that only 65%

do in fact avoid the use of alcohol with their medication (Cheng et al., 2018).

Cocaine. Cocaine is a substance, which affects several neurotransmitters in the brain including dopamine, norepinephrine and serotonin. It's ability to bind with neurotransmitter transporters in the synapse inhibits the removal of the neurotransmitters and allows them to remain in the synapse and bring about the common positive symptoms associated with the drug: pleasure, sense of well-being and alertness, etc. (Morton, 1999). Cocaine also has the potential to bring about negative effects such as symptoms of psychosis, paranoia, suspiciousness, as well as difficulties with sleep (Morton, 1999).

The mechanism, by which cocaine brings about these effects within the body, reinforces the potential for adverse interactions when mixed with psychotropic medication. As psychotropic medications also influence the production, maintenance and removal of these neurotransmitters within the brain, the added effects of the cocaine can be detrimental to the effectiveness of the medication, as well as the overall health of the individual.

Antidepressant medications work by increasing the amount of serotonin that is available within the brain. When used concurrently with cocaine, increased serotonin levels can lead to serotonin syndrome. Malik and Kumar (2012) describe this syndrome as a potentially life-threatening condition, which is a result of excess serotonin in the nervous system. This excess can lead to changes in one's mental status, autonomic dysfunction and neuromuscular hyperactivity (Malik and Kumar,

2012).

Opioids. Opioids' sedative and analgesic effects come about through their agonist effect on three opioid receptor subtypes (Pathan & Williams, 2012). Binding of an opioid to these receptor types results in an analgesic effect. Along with its analgesic effect, opioids, when binding to receptors, also have the potential to inhibit respiratory function and induce sedation (Pathan & Williams, 2012).

Opioids, when used with benzodiazepines and Monoamine oxidase-inhibitor's (MAOI) have the potential to result in central nervous system depression and sedation (Lindsey et al., 2012, Saber-Tehrani et al., 2011,). Jones, Mogali and Comer (2012) investigated the combined use of opioids and benzodiazepines and examined their pharmacological interactions. It was noted that as these drugs have similar effects on the body, and as such, their concurrent use results in a subjective strengthening of the effect of the drug (Jones et al., 2012). Lindsey and colleagues (2012) stated that individuals utilize these two drugs together to "amplify the high." As a result, these drugs have a high rate of co-administration and high potential for abuse.

This high rate of co-administration has received much attention in the literature as well as within the FDA (Phillips et al., 2017). Jones and McAnich (2015) indicated that the co-administration of benzodiazepines and opioids have been shown to contribute to up to one-third of the fatal opioid overdoses within the United States, illuminating the significant risk associated with concurrent use. The

FDA has indicated that nonmedical use of both of these drugs has increased significantly from 2004 to 2011 and that during this time, overdoses occurring from co-administration have tripled. With such as high risk associated with concurrent use, the FDA has moved forward with the addition of increased warnings on packaging as well as the implementation of the use of a patient-focused medication guide to disseminate information to patients about the significant risks associated with concurrent use (FDA, 2016).

Cannabis. When Tetrahydrocannabinol (THC), the active ingredient in Marijuana, enters into the body, it binds to cannabinoid receptors. This in turn activates neurons in the brain, much like neurotransmitters (Lindsey et al., 2012). The drugs ability to bind at these sites results in its ability to bring about its well-known anxiolytic and sedative effects. The enzyme, which metabolizes THC, is also responsible for the mediated metabolism of tricyclic antidepressants and SSRI's (Lindsey et al., 2012). As such, there is a significant possibility of interaction effects between these two drugs.

Research conducted by Lindsey and colleagues (2012) has indicated that cannabis, when used with tricyclic antidepressants, could result in symptoms of mania and delirium. It was noted that when combined with barbiturates or depressants, cannabis may lead to symptoms of sedation. Additionally, it was reported that when utilized with lithium, cannabis use may influence increased concentrations of lithium, potentially resulting in a concentration within the body

that extends beyond the therapeutic range and can result in adverse reactions (Lindsey et al., 2012).

Notably, THC is categorized as a depressant and therefore, its use with other CNS depressants may result in an intensifying effect. Severe CNS depression can lead to an individual becoming unresponsive, unconscious and may even lead to coma or ultimately death. The concomitant uses of these substances can lead to fatal consequences.

Methamphetamine. Methamphetamine works like cocaine to increase levels of neurotransmitters such as dopamine in the synapse (Lindsey et al., 2012). As such, the result is an increase in positive emotions and alertness (Cruickshank & Dyer, 2009). Although individuals use methamphetamines for the aforementioned positive effects, there are negative effects associated with its use as well. Methamphetamine also induces the release of catecholamine's from the adrenal glands. This can lead to the individual experiencing CNS stimulation, cardiac arrhythmias and hypertension (Barr et al., 2006). Lindsey and colleagues (2012) also noted important side effects of use to be anxiety, insomnia, paranoia and hallucinations. This is important to note for clinicians, as psychotropic medications prescribed for individuals may be to treat such symptoms, which are then exacerbated by methamphetamine use.

Impact of Substance Use Disorder on Medication Adherence

Substance use has been shown to negatively affect medication adherence among mental health patients (Chandra et al., 2014, Manwani et al., 2007; Weiss, 2004). Previous research has indicated psychiatric patients with substance use disorders (SUD) show high rates of treatment non-adherence (Herbeck, Fitek, Svikis, Montoya, Marcus & West, 2005). In fact, a study conducted by Herbeck et al. (2005) examined treatment adherence in individuals with comorbid SUD. A component of their study involved surveying psychiatrists to determine rates of adherence across their patients with this comorbidity. Results of this survey indicated that the psychiatrists reported 40.5 percent of their clients with SUD exhibited treatment adherence difficulties. The authors specified that this percentage is representative of two out of five patients with a comorbid SUD presenting with some form of medication non-adherence.

Schizophrenia. Olfson, Mechanic, Hansell, Boyer, Walkuo and Weiden (2000) examined predictors of non-adherence with medications in a group of patients with schizophrenia, following discharge from hospitalization. The authors found three predictors of nonadherence in these participants: (a) history of non-adherence, (b) substance use, and, (c) refusal of family members to participate in their treatment. Of these predictors, substance use was the strongest predictor of patient medication non-adherence. Cannabis, in particular, was found to significantly hinder adherence to medication in patients with schizophrenia (Miller

et al., 2009).

Lacro and colleagues (2002) reported patients most often indicated factors for non-adherence with medication to be poor insight into their illness, poor therapeutic alliance, negative attitudes toward medication and substance abuse. Chandra, Kalasapati, Mallepalli and Chada Muni (2014) also examined factors effecting non-adherence in patients with schizophrenia. Like Lacro et al. (2002), their study found substance abuse significantly contributed to non-adherence with psychiatric medication.

Further examination of factors predicting adherence to medication among patients diagnosed with Schizophrenia, was conducted by Novick, Haro, Suarez, Perez, Dittmann and Haddad (2010). Specifically, this study examined the predictors of patient's adherence and non-adherence to prescribed antipsychotic medications (Novick et al., 2010). The study looked to evaluate characteristics of the patients, which were present at baseline, which could be predictive of greater adherence to medication. Factors found to influence adherence to medication adherence were patient's previous hospitalizations, living independently and hostility. In addition, as was seen in previous studies, the authors found that of the patients who were found to be non-adherent, alcohol dependence and substance use were shown to be significant risk factors for non-adherence (Novick et al., 2010). Notably, the authors indicated that addressing substance use could be a potential strategy for improving medication adherence within this population.

