COGNITIVE DISTORTIONS IDENTIFIED WITH TYPE AND FREQUENCY OF SELF-REPORTED SUBSTANCE ABUSE USAGE.

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

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ABSTRACT

The topic of criminogenic cognitive distortions among substance abusers has largely been ignored in the literature despite that studies indicate a high comorbidity between drug usage and involvement in the criminal justice system. This proposal involves the use of archival data from an inner city residential drug treatment program for offenders. Subjects are 129 men referred by the criminal justice system for drug treatment for a period of three to nine months. An investigation using a General Linear Multivariate Analysis (MANCOVA) of demographic data that includes a self-report of the frequency of substance usage, along with assessment of cognitive distortions from the How I Think Questionnaire (HIT) is utilized. Five drug classes (Ecstasy, Alcohol, Opiates, LSD/hallucinogens and Amphetamines) along with four categories of cognitive distortion on the HIT (Self-Centered, Blaming Others, Minimizing/Mislabeling and Assuming the Worst) were analyzed along with covariates of age of subject and number of drugs used. Results indicate that only the drug Ecstasy (3,4-Methylenedioxymethamphetamine) exhibited significant main effect for patterns of cognitive distortions and present on three of the four scales of the HIT. Implications for cognitive distortions as reinforcement of MDMA usage are discussed. A review of critical items found on the HIT, normative comparisons, and cluster analysis of drug usage patterns are presented. For the total model, drug usage increases are associated with increases in measured criminogenic cognitive distortions.
DEDICATION

To God

“A true measure of a man is not how far he has gone
But how high the hills he had to climb.”

M. Forbes
ACKNOWLEDGMENTS

This dissertation is really a concerto; an “audience” listens to the finished work without realizing that even before a note is played, countless years have been spent fine-tuning and shaping the symphony by individual members. In producing this piece of work, I am keenly aware of those around me who have contributed, and by their support, are co-owners of this finished product.

I feel proud and also privileged to be graduating from one of the top programs in the country. I am very fortunate to have two advisors, Dr. Michael Klein and Dr. Bruce Growick, who have gone above and beyond in their assistance to me over the years. I am also grateful to Dr. Bruce Walsh who has been supportive in serving on my committee as well that of several fellow students. He has been a friend to our department for years.

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# TABLE OF CONTENTS

Abstract ................................................................................................................................................................. ii

Dedication ............................................................................................................................................................... iii

Acknowledgments ................................................................................................................................................ iv

Vita ....................................................................................................................................................................... v

Table of Contents ................................................................................................................................................ vi

List of Tables ........................................................................................................................................................ x

List of Figures ........................................................................................................................................................ xi

CHAPTER 1  INTRODUCTION ................................................................................................................................. 1

Significance of the Problem ....................................................................................................................................... 3

Purpose of study ....................................................................................................................................................... 4

Need for the Study ................................................................................................................................................... 5

Research Questions and Variables .......................................................................................................................... 6

Hypothesis ................................................................................................................................................................. 6

Basic Assumptions ................................................................................................................................................ 7

Limitations ............................................................................................................................................................... 7

Definition of Terms ............................................................................................................................................... 9

Summary ................................................................................................................................................................. 10

CHAPTER 2  REVIEW OF THE LITERATURE ........................................................................................................... 11

Introduction ............................................................................................................................................................ 11

Cognitive Distortion ............................................................................................................................................... 12

Internalizing Cognitive Distortions ....................................................................................................................... 13

Externalizing Cognitive Distortions ..................................................................................................................... 13

Self-Reports ............................................................................................................................................................ 14

Self-Reports Measuring Frequency ..................................................................................................................... 14

Populations ............................................................................................................................................................. 16

Self Report in Criminal Justice ............................................................................................................................ 16

Self Report and Adults in Treatment .................................................................................................................. 18

Reliability and Validity of Self-Reports ................................................................................................................ 18

Reliability and Urinalysis ..................................................................................................................................... 18

Reliability and Hair analysis ................................................................................................................................. 20

Validity and Collateral Informants ..................................................................................................................... 21
## CHAPTER 3 METHODS

### Subjects

- The Program
- The Agency
- Sampling Frame
- The Database

### Data Collection

- Data Collection
- Missing Data
- Confidentiality
- Instruments

### Drug Classes

- How I Think Questionnaire
- Reliability
- Content and Face Validity of the HIT
- Construct Validity
- Data Analysis
- Question 1

### General Linear Model Multivariate Analysis (MANOVA/MANCOVA)

### Significance Tests
LIST OF TABLES

Table
3.1 Matrix Structure of the HIT Questionnaire (Gibbs et al., 2001). ....................... 52
4.1 Age Range of Subjects. .......................................................................................... 65
4.2 Mean Age of Subjects. ........................................................................................... 66
4.3 Test of Homogeneity of Variances for Age Categories on HIT Scales. .......... 67
4.4 ANOVA of Age Categories on HIT Scales........................................................... 68
4.5 Number of Subject Endorsing Use of a Drug Class and Age of First Use........... 69
4.6 Pearson R Correlations of Drug Classes on Use vs. No Use. ............................. 71
4.7 Spearman Rank Correlations on Drug Class Rankings........................................ 72
4.8 Agglomeration Schedule .................................................................................... 72
4.9 How I Think Norms Compared to Adult Substance Abusers ......................... 75
4.10 How-I-Think Scales Descriptive of Curves. ..................................................... 79
4.11 Between Factors Subject for Independent Variables. ...................................... 84
4.12 Assumption of Homoscedasticity Box M. ........................................................... 85
4.13 Assumptions: Levene’s Test of Equality of Error Variances............................ 85
4.14 Multivariate Test of Drug Classes....................................................................... 88
4.15 Tests Between-Subjects Effects ......................................................................... 90
4.16 Bonferroni Post Hoc Analysis............................................................................ 93
LIST OF FIGURES

Figure

4.1 Number of Drug Classifications with Normal Curve .............................................. 70
4.2 Hierarchical Cluster Analysis of Drug Class Usage. ............................................. 73
4.3 Self-Centered With Normal Curve ......................................................................... 79
4.4 Blaming Others with Normal Curve. ..................................................................... 80
4.5 Minimizing/Mislabeling with Normal Curve ....................................................... 81
4.6 Assuming the Worst with Normal Curve .............................................................. 82
4.7 Estimated Marginal Means For Self-Centered ...................................................... 94
4.8 Estimated Marginal Means For Blaming Others ................................................. 95
4.9 Estimated Marginal Means For Minimizing/Mislabeling .................................... 96
4.10 Estimated Marginal Means For Assuming The Worst ........................................ 96
CHAPTER 1

INTRODUCTION

The goal of this dissertation is to provide insight into the type and nature of cognitive distortions among criminal justice substance abusers in an effort to enhance rehabilitation efficacy. In the United States alone, 3.5 million individuals were admitted to treatment for substance abuse problem during 2002 (Substance Abuse and Mental Health Services Administration, 2004). This is in addition to those who were currently involved in treatment or in some type of aftercare. The most common substances abused that lead to treatment admission were alcohol, followed by opiates, cocaine, marijuana, and stimulants respectively. Since the early 80’s, legislatures have advanced a “war on drugs” that has involved increased criminal prosecution for drug possession, greater interdiction measures for smugglers, and increases in revenue available for treatment providers.

A study reported by The Lewin Group for the National Institute on Drug Abuse (NIDA) and the National Institute on Alcohol Abuse and Alcoholism (NIAAA) estimated that the economic costs in 1992 of both drug and alcohol usage cost 245.7 billion for that year (National Institute on Drug Abuse, 1999). These costs were attributed to four primary factors; 1) the epidemic of heavy cocaine use, 2) The HIV epidemic, 3) an eightfold increase in state and federal incarcerations, and 4) a threefold increase in crimes related to drugs.
Substance abuse is considered our nation's largest social ill. Of the estimated 9.4 million addicted and dependent individuals, almost 80% go untreated (Epstein & Gfroerer, 1998). Some of the barriers to substance abuse rehabilitation include the stigma of drug abuse, as well as political and financial barriers. Currently there is wide variation in the prevalence of illicit drug use by age and gender. The age group of 18-25 is the highest and the group 35 and older is the lowest (Anthony, Warner, & Kessler, 1994). Males are also twice as likely as females to have used illicit drugs and surprisingly, African-Americans under the age of 25 report rates equal or lower than other ethnic groups. For adolescents, the trend of drug abuse appears to be decreasing slightly. For those under the age of 18, the triad of alcohol, marijuana, and cocaine are the most common substances abused by those admitted to treatment and youth age 13-15 diagnosed with alcoholism are more likely dependent on drugs by age 15-16 (Kandel et al., 1997). Research on substance abuse in the elderly is often overlooked in the literature. Considering that the baby-boom generation is advancing, substance abuse in the elderly brings with it a set of unique complications when one considers health issues, family dynamics, assessment and resource availability. Menninger (2002) indicates that up to 16% of the elderly have alcohol disorders and that within the next 30 years the population will double making it the fastest growing group of substance abusers. For many of these individuals the alcohol problem accelerates and become more significant as they age (Menninger, 2002).

It is also known that those with physical disabilities report higher usage of illicit drugs when compared to peers. Among adults age (18-24) with physical disabilities, they are more likely to use heroin and crack cocaine. Among adults 35 years and older,
persons with physical disabilities are more likely to report abusing sedatives and tranquilizers not medically prescribed (Gibson et al., 1996). These results are consistent with the higher abuse rates among those with physical disabilities previously found by (Adlaf, Smart & Wash, 1992).

Substance abuse treatment does provide a dose-effect at reducing the ills of illegal drug use. The Drug Abuse Treatment Outcome Study (DATOS) tracked more than 10,000 patients in 100 drug programs in 11 cities over the course of 3 years. Results found that drug treatment was effective at reducing drug use and crime. In a 1-year follow up, clients reported 50% less weekly or daily use of cocaine compared to preadmission year and 50% reduction in illegal activity (Craddock, Hubbard, Flynn, Anderson & Etheridge, 1997). According to several estimates drug treatment is cost effective. For every $1 invested in addiction treatment programs yields a return between $4 and $7 in reduced drug related crime, criminal justice costs, and thefts alone (NIDA, 2000).

Significance of the Problem

Despite the advances in treatment, substance abusers are making up an increasing number of the individuals involved in the criminal justice system. The involvement of both chronic drug usage and a life involving criminal activity is common. Substance usage increases the likelihood that an individual will engage in criminal activity resulting from a need in securing money to support a drug habit by illegal means, and because substance usage exacerbates the impulsivity common in offender populations. More than 80 percent of child abuse neglect cases and 70 percent of theft and property crimes
involve drug abuse (National Institute of Justice, 1999). Two thirds of patients in long-term residential, one half in outpatient drug treatment, and one quarter in methadone maintenance are actively involved in the criminal justice system (Craddock et al., 1997). Within the correctional system, that includes jail, prison, probationers and parolees, an estimated 80 percent are active substance abusers (Belenko & Peugh, 2005). Incarceration alone rarely does much to break the crime-drug abuse cycle and offenders sentenced for incarceration for drug related offenses have a high rate of recidivism (Drug Court Clearinghouse and Technical Assistance Project, 1997). In some studies, 85 percent of substance abusing offenders returned to drug use within 1-year of release from prison, and 95 percent returned to drug use within 3 years (Martin, 1999).

**Purpose of study**

The purpose of this study is to identify if criminogenic\(^1\) cognitive distortions are present in substance abusing adults involved in the criminal justice system and if these cognitive distortions vary by type and amount of substance abused. While this study does not address the issue of cause and effect, by utilizing a database that includes information on self-reporting of drug usage and measures of cognitive distortion as assessed by the How I Think Questionnaire, a determination can be made if certain types of cognitive distortions are associated with specific substances. Further analysis will determine if variables such as years of usage and frequency of usage have an impact. Additionally, the

\(^1\) “Criminogenic” earliest use in the literature: Kinberg (1930) indicated that imprisoned Russian counter-revolutionists were incarcerated because of multiple determinants, i.e., mental illness, and not because a single criminogenic factor. Von Hentig (1931), a German psychoanalyst used the term to advocate sterilization of “mental deficient” and “criminals.”
study may explore if certain criminal beliefs (behavioral referents) are unique to certain substances of abuse.

The subjects were male offenders referred for intensive substance abuse treatment by the criminal justice system and placed in a residential treatment facility. Data was collected on residents during admission and entered into a database for future analysis.