Jonsdottir et al., (2013) also examined risk factors for medication non-adherence. Participants had either a diagnosis of bipolar disorder or schizophrenia. The authors, like previous researchers, hypothesized the use of illicit substances or alcohol would result in a decrease in adherence to prescribed medications. The study found a relationship between substance use and non-adherence across both diagnostic groups, although differences in the amount of substances and prevalence of abuse were also seen. They noted that patients, who were partially adherent, used illicit drugs more often than those who were identified as fully adherent.

Bipolar Disorder. Baldessarini, Perry and Pike (2008) examined risk factors for non-adherence among patients diagnosed with Bipolar Disorder. Results of their study indicated that, like Olfson and Colleagues (2000), the factor most strongly associated with non-adherence within this population was substance use, specifically alcohol-dependence. Perlis and colleagues (2010) reported alcohol use disorder was significantly associated with pharmacologic non-adherence. Manwani (2007) examined the effect of substance use on patient adherence to prescribed mood stabilizers. Results of their study noted significantly lower levels of adherence in individuals who indicated the use of illicit substances.

Teter, Falone, Bakaian, Tu, Ongur and Weiss (2011) examined the impact of current, past (no use for at least one year) and no substance use disorder on medication adherence in individuals with Bipolar Disorder. The authors hypothesized that individuals with current substance use disorder (SUD) would

exhibit lower rates of adherence to medication and show increased negative attitudes toward the use of medication treatments. Additionally, it was hypothesized that similar attitudes toward medication and rates of adherence would be seen across the no SUD and past SUD groups. Results of the study indicated that participants who were using substances during treatment exhibited higher rates of non-adherence and more negative attitudes regarding medication use than the no substance use or past use patients. Individuals with past history of use and those with no history were shown to exhibit similar medication adherence behaviors (Teter et al., 2011).

A literature review conducted by Pompili, Venturini, Palermo, Stefani, Seretti and Lamis (2013) examined studies related to predicting non-adherence to medication in individuals with mood disorders (i.e., bipolar disorder, major depressive disorder, and dysthymic disorder. The author's analysis included 54 articles published between 1988 and 2012. Predictors of non-adherence within the studies included in the analysis were sociodemographic factors, physical and psychiatric comorbidity, patient beliefs, the relationship between patient and doctor, clinical characteristics of the disease, and characteristics of treatment.

Following analysis, the authors noted that comorbid SUD was found to be the most important predictor of non-adherence in individuals with BD, although it was also noted that comorbid SUD may also decrease adherence in individuals diagnosed with depression.

Depressive Disorders. A study conducted by Akerbald, Bengtsson, Holgersson, Knorring and Ekselius (2008) examined risk factors for non-adherence with antidepressant medication in patients with a diagnosis of Major Depressive Disorder. The authors noted that there were certain patient, as well as illness-related factors, which resulted in the individual being more likely to not comply with medication instructions. Of these factors, they identified substance abuse to be one of the significant predictors of non-adherence to medication (Akerbald et al., 2008).

Zivin, Ganoczy, Pfeiffer, Miller and Valenstein (2009) examined antidepressant adherence in Veteran patients diagnosed with depressive disorder and discharged from a psychiatric hospital. To evaluate medication adherence, the authors calculated medication possession ratios (MPR) from information received from the VA pharmacy, approximately three to six months following discharge (Zivin et al., 2009). These numbers were then compared to patient demographic and clinical factors such as diagnoses to determine if any relationship existed. The authors indicated a score of 0.8 to reflect good adherence, as this indicated that patients took 80% of the medication they were prescribed.

Results indicated 49% of patients showed adherence rates below 80%, with 27% of patients taking medication less than 50% of the time. Notably, the results of the comparison of adherence and clinical predictors indicated that patients, who had comorbid SUD, were more likely to exhibit poor adherence to medication (Zivin et al., 2009). This relationship was expressed by an adjusted odds ratio of

1.86; indicating that non-adherence is 86% more likely in individuals with a comorbid SUD. It was additionally noted that due to the large sample size used within this study, a odds ratio of greater than 1.3 is less likely to be due to a false positive and therefore, more likely to indicate a true predictor of non-adherence.

Substance Use Frequency and Medication Adherence

Without a doubt, substance use has a negative effect on medication adherence in psychiatric patients. Previous research has consistently identified substance use a significant predictor of non-adherence with psychotropic medication among a variety of mental health diagnoses. It has also reiterated the importance of obtaining a thorough understanding of this relationship to provide treatment that is more effective to mental health patients. Therefore, although the relationship between substance use and medication adherence has been well established, the relevant features of this relationship such as intensity or frequency of use, have received less attention.

Magura, Rosenblum, and Fong (2011), examined predictors of medication non-adherence in psychiatric patients with substance use histories. In addition to examining medication-related risk factors, psychological risk factors, and social/environmental risk factors, the researchers examined the effect of the intensity of substance use on rates of non-adherence. During their intake, patients were asked within the past 90 days, how many days had they used illicit drugs (i.e., alcohol, marijuana, cocaine, heroin or other opioids, methadone, hallucinogens,

barbiturates, sedatives, stimulants, ecstasy and inhalants). The authors indicated that a higher score was indicative of more alcohol or drug use. Their study found no association between the intensity of substance use and non-adherence with medication (Magura et al., 2011). The authors indicated that these results were similar to that of Lacro and colleagues (2002), which also found no significant difference across intensity of use. That is, utilization of drugs or alcohol may serve more as a qualifier that influences one's ability to be compliant with psychotropic medications, instead of a predictive qualifier of the severity of the non-adherence. They stated that:

> It might be surprising that the intensity of substance use was not associated with medication adherence, but this is not necessarily inconsistent with prior research, which generally has found differences in adherence between those with and without substance use, rather than between those varying degrees of use (Magura et al., 2011).

The authors cite Lacro and colleagues (2002), a literature review, which found that 5 out of 9 studies, examining the effect of a substance use on medication adherence, indicated a significant association. Notably of these 5 studies, only one study conducted by Drake, Osher, and Wallach (1989) examined varying intensity of use. Drake and colleagues (1989) examined the association between mild to severe alcohol use and medication adherence, street drug use, psychiatric symptoms, medical problems and hospital tenure (i.e., re-hospitalization and days

spent in the hospital). The authors indicated alcohol use was significantly associated with medication non-adherence. They also noted that rates of non-adherence with medication increased with increased alcohol use. Specifically, the authors found that individuals who did not use alcohol showed a 22% medication non-adherence rate, similar to individuals who were identified to drink a mild amount of alcohol who showed a 19% non-adherence rate (Drake et al., 1989). Moderate drinkers were shown to have a 38% non-adherence rate, severe drinkers a 44% non-adherence rate and extremely severe drinkers showed a 50% non-adherence rate (Drake et al., 1989).

Magura, Mateu, Rosenblum, Matusow and Fong (2014) furthered the study of medication adherence by examining non-adherence in psychiatric patients who have a history of substance use, using a larger sample size obtained across multiple locations. Like the previous studies, Magura and colleagues (2014) examined sociodemographic variables, medication adherence, medication risk factors and psychological risk factors. Looking to add to the previous literature, the authors also examined social/environment risk factors for non-adherence. This variable consisted of an evaluation of the participant's level of support (both medical and social), finances, living arrangements, and behavior risk factors (Magura et al., 2014). Behavior risk factors were comprised of alcohol or illicit drug use, excessive alcohol use, urge to use, criminal justice involvement and alcohol or drug recovery-group attendance (Magura et al., 2014).

The authors examine these relationships using a linear regression. Their study found that of the behavioral risk factors, alcohol use or drug use, urge to use, criminal justice involvement and excessive alcohol use were found to significantly predict non-adherence (Magura et al, 2014). The authors then utilized a backward elimination procedure. The results of this statistical analysis showed excessive alcohol use continued to be a significant predictor of medication non-adherence, while alcohol and drug use was found to no longer show significance (Magura et al., 2014).

With this is mind; it is plausible to say that more excessive use of alcohol predicted non-adherence above and beyond that of alcohol or drug use alone. As such, it is possible, although it was not directly tested in this study, that intensity of use would be a significant predictor of non-adherence, like was seen in Drake and colleagues (1989).

Rationale for Proposed Study

With the ever-increasing rates of prescription drug utilization in the United States, and the significant increase in rate of prescribing, prescription drug use is becoming an increasingly important field of study. Previous studies have elucidated the significant rates of non-adherence to medication, particularly in the mental health field. Additionally, it was noted that medication adherence is a critical factor in the effectiveness of treatment and overall clinical outcomes for patients.

Several factors effecting non-adherence have been studied, and of these factors, substance use has been identified to be a significant predictor. When studying non-adherence in individuals with mental health diagnoses, in particular, this information is especially important as many disorders show a high rate of comorbid SUD or related sub-clinical substance use. As such, these individuals have the potential to be at a higher risk for non-adherence with medication and, in turn, its adverse effects on treatment and outcomes.

So, do different rates of use result in a higher likelihood of non-adherence? Whereas previous studies have shown substance use to have a significant impact on patient adherence to prescribed medication, the research examining the effects of the dimensions of its use have had mixed results (Drake and colleagues, 1989; Lacro and colleagues, 2002; Magura et al., 2014). Therefore, with little definitive research conducted examining the effect of the intensity of substance use on non-adherence with medication, the present study will look to further examine this relationship. Obtaining this information will provide both clinicians and providers within the field a greater understanding of the effect of substance use on the effectiveness of treatment with psychotropic medications.

Study Objectives and Hypotheses

The examination of existing literature has indicated that psychotropic medication adherence is significantly influenced by substance use in individuals with mental health diagnoses. Obtaining a greater understanding of this relationship

is paramount, as medication non-adherence has adverse effects on treatment effectiveness and overall patient outcomes. Gaining a comprehensive understanding requires examining more thoroughly the dimensional aspects of the factors known to influence adherence; in this case the effect of intensity of use. Therefore, this study will attempt to: (1) add to the existing literature examining the effect of substance use on non-adherence with psychotropic medication use, and (2) examine the effect of varying intensities of drug use on rates of non-adherence with prescribed psychotropic medication. Once completed, this information will provide mental health professionals with invaluable information needed for program development and ensuring more effective treatment outcomes.

Based on the reviewed literature relating to this project, the following are hypotheses of the proposed study:

1. Indication of a substance use will significantly predict medication non-adherence in patients prescribed psychotropic medications.
    a. Approximately 25% (or greater) of patients in this study will have used some type of illicit drug or alcohol while taking prescription medication.
    b. Approximately 50% (or greater) of patients will demonstrate non-adherence to medications prescribed.
2. Significant differences in the effect on medication adherence will be seen across varying degrees of substance use.

3. Substance use intensity will have a positive correlation with medication non-adherence.

Method

Procedure

This study was approved by the Florida Institute of Technology Institutional Review Board (IRB) prior to participant recruitment. Participants were recruited from within two local, Circles of Care Inc., community mental health clinics. Circles of Care, Inc. is a non-profit mental health-based program comprised of inpatient, crisis services, and outpatient mental health care services through its hospital-based and State and County contracted programs. Circles of Care has 52 licensed hospital beds, 50 state licensed adult crisis stabilization beds, 78 licensed residential and treatment beds, 18 licensed chemical dependency detoxification beds, 12 licensed chemical dependency intensive residential treatment beds, 16 children's crisis stabilization beds as well as a complete continuum of outpatient care to provide services to residents of the Brevard County community. Permission was granted to the authors to survey and collect data from the clients at their two local outpatient clinics. Data was collected via a self-report survey. Participants were provided with a paper copy of the informed consent and survey as part of their intake packet for treatment (see Appendix A and B).

Patient’s responses were kept confidential and they were not asked to identify themselves on the questionnaire. The informed consents were kept in a

separate file from the surveys that were collected. This allowed there to be no matching of informed consent with survey data and maintain the confidentiality of the participant. Inclusion criteria for the study consisted of participants (1) being over the age of 18, (2) prescription of a psychotropic medication, and (3) concurrent illicit drug use.

Outcome Measures

The survey was created specifically for use within this study. The survey requested demographic information, information pertaining to prescribed psychotropic medications and subjective measures of adherence and non-adherence with prescription instructions. Adherence with medication was evaluated using a Likert scale. The Likert scales provided a measure of the participant's compliance with their prescribed dosage guidelines and their likelihood of terminating medication use without consulting their prescribing doctor. An example of one of the Likert Scale questions on the survey is as follows:

> *Of the medications circled above, and is prescribed daily, (Please write in your medication)* _____, *How often do you take half, or less than half of the recommended dosage of this medication?*

The participants were then provided a Likert Scale from 1 (Never) to 4 (Always). If medication non-adherence was identified, patients were then asked to identify the factor(s) that function as a barrier to their medication adherence. Additionally, the questionnaire utilized questions from the Drug Use Screening Inventory-Revised

adult survey (DUSI-R). The DUSI-R is a self-report questionnaire used to examine the severity of problems in 10 domains, one of them being substance use. For the purpose of this study, only the component of the DUSI-R, which is used to screen for involvement with drugs, was utilized. This measure allowed the researchers to analyze potential associations between rate of medication non-adherence and frequency of drug use. The participants were asked to identify each substance used within the past year, and how many times it was used per month.

Data Analysis

The questionnaire utilized four types of questions to measure rates of participant adherence and non-adherence to medication. Two types of questions asked participants to rate nonadherence on a Likert scale, while the other two asked for the same ratings pertaining to adherence. To obtain an overall nonadherence score, responses to questions pertaining to adherence were reverse coded to reflect a rate of non-adherence. Then, ratings across all questions were summed to obtain an overall nonadherence score for each participant. Similarly, substance use scores consisted of the sum of the Likert responses across each substance, for each participant.

To test our first hypothesis the continuous variable of substance use score was transformed into a categorical variable with two conditions: people who indicated using substances and people who did not. With this categorical variable and the continuous variable of non-adherence score, an independent samples T-test was run

to determine if there was a significant difference in non-adherence between substance users and non-users.

To identify the percentage of individuals within our sample which indicated using substances, descriptive statistics pertaining to the substance users and non-user's variable were explored. In order to identify the percentage of individuals who were non-adherent to medications, non-adherence scores were standardized to identify the mean of non-adherence scores. The selected criteria for non-adherence for our study, was defined as an individual's non-adherence to medication greater then 50% of the time. With the identified mean score, the researchers were able to ascertain the number of individuals falling above this score and obtain a percentage of individuals who are identified as non-adherent.

For our second hypothesis the variable of substance use score was standardized to identify the mean. Substance use was then transformed into a categorical variable of above and below average substance users. An independent-samples *t*-test was then conducted to compare medication non-adherence, using non-adherence scores, and the dichotomous variable of below average users and above average users. This would allow the researchers to examine the effect of intensity of use on medication nonadherence.

Lastly a simple linear regression was used to examine the relationship between intensity of use and adherence. The continuous variables of substance use scores and non-adherence scores were used. The strength and direction of the

correlation was then examined to determine the relation between these two factors. The aforementioned analyses were completed using the Statistical Package for Social Sciences (SPSS).

Results

Participants

In total, 237 participants completed the survey. A total of 42 cases were deleted, due to missing values in regard to compliance data. As compliance behavior was the primary variable of interest, participants who did not disclose this information, were therefore removed from the study. After cleaning the data, 195 participants remained and were included in data analysis. Descriptive statistics for participants can be seen in Table 1 of the appendix.