Need for the Study

The need for this study and potential ramification of the findings will benefit both the research and treatment community. While this study is specifically focused on the offender population, the findings have implications for other environments that treat substance abusers. There has been no research on identifying the criminogenic cognitive distortions among substance abusers despite the extremely high comorbidity of antisocial behavior and drug abuse. As a population, they are also known to be highly stigmatized group. It is hypothesized that this group is likely to possess unique cognitive distortions that perpetuate the crime-drug abuse cycle. Effective treatment may involve addressing maladaptive beliefs embodied in both relapse and criminogenic cognitions. Currently, the treatment community does not address unique variations in cognitive distortions among substance abusers. Once admitted to a program that addresses cognitions in a treatment approach, all addictive substances are considered the same. The need for this study can be summarized as follows:

1. The issue of criminogenic cognitive distortions has not been researched among substance abusers.
2. Recidivism is high among offending substance abusers and research that identifies unique treatment concerns is an ongoing need.

3. Relapse is extremely high with success often determined by the number of times through treatment. Cognitive distortions related to criminogenic behavior could be a contributing factor for rehabilitation failure.

Research Questions and Variables

The research question in this study to be answered is:

**Question 1:** Which of the five ranked drugs classes identified in the CompDrug database predict cognitive distortions as measured on the How I Think Questionnaire?

Thirteen categories of substances identified are indicated on a demographic self-report instrument as follows; marijuana, heroin, alcohol, LSD/hallucinogens, crack cocaine, powder cocaine, opiates/pain pills, PCP, Amphetamines, Valium, Inhalants, Ketamine, and Ecstasy. Each subject was given the same categories for each question. The scaling asks them to rank in numerical order from highest (1) to lowest (possible 13) with respect to frequency of usage. Five of the self-reported substances, Ecstasy, Alcohol, Opiates, LSD/Hallucinogens, and Amphetamines will be used as independent variables. The dependent variables (cognitive distortions) are Self-Centered, Blaming Others, Assuming the Worst, Minimizing/Mislabeling.

Hypothesis

The hypotheses to be examined in this project are to be examined as follows:
**H0:** There is no difference between the five categories of self-reported frequency of drug usage on the measure of cognitive distortion controlling for age and the number of drugs used.

**H1:** There are significant differences between the five categories of self-reported frequency of drug usage on the measure of cognitive distortion controlling for Age and the number of drugs used.

**Basic Assumptions**

First, it should be noted that this study makes no assumptions regarding cause and effect relationships, but rather the focus is to explore and describe the results of an Ex Post Facto assessment. Research on both substance abusers and criminal offenders ordinarily present with unique concerns regarding honesty and attitude of subjects concerns. This study also assumes that the database is a reliable and valid measure.

Additionally, this study utilizes a self-report measure of ranked drug frequency. In essence, it measures the subject’s perception of the drugs they have used the most, in ranked order. There can be no inferences on the actual physical quantity of the drugs used. This limitation is also present when self-reports attempt to actually quantify drug consumption for reasons further addressed in Chapter 2.

**Limitations**

This study presents with several limitations that need to be considered. The data from this study didn’t utilize any type of control groups; as such there may be rival explanations that are plausible.
In addition, this study presents with multiple instrumentation concerns. The self-report on frequency of substance usage is an instrument used as part of demographic data collection. While several variations of the same design have been successfully used in the literature, self-report instruments, especially among substance abusers, presents with some unique reliability concerns. In addition, the database does not include the original reliability, panel and field study data from the demographic self-report instrument.

The second instrument concern is with regard to the use of the How I Think Questionnaire that was primarily designed for use with adolescent offenders. The reliability and validity of this instrument is well established in the literature, however it is the first time being used with adult substance abusers. It has only recently been used with adults, and the authors have future interest in establishing norms for substance abusers. As such, the normative cut-offs of the HIT established for adolescents for when a cognitive distortion is clinical versus sub-clinical will not being used in this study.

It is also important to note that cognitive distortions, synonymous with maladaptive beliefs, don’t lead to a particular behavioral outcome per se. In the case of substance abuse and deviant behavior, numerous other variables, such as heredity, and environment, interact in the diathesis-stress model along with cognitive distortions in the expression of psychopathology.

Subjects were required to rank substances according to the frequency of use with those substances abused the most being rank highest. Subjects may have ranked certain drugs classes highest that they may have discontinued years ago; temporal consideration is void in the frequency ranking. A high ranking of a particular substance doesn’t
necessarily indicate that it is a substance of concern in treatment (ecological validity) or that a substance that has the most deleterious effect on cognitive processes.

The forced choice of ranking by drug class presents with several limitations. It is possible that an alternative scaling of the instrument, e.g., Likert scaling, weighted composites scores, would yield different findings. In addition, recently used drugs that are quite problematic may be ranked lowest for individuals with years of polysubstance abuse.

Definition of Terms

**Age**- Age denotes the individual’s chronological age at the time of completing the assessment.

**Age of first use**- Denotes the age that the individual first used the given substance of abuse. For each substance ranked the individual must also indicate the age of first use adjacent.

**Behavioral Referents**- As utilized on the How I Think Questionnaire, behavioral referents are beliefs that an individual has with regard to employing a particular behavioral strategy such as stealing, lying, physical aggression and oppositional-defiance.

**Cognitive Distortion**- An inaccurate or biased way of attending to or conferring meaning upon experiences (Barriga, Gibbs, Potter & Liau, 2001). Cognitive distortions contribute to problematic emotional and behavioral experiences that develop and maintain psychopathology.

**Frequency of Drug Use**- This concept measures the subject’s perception of the drugs they have used the most, in ranked order. It is a self-reported item within the database.

**Years of Drug Usage**- This denotes the span of years that an individual may have
Summary

This chapter began with a brief review of the significance of substance abuse today in the United States and the implications of this study. Rehabilitation failure is high in the substance abuse field with repeat admission to treatment the norm. Cognitive distortions have been studied in the substance abusing populations, however not with respect to distortions that are criminogenic in nature. This is despite that there is a high comorbidity of antisocial behavior and substance abuse. Effective rehabilitation should involve identifying cognitions that contribute to relapse and drug use, as well as the cognitions that contribute to the antisocial behavior associated with it.

This study proposes accessing a database that used a self-report demographic assessment of drug usage by ranked classification and the How I Think Questionnaire (HIT). The use of self-report demographic information presents with unique concerns; this is especially so in the substance abuse rehabilitation field. Therefore it is necessary to include a comprehensive literature review that presents many of the concerns surrounding the use of self-reports and reliability issues in the substance abuse field.
CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

While exploring the theme of criminogenic cognitive distortions among substance abusers is relatively novel, the use of self-report as a means of assessing severity of substance usage is well researched. The most notable finding in the research of self-reporting in substance abuse is that the results vary considerable depending on the population, type of substance abused, physical setting, the scaling of the instrument, and a host of other variables. Consistency is further clouded in the literature when researchers frequently corroborate false positives, i.e., negative self-report with a negative drug screen, which appear to superficially inflate validity and reliability. For the reasons above, an extensive review on self-reporting is presented.

This section begins with the topic of cognitive distortions, followed by a review of the variables that have a significant impact on the efficacy or self-reports. The ending of the chapter provides an overview of substance abuse settings where self-reports are often employed and a review of substances of abuse from a neurophysiological perspective.
Cognitive Distortion

Cognitive distortions have been proposed as major factors in predicting and treating antisocial behavior. The presence and type of cognitive distortions associated with a given disorder are often a central focus of treatment providers. Cognitive distortions (CD) are measured and assessed as a means of determining severity of pathology as well as identifying the amount of change resulting from an intervention. Both Beck (1976) and Ellis (1962) are the most common researchers associated by treatment providers as advancing the treatment of cognitive distortions. Their treatment models have increasingly been applied to ever growing body of populations including cocaine addicts (Beck, Wright & Newman, 1992) and general substance abusers including alcoholics (Ellis, McInerney, DiGiuseppe, & Yeager, 1988). Such approaches have focused on identify cognitions related to relapse, cravings, utilizing recovery services, depression, anxiety, panic, and withdrawal within the cognitive behavioral model of treatment. Other disorders have also been researched to identify unique cognitive distortion-behavior paradigms such as gambling (Ferguson, 2003), sexual predation (Mair, 1996), pedophilia (Haywood, Grossman, Kravitz, & Wasyliw, 1994) and chronic pain (Smith, O’Keeffe, & Christensen, 1994). While most research on cognition has focused on clinical application, relatively less attention has been spent on cognitive distortion.

In social information processing theory, cognitive distortions are characterized mainly as biases in the processing that mediates between incoming informational stimuli and behavioral responses. The bias may pertain to both general schemata and particular knowledge structures that comprise the ongoing processing of information, that is,
encoding, mental representation, goal clarification, accessing and generating potential responses, selecting a response, and evaluating responses (Crick & Dodge, 1994). Cognitive distortions are inaccurate ways of processing to or conferring meaning of an experience and have been studied numerous theoretical vantage points in relation to both externalizing and internalizing symptomology. One’s beliefs, expectancies, attributions and other cognitive activities are central to producing, predicting, and understanding psychopathological behavior. Cognitive distortions have been identified as a central role in perpetuating deviant behavior, yet research on cognitive distortions of offending substance abusers have not received the attention that other disorders have.

Internalizing Cognitive Distortions

Internalized cognitive distortions are considered to be self-debasing in nature. Self-debasing cognitive distortions have been studied as faulty or irrational beliefs in Ellis’s (1977) rational-emotive therapy, and as habitually, erroneous, negative and depressogenic automatic thoughts in Beck’s cognitive therapy (Beck, 1976).

Internalized cognitive distortions are associated with the symptoms of anxiety, depression, panic, post-traumatic stress disorder, and low self-esteem and lend themselves to a variety of cognitive-behavioral treatment protocols.

Externalizing Cognitive Distortions

According to Gibbs et al. (1996) cognitive distortion may facilitate antisocial behavior by suppressing empathic responsiveness. As such, the presence of these distortions has been found to correlate inversely with both empathy (Cohen and Strayer, 1996) and moral judgment maturity (Barriaga, 1996).
CD’s of externalizing individuals have been described mainly as biased processing tendencies gratuitously attributing hostile intentions to others, in social information processing or cognitive behavioral strategies (Dodge, 1993).

Samenow (1976) identified errors of thinking that they regarded as criminogenic in the interview of male offenders. Evidence for a functional link between such cognitive biases or errors and their behavioral and emotional expression have been found in experimental contexts (Bandura, 1990).

Externalizing individual’s cognitive distortion may be criminogenic insofar as they help protect the self from blame or from a negative self-concept and thereby disinhibit aggression or other antisocial behavior. The self-serving role is reflected in conceptions of cognitive distortions as mechanisms of moral disengagement in cognitive social learning theory (Bandura, 1991), as ego-defense mechanisms in psychodynamic theory (Redi & Wineman, 1957), and as rationalizing attitudes and beliefs in sociological neutralization theory. Individuals who engage in the frequent use of cognitive distortions are likely to exhibit a variety of forms of psychopathology. Barriga, Landau, Stinson, Liau, and Gibbs (2000) have conceptualized cognitive distortions that are resulting external behavioral manifestations as self-serving, and these associated with internalizing behaviors as self-debasing.

Self-Reports

Self-Reports Measuring Frequency

Methods of self-reports on substance usage often focus on quantity-frequency (QF) or the day-by-day measure. The QF typically asks how frequently and how much
substances they have used in a given time period and ask patients to summarize their usage over a period of time. The day-to-day measure employs a retrospective interview chronologically starting from the present day. It is also similar to the Time-line Follow-Back (TLFB) and has been shown to be reliable up to six months (Sacks, Drake, Williams, Banks, & Herrell, 2003).

A review of the literature identifies significant variables that indicate exceptions to this rule and point to the need for additional clarity in self-report research among substance abusers. Within the field of substance abuse self-reports, the demand characteristics as represented in the scaling of the instrument vary considerably. Self-reports include the use of telephone interviews, computer assisted self-interviews, verbal interviews, and paper/pencil questionnaires that may be formatted into categorical classifications, weighted, or composite indices. The format of the questions often rely on frequency within a given time period, e.g., past 30 days, past week; and also about quantity and type of usage within those time periods. Studies have utilized binary measures for drug consumption for drug classes (Hasin et al., 1997), categories of use vs. non-use (Pompi & Shriner, 1979), and ordinal measures of frequency measures (Anglin et al., 1993). While there is appeal in measuring actual consumption, frequency measures do not appear reliable on this scaling. Martin, Pearlman and Li (1999) found that numbers of days of drug use and daily frequencies of use were not highly correlated and deteriorated after time. The most significant reduction in reliability occurred after 90 days. In addition, both self-reports and biological assays are unreliable when it comes to quantity of usage (McLellan et al., 1992). Morral, McCaffrey, and Iguchi (2000) found that drug underreporting on frequency scaling was substantial and suggested that it posses
a threat to the validity of some treatment outcome evaluations and needs assessments. Alcohol beverages vary by alcohol content, and absorption can be dependent on health condition and physiological makeup of the abuser. Street drugs such as heroin, marijuana, and cocaine, are frequently “stepped-on” by adding impurities so as to increase physical volume and profitability at the expense of purity. The dilemma in quantification is further obscured in that substance abusers are known to have difficulty in learning and memory (Dalton & Klein, 2005) and as such accuracy in recall is likely to be subject to the degree of memory impairment.