Of the participants that were included in our study, 31.8% (n = 62) were male and 68.2% (n = 133) were female. 36% (n =69) were between the ages of 41-55, 29% (n = 55) were between the ages of 26-40, 18% (n =34) were between the ages of 56-65, 8% (n =15) were between the ages of 66-74, 5% (n = 9) were between the ages of 18-25, and 3% (n = 6) were 75 and above.

The participants were 83% (n = 161) Caucasian, 8% (n = 16) African American/Caribbean, 4% (n = 8) Hispanic, 1% (n = 3) Asian, 2% (n = 4) American Indian or Native American, and 1% (n = 3) selected other. Approximately 82% (n = 153) of participants indicated a heterosexual orientation. 8% (n = 15) indicated that

they were bisexual, 8% (*n* = 15) preferred not to report, and 2% (*n* = 4) reported a homosexual orientation.

The most frequently endorsed level of education was a high school diploma or GED (*n* =83: 43%), followed by an associate's degree (*n* = 39 : 20%), no high school diploma or GED (*n* = 23 : 12%), a bachelor's degree (*n* = 21 : 11%), attended a trade school (*n* = 17 : 9%), and 5% (*n* = 9) of participants had a post-secondary degree. 72% (*n* = 138) indicated that they were currently unemployed. 15% (n= 29) reported they were employed full-time. 13% (*n* = 24) reported being employed Part-time.

Of the participants who chose to respond, 62% (*n* = 120) indicated that they had been previously hospitalized while 38% (*n* = 72) reported no history of hospitalization.

Statistical Analyses

Percentages of illicit substance use and noncompliance. The first hypothesis proposed that over 25 percent of participants would engage in substance use and over 50 percent of participants would demonstrate non-adherence to prescribed medication. The survey was answered by 195 participants, of whom 80 percent were found to engage in substance use. This was determined by utilizing the dichotomous variable of substance use users and nonusers created previously. Frequency statistics indicated 60 percent of participants engaged in the use of illicit

substances. This statistic excluded tobacco and alcohol as these are considered legal substances. When alcohol used was added, the percentage of use increased to 73 percent.

Analysis of frequency statistics also indicated that 50.3% percent of all participants were shown to display above average medication noncompliance. Therefore, the hypothesis indicating 50 percent of participants would demonstrate non-adherence to prescribed medication, was supported.

Substance use and medication non-adherence. The other portion of our first hypothesis proposed that substance use would significantly predict non-adherence to prescribed medications. An independent-samples *t*-test was conducted to compare medication non-adherence between substance users and nonusers. Levene's test showed the variances for non-adherence for both groups to be equal, therefore, equal variances are assumed, F (195) = 2.10, p >.05. There was no significant difference in medication non-adherence for substance non-users (M = 11.76, SD = 8.33) and substance users (M = 12.65, SD = 7.47); t (195) = -.64, p = .57, two-tailed. The magnitude of the differences in the means (M difference = -.89, 95% CI [-3.62, 1.82]) was small (Cohen's d = 0.11). The hypothesis that substance users would show a greater amount of medication non-adherence was not supported.

Noncompliance and intensity of substance use. The second hypothesis proposed that significant differences in the effect on medication adherence will be

seen across varying degrees of substance use. An independent-samples *t*-test was conducted to compare medication non-adherence between below average users and above average users to examine the effect of intensity of use. Levene's test showed the variances for non-adherence for both groups to be equal, therefore, equal variances are assumed, F (163) = 2.0, p >.05. There was no significant difference in medication non-adherence for below average substance users (M = 13.52, SD = 7.88) and above average substance users (M = 12.03, SD = 7.06); t (163) = 1.18, p = .24, two-tailed. The magnitude of the differences in the means (M difference = 1.48, 95% CI [-.99, 3.96]) was small (Cohen's d = 0.19). The hypothesis that intensity of substance use would show a greater amount of medication non-adherence was not supported.

The third hypothesis proposed that substance use intensity will have a positive correlation with medication non-adherence. A simple linear regression was used to examine the relationship between non-adherence and intensity of substance use. Results indicated an inverse relationship between the intensity of use and medication non-adherence, r (163) = - .11, p > .05. This relationship was not shown to be statistically significant.

Discussion

Impact of Study

Psychotherapy excluded, psychotropic medication is the primary treatment modality for individuals undergoing mental health treatment. Although frequently

prescribed by providers, the psychotropic medication regimen is rarely adhered to by patients in a way that maximizes treatment efficacy. Non-adherence to medication has been shown to have disastrous effects on patient outcomes and has elicited the interest of many previous researchers (Chapman & Horne, 2013; De Las Cuevas et al., 2017; Magura et al., 2014). Notably, individuals undergoing mental health treatment have also been shown to exhibit high rates of comorbid substance use, which has been identified by previous research to be a significant predictor for non-adherence. With the high rates of substance use among individuals receiving psychotropic medication, it is imperative to gain a greater understanding of the relationship between substance use and medication non-adherence, warranting a more in-depth analysis undertaken by the current research.

Adding to the existing literature, this study examined the frequency of concurrent substance and psychotropic medication use amongst patient attending treatment within an outpatient clinic. We hypothesized that approximately 25 percent of patients in this study would have used illicit drugs or alcohol while taking prescription medication. Results indicated 73 percent of individuals engaged in illicit substance and alcohol use concurrently with medication, thus, supporting our hypothesis.

The data collected through this study goes above and beyond that which was hypothesized. That is, 80 percent of individuals surveyed indicated engaging in some form of substance use (i.e., illicit drugs, alcohol and tobacco). And as was

previously noted, 73 percent reported engaging in illicit drugs and/or alcohol use. The results are consistent with the high rates of comorbidity between mental illness and substance use identified in the previous literature (Herbeck, Fitek, Svikis, Montoya, Marcus & West, 2005; Substance Abuse and Mental Health Services Administration, 2017). Specifically, research conducted by the SAMHSA in 2017, which identified 8.2 million individuals within the United States were diagnosed with co-occurring mental and substance use disorders. As the study was conducted within a mental health treatment facility, it is plausible that these high rates of comorbid SUD are being reflected in our obtained rates of participant substance use.

This study also hypothesized that approximately 50% of patients would demonstrate non-adherence to the psychotropic medications that they were prescribed. This hypothesis was substantiated by our results. Results indicated that 50.3% of participants reported non-adherence to their psychotropic medications. This finding is consistent with the previous literature which indicated an average of 52 percent of participants reporting non-adherence to medication (Sansone &Sansone, 2012).

One factor specific to the community surveyed was demographics of this underserved mental health setting. As such, patient factors such as their socioeconomic status coupled with the cost and availability of these medications may be a factor affecting participant adherence. Additionally, as was noted within

the previous research, substance use has been shown to significantly influence patient medication adherence. As participants were receiving treatment for mental health difficulties, and there is a high rate of comorbidity with substance use, it is plausible to see high rates of non-adherence to medications within this setting and population specifically. This, therefore, is one explanation for the commiserate result founded regarding non-adherence to medication.

Contrary to our hypothesis, a significant relationship between substance use and medication non-adherence was not found. This finding is inconsistent with the previous literature conducted by Drake and colleagues (1989), Lacro and colleagues (2002), and more specifically Magura et al. (2014); one of the studies for which the current study wished to expand. As previously discussed, the relationship between substance use and medication non-adherence had been relatively well established within the literature, although a similar result was not seen within the current research study. It is possible that the variability in both population, as well as SUD, may have impacted the observed relationship as it related to medication non-adherence. Also, sample size (as will be discussed later) may have been a factor in getting a generalizable enough demographic to be comparable to the literature suggestions.