Self-reports based upon whether the substance was used during a lifetime tend to be more valid. The more specificity of the information sought influences reliability. Higher rates of distortion are reported on items that request exact information, e.g., age of first drug use as opposed to easier questions, “Have you used marijuana?” (Ball, 1967).

Populations

Self Report in Criminal Justice

There is a high co-morbidity between substance abuse usage and anti-social personality disorder and as such many receive treatment in prisons, halfway houses, and Community Based Correctional Facilities (CBCF). According to the White House’s Office of National Drug Control Policy (Office of National Drug Control Policy, 2000), overall crime has decreased, while the rate for drug law violations continued to climb to record levels. In 1998 1.6 million Americans were arrested for drug crimes accounting for 60% of all prisoners sentenced to the federal prison system (Mumola, 1998). Increased incarceration for drug abuse has been seen in males (Bureau of Justice

16
Statistics, 1997), females (Mumola, 2000) and juvenile offenders (Stahl, 1998), placing an increased burden of social systems for providing treatment.

Self-report is a common assessment method in criminal justice substances abusers indicating mixed reliability and validity with a tendency toward underreporting. Yacoubian (2001) has suggested that self-report is effective in juvenile offenders and accurate enough that the need for urinalysis should be reconsidered. In contrast, in a meta-analytic review of 24 studies, Magura and Kang (1996) found that with criminal justice substance abusers and self-report the median kappa was .42 and considerably below the .80 that is considered reliable reporting. Even after reassurances of arrestees, researchers have repeatedly found that two to four times as many recent drug arrestees are detected by urinalysis than arrestee self-report data (Rosenfield & Decker, 1993).

The Drug Use Forecasting (DUF) Program, renamed to the Arrestee Drug Abuse Monitoring (ADAM) Program was launched in 1987 by the National Institute of Justice (NIJ) as a means of monitoring drug trends in the criminal population. Data has been collected in 35 cities nationwide. Arrestees voluntarily are interviewed and subsequently provided a urine specimen for comparison. Results indicated underreporting as the norm and varying according to sites with a high of 65% to a low of 25% (Mieczkowski, 1990). In contrast, Ball (1967) compared data from hospital records to Federal Bureau of Investigation (FBI) records on a group of narcotic addicts looking at substance abuse usage, demographic data, and criminal activity. Across all the domains subjects provided “a rather surprising veracity of on the part of former addicts.”

The findings are that adults in the criminal justice system generally underreport the amount and types of substances abused (Gray & Wish, 1999; Wish, Cuadrado, &
Martorana, 1986) and that those considered the worst offenders are least reliable (Simon, 1999; Stephens, Braithwaite, & Tiggs, 2004).

Self Report and Adults in Treatment

Adults in treatment make up majority of self-report research with regard to substance abuse. There is a large overlap demographically between those in external based treatment, e.g., community programs and hospitals and those incarcerated and forced into treatment. Despite this commonality, self-report reviews in the general treatment population are more favorable (Darke, 1998). Secades-Villa and Fernandez-Hermida (2003) investigated 207 subjects that had participated in a drug-free treatment program utilizing information from family members and official records to corroborate self-reports. Results indicated a 91.3% and 90.35 % agreement for illegal drugs and alcohol respectively. O’Farrell, Fals-Stewart, and Murphy (2003) found that utilizing the Time-Line Follow-Back (TLFB) measure compared to collateral reports indicated a 99% agreement for all drugs for both men and women. Part of this is related to the effect of contingencies based upon the reports. When no contingencies are indicated, self-report data is fairly accurate (Bale, VonStone, Engelsong, Zarcone, & Kuldane, 1981; Schumacher et al., 1995). Women tend to also provide more accurate data than men and those who are older are less likely to underreport (Nelson et al., 1998).

Reliability and Validity of Self-Reports

Reliability and Urinalysis

Comparing results of self-reports with urinalysis panels is the most common reliability study done with self-reports. A drawback is that urinalysis can only detect drug
usage within a window of a few days. In addition, studies that conduct urinalysis during
the assessment period are likely to have more accurate self-reports. A confounding
variable unacknowledged in self-report/urinalysis studies is that the threat of random
urinalysis may contribute to subjects being more cognizant of when violations occur that
would result in an increased salience in recall.

Other biological assays less commonly employed but available are saliva samples
that have a detection time of 12-24 hours and sweat samples that have detection period of
1-4 weeks (Cone, 1997). Both of these methods present with unique limitations that make
reliability more difficult.

A drug must be in the body to be detected. The actual duration can vary
significantly depending biological half-life, dosage, and individual differences in health
and metabolism (Cone & Dickerson, 1992). In addition, an abuser may use multiples
times or just once within the window of assessment, hence self-reports are often relied
upon to indicate severity. Despite this limitation, it is a common approach to establishing
the reliability of the questionnaire. Current levels of cutoffs are as followed as
recommended by the Department of Health and Human Services and detection periods
(Cone, 1997).

1. Amphetamines 1000 nanograms/milliliter (ng/mL). (2-4 days).
2. Barbituates 200 (ng/mL) (2-4 days; up to 30 days for long acting)
3. Benzodiazapines 200 (ng/mL) (up to 30 days)
4. Cocaine/cocaine metabolite 300 (ng/mL) (1-3 days)
5. Heroin 300 (ng/mL) (1-3 days)
6. Marijuana 50 ng/mL (1-3 days; up to 30 days for chronic use)
7. Methamphetamine 1000 (ng/mL) (2-4 days)

8. Opiates 300 ng/mL (2-7 days; up to 30 days for chronic use)

9. Phencyclidine 25 ng/mL (2-7 days; up to 30 days for chronic use)

Another concern about many studies validating self-report with urinalysis is that frequently studies report concurrent validity based upon the sum of both positive and negative screens. For example, a study of 100 subjects where only 10 subjects tested positive and a self-report indicated 9 subjects admitted would be calculated as a 99% agreement. While this approach is common in the literature, the bias that it presents is not often addressed.

In paradox, concerns about self-report validity and urinalysis also exist regarding the subjects’ ability. Williams and Nowatzki (2005) evaluated the validity of self-report in 367 substance abusing adolescents. In this study, clinicians gathered substance abuse history from subjects using a structured interview that had established reliability and validity (Adolescent Drug and Alcohol Diagnosis). Subjects were unaware that upon completion of the assessment that they would provide a specimen for urinalysis. Surprisingly, 34% of the subjects reported substance usage within the urinalysis detection window that had a negative urinalysis.

Reliability and Hair analysis

Hair analysis provides longer window of assessment with time periods reaching 100 days (Cone, 1997). It is less intrusive than other biomarkers and provides a longer period of assessment. While more expensive then urinalysis, a number of studies have utilized hair analysis to establish the concurrent validity of self-reports.
Siddiqi, and Lipton, (1992) obtained an 80% concordance between self-reported heroin use and hair analysis, and 76% for cocaine. Tassiopoulos et al., (2004) utilized hair analysis and self-reports among heroin users in a medical setting to discover underreporting in that 34% of the subjects were also using cocaine.

Validity and Collateral Informants

Several studies have compared self-report results with information from family members, probation officers and documented records. Secades-Villa & Fernandez-Hermida (2003) found that self-reports and comparison with information from family on drug and alcohol usages had a level of agreement of 91% and 90% respectively. It was also found that family members had more optimistic view of the addictive behavior than the subjects themselves.

Davies and Baker (1987) found that heroin users to a non-user interviewer than to a peer interviewer were more valid. Of concern with collateral reports is that the level of agreement between patient and collateral is largely affected by the degree of personal contact between the pair over the self-report interval suggesting that reliability is a function of what the abuser is willing to reveal (Cordingley, Wilkinson, & Martin, 1990; Maisto, Sobell, & Sobell, 1979). Data obtained from collaterals that is based upon personal observation is more valid than information provide by the patient and should exhibit some independence between them.

Concurrent Validity

Concurrent validity with self-reports involves test-retest conducted over a specified time. Martin et al. (1998) found that at 2 and 4-week retest for 13 drug classes found an agreement from 99% to 74%. Research in this study on frequency of usage was
much poorer. Others studies have found strong results; Shillington et al. (1995) found that a 10-year retest of subjects who reported baseline drug use at follow up indicated a 83% concordance on opiate use, and 86% on cocaine use. Amsel et al. (1976) found an overall estimated drug use at one-month retest at 93%. Adlekan (1996) in a 1-2 week retest found an r = 0.79 for all drug classes and no interviewer effect.

In contrast, a study by Percy, McAlister and Higgins (2005) of a one-year follow up on a lifetime drug assessment with adolescents found that recanting of substance usage so prevalent that they questioned the overall reliability of self-reports among substance users. In a review of 13 substances of abuse, at one year follow up, recanting by subjects ranged from 7% for past alcohol use to as high as 87% for hallucinogenic mushrooms.

When frequency measures are used with test retest combined with ongoing urinalysis the accuracy of self-report increases. Ehrman & Robbins, (1994) administered two interviews six weeks apart and found that during both interviews subjects reported similar levels of drug activity for cocaine usage and heroin.

Bias and Error in Self-Reports

Demand Characteristics of Self-Reports

Self-reports while common in the psychological sciences are fallible to several types errors. Wording, design, and context all influence the nature and type of responses received by subjects. A common concern in self-reports is whether the questioner’s intention matches the pragmatic meaning of the questions that is often influenced by the scaling presented. For example, Schwartz and Scheuring (1992) found that when asking about physical symptoms with psychosomatic patients, 62% reported frequencies of more
than twice a month when the scaling was ranged from “twice a month or less” to “several times a day.” When the scale ranged from “never” to “more than twice a month” only 39% reported frequencies of more than twice a month. Schwartz, Strack and Mai (1991) when looking at marital satisfaction as a contributor to overall life satisfaction found that it was a function of question order with correlations ranging from .18 to .67. Medical judgments regarding severity of a condition by physicians have been found to vary considerable as the frequency choice overlaps between a high frequency scaling and a low frequency scaling (Schwartz, Bless, Bohner, Harlacher & Kennebenz, 1991).

Researchers have also found that results may vary depending who is administering the self-report. Self-administered questionnaires provided a higher endorsement of substances abused than interviewer administered questionnaires (Turner, Lessler & Devore, 1992). However, in another study Adelekan et al. (1996) found know differences between reports administered by independent researchers and clinicians for drug use, injecting and criminal behavior.

McGarvey et al. (2002) found that the incarcerated were more likely to disclose lifetime drug and alcohol usage to university researchers than to corrections professional. When independent self-reports were administered weeks apart from each other a correlation of .57 was found between the two groups.

The level of perceived privacy also influences the willingness to report and self-disclose substance abuse details (Turner et al., 1992). In a review of self-report of substance abuse among military personnel the level of confidentiality had a significant impact on reporting. The Department of Defense (DOD) survey of Health Related Behaviors Among Military Personnel gathered substance abuse information on 11,000
Navy Personnel in basic training from 1996 to 1997. Results indicated that 26% admitted to drug use the year prior to joining the service when the survey was anonymous and administered by a civilian. When the information was confidential but asked for the subjects’ names, 21% of the personnel admitted to substance usage the year prior. When the exact same subjects who participated in the confidential survey were asked again on a medical survey that was part of their personnel records, 1% admitted to substance usage (Bray et al., 2003).