A literature review conducted by Hendershot and collogues (2010), evaluated previous studies examining of the effects of alcohol use on antiretroviral medication adherence. Through their research they noted several variables which

were identified to moderate this relationship. They noted a stronger association between alcohol use and non-adherence to medication among samples which contained a higher of number of males then females, studies which utilized a larger sample size, ones which measured alcohol use quantity as opposed to frequency, studies which utilized greater stringency when defining adherence, and those which utilized assessments that were not self-report measures. In fact, the authors indicated that especially for adherence measurement, the use of more objective measures such as a Medication Event Monitoring System (MEMS), produced the most reliable results. This system uses a cap that is placed on a medicine bottle, and records data on the date and time it is opened and closed. This method decreases areas of potential measurement error.

The moderating factors noted by Hendershot and collogues (2010), specifically, the use of a questionnaire and the measures of substance use, may have significantly impacted the ability of the current study to obtain significant results. The questionnaire was not an objective measure and therefore was likely affected by participant error. Additionally, the current study measured substance use by inquiring about participants frequency of use, as opposed to quantity of use. As we did not examine the moderating effects of these factors specifically, we are not able to speak to their potential effect on participant non-adherence within this study. We do, however, urge future researchers to continue to examine the potential

impact of these factors on the association between medication non-adherence and substance use.

Additionally, this study found no significant relationship between intensity of use and non-adherence to psychotropic medications. Research conducted by Jonsdottir et al., (2013) indicated differences in adherence rates across participants engaging in differing quantities of drug use. Similar results were seen in the research conducted by Magura et al., (2014) which found excessive alcohol was a stronger predictor of non-adherence in patients, above and beyond that of alcohol and drug use alone. Although the results of the current study did not support the results of the studies conducted by Jonsdottir et al., (2013) and Magura et al., (2014), they are commensurate with the results of the studies conducted by Lacro et al., (2002) and Magura and collogues (2011). The data collected by Magura et all, (2011) indicated no association between the intensity of substance use and greater non-adherence to medication. The authors noted a tendency to find differences between groups of users and non-users, as opposed to within groups of users of varying intensities. As previous studies have shown varying findings concerning the association between these two factors, this area, in particular, should continue to receive attention in future research.

Lastly, we hypothesized that substance use intensity would have a positive correlation with medication non-adherence. Consistent with previous literature, our

study found no significant association between the intensity of substance use and non-adherence with medication.

As indicated in our review of the literature, the high rates of comorbidity between psychiatric and substance use disorders lays the groundwork for polypharmacy. With polypharmacy comes the potential for drug-drug interactions, which although often detrimental to the health of patients, may also be a factor influencing medication adherence. For example, patients may be utilizing some medications in hopes of increasing the effects of illicit drugs, or vice versa. Therefore, as substance use increases, there is the potential for an increase in use of prescribed medication, as seen within the current study. Future research may wish to examine the influence of interaction effects on medication adherence rates, in individuals who engage in substance use concurrently with prescribed medication.

Limitations and Areas for Future Research

Small sample size. As previously discussed, the nonsignificant results obtained within this study may be the result of a lack of power due to a small sample size. A larger sample size may increase the chances of detecting a true effect within the data. As such, future studies may consider increasing the sample size to allow for more reliable results with greater power to detect differences.

Validity of the Questionnaire. The questionnaire used was adapted for this study using questions created by the researchers, as well as those adapted from the

Drug Use Screening Inventory-Revised adult survey (DUSI-R). As there was no pilot study to establish the validity of the questionnaire for evaluating these factors, there is the potential that the developed questionnaire did not accurately measure the constructs we set out to measure. As the DUSI-R is a reliable and valid self-report measure, and the questions from the DUSI-R coupled with the questions created by the researchers appeared to effectively examine the constructs within this study, we felt it was the best available option to utilize this original questionnaire. Future research may wish to utilize a questionnaire, whose validity has been confirmed and used within previous studies.

Additionally, as was mentioned by Hendershot and collogues (2010) and Haddad, Brain, and Scott (2014), the use of subjective self-report measures to identify non-adherence has been shown to have poor validity and a tendency to underestimate rates of nonadherence within the sample. Therefore, more objective measures such as a MEMS system, can be utilized within future research to combat any errors which may occur when using more subjective measures.

Participant Bias. The survey asked participants to disclose information about sensitive topics such as drug use and medication taking behaviors. Participants may wish to present themselves, and their behaviors in a more positive light, by underreporting such behaviors. This may increase error in the research data and contribute to the difficulty detecting differences between groups.

Although the experimenters took measures to deter such a bias, such as informing the participants of confidentiality and anonymity within the informed consent, participants may still have responded in ways that would minimize disclosure about the variable of interest within this study. Future studies may examine the use of other measures, which minimize the potential for social desirability biased responding.

Conclusion

The study was conducted in an effort to add to the existing literature examining medication nonadherence and substance use. The current study looked to expand the research examining the relationship between substance use and non-compliant medication behavior, as well as evaluate the effect of intensity of substance use on non-adherence. Furthermore, previous research has been variable in its findings, and as such, warranted further examination.

Results obtained in this study continue to highlight the high frequency of patients utilizing substances concurrently with prescribed medications. Previous research has shown that substance use affects medication adherence, and although not seen within the current study, this information remains important not only for medical professionals but also clinicians as concurrent use raises concerns about the treatment approaches utilized. Additionally, drug-to-drug interactions, expectations of prescribed drug effect and duration, and self-medication all remain areas of complicated concern among patients in this demographic. As intensity of

use was not shown to have a significant effect on non-adherence, emphasis should therefore not only be placed on those who exhibit more intense drug use, but on any drug use disclosed by the patient. With this knowledge, doctors and clinicians are better equipped in the battle against medication non-adherence. Understanding the factors affecting medication non-adherence is advantageous in the development of strategies to increase adherence in patients and improve overall patient outcomes.

References

Akerbald, A. C., Bengtsson, F., Holgersson, M., von Knorring, L., & Ekselius, L. (2008). Identification of primary care patients at risk of nonadherence to antidepressant treatment. *Patient preference and adherence*, *2*, 379-86.

Baldessarini, R. J., Perry, R., & Pike, J. (2008). Factors associated with treatment nonadherence among US bipolar disorder patients. *Human Psychopharmacology: Clinical and Experimental*, *23*(2), 95-105.

Barr, A. M., Panenka, W. J., MacEwan, G. W., Thornton, A. E., Lang, D. J., Honer, W. G., & Lecomte, T. (2006). The need for speed: an update on methamphetamine addiction. *Journal of psychiatry & neuroscience: JPN*, *31*(5), 301–313.

Brown, M. T., & Bussell, J. K. (2011, April). Medication adherence: WHO cares?. In *Mayo Clinic Proceedings* (Vol. 86, No. 4, pp. 304-314). Elsevier.

Cascorbi I. (2012). Drug interactions--principles, examples and clinical consequences. *Deutsches Arzteblatt international*, *109*(33-34), 546–556. doi:10.3238/arztebl.2012.0546

Center for Disease Control. (2015). Therapeutic Drug Use. Retrieved from https://www.cdc.gov/nchs/fastats/drug-use-therapeutic.htm

Chakrabarti, S. (2017). Medication non-adherence in bipolar disorder: Review of rates, demographic and clinical predictors. *World Journal of Meta-Analysis*, *5*(4), 103-123.

Chandra, I., Kumar, K., Reddy, M., & Reddy, C. M. (2014). Attitudes toward medication and reasons for non-compliance in patients with schizophrenia. *Indian Journal of Psychological Medicine, 36*(3), 294-298. doi:http://dx.doi.org.portal.lib.fit.edu/10.4103/0253-7176.135383

Cheng, C., Mithoowani, F., Ungar, T., & Lee, M. (2018). Interaction between Psychotropic Medications and Alcohol: Perceptions among Patients Attending an Adult Mental Health Day Hospital Program. *The Canadian journal of hospital pharmacy*, *71*(1), 7-13.