**Temporal Proximity**

Errors in self-report can be attributed to memory failure, attempts at concealment, or exaggeration that may be time dependent. The degree of accuracy does depend on the nature of the recalled events and temporal proximity to the reporting (Garrison, Schoenbach, Schluchter & Kaplan, 1987). Difficulty with recall events and patterns are likely to increase with time. The concealment or exaggeration of less acceptable behaviors is more likely the closer the time of the event is to the interview (O’Malley et al., 1983). O’Farrel and Maisto (1987) found that when alcohol abusers have a positive blood alcohol level at the time of assessment about 50% will under report their usage. In a study utilizing the TLFB interview utilizing a control group comparison, subjects were interviewed twice at 8-day intervals TFLB with subjects in a 28-day TFLB. Average subjects’ regression slope indicated a 0.011 drink per decay in reported consumption for each day going back in time. For the case subjects it was greater with a 0.018 drink decay per day (Vinson, Reidinger & Wilcosky, 2003). In contrast, Hersh, Mulgrew, Van Kirk, and Kranzler, (1999) found that accuracy in two groups of cocaine abusers actually
increased as the window of which the comparisons were drawn increased. Generally, subjects appear more willing to report past drug use but less willing to report current use (McNagy & Parker, 1992).

Errors in Dating

When dates of events are used to identify frequencies of events, the demand of the recall is likely involve complex cognitive processes. Calendar time rely on autobiographical memory and are reconstructed within the context of the events themselves. Bradburn (2000) identified eight likely sources of error with regard to dating of occurrences.

1. The better an event is remembered, the greater the likelihood of being able to date it. Events that are considered to be less well-known are likely to have their dates have happened longer ago.

2. Frequent time errors involve misplacing a date by some systematic calendar related factor. Errors will take the form of being off by a week, month, or year depending the demand characteristics.

3. Time and date errors are subject to rounding up or down.

4. There is a general tendency (telescoping) to remember events as having happened more recently then they actually have. The result is that there is an over reporting of the frequency of events within a given time period.

5. Events that are low frequency or personally atypical are more often exactly dated.

6. Gender differences exist with women better at remembering dates than men.
7. Events that are deemed pleasant are more often exactly dated than unpleasant events. Dates of atypical and pleasant events lend themselves to rehearsal.

8. Events that occur around boundaries of socially defined time periods tend to be remembered better, e.g., Christmas, Fourth of July, etc.

Social Desirability and Stigma

The veracity of a self-report is also a function of the social desirability that the subject has with the perceived reviewer. Subjects can exaggerate their drug use to impress the interviewer, justify treatment, or live up to a self-image. They can also conceal information out of fear of stigma and damage to self-perception (Aiken, 1986). Skinner (1984) has suggested that self-reports can have improved reliability when solicited in the context of a trusting relationship, assured of confidentiality and use of a structured approach. Such concerns are consistent with social desirability theory that suggests accuracy of information obtained is often a function of perceived acceptability of the subject (Edwards, 1957).

Contingencies and Self-Report

Contingencies placed on the subject during the self-report administration, or based upon the results of the report, exert an influence on the type and quality of data obtained. Sherman and Bigelow (1992) found that in two-phase study, distinct differences in self-report reliability between patients on a waiting list for methadone treatment and those already enrolled in the program. Patients on the waiting list completed self-report that were accompanied by urinalysis compared with those already in treatment. The study found those on the waiting list had nothing to lose, and answered
honestly, whereas those in the program received penalties for usage and was a factor in their significant underreporting. Maisto, Sobell, & Sobell, (1982) found that entering treatment had an effect on openness on self-reports. Multiple checks on self-reports, arrests, and hospitalizations over a 2-year period were conducted with initial assessment during intake. Accuracy of self-report at pre-admission was at $r = .80$ and subsequently dropped off after completion of treatment.

Other researchers have found that when there are no contingencies for reporting of drug use, self-report validity increases (Bale, Von Stone, Engelsing, Zarcone, Kulden, & Kuldan, 1981; Milby & Stainback, 1991).

The use of a “bogus pipeline” is a procedure to increase accurate responding that involves asking subjects to provide information that they are led to believe that objective, external validation in their responses is available to the data gatherer (Jones & Sigall, 1970). This procedure has been successfully used with pregnant woman who reported using alcohol usage (Lowe et al., 1986), and adolescents who were smoking (Luepker et al., 1981), when combined with biological assays.

Underreporting by Drug Type

Underreporting of drugs has been found to vary according the degree that the substance is stigmatized even within the same subject assessment (Harrell, 1997).

Heroin

Heroin is frequently a highly stigmatized substance. Harrell (1997) found self-report reliability of 68% when compared to urine screening among general adult population. Kokkevi, Ricardson, Palermou, and Leventakou, (1997) found on 90%
agreement on self-reports of heroin within a testing period of 50 days and a 100% on history of injecting. Dowling-Guyer (1994) found a test-retest of $r = .81$ for heroin using frequency measures at a 30 day interval and that internal consistency of heroin as dichotomous variable of “no-use,” “use,” provided a kappa of 1.00. In contrast, Parry (1980) identified that two-thirds of respondents identified as heroin users in clinics record denied using heroin during a self-report survey.

**Alcohol**

In 2002, over 800,000 individuals sought treatment for alcohol abuse and dependence (Substance Abuse and Mental Health Services Administration, 2004). Martin, Pearlman and Li (1999) found a 90% agreement between test-retest at four weeks for self-report of alcohol.

**Cocaine**

The number of individuals admitted to treatment for a cocaine related abuse and dependence continue to be on a rise with the latest figures indicating that 241,000 admitted to treatment in the US in 2002 (Substance Abuse and Mental Health Services Administration, 2004).

Cocaine users were found to admit to usage on self-report 84% (Harrell, 1997). Martin et al. (1999) found a test retest of 94% agreement of cocaine on self-report. Dowler-Guyer et al. (1994) found in a study of HIV risk behaviors that included a test-retest, found reliability coefficient for crack of $r = .84$ and cocaine $r = .80$ at a 30 day interval. Morral, McCaffrey and Iguchi (2000) found that underreporting of cocaine was also a function of usage. Subjects whose patterns are defined as “hardcore use,” more
than 10 days in the past 30, were most likely to underreport. In Tassiopoulos et al (2004) study of heroin users 34% of the subjects underreported their cocaine usage.

**Marijuana**

Marijuana is considered the least stigmatized drugs of abuse and this is reflected in the number of treatment admission. In 2002, 283,000 were admitted for treatment of marijuana use and abuse (Substance Abuse and Mental Health Services Administration, 2004). Harrell (1997) found that 96% of responders admitted to treatment for marijuana later admitted to usage on self-report. Martin et al. (1999) found a 99% agreement on test retest for marijuana users.

**Hallucinogen**

Hallucinogen usage is often a substance used in conjunction with other primary drugs such as alcohol or marijuana. In 2002, 2,795 were admitted for treatment of hallucinogen use and abuse (Substance Abuse and Mental Health Services Administration, 2004). Harrell, (1997) found a 70% agreement between hallucinogen users and urinalysis. Martin et al. (1999) found a 63% agreement on test retest for hallucinogen users

**Cognitive Processes and Self-Report**

A major source of data error in self-report is memory difficulties. Information sought upon past experiences relies upon the use of autobiographical memory that is dependent on distinct cognitive processes. Once a representation of an experience does enter memory it is dynamically subjected to the influence of new experiences that can
alter the quality of the inferences that self-reports can provide. Tourangeau (2000) identified four types of sources of forgetting related to memory with autobiographical data in self-reports.

Encoding

The quality of a memory trace that is laid down in neural networks is directly related to the reliability of the information being retrieved at a future time (Craik & Lockhart, 1972). As such encoding errors include cases where information is superficial encoded. The depth and elaboration of the encoding is reflected in the distinctiveness, emotional impact and duration of the events and contributes to the quality of encoding holding all other abilities constant (Tourangeau, 2000). Substance abusers’ particularly are likely to experience challenges to the encoding process as the drugs they abuse exert a terotogenic press on cognitive processing both acutely and over time (Burst, 1993). The potential error on the self-report would be that the abuser never really knew the correct answer to begin with.

Storage Difficulties

Once an initial encoding of an event it is stored on long-term memory where the level of detail is dependent on the degree of rehearsal. The process of recounting a memory not only serves as a rehearsal and a strengthener but also is subject to having details added to it. Details of events that are expressed may be elaborated or abbreviated and any errors introduced in the expression may become part of the memory itself (Neisser & Harsch, 1992). For many substance abusers, long-term memory processing is already impaired (Ammassari-Teule, 2001) and likely to contribute to further distortion of autobiographical data.
In addition, human memory is not judgment-free. Retrieval from memory is often shaped by the beliefs that an individual has regarding a particular topic. The most common belief system encountered in substance abuse treatment, “denial,” would directly alter the veracity of a memory with respect to self-report validity. It is also plausible that if an abuser actually believes that they are progressively working toward abstinence then the memories they have of usage frequency may be unconsciously skewed.

Retrieval Failure

The failure to retrieve information occurs when information has been stored in long-term memory but unable to be accessed for a variety of reasons. Retrieval is a function of how the information sought. Unaided and free recall is more likely to provide less information than recognition. As such, the press that a self-report exerts in terms of its demand characteristics will influence accuracy. In addition, retention is also affected by both proactive and retroactive interference where a there is a failure in retrieval of targeted material resulting from learning. As such, the design of the instrument may actually help or hinder memory retrieval and influence validity.

Reconstruction Errors

When individuals have incomplete retrieval there is a bias toward filling in or reconstructing the experience to make it complete. Over time subjects will shape the retrieved memory toward the typical pattern for events of its type (Tourangeau, 2000). Respondents are likely to utilize the least-taxing cognitive strategy when it comes to accessing memory-based material. Menon and Yorkston, (2000) have identified three factors that affect episodic recall versus an estimation strategy.
1. **The actual frequency of the event.** More than six episodes trigger the use of an estimation strategy.

2. **The reference time frame.** Longer time frames enhance the use of an estimation strategy.

3. **Question Wording.** “How many” vs. “how many times,” with the latter triggering an estimation strategy.

When an event is perceived to be a regular one, people have rates-of-occurrence already encoded in memory to use as an estimation strategy. When behaviors are infrequent, subjects are more likely to utilize an episodic recall strategy to determine a given frequency judgment (Menon & Yorkston, 2000). Given that many substance abusers may use on sporadic basis, in part because of economics, availability and prolonged usage, rates of occurrences likely will vary greatly among subjects.

**Self-Report Assessments Settings**

Self-report assessments are conducted in a variety of treatment and medical settings and are critical to the appropriate delivery of services. Types of treatment service vary considerably depending on the level of care required by the client and availability of resources to provide that care.

The Substance Abuse and Mental Health Services Administration (SAMHSA) collects information on the nation’s treatment of substance abuse summarizing results in the Treatment Episode Data Set (TEDS) (Substance Abuse and Mental Health Services Administration, 2004). The following define SAMHSA’s type of treatment considered in the development of TEDS where a self-report assessment of drug usage occurs.
1. Detoxification-24-hour service, hospital inpatient- 24-hour per day medical acute services in a hospital setting for detoxification provides assistance to those with severe medical complications associated with medical withdrawal. Medications are frequently used to assist in withdrawal and close monitoring by medical professionals.

2. Detoxification-24-hour service, free-standing residential- 24-hour per day services in a non-hospital setting providing for safe withdrawal and transition to ongoing treatment.

3. Rehabilitation/residential-Hospital (other than detoxification)-24-hour per day medical care in a hospital setting in conjunction with treatment services for alcohol and other drugs and dependency.

4. Rehabilitation/residential-Short-term (30 days or fewer)-Typically, 30 days or less of non-acute care in a setting with treatment services for alcohol and other drug abuse and dependency.

5. Ambulatory-intensive outpatient-As a minimum, the client must receive treatment lasting two or more hours per day for three or more days per week.

6. Ambulatory-Non-intensive outpatient-Ambulatory treatment services including individual, family, and/or group services; these may include pharmacological

7. Ambulatory-Detox-Outpatient treatment services providing for safe withdrawal in an ambulatory setting. (pharmacological or non-pharmacological)
In addition, substance abuse is assessed by self-reports in physician offices, correctional facilities, emergency departments, schools, private practitioners, and in research projects.

Drugs Classes and Mechanisms of Action

Marijuana

Marijuana is one of the commonly abused substances yet it wasn’t until recently that the neurobiological actions of this substance were understood with respect to endogenous cannabinoid receptors. Δ9-tetrahydrocannabinol (Δ9-THC) binds to both CB1 and CB2 receptors. CB1 is thought to activate G proteins that act on adenylyl cyclase (AC), Ca2+ and K+ channels (Childers & Breivogel, 1998). CB1 receptors are found throughout the CNS with the highest density in outflow nuclei of the basal ganglia to the substantia nigra and globus pallidus. CB2 receptors have been found primarily on the cells of the immune system, predominately B cells, and have been implicated in immunomodulation effect of cannabinoids (Kaminski et al., 1992). The research on the endogenous cannabinoid system including signaling pathways, indicates influence in the regulation of motor behavior, learning, memory and antinociception (Di Marzo, Melk, Bisongo & De Petrocellis, 1998).

Similar to other drugs, cannabinoids activate mesolimbic dopaminergic neurons, implicated in reward circuitry (Gardner, 1992). Recently the CB1 receptor has been implicated in the dependence and withdrawal of other drugs. Gonzalez et al. (2001) indicated that CB1 receptor mRNA binding was modified in animals chronically exposed to morphine, cocaine or ethanol with cocaine and morphine producing the most changes
density of CB1 receptors. De Vries, et al. (2001) found that use of a synthetic CB1 agonist provokes relapse to cocaine after prolonged withdrawal periods and that CB1 antagonists attenuate relapse induced by cocaine associated cues or cocaine itself, but not relapse induced by stress. Fernandez-Ruiz, Berrendro, Hernandez and Ramos’s (1999) review of endocannabinoids in brain development suggest that synthetic and plant based cannabinoids when administered to pregnant rats altered brain development in their pups and is evident at several different stages. Changes include increased D1 and D2 binding, reduced 5HT and increased opioid receptor binding. Animals perinatally exposed to Δ9-THC also exhibit increased opiate vulnerability, in particular males. The use of naloxone at the ending of cannabinoid exposure triggered mild somatic signs of withdrawal (Vela, et al, 1998). It has also been found that these animals exposed perinatally to Δ9-THC indicated a higher morphine preference in conditioned place preference test (Fernandez-Ruiz, et al., 1999).

Although marijuana is known to cause memory deficits in humans and laboratory animals the mechanism have not been completely understood. Chan, Hinds, Impey and Storm, (1998) suggest that Δ9-THC is toxic to hippocampal cells. Endocannabinoid receptors within the hippocampus have been found to influence the blocking or reduced encoding of stimuli resulting in impaired delayed match and non-match sample performance. A dose effect indicated additional deficits over an above found in the lower group with higher levels of CB1 agonists (Hampson & Deadwyler, 1999)

In humans, heavy marijuana has been found to impair memory and attentional processing systems (Pope & Yurgelun, 2004). In a study of N = 65 heavy users and N= 64 users, controlling for psychological and demographic variables, it was found both
groups predicted impairment with the heavy users showing pronounced deficit (Pope & Yurgelun-Todd, 1996). Utilizing the Wisconsin Card Sorting Test, California Verbal Learning Test, Benton Verbal Fluency, Rey-Osterreith Complex Figure Test and Weschler Memory Scales indicated reduced functioning in the attentional/executive system, decreased mental flexibility, impaired verbal fluency and reduced learning abilities. These findings are consistent with the results from other researchers (Pope, Gruber, & Yurgelun-Todd, 1995; Varma, et al., 1988).

Studies looking at residual effects have found that memory impairment after 6 weeks (Schwartz, Gruenewald, Klitzer, & Fedio, 1989) and another found deficits on an auditory selective attention task after a mean of two-years abstinence (Soiownj, 1995). Ehrenreich et al., (1999) found that earlier age of initial usage was a predictor of attentional dysfunction and visual scanning deficits in adult cannabis users. Age of first use was more predictive then cumulative amount used and theorized that visual scanning undergoes a major maturation process at around age 12-15 years and that the visual system is sensitive to cannabinoids and implicated in the impairment.

Alcohol

Alcohol is thought to involve the opiate, GABAergic, and glutamate neurotransmitter systems. Alcohol is proposed to act mainly at two sites of action. Alcohol binds with the GABA\(_A\) receptor as an indirect agonist and produces an inhibitory effect on postsynaptic terminal resulting in a sedative like response. It also acts as an inverse agonist at NMDA receptors interfering with glutamate transmission. Alcohol is thought to impair LTP and interfere with the spatial receptive field cells in the hippocampus (Givens & McMahon, 1995). Alcohol is also considered an NMDA
antagonist that its actions produce sedative effects that impair cognitive performance and also cause the release of dopamine into the nucleus accumbens. It is suggested that the acute effects of alcohol usage are caused by the antagonistic effect on NMDA receptors. Pro-longed suppression of NMDA receptors results in an upregulation (increased sensitivity of receptors). When alcohol intake decreases, the increased activity of NMDA receptors inhibit the mesolimbic neurons release of dopamine into ventral tegmental neurons and the nucleus accumbens (Winger, Hofman, & Woods, 1992).

Alcohol is also thought to increase the secretion of endogenous opioids and the activation of opiate receptors in the brain. The use of naltrexone, and opiate antagonist, results in lower alcohol usage and is often used as a treatment adjunct in alcoholics (Davidson, Swift, & Fitz, 1996). Alcohol also has an impact on serotonergic neurons. Breggren, Eriksson, Fahlke, and Balldin (2002) found there is a relationship between years of excessive alcohol use and central serotonergic transmission indicating a possible toxic effect. Surprisingly, despite the noted impact there was no association found among increased ratings of anxiety and depression.

There are two ways that alcohol through activation of GABA<sub>A</sub> receptors is believed to lead to activation of DA containing neurons. DA neurons, and interneurons in the substantia nigra (SN) and ventral tegmental area (VTA), are at first inhibited by alcohol (GABA agonist). The interneurons of the SN and VTA are more sensitive to GABA then DA. As a result, GABA will cause a stronger inhibition of the inhibitory interneurons and thereby increase DA neuron firing upon removal of the inhibitory influence (Grace, 2000). In the second way, DA neurons are known to burst firing, an increase in neurotransmitter release greater then expected through normal modulation.
Alcohol by modulating GABAergic systems increases firing rate of DA neurons and leads to an increase in spike-dependent DA release in postsynaptic regions (Grace, 2000). While some studies indicate increases in DA spike dependency other indicates a decrease in DA synaptic receptivity. Markianos, Lykouras, Moussas and Hatzimanolis (2001) found a down-regulation of DA reward system as an indice of relapse. In recovering alcoholics, increases in dopamine receptor responsivity after detox was found to be a predictor factor for non-relapse in a 6-month follow up.

Neuropsychologically, alcoholics have been found to experience generalized difficulties in learning and memory, and specific deficits in visual-spatial performance and construction (Beatty, Blanco, Hames & Nixon, 1997; Bond et al., 2004; Parsons & Nixon, 1993; Yonker, 2005). Fox, Coltheart, Solowij, Michie, and Fox (2000) present that the traditional assessment of visual spatial deficits in alcoholics could best be understood by separating the domain of cognitive deficits into independent organizational and visual spatial impairments. Pothos and Cox (2002) in an experimental paradigm of learning and interference found that heavy users of alcohol were impaired in learning tasks when stimuli were alcohol related, but not impaired when stimuli in the same design were neutral. Light users performed the same in both alcohol and neutral stimuli tasks suggesting that a bias in processing substance related cues interferes in cognitive processing.

Cocaine and Amphetamines

Both cocaine and amphetamine act as dopamine agonists that activate the mesolimbic dopaminergic pathway, acting on different sites in the brain, and produces sensitization to the drugs rather then tolerance (Hopper et al., 2004). Cocaine reinforcing
properties involves binding with and deactivating dopamine transporter proteins and blocking reuptake of DA after it is released from terminal buttons. Amphetamines block reuptake of DA but also activate release by pumping of DA from the terminal buttons (Battaglia & Napier, 1998). Both drugs result in increase dopamine in the nucleus accumbens (Giro et al., 1996). Additionally, increased extracellular concentrations of DA lead to a decrease in postsynaptic dopamine receptors.

Decreased serotonin levels have also been implicated in cocaine withdrawal. Harris, Altomare, and Aston-Jones (2001) found that increasing 5HT transmission abolished conditioned place preference in sub-chronically cocaine-treated rats. The same results were also obtained by microinjecting sertraline into the nucleus accumbens.

Discontinuation of psychostimulants results in a rapid decrease in extracellular dopamine and triggers an inhibitory effect on additional release of dopamine resulting in a depletion state. When dopamine decreases, there is an increase in dynorphin, an endogenous opioid that acts on kappa receptors in inhibiting dopamine in the nucleus accumbens. Chronic psychostimulant use sensitizes dynorphin-kappa receptor action of increased inhibition of dopamine levels in the nucleus accumbens (Battaglia & Napier, 1998; Hyman, 1996).

The rate and method of administration of psychostimulants also determines the degree of sensitization, with those getting into the system quicker, smoking crack and injection of amphetamines, have a more pronounced impact on neural plasticity then slower routes (Samaha, Li, & Robinson, 2002).

Homer, (1999) in a review of 17 studies regarding attentional functioning in abstinent cocaine abusers found that mixed results on domains of reduced cognitive speed
and impaired sustained attention. Recently, Sclafani, Tolou-Shams, Price and Fein (2002) found that dosage size and duration of peak usage (length of binge) predicted brain damage in crack cocaine users. Both crack users and crack users that abused alcohol showed similar significant cognitive impairments in attention, spatial processing, and immediate memory. Controlling for demographics and depression, follow-up among the abstinent users at 6 months found the same deficits as measured at 6 weeks in both groups. In stop-signal paradigms and response inhibition, assessment of cocaine abusers indicated significant impairment in controlling of behavior responses (Fillmore & Rush, 2002). These finding are consistent with imaging studies that have indicated neuroanatomical modifications in the frontal lobes of cocaine users (Volkow, et al., 1996).

3,4-Methylenedioxyamphetamine (MDMA)

MDMA is a relatively new “designer drug” that hit the streets. The drug patented in 1914, has been largely forgotten except for research trials in the US ARMY and experimentation research in the 1970s. MDMA causes a presynaptic efflux of serotonin from vesicle stores that diffuse across cell membranes. A single dose of MDMA can release around 80% of central serotonin stores (Berger, Gu, & Azmitia, 1992; McCardle, Luebbers, Carter, Croft, & Stough, 2004). MIDMA is called “neurochemically messy” because the great efflux of serotonin and the interconnection with other neurotransmitters results in a boost of dopamine, noradrenalin, acetylcholine and histamine (Liechi & Vollenweider, 2001). In addition, drugs that increase synthesis or decrease degradation of serotonin tend to enhance the MIDMA experience and those that block synthesis or deplete presynaptic vesicles tend to attenuate it (Huether, Zhou, &
Ryuther, 1997). Many MDMA users also utilize other substances to modify their MDMA as an attempt to increase euphoric properties.

One of important physiological correlates of MDMA usage is impaired thermoregulation. Rats treated with MDMA placed in a cool environment, cool down excessively, whereas when they are placed in a hot environment they overheat in a dose dependent manner (Drafters, 1994). The positive effects of MDMA, namely euphoria, decreases over repeated usages, and results in increased dosing whereas the unwanted side effects increase as the same time. The most frequent side effect post-MDMA is depression that can be short or prolonged depending on the abuse history. While tolerance and dependency have been described in it literature it does not appear to be on the same scale as that of cocaine or opiates. Most users have minimal difficulty quitting once they decide to and more often then not it is the bad side effects or a bad experience on MIDMA that trigger the decision.

Currently, the area of cognitive impairment in MDMA is a frequently researched topic. The literature indicates a disturbing picture of significant and possibly permanent cognitive impairment (Morgan, McFie, Fleetwood, & Robinson, 2002; Wareing, 2005). Researchers have found impairment in verbal memory (Rogers, 2000), central executive functioning (Heffernan, Jarvis, Rogers, Scholey & Ling, 2001), auditory memory and retrieval (Fox, Toplis, Turner, & Parrot, 2001), and working memory (Morgan, McFie, Fleetwood, & Robinson, 2002). Such deficits have been noted in users who have used less then 10 times (Parrott & Lasky, 1998).
Opiates

Opioid drugs act by binding to specific receptors on neurons distributed throughout the central nervous system and peripheral nervous system. Three major types of opioid receptors are mu (μ), kappa (κ), and delta (Δ). Most of the μ agonists are full agonists like morphine or heroin and produce a variety of effects like decreased anxiety, analgesia, tranquility, suppression of corticotropin-releasing factor (CRF), adrenocorticotropic hormone release (ACHF) and the sought after “rush” of sensation from usage. When a μ agonist is used repeatedly, tolerance and dependence develop depending on pharmacokinetics and route administered.