Chapman, S. C., & Horne, R. (2013). Medication nonadherence and psychiatry. *Current opinion in psychiatry*, *26*(5), 446.

Cramer, J. A., Roy, A., Burrell, A., Fairchild, C. J., Fuldeore, M. J., Ollendorf, D. A., & Wong, P. K. (2008). Medication compliance and persistence: terminology and definitions. *Value in health*, *11*(1), 44-47.

Cruickshank, C. C., & Dyer, K. R. (2009). A review of the clinical pharmacology of methamphetamine. *Addiction*, *104*(7), 1085-1099.

Conway, K. P., Vullo, G. C., Nichter, B., Wang, J., Compton, W. M., Iannotti, R. J., & Simons-Morton, B. (2013). Prevalence and Patterns of Polysubstance Use In a Nationally Representative Sample of 10th Graders in the United States. *The Journal of Adolescent Health : Official Publication of the Society for Adolescent Medicine*, *52*(6), 716–723. http://doi.org/10.1016/j.jadohealth.2012.12.006

De las Cuevas, C., de Leon, J., Peñate, W., & Betancort, M. (2017). Factors influencing adherence to psychopharmacological medications in psychiatric patients: a structural equation modeling approach. Patient Preference and Adherence, 11, 681-690. http://doi.org/10.2147/PPA.S133513

Holgersson, M., von Knorring, L., & Ekselius, L. (2008). Identification of primary care patients at risk of nonadherence to antidepressant treatment. *Patient preference and adherence*, *2*, 379-86.

Drake, R. E., Osher, F. C., & Wallach, M. A. (1989). Alcohol use and abuse in schizophrenia: a prospective community study. *Journal of nervous and mental Disease*.

Eticha, T., Teklu, A., Ali, D., Solomon, G., & Alemayehu, A. (2015). Factors associated with medication adherence among patients with schizophrenia in mekelle, northern ethiopia. *PloS One, 10*(3), e0120560. doi:10.1371/journal.pone.0120560

FDA (U.S. Food and Drug Administration). FDA requires strong warnings for opioid analgesics, prescription opioid cough products, and benzodiazepine labeling related to serious risks and death from combined use. 2016. [March 2, 2017]. https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm518697.htm.

Gellad, W. F., Grenard, J. L., & Marcum, Z. A. (2011). A Systematic Review of Barriers to Medication Adherence in the Elderly: Looking Beyond Cost and Regimen Complexity. *The American Journal of Geriatric Pharmacotherapy*, *9*(1), 11–23. http://doi.org/10.1016/j.amjopharm.2011.02.004

Gianfrancesco, F. D., Sajatovic, M., Rajagopalan, K., & Wang, R. H. (2008). Antipsychotic treatment adherence and associated mental health care use among individuals with bipolar disorder. *Clinical therapeutics*, *30*(7), 1358-1374.

Haddad, P. M., Brain, C., & Scott, J. (2014). Nonadherence with antipsychotic medication in schizophrenia: challenges and management strategies. *Patient related outcome measures*, *5*, 43.

Hendershot, C. S., Stoner, S. A., Pantalone, D. W., & Simoni, J. M. (2009). Alcohol use and antiretroviral adherence: review and meta-analysis. *Journal of acquired immune deficiency syndromes (1999)*, *52*(2), 180.

Herbeck, D. M., Fitek, D. J., Svikis, D. S., Montoya, I. D., Marcus, S. C., & West, J. C. (2005). Treatment compliance in patients with comorbid psychiatric and substance use disorders. *American Journal on Addictions*, *14*(3), 195-207.

Jawad, I., Watson, S., Haddad, P. M., Talbot, P. S., & McAllister-Williams, R. H. (2018). Medication nonadherence in bipolar disorder: a narrative review. *Therapeutic advances in psychopharmacology*, *8*(12), 349-363.

Jawad, I., Watson, S., Haddad, P. M., Talbot, P. S., & McAllister-Williams, R. H. (2018). Medication nonadherence in bipolar disorder: a narrative review. *Therapeutic advances in psychopharmacology*, *8*(12), 349-363.

Jimmy, B., & Jose, J. (2011). Patient Medication Adherence: Measures in Daily Practice. *Oman Medical Journal*, *26*(3), 155–159. http://doi.org/10.5001/omj.2011.38

Joe, S., & Lee, J. S. (2016). Association between non-compliance with psychiatric treatment and non-psychiatric service utilization and costs in patients with schizophrenia and related disorders. *BMC psychiatry*, *16*(1), 444.doi:10.1186/s12888-016-1156-3

Jones, C. M., & McAninch, J. K. (2015). Emergency department visits and overdose deaths from combined use of opioids and benzodiazepines. *American journal of preventive medicine*, *49*(4), 493-501.

Jones, J. D., Mogali, S., & Comer, S. D. (2012). Polydrug abuse: a review of opioid and benzodiazepine combination use. *Drug and alcohol dependence*, *125*(1-2), 8-18.

Jonsdottir, H., Opjordsmoen, S., Birkenaes, A. B., Simonsen, C., Engh, J. A., Ringen, P. A., ... & Andreassen, O. A. (2013). Predictors of medication adherence in patients with schizophrenia and bipolar disorder. *Acta Psychiatrica Scandinavica*, *127*(1), 23-33.

Julius, R. J., Novitsky Jr, M. A., & Dubin, W. R. (2009). Medication adherence: a review of the literature and implications for clinical practice. *Journal of Psychiatric Practice®*, *15*(1), 34-44.

Kamali, M., Kelly, B. D., Clarke, M., Browne, S., Gervin, M., Kinsella, A., ... & O'Callaghan, E. (2006). A prospective evaluation of adherence to medication in first episode schizophrenia. *European Psychiatry*, *21*(1), 29-33.

Kantor, E. D., Rehm, C. D., Haas, J. S., Chan, A. T., & Giovannucci, E. L. (2015). Trends in Prescription Drug Use among Adults in the United States from 1999–2012. *JAMA*, *314*(17), 1818–1831. http://doi.org/10.1001/jama.2015.13766

Lacro, J.P., Dunn, L.B., Dolder, C.R., Leckband, S.G., Jeste, D.V., 2002. Prevalence of and risk factors for medication nonadherence in patients with schizophrenia: a comprehensive review of recent literature. Journal of Clinical Psychiatry 63, 892–909.

Lindsey, W. T., Stewart, D., & Childress, D. (2012). Drug interactions between common illicit drugs and prescription therapies. *The American journal of drug and alcohol abuse*, *38*(4), 334-343.

Magura, S., Rosenblum, A., & Fong, C. (2011). Factors associated with medication adherence among psychiatric outpatients at substance abuse risk. *The Open Addiction Journal*, *4*, 58–64. http://doi.org/10.2174/1874941001104010058

Magura, S., Mateu, P. F., Rosenblum, A., Matusow, H., & Fong, C. (2014). Risk factors for medication non-adherence among psychiatric patients with substance misuse histories. *Mental Health and Substance Use*, *7*(4), 381-390.

Malik, H. U., & Kumar, K. (2012). Serotonin syndrome with escitolapram and concomitant use of cocaine: a case report. *Clinical medicine insights. Case reports*, *5*, 81-5.

Manwani, S. G., Szilagyi, K. A., Zablotsky, B., Hennen, J., Griffin, M. L., & Weiss, R. D. (2007). Adherence to pharmacotherapy in bipolar disorder patients with and without co-occurring substance use disorders. *The Journal of clinical psychiatry*, *68*(8), 1172-1176.