The endogenous opioid peptides are generalized into three categories of action; preenorphin peptides (11 types) which bind to kappa receptors, enkephalin (10 types) which bind to delta receptors, and endorphins (2 types), that show an affinity for both mu and delta receptors. The nucleus accumbens and ventral tegmental area are considered the reward systems involved in drug addiction. Mu and delta opioid agonists increase efflux of dopaminergic neurons into the ventral tegmentum by inhibiting GABA\textsubscript{A} interneurons that normally exhibit an inhibitory effect. In addition, the mu and delta receptor sites are located in the nucleus accumbens and provide direct reinforcement into the ventral tegmentum (Nestler, 1996). All three opioid receptors agonists produce inhibition of adenylyl cyclase and a decrease in cyclic adenosine monophosphate (cAMP).

The mu agonist withdrawal syndrome is the rebound of the opiate receptor to excessive activation. Opioid withdrawal after prolonged use is generally regarded as unpleasant.
Ornstein et al. (2000) found that heroin addicts exhibited dysfunction in frontal executive function and pattern recognition memory. In cases where heavy use of opiates in long-term cases there was greater neuropsychological impairment as assessed by the WAIS and Halstead battery (Grant et al., 1978). In a study of current and past opiate abusers compared to controls on a range of neuropsychological instruments, 60% of those currently using showed impairments of two standard deviations on neuropsychological tests compared to controls (David, Liddiard, & McMillan, 2002). The drug free group fell in between the two groups suggesting abstinence may lead to recovery of functions.

Summary

This chapter presented a review of the seven areas of significance for this study; (a) Self-reports and measurement; (b) Populations; (c) Reliability and validity of self-reports; (d) Demand characteristics of self-report; (e) Underreporting by drug type; (f) Cognitive processes and self-report; and (g) Drug Classes and Mechanisms of action. The next chapter addresses the methods to be utilized.
CHAPTER 3

METHODS

Subjects

The subjects were men who were court order to participate in residential substance abuse treatment. Most participants were incarcerated for drug related offenses, e.g., trafficking, and were released from a correctional facility to complete a residential treatment program. As such, there is a high comorbidity of Antisocial Personality Disorder (ASPD) among the population. A total of 129 subjects have completed the assessment and been added into the database.

The Program

Community Residential Treatment Services (CRTS) is a 100-bed all male residential facility located in downtown Columbus. Upon release from a correctional facility, residents complete an intake assessment and program orientation. The program is structured were frequent census of residents taken every two hours and all traveling itineraries are verified as authenticated. Residents eat, sleep, and attend treatment within the center but are allowed to work outside the program.

Treatment involves participating in group/individual psychotherapy, employment counseling, and regular case management. As such, each person is assigned a therapist,
employment counselor and case manager that work in a team format. Residency in the program lasts from 3-9 months depending on outside support networks and severity of behavioral problems. The program is behavioral in nature with participants receiving credits toward completion of program and treatment goals. In the event of non-compliance or excessive infractions individuals’ are re-incarcerated. Primary referrals are from the Ohio Adult Parole system and to a lesser extent, Franklin County Adult Probation.

The intake process involves completion of the Addiction Severity Index (ASI) short form, psychosocial assessment, records review, health assessment and rendering of a DSM-IV substance abuse diagnosis. Additional psychological testing is administered as needed.

The Agency

Community Residential Treatment Services (CRTS) is a division of the CompDrug Corporation, a large non-profit organization in Columbus, Ohio that provides a diversity of services to inner-city substance abusers. Services include methadone maintenance, outpatient counseling, HIV assessment and monitoring and a full range of prevention services. The agency is supported by a combination of local levy dollars, grants, and contractual agreements with the Ohio Department of Corrections and Rehabilitation.

Sampling Frame

Assessment of subjects occurred between the dates of 1999 and 2001.
The Database

The database is an archival collection of non-identifying intake and assessment information collected and entered on each subject. Each person as required by program guidelines to complete the information and would receive a “group credit” for returning information. The assessment was administered during first week of intake and subjects were channeled through a structured process that facilitated entry into the various programs. While subjects could refuse to complete the information packet, most were eager to complete all requirements.

Data Collection

Each resident was given a packet of forms and surveys to complete upon admission to the program (within one week). The packets were given out with instructions on completing by the employment counselors, drug counselors and case managers. Each packet included an example of the instrument already completed as a guide to the instructions. The packets were to be returned to the respective case manager with 24-hours for review of completion and then to the drug counselor for the rendering of a group credit. Each packet included a psychosocial history assessment, several questionnaires addressing attachment and quality of relationships, and a drug use survey questionnaire that measures cognitive distortions. Individuals who were illiterate were exempt.

Missing Data

Data that is missing was included in the entry into spreadsheets however will not be computed in the statistical analysis.
Confidentiality

Subjects were informed at the time of administration that data obtained would be confidential from administrative staff, parole and probation officers and fellow residents.

Instruments

Drug Classes

Demographic information obtained during an initial admission to the facility included a self-report of ranked frequency of drug use. Subjects provided rankings to 13 different drug classes according to perceptions of most frequent use the most frequently used drug being ranked (1) and progressing to (13). Subjects could rank a minimum of one to a maximum of thirteen drug classes. The 13 drug classes were; Marijuana, Heroin, Alcohol, PCP, Ecstasy, Ketamine, LSD/Hallucinogens, Valium/Benzodiazepines, Crack Cocaine, Powder Cocaine, Inhalants, Opiates/pills, and Amphetamines. This study will include information on the 13 drug classes, though because of statistical constraints, only 5 classes will utilized in advanced models. The five classes that will be used in analysis are Ecstasy, Alcohol, Opiates/pills, LSD and Amphetamines.

The drug class scale for the five drugs was recoded to form into two scales; the original scale of self-reported ranked frequency of a use of given drug class, and categorized scales of (1), (2), (3) and (4). The recoding for the scales and categories assignments are as follows: [(1) (High use)], [(2) (Moderate use)], and [(3) (Low use)]. For each drug class, a tabulating of frequency of the rankings was done and divided as close to a third in each category. The 4-scale is denoted as No-Use for that substance.
How I Think Questionnaire

The “How I Think” (HIT) questionnaire, published by Research Press, is designed to measure self-serving cognitive distortion in antisocial youths. It has been used as an assessment device to indicate severity of specific maladaptive thought processes and a measure to identify changes in cognition in response to a particular intervention. It has recently been utilized with adult population with reported success though new norms have not been established.

Self-serving distortions is criminogenic thinking that is correlated with antisocial and externalizing behavior disorders. The HIT Questionnaire is based upon a four-category typology of self-serving cognitive distortions (Gibbs, 1991, 1993; Gibbs, Potter & Goldstein, 1995). It is designed to measure self-serving cognitive distortions implicated in antisocial behavior. Subjects respond to questionnaire items along a 6-point agree/disagree likert scale (from agree strongly to disagree strongly).

1. Self-Centered: According status to one’s own views, expectations, needs, rights, immediate feelings, and desires to such a degree that the legitimate views, etc., of others (or even one’s own long-term best interest) are scarcely considered or are disregarded altogether.

2. Blaming Others: Misattributing blame to outside sources, especially another person, a group, or a momentary aberration (one was drunk, high, in a bad mood, etc.), or misattributing blame for one’s victimization or other misfortune to innocent others.
3. Minimizing/Misleading: Depicting antisocial behavior as causing no real harm or as being acceptable or even admirable, or referring to others with a belittling or dehumanizing label.

4. Assuming the Worst: Gratuitously attributing hostile intentions to others, considering a worst-case scenario for one’s own or others’ behavior.

The 54-item pool identifies a representation of eight items per cognitive distortion category. These items are also classifiable according to the type of antisocial behavior. The items refer to one of four categories derived from antisocial behavior; stealing, lying, physical aggression and disrespect for rules, laws and authority, i.e., the Opposition/Defiance scaling. Each of the cognitive distortion categories collectively contain at least two or three items referring to a given antisocial behavior category. The four cognitive distortion categories and the four behavioral referent categories define eight subscales. The eight subscales reflect the current beliefs of the individual and are not an assessment of retrospective behaviors, e.g., endorsements on Stealing scale indicate beliefs about stealing, “If you know you can get away with it, only a fool wouldn’t steal” #22, or “Everybody steals-you might as well get your share” #53.

Of the four-category typology, the scale of Self-Centered is indicated as the primary cognitive distortion in part because that it arises from egocentric bias. Egocentric bias is the tendency to process human information from our own viewpoints. While it is normal in most adults, it is not to the detriment of attaining another person’s viewpoint. Self-serving cognitive distortion can be construed as reflecting immature or inadequate moral orientation (Gibbs, 1993), e.g., “Getting what you need is the only important thing” # 42. The remaining three cognitive distortions, Blaming Others,
Minimizing/Misleading and Assuming the Worst are considered secondary cognitive distortions.

The secondary cognitive distortions have been characterized as pre- or post-transgression rationalizations that serve to neutralize conscience or guilt and thereby mitigate any damage to the self-image when the individual is engaging in antisocial behavior. Secondary cognitive distortions reduce the stresses from the consequences of the primary distortions.

Blaming others involves misattributing blame for one’s victimization. Accordingly, the victim in question is responsible for their misfortune and thus the perpetrator is blameless, e.g., “It’s OK to tell a lie if someone is dumb enough to fall for it” #21 or “When I lose my temper, it’s because people try to make me mad” #46.

The use of minimizing and mislabeling as a secondary cognitive distortion involves the cognitive process of viewing antisocial behavior as causing no real harm or as being acceptable, e.g., “A lie doesn’t really matter if you don’t know that person” #33 or “People need to be roughed up once in a while” #5. It is indicative of the individual’s tendency to downplay harm brought by their actions.

The use of Assuming the Worst, also identified as hostile attributional bias, involves a projection onto others of intentions of hostility and threat, e.g., “you can’t trust people because they will always lie to you,” #8 and “you should hurt people first, before they hurt you,” #32. The dynamic of Assuming the Worst has been found to relate to aggressive acting out behavior (Lochman & Dodge, 1994).

Each cognitive distortion category contains at least two and not more than three items referring to a given behavioral referent category. The eight subscales also utilized
to determine three summary scales; the Opposition-Defiance and Physical Aggression scales constitute the Overt Scale (OV), which reflects behavioral referents that involve direct confrontation of a victim. The Lying and Stealing subscales constitute the Covert Scale (CS) that reflects antisocial behaviors that typically do not involve direct confrontation of a victim. The Anomalous Responding (AR) Scale was designed to detect disingenuous, incompetent, or otherwise suspect responding. It also includes positive filler-items, i.e., prosocial statements that camouflage the distortion items. The eight subscales comprise the total How I Think (HIT) score.

Reliability

An instrument is considered reliable when the results obtained from it are stable and consistent. Cronbach’s alpha is a coefficient measure of internal consistency of a scale and is based on the average correlation of items within the scale (Cronbach, 1951). Alpha levels range between –1.0 to +1.0 with reliability being indicated the closer it gets to +1.0. Internal consistency of the estimates for the cognitive distortion subscales, behavioral referent subscales, and AR Scale are high ranging from .63 to .92. The Overt and Covert Scales also exhibited high internal consistency, with alphas ranging from .83 to .94. Internal consistency estimates of the overall score were very high, ranging from .92 to .96. At 1-week test-retest reliability was high, \( r (135) = .91, p < .0001 \) (Barriga & Gibbs, 1996).
Cognitive Distortions

<table>
<thead>
<tr>
<th>Behavioral Referents</th>
<th>Self-Centered</th>
<th>Blaming Others</th>
<th>Minimizing/Mislabeling</th>
<th>Assuming The Worst</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposition-Defiance</td>
<td>37, 42, 54</td>
<td>6, 46</td>
<td>12, 40</td>
<td>2, 18, 29</td>
<td>10</td>
</tr>
<tr>
<td>Physical-Aggression</td>
<td>10, 28</td>
<td>36, 44, 50</td>
<td>5, 19</td>
<td>15, 23, 32</td>
<td>10</td>
</tr>
<tr>
<td>Lying</td>
<td>3, 52</td>
<td>21, 26</td>
<td>14, 33</td>
<td>8, 49</td>
<td>8</td>
</tr>
<tr>
<td>Stealing</td>
<td>7, 22</td>
<td>11, 25, 39</td>
<td>17, 30, 47</td>
<td>35, 43, 53</td>
<td>11</td>
</tr>
<tr>
<td>Totals</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>39</td>
</tr>
</tbody>
</table>

Table 3.1: Matrix Structure of the HIT Questionnaire (Gibbs et al., 2001).

Content and Face Validity of the HIT

The face validity of the HIT was established by a review of 10 judges (Graduate students in psychology). Judges were highly accurate in classifying items by cognitive distortion category. Of the 39 items, 16 were accurately classified by 100% of the judges, 13 items by 90% of the judges, 1 items by 80% of the judges, 5 items by 70% of the judges, and 2 items by 60% of the judges (Barriga et al, 2001).

Construct Validity

Construct validity refers to the degree that an instrument measures what designed to measure. The construct validity of the HIT Questionnaire as a measurement tool of cognitive distortions has been established with such instruments as the Sociomoral Reflection Measure, the Social Reactions Questionnaire, The Achenbach Youth Self-Report, the Children’s Negative Cognitive Error Questionnaire and the Adapted Good-Self Assessment (Barriga, Gibbs, Potter, & Liau, 2001). The HIT Questionnaire has recently found expanded use in the adult population (Liu, Shively, Horn, Landau, Barriga & Gibbs, 2004; Hawkins et al, 2003; White, 1997) and has been used regularly by the
Corrections Corporation of America in assessing adults (Barriga, personal communication, March 22, 2005).

Data Analysis

Data analysis will be conducted using SPSS-13.

**Question 1:**

Which of the five ranked drugs classes identified in the CompDrug database predict cognitive distortions as measured on the How I Think Questionnaire?

This question is answered by utilizing the ranked frequency in categories for each of the substances of abuse in a General Linear Model (GLM) Multivariate Analysis also known as MANOVA. Since covariates are used in the model to control unwarranted effects, the MANCOVA variation of GLM with be used. The ranked drug classes according to frequency are the predictor variables and the scores on the four cognitive distortion scales are the response variables. The covariates are Age of subject and number of drug classes used.

In addition, variables will be presented in descriptive format. The most common used techniques will include:

**Central Tendency**- Data indicating central tendency includes possible presentation of mean median and mode measurements.

**Cluster Analysis**- This procedure attempts to identify relatively homogeneous groups of cases (or variables) based on selected characteristics, using an algorithm that starts with each case (or variable) in a separate cluster and combines clusters until only one is left.
**Frequency Distribution** - A tally of the number of times each score occurs in a group of scores. More formally, it is a way of presenting data that shows the number of cases having each of the attributes of a particular variable.

**Standard Deviation** - Indicates the spread and dispersion of the distribution of scores. The standard deviation is calculated by taking the square root of the variance.

**T-Tests** - The Independent Samples T Test procedure compares means for two groups of cases. T-Tests will conducted to compare scores on the HIT to those of the questionnaires norm. Given that this instrument is being applied to a new population, results could be beneficial to future researchers.

**Zero-Order/Spearman Rank Correlations** - A correlation between two variables in which no additional variables have been controlled for. In correlational research, researchers seek to determine if a relationship exists between two or more quantitative variables and the strength of that relationship.

**General Linear Model Multivariate Analysis (MANOVA/MANCOVA)**

The MANOVA/MANCOVA procedure is used to test the significance of the effects of one or more categorical independent variables on two or more continuous dependent variables. MANOVA/MANCOVA provides regression analysis and analysis of variance for multiple dependent variables by one or more factor variables or covariates. The factor variables divide the population into groups. Using this general linear model procedure, the null hypotheses are tested about the effects of factor variables on the means of various groupings of a joint distribution of dependent variables. Interactions between factors can be investigated as well as the effects of individual
factors. In addition, the effects of covariates and covariate interactions with factors can be included. For regression analysis, the independent (predictor) variables are specified as covariates. The benefits of MANOVA/MANCOVA with respect to this proposal are identified as follows (Weinfurt, 1998).

1. MANOVA/MANCOVA allows for the keeping of Type I error to a minimum in that alpha can be computed *familywise* (comparison alpha) and *experimentwise alpha* where such comparison is made as a family of tests.

2. MANOVA/MANCOVA offers analysis of data that can identify when groups differ on a system of variables. A linear composite of the four HIT Questionnaire scales is created that will maximize the separation between the drug classes.

Models can be both balanced or unbalanced. A design is balanced if each cell in the model contains the same number of cases. In a multivariate model, the sums of squares due to the effects in the model and error sums of squares are in a matrix and serve as the test statistic. These matrices are called SSCP (sums-of-squares and cross-products) matrices. If more than one dependent variable is specified, the multivariate analysis of variance using Wilks' Lambda will be utilized. There are assumptions of MANOVA/MANCOVA that are of concern and must be accounted for in the analysis (Weinfurt, 1998).

1. All independent variables must be distributed normally. In addition, any linear combination of the dependent variables must also be normally distributed. A violation of this assumption could have an impact on statistical power.
Therefore, histograms of each variable with a normal curve will be presented. Observations must independent of one another. MANOVA/MANCOVA is not robust when the selection of one observation depends on selection of one or more earlier ones, as in the case of before-after and other repeated measures designs.

2. MANOVA/MANCOVA requires that the covariance for all unique pairs of the dependent measures be equal for all the groups. If needed, a Box’s $M$ test will be used to determine homogeneity. Box's M tests MANOVA's assumption of homoscedasticity using the F distribution. If $p(M)<.05$, then the covariances are significantly different. Thus we want M not to be significant, rejecting the null hypothesis that the covariances are not homogeneous. That is, the probability value of this F should be greater than .05 to demonstrate that the assumption of homoscedasticity is upheld. Box's M is extremely sensitive to violations of the assumption of normality, making the Box's M test less useful than might otherwise appear. For this reason, some researchers test at the $p=.001$ level, especially when sample sizes are unequal.

3. Homoscedasticity (homogeneity of variances and covariances): within each group formed by the categorical independents, the variance of each interval dependent should be similar, as tested by Levene's test, below. Also, for each of the $k$ groups formed by the independent variables, the covariance between any two dependent variables must be the same. When sample sizes are unequal, tests of group differences (Wilks, Hotelling, Pillai-Bartlett, GCR) are not robust when this assumption is violated. Pillai-Bartlett trace was found to
be more robust than the alternatives when this assumption was violated but sample sizes of the groups were equal (Olson, 1976).

4. The independent variable is or variables are categorical. The dependent variables are continuous and interval level.

5. Low measurement error of the covariates: The covariate variables are continuous and interval level, and are assumed to be measured without error. Imperfect measurement reduces the statistical power of the F test for MANCOVA and for experimental data, there is a conservative bias (increased likelihood of Type II errors: thinking there is no relationship when in fact there is a relationship). As a rule of thumb, covariates should have a reliability coefficient of .80 or higher.

6. Equal group sizes. To the extent that group sizes are very unequal, statistical power diminishes. SPSS adjusts automatically for unequal group sizes.

7. Adequate sample size. At a minimum, every cell must have more cases than there are dependent variables. With multiple factors and multiple dependents, group sizes fall below minimum levels more easily than in ANOVA/ANCOVA.

8. The slopes of the regression lines should be the same for each group formed by the categorical variables and measured on the dependents. The more this assumption is violated, the more conservative MANCOVA becomes and increases likelihood of Type I errors.
Significance Tests

The overall F test is the first of the two-step MANCOVA process of analysis. It tests the null hypothesis that there is no difference in the means of the dependent variables for the different groups formed by categories of the independent variables. The multivariate formula for F is based not only on the sum of squares between and within groups, as in ANOVA, but also on the sum of crossproducts, it takes covariance into account as well as group means. Significance tests for multiple dependents (ex., Hotelling, Wilks, or Pillai tests) all follow the F distribution and so an F value and corresponding significance level are printed out for each of these tests in SPSS.

Post Hoc Tests

Bonferroni adjustment: When there are many dependents, some univariate tests might be significant due to chance alone. That is the nominal .05 level is not the actual alpha level. Researchers may adjust the nominal alpha level. Actual alpha = 1 - (1-alpha1)(1-alpha2)...(1-alphan), where alpha1 to alpha-n are the nominal levels of alpha for a series of post hoc tests. For instance, for a series of 4 tests at the nominal alpha level of .01, the actual alpha would be estimated to be 1-.99^4 = .039. One wants an actual adjusted alpha level of at least .05.

Variables

The following are a list of variables that will be used to answer the question. The independent variables are from the demographic intake information. The dependent variables are from the HIT Questionnaire.

Independent Variables

Frequency ranking of Alcohol
Frequency ranking of LSD/Hallucinogens
Frequency ranking of Opiates
Frequency ranking of Amphetamines
Frequency ranking of Ecstasy

Dependent Variables

Self-Centered (SC)
Blaming Others (BO)
Minimizing/Mislabeling (MM)
Assuming the Worst (AW)

Threats to Validity

This study is an Ex Post Facto exploration that presents with several threats to validity (Campbell and Stanley, 1966). Ex Post Facto research limits the interpretation of results because levels of the variables are not manipulated, subjects are not randomly assigned, and there is a lack of control over the treatment levels. There are numerous antecedents that influence self-selection of substance abuse such as income level, family systems, heredity, environment and a host of others. Therefore, if certain cognitive distortions are associated with specific substances of abuse, there are rival influences that could explain this phenomenon as well. The following are threats to internal validity:

Location

The environment in which the level of the independent variable takes place may be different from the environment in which other levels of the independent variable take
place. The subjects in this study were confined in a residential treatment center with other substance abusing offenders. It is plausible that the same subjects in a different environment, e.g., home among their family members may respond differently to the HIT Questionnaire.

History

Events may have occurred during the course of the study that can affect the responses of the subjects. For example, a change in staffing or policy at the residential facility may influence responses to the intake assessment of demographic information. Since there was no control group, and the data was collected over the course of a year, the events that occurred during that year could have an influence on responses. Additionally, subjects completed the intake information shortly after arrival at the facility. There could be a halo effect or a “honey moon” effect on subjects wanting to make a good impression on staff.

Attitude of Subjects

The way in which subjects view a study and their participation in it can create a threat to the internal validity. Subject were all involved in the criminal justice system and receiving group credit for completing the assessment. Many of the subjects were profoundly antisocial with disdain for any type of authority figures. There were no systematic control measures in place to address blatant disregard. Some subjects may have agreed to the assessment for group credit with no intention of complying with the assessment. Results were visually reviewed to determine if haphazard and random
responding were utilized. If this was the case, the assessment was either discarded or subjects ask to retake. The numbers of such incidents were reportedly very small.

Measurement Error

Self-report instruments that assess drug abuse severity are used extensively within the field and administered as questionnaires, computer assisted interviews, and face-to-face interviews. The ranked classification by frequency instrument in this study had not been rigorously tested. Defects in the instrument could strongly influence outcomes. It is important to note that this is an analysis of self-report of frequency of drug usage that measures the subjects’ perception of their drug use and not actual physical consumption of the drug. Irrespective of the data obtained, the literature review indicates that self-reports present with several limitations in determining severity of addiction and can have an extensive list of validity concerns.

Selection

A final concern is the possibility of a selection error. Subjects that could not read were excluded and no tabulation of this was made. Additionally, some subjects may have had cognitive impairments that influenced the veracity of the data. These individuals’ responses were not controlled for or monitored.
CHAPTER 4

RESULTS

This chapter describes the statistical analysis conducted on a database of 129 subjects who participated in the study. The data analysis looked at several factors including types of drugs utilized and age of first use. A more detailed analysis is provided on the individual item endorsements of the How I Think Questionnaire (HIT) in addition to analysis of the scales. The reason for this is that the use of the HIT is relatively new to adults with only a few published studies, and the uniqueness of this study on a targeted segment of the adult population warrants closer scrutiny.

The premise of this study is to explore and describe if cognitive distortions as measured by the HIT are unique to specific types of substance abusers utilizing MANOVA and MANCOVA. The main predictor variables are the endorsements of self-reported substance abuse recorded on demographic information. This scale was recoded to form into two scales; the original scale of self-reported ranked frequency of a use of given drug class, and categorized scales of 1, 2, 3 and 4. The recoding for scales 1 (High use), 2 (Moderate use), and 3 (Low use) for each drug class involved tabulating a frequency of the rankings and dividing as close to a third in each category. The 4 scale is denoted as No-Use for that substance. The response variables are the scores on the HIT questionnaire with a concentration on four main scales of Self-Centered, Blaming Others,
Assuming the Worst, and Minimizing/Mislabeling, though additional scales are included for norm comparison and a critical items review.

A correlational design was employed to extract meaningful relationships between the drug classes in both ranked and “use/no use” format. Additional computations were done to ascertain if certain items of the HIT was related to specific rankings on the self-report for a given drug class. These individual HIT items identified by item number, item content, scales endorsed, followed by the correlation coefficient, provide a view of single item endorsements of cognitive distortion. The format that follows includes a Review of Methodology, results of the drug class information, and results of the HIT scores, followed by MANCOVA results.