Masnoon, N., Shakib, S., Kalisch-Ellett, L., & Caughey, G. E. (2017). What is polypharmacy? A systematic review of definitions. *BMC geriatrics*, *17*(1), 230. doi:10.1186/s12877-017-0621-2

Mayo Clinic. (2013). Nearly 7 in 10 Americans Take Prescription Drugs, Mayo Clinic, Olmsted Medical Center Find. Retrieved from https://newsnetwork.mayoclinic.org/discussion/nearly-7-in-10-americans-take-prescription-drugs-mayo-clinic-olmsted-medical-center-find/

McHugh, R. K., Nielsen, S., & Weiss, R. D. (2014). Prescription drug abuse: from epidemiology to public policy. *Journal of substance abuse treatment*, *48*(1), 1-7.

Miller, R., Ream, G., McCormack, J., Gunduz-Bruce, H., Sevy, S., & Robinson, D. (2009). A prospective study of cannabis use as a risk factor for non-adherence and treatment dropout in first-episode schizophrenia. *Schizophrenia research*, *113*(2-3), 138-144.

Mitchell, A. J., & Selmes, T. (2007). Why don't patients take their medicine? Reasons and solutions in psychiatry. *Advances in Psychiatric Treatment*, *13*(5), 336-346.

Moore, T. J., & Mattison, D. R. (2017). Adult utilization of psychiatric drugs and differences by sex, age, and race. *JAMA internal medicine*, *177*(2), 274-275.

Morton W. A. (1999). Cocaine and Psychiatric Symptoms. *Primary care companion to the Journal of clinical psychiatry*, *1*(4), 109-113.

Novick, D., Haro, J. M., Suarez, D., Perez, V., Dittmann, R. W., & Haddad, P. M. (2010). Predictors and clinical consequences of non-adherence with antipsychotic medication in the outpatient treatment of schizophrenia. *Psychiatry research*, *176*(2-3), 109-113.

Olfson, M., & Marcus, S. C. (2009). National patterns in antidepressant medicationtreatment. *Archives of general psychiatry*, *66*(8), 848-856.

Olfson, M., Mechanic, D., Hansell, S., Boyer, C. A., Walkup, J., & Weiden, P. J. (2000). Predicting medication noncompliance after hospital discharge among patients with schizophrenia. *Psychiatric Services*, *51*(2), 216-222.

Omenka, I. and Greene, MS. (2017). "Polypharmacy Among Prescription Drug Users". Published by The Center for Health Policy at the IU Richard M. Fairbanks School of Public Health, Indianapolis, IN.

Pathan, H., & Williams, J. (2012). Basic opioid pharmacology: an update. *British journal of pain*, *6*(1), 11-16.

Perlis, R. H., Ostacher, M. J., Miklowitz, D. J., Hay, A., Nierenberg, A. A., Thase, M. E., & Sachs, G. S. (2010). Clinical features associated with poor pharmacologic adherence in bipolar disorder: results from the STEP-BD study. *The Journal of clinical psychiatry*.

Phillips, J. K., Ford, M. A., Bonnie, R. J., & National Academies of Sciences, Engineering, and Medicine. (2017). Trends in Opioid Use, Harms, and Treatment. In *Pain Management and the Opioid Epidemic: Balancing Societal and Individual Benefits and Risks of Prescription Opioid Use*. National Academies Press (US).

Pompili, M., Venturini, P., Palermo, M., Stefani, H., Seretti, M. E., Lamis, D. A., ... & Girardi, P. (2013). Mood disorders medications: predictors of nonadherence–review of the current literature. *Expert review of neurotherapeutics*, *13*(7), 809-825.

Saber-Tehrani, A. S., Bruce, R. D., & Altice, F. L. (2011). Pharmacokinetic drug interactions and adverse consequences between psychotropic medications and pharmacotherapy for the treatment of opioid dependence. *The American journal of drug and alcohol abuse*, *37*(1), 1-11.

Sansone, R. A., & Sansone, L. A. (2012). Antidepressant adherence: are patients taking their medications?. *Innovations in Clinical Neuroscience*, *9*(5-6), 41.

Substance Abuse and Mental Health Services Administration. (2017). *Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health* (HHS Publication No. SMA 17-5044, NSDUH Series H-52). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Stein, M. B., Cantrell, C. R., Sokol, M. C., Eaddy, M. T., & Shah, M. B. (2006). Antidepressant adherence and medical resource use among managed care patients with anxiety disorders. *Psychiatric Services, 57*(5), 673-80. Retrieved from https://searchproquestcom.portal.lib.fit.edu/docview/213090877?accountid=27313

Substance Abuse and Mental Health Services Administration. *Behavioral Health, United States, 2012*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2013.

Teter, C. J., Falone, A. E., Bakaian, A. M., Tu, C., Öngür, D., & Weiss, R. D. (2011). Medication adherence and attitudes in patients with bipolar disorder and current versus past substance use disorder. *Psychiatry research*, *190*(2-3), 253-258.

Weiss, R. D. (2004), Adherence to pharmacotherapy in patients with alcohol and opioid dependence. Addiction, 99: 1382-1392. doi:10.1111/j.1360-0443.2004.00884.x

Weathermon, R., & Crabb, D. W. (1999). Alcohol and medication interactions. *Alcohol research and Health*, *23*(1), 40-54.

Zivin, K., Ganoczy, D., Pfeiffer, P. N., Miller, E. M., & Valenstein, M. (2009). Antidepressant adherence after psychiatric hospitalization among VA patients with depression. *Administration and Policy in Mental Health and Mental Health Services Research*, *36*(6), 406-415.

Table 1

Descriptive Statistics of Participant Demographic Information

Variable	N	Percent
Race and Ethnicity		
African American/Caribbean	16	8.2%
American Indian or Native American	4	2%
Asian	3	1.5%
Caucasian	161	82.6%
Other	3	1.5%
Hispanic	8	4.2%
Age		
18-25	9	5%
26-40	55	29%
41-55	69	34%
56-65	34	18%
66-74	15	8%
75+	6	3%
Educational Attainment		
No High School Diploma or GED	23	12%
High school Graduate or GED	84	43%
Trade School	18	9%
Associates Degree	39	20%
Bachelor's Degree	21	11%
Master's Degree	10	5%
Doctoral Degree	0	0
Sex		
Male	62	31.8%
Female	133	68.2%
Sexual Orientation		
Heterosexual	156	81%
Homosexual	4	2%
Bisexual	16	8%
Prefer Not to Say	16	8%
Employment Status		
Full-Time	29	12%
Part-Time	24	10%
Unemployed	138	58%

Appendix A

Demographics

What is your age: (Check One)

18-25 ☐ 26-40 ☐ 41- 55 ☐ 56-65 ☐ 66-74 ☐ 75+ ☐

What is your gender: (Check One)

Male ☐ Female ☐ Prefer not to say ☐

What is your ethnicity: (Check One)

Caucasian ☐ African American/ Caribbean American ☐ Hispanic ☐

Pacific Islander ☐ Native American/ American Indian ☐ Asian ☐

What is your highest level of education: (Check One)

Did not complete High School ☐ High School Diploma/ GED ☐ Associates ☐

Bachelor's Degree ☐ Master's Degree ☐ Doctorate ☐

Trade school Certification ☐

What is your current employment status: (Check One)

Full-Time ☐ Part-Time ☐ Unemployed ☐

What is your sexual orientation: (Check One)

Heterosexual ☐ Homosexual ☐ Bisexual ☐ Prefer not to say ☐

What is your marital status: (Check One)

Single/ Never Married ☐ Legally Separated ☐ Divorced ☐ Widowed ☐

Medical History:

Have you ever been hospitalized overnight due to a psychiatric condition: (Check One)

Yes ☐ No ☐

Are you currently prescribed any of the following medications? (Circle any/ and all medications that you are currently prescribed)

Antidepressants

Anafranil (Clomipramine)

Tofranil (Imipramine)

Lexapro (Escitalopram)

Prozac (Fluoxetine

Paxil (Paroxetine)

Celexa (Citalopram)

Zoloft (Sertraline)

Effexor (Venlafaxine)

Luvox (Fluvoxamine)

Desyrel (Trazadone)

Antipsychotics

Clozaril (Clozapine)

Thorazine (Chlorpromazine)

Haldol (Haloperidol)

Seroquel (Quetiapine)

Geodon (Ziprasidone)

Elavil (Amitriptyline)

Abilify (Aripiprazole)

Risperdal (Risperdone)

Zyprexa (Olanzapine)

Anticonvulsants

Neurontin (Gabapentin)

Klonopin (Clonazepam)

Tegretol (Carbamazepine)

Keppra (Levetiracetam)

Depakote (Valproic Acid)

Beta Blocker

Ternormin (Atenolol)

Metoprolol (Lopressor)

Anti-anxiolytics/Sedative

BuSpar (Buspirone)

Ativan (Lorazepam)

Valium (Diazepam)

Xanax (Alprazolam)

Librium (Chlordiazepoxide)

Other _________________________ (Please write in medication)

<u>If you have more than one prescribed medication, please answer for each separate medication in section 1, 2, and 3</u>

<u>Section 1:</u>

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_________________, How often do you full comply with the dosage guidelines on the label?
<u>Please circle your answer below:</u>

1	2	3	4
Never	Rarely	Most of the time	Always

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_________________, How often do you full comply with the dosage guidelines on the label?
Please circle your answer below:

1	2	3	4
Never	Rarely	Most of the time	Always

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_________________, How often do you full comply with the dosage guidelines on the label?
Please circle your answer below:

1	2	3	4
Never	Rarely	Most of the time	Always

<u>Section 2:</u>

Of the medications circled above, and is prescribed daily, (Please write in your medication)
________________, How often do you take half, or less than half of the recommended dosage of this medication?

1	2	3	4
Never	Rarely	Most of the time	Always

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How often do you take half, or less than half of the recommended dosage of this medication?

1	**2**	**3**	**4**
Never	Rarely	Most of the time	Always

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How often do you take half, or less than half of the recommended dosage of this medication?

1	**2**	**3**	**4**
Never	Rarely	Most of the time	Always

<u>Section 3:</u>

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How likely are you to stop taking this medication completely, without first consulting your prescribing doctor?

1	**2**	**3**	**4**
Never	Unlikely	Likely	Highly Likely

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How likely are you to stop taking this medication completely, without first consulting your prescribing doctor?

1	**2**	**3**	**4**
Never	Unlikely	Likely	Highly Likely

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How likely are you to stop taking this medication completely, without first consulting your prescribing doctor?

1	**2**	**3**	**4**
Never	Unlikely	Likely	Highly Likely

Section 4:

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How often do you take this medication on a daily basis?

1	**2**	**3**	**4**
Once	Twice	Three or more	As needed

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How often do you take this medication on a daily basis?

1	**2**	**3**	**4**
Once	Twice	Three or more	As needed

Of the medications circled above, and is prescribed daily, (Please write in your medication)
_____, How often do you take this medication on a daily basis?

1	**2**	**3**	**4**
Once	Twice	Three or more	As needed

Section 5:

Please circle your answer below:

The majority of the time I take the above medication by myself, without assistance or prompting.

The majority of the time a friend or family member encourages, assists, or reminds me to take the above medication in some way.

Section 6:

If you answered less than 4 for any of the above questions, what are sometimes barriers (factors that get in the way) for taking your medication on-time and/or consistently? (Circle all that apply)

Financial issues/Limitations Forgetting Religious Reasons

Side Effects (e.g. impact on appetite, nausea, drowsiness)

History of Addiction Find it to be an inconvenience

Instructions too complicated Unsure if medications are working

Other_____

Section 7:

Of the above circled, Please rank the top three barriers of medication compliance beginning with the most significant barrier as #1.
(Please write in answer):

#1 _____

#2 _____

#3 _____

Section 8:

Ordinarily, how many times each month have you used each of the following drugs in the past year? (NOTE: If you have only used a drug a few times over this past year, answer "0 times")

Circle your response:

Alcohol	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Amphetamines/ Stimulants/ "uppers"	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Cocaine/Crack	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Prescription diet pills	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Heroin/morphine /opiates	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Methadone	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Prescription pain killer pills	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Barbiturates	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Quaaludes	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Tranquilizer Pills	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
LSD/Hallucinogens	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Ecstasy	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
PCP	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Marijuana	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Glue	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Gasoline or other fumes	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Smoking Tobacco	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Chewing Tobacco	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Anabolic Steroids	**0 times**	**1-2 times**	**3-9 times**	**10-20 times**	**More than 20 times**
Which drug causes you the most problems					
Which drug do you prefer the most					

Appendix B

Informed Consent

Please read this consent document carefully before you decide to participate in this study. The researcher will answer any questions before you sign this form.

Study Titles:
Medication Non-Compliance: Compliance to Psychotropic Medications within Community Mental Health.
The Impact of Illicit Drug Use on Prescribed Psychotropic Medication Adherence.
Purpose of the Study: The purpose of the current study is to identify factors that prevent individuals from fully taking their medications as prescribed. One of the factors that will be investigated further, is the effect of different levels of drug use on the medication taking behavior of individuals who are prescribed psychotropic medications. Participants are chosen on a voluntary basis, and this study is offered to anyone attending outpatient therapy.

Procedures: Participants will be asked to sign this form, as well as complete the short, attached, survey. The survey will ask for some general demographic information as well information about current medications, how often the individual takes half or less than half of the recommended dosage of the medication, and some potential reasons that may prevent the individual from fully taking the medication as prescribed. Additionally, individuals will be asked about their drug use. If drug use if identified, individuals are asked how many times each month have they used, within the past year.

Potential Risks of Participating: Risks to participants are no more than what is experienced in everyday life.

Potential Benefits of Participating: Participation would allow the medication providers, as well as mental health professionals, to identify factors that prevent individuals from taking their medication fully as prescribed. This will help to develop programs to make medication adherence easier for the participants, resulting effective treatment and improved outcomes for patients.

Confidentiality: All information will be kept completely confidential. After it is collected, the informed consent form will be kept separate from the survey form so there will be no way to match a name to the survey and ensure the information provided cannot be connected to the individual. Instead of using any identifying information on the survey, responses will be assigned a code number. The list connecting your name to this number will be kept in a locked file in the Florida Institute of Technology Psychology Department. Your name will not be used in any report. The only individuals who will have access to your responses are the principal investigators and their advisor. When the study is completed and the data has been analyzed, the data will be destroyed.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating. If you wish to not participate, this will not impact your ability to receive your prescribed medications. You may also refuse to answer any of the questions we ask you.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence.

Whom to contact if you have questions about the study:

Emily E. DePetro MS, Principle Investigator
150 West University Blvd.
Melbourne, FL 32901
Email: edepetro2016@my.fit.edu

Lauren N. Stroker MS, BCBA, Principle Investigator
150 West University Blvd.
Melbourne, FL 32901
Email: Lstroker2014@my.fit.edu

Whom to contact about your rights as a research participant in the study:

Dr. Lisa Steelman, IRB Chairperson
150 West University Blvd.
Melbourne, FL 32901
Email: lsteelma@fit.edu Phone: 321.674.8104

Agreement:

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.