The analysis and results that follows are a (1) Analysis of age; (2) Analysis of Polypharmacy; (3) Cluster Analysis and correlations of drug usage (4) Comparison to norms on the HIT; (4) HIT Scale normality; (5) Critical items review of HIT; (6) MANCOVA; (7) Univariate ANOVA; and (7) Post Hoc analysis.

Review of Methodology

The methodology will include the use of correlation and frequency measures to describe the subjects and their pattern of substance usage. A cluster analysis is presented to identify clusters of users by substance. A T-Test will be presented to compare findings on the HIT with that of established norms.

Question 1:

Which of the five ranked drugs classes identified in the CompDrug database predict cognitive distortions as measured on the How I Think Questionnaire?
This question is answered by utilizing the ranked frequency for each of the substances of abuse in a General Linear Model (GLM) Multivariate Analysis also known as MANCOVA. MANCOVA presents with several assumptions that must be met in order conduct the analysis. A summary of the MANCOVA assumptions from Chapter 3 is as follows:

1. All independent variables must be distributed normally.
2. Covariance for all unique pairs of the dependent measures must be equal for the all the groups homogeneity of variances and covariances. Within each group formed by the categorical independents, the variance of each interval dependent should be similar.
3. The independent variable is or variables are categorical. The dependent variables are continuous and interval level.
4. Low measurement error of the covariates: The covariate variables are continuous and interval level, and are assumed to be measured without error.
5. Equal group sizes: To the extent that group sizes are very unequal, statistical power diminishes.
6. Adequate sample size. At a minimum, every cell must have more cases than there are dependent variables.
7. The slopes of the regression lines should be the same for each group formed by the categorical variables and measured on the dependents. The more this assumption is violated, the more conservative MANCOVA becomes and increases likelihood of Type I errors.
Presentation of the Results

Demographic Drug Use

Subjects upon admission into treatment were given a comprehensive assessment that included completing self-reported information on perceptions of frequent drug usage in ranked format as well as details on the age of drug initiation for a given drug class. Thirteen drug classes of this demographic information were included in the analysis: Marijuana, Heroin, Alcohol, LSD, Crack Cocaine, Cocaine Powder, Opiates, PCP, Amphetamines, Valium/BDZ, Inhalants, Ketamine and Ecstasy.

Age of Subjects

Subjects were also required to indicate age of first use of a given drug class. The following is a tables and graph indicating age of subjects, frequency that a given drug class was endorsed, mean age of first drug use. The mean age for subjects in the study is 33.89 years old ($SD = 8.72$), with the 25-34 and 35-44 year old age bracket combined comprising 76% of the subjects.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
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Table 4.1: Age Range of Subjects.
Current Age

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<td>Std. Deviation</td>
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Table 4.2: Mean Age of Subjects.

The assumptions of MANOVA require that scrutiny of the relationship among response, predictor and covariate variables is identified to minimize sources of error. An ANOVA analysis of age with respect to scores on the HIT identified that the scales and subscales measuring cognitive distortions are influenced by the age of the subjects. This finding of significant influence is also present when Age is in a continuous variable as oppose to a categorical. While the amount of variance explained by Age is small e.g., Lying, \( F(3, 125) = 4.077, p < .01 \), three of the Cognitive Distortion scales; Assuming The Worst, Minimizing/Mislabeling, Blaming Others; four of the Behavioral Referents, Lying, Stealing, Physical Aggression, Oppositional Defiance; total HIT and the Overt and Covert subscales scores indicate Age is an influence on scale measurement. Though repeated measures on ANOVA increase the probability of Type I errors significantly, the goal is to minimize violating assumptions of MANOVA. The tables that follow include a Pearson r correlation matrix and ANOVA table indicating that Age of the subject has some influence on the scores of the HIT.
### Homogeneity of Variances for Age Categories on HIT Scales

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<th>df2</th>
<th>Sig.</th>
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Table 4.3: Test of Homogeneity of Variances for Age Categories on HIT Scales.
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Alpha = .05

Table 4.4: ANOVA of Age Categories on HIT Scales.
Patterns of Polypharmacy

Measurement of drug class endorsements and age of first use provides an indicator of polypharmacy abuse along with a “slice of time” measure of the progression of addiction and abuse. A pattern of usage exists with subjects abusing certain drugs classes and not others. Both Alcohol and Marijuana indicate wide use with 111 (86%) and 116 subjects (90%) using respectively. Both substances account for the earliest ages of substance usage (14.37 and 14.60) use along with Inhalants at (14.50). Mean age of first use of a substance range from Alcohol (Mean = 14.37, SD = 4.88), the earliest age, to the latest age of initiation, Crack Cocaine (Mean = 25.25, SD = 6.86). Polypharmacy usage appears to be the norm with subjects (Mean = 3.89, SD = 2.26) substances used by a subject.

<table>
<thead>
<tr>
<th>Drug Type</th>
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<th>SD</th>
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</thead>
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<td>4.88</td>
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<tr>
<td>Inhalants</td>
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<tr>
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<td>PCP</td>
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<td>17.25</td>
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</tr>
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<td>3.34</td>
</tr>
<tr>
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</tr>
<tr>
<td>Amphetamine</td>
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<td>23.38</td>
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<td>Crack Cocaine</td>
<td>59</td>
<td>25.26</td>
<td>6.86</td>
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</table>

Table 4.5: Number of Subject Endorsing Use of a Drug Class and Age of First Use.
An analysis of the patterns of substances usage was initiated to meet assumptions of MANOVA and identify subpopulations of abusers. Both Alcohol and Marijuana use were widespread substances of abuse among subjects. Correlations for both ranked responses (Spearman Rank Coefficients) and recoded, Use vs. No Use. Pearson R Correlations indicated that many subjects indicated preference patterns beyond Alcohol and Marijuana alone. A Hierarchical Cluster Analysis base upon Use vs. No Use identifies the groups of drug classes by usage. Despite multicollinearity, several clusters emerged: (1) Ketamine, Ecstasy, PCP and Inhalants; (2) Opiates, Valium and LSD; (3) Crack Cocaine and Powder Cocaine; (4) Alcohol and Marijuana.

An unacceptably high level of intercorrelation among the independents is detrimental in MANOVA/MANCOVA as the effects of the independents cannot be
separated. Under multicollinearity, estimates are unbiased but assessments of the relative strength of the explanatory variables and their joint effect are unreliable. Beta weights, if utilized, and R-squares cannot be interpreted reliably even though predicted values are still the best estimate using the given independents (Hair et al., 1998).

As a rule of thumb, intercorrelation among the independents above .80 signals a possible problem. Likewise, high multicollinearity is signaled when high R-squared and significant F tests of the model occur in combination with non-significant t-tests of coefficients. Though none of the independents reached the .80 level it is necessary to monitor when placing multiple variables in a model.

### Pearson R Correlations, Use versus No Use

<table>
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<th>4</th>
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<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 4.6: Pearson R Correlations of Drug Classes on Use vs. No Use.
### Spearman Rank Correlation Matrix

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<td>Ketamine</td>
<td>-.08</td>
<td>A</td>
<td>-.50</td>
<td>.66</td>
<td>1.00**</td>
<td>-.40</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>-1.00**</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>Ecstasy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed). 
a Cannot be computed because at least one of the variables is constant

### Table 4.7: Spearman Rank Correlations on Drug Class Rankings.

#### Agglomerate Schedule

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cluster Combined</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Coefficients</th>
<th>Stage Cluster First Appears</th>
<th>Next Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12 13</td>
<td></td>
<td></td>
<td>9.000</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>8 11</td>
<td></td>
<td></td>
<td>9.000</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>8 12</td>
<td></td>
<td></td>
<td>14.000</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2 8</td>
<td></td>
<td></td>
<td>17.500</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>7 10</td>
<td></td>
<td></td>
<td>22.000</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>1 3</td>
<td></td>
<td></td>
<td>23.000</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>4 7</td>
<td></td>
<td></td>
<td>24.000</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>2 9</td>
<td></td>
<td></td>
<td>24.600</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>2 4</td>
<td></td>
<td></td>
<td>32.833</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>0</td>
<td>5 6</td>
<td></td>
<td></td>
<td>45.000</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>1</td>
<td>2 5</td>
<td></td>
<td></td>
<td>54.722</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>1 2</td>
<td></td>
<td></td>
<td>90.318</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 4.8: Agglomerate Schedule
Dendrogram using
Average Linkage (Between Groups)

### Rescaled Distance Cluster Combine

<table>
<thead>
<tr>
<th>Label</th>
<th>Num</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>12</td>
</tr>
<tr>
<td>Ecstasy</td>
<td>13</td>
</tr>
<tr>
<td>PCP</td>
<td>8</td>
</tr>
<tr>
<td>Inhalants</td>
<td>11</td>
</tr>
<tr>
<td>Heroin</td>
<td>2</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>9</td>
</tr>
<tr>
<td>Opiates</td>
<td>7</td>
</tr>
<tr>
<td>Valium</td>
<td>10</td>
</tr>
<tr>
<td>LSD</td>
<td>4</td>
</tr>
<tr>
<td>Crack</td>
<td>5</td>
</tr>
<tr>
<td>Cocaine</td>
<td>6</td>
</tr>
<tr>
<td>Marijuana</td>
<td>1</td>
</tr>
<tr>
<td>Alcohol</td>
<td>3</td>
</tr>
</tbody>
</table>

![Dendrogram](image)

**Figure 4.2: Hierarchical Cluster Analysis of Drug Class Usage.**

**Normative Information**

The subjects' scores on the HIT Questionnaire are compared to the established norms. The norms for the HIT Questionnaire are made up based upon a combination of four validation samples. Sample one included male and female subjects ages 13-19 incarcerated at a Department of Youth Services. Sample two included male and female subjects age 12-18 psychiatrically hospitalized for disruptive behavior. Sample three was composed of male and female subjects age 13-21 who were either court-mandated for a psychological evaluation or incarcerated at a Department of Youth Services. Sample four were students age 16-19 enrolled in an introductory psychology course at a large midwestern university. T-Tests were conducted to determine if significant difference existed. Results indicated that four scales differed from the normative group $p < .05$;
Anomalous Responding \((Mean = 2.83, SD = .78, T = 7.35, P = .01, DF = 128)\),
Minimizing/Mislabeling \((Mean = 2.15, SD = .72, T = 2.52, P = .5, DF = 128)\), Physical
Aggression \((Mean = 2.15, SD = .65, T = 2.80, P = .01, DF = 128)\) and Lying \((Mean = 
2.54, SD = .80, T = 2.13, P = .05, DF = 128)\). Each of the four scores were lower than the
norms.

A critical item review using Pearson R Correlation was done to ascertain if
individual items on the HIT are related to certain drug classes. The applicability of the
HIT to adults, and substance abusers, may be related to factor structure. Results varied
greatly with some widely used substances such as Marijuana having no individual item
relationship to the drug class, while others such as Ecstasy had 13 items correlated at \(p <
.05\). Some items with exceptionally small number of subjects, e.g., Inhalants, Ketamine,
provided inflated significance. The Critical Items Review that follows indicates each
Drug Class and correlation with individual items along with an indication of the scales
that item loads upon.
How I Think Norms Compared to Adult Substance Abusers

<table>
<thead>
<tr>
<th>HIT Scale</th>
<th>Normative M</th>
<th>Normative SD</th>
<th>Substance Abuser M</th>
<th>Substance Abuser SD</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall HIT Score</td>
<td>2.39</td>
<td>0.69</td>
<td>2.29</td>
<td>0.67</td>
<td>1.69</td>
</tr>
<tr>
<td>Anomalous Responding</td>
<td>3.33</td>
<td>1.07</td>
<td>2.83</td>
<td>0.78</td>
<td>7.35**</td>
</tr>
<tr>
<td>Cognitive Distortion Subscales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Centered</td>
<td>2.42</td>
<td>0.79</td>
<td>2.37</td>
<td>0.76</td>
<td>0.75</td>
</tr>
<tr>
<td>Blaming Others</td>
<td>2.42</td>
<td>0.79</td>
<td>2.33</td>
<td>0.68</td>
<td>1.50</td>
</tr>
<tr>
<td>Minimizing/Mislabeling</td>
<td>2.31</td>
<td>0.78</td>
<td>2.15</td>
<td>0.72</td>
<td>2.54*</td>
</tr>
<tr>
<td>Assuming the Worst</td>
<td>2.35</td>
<td>0.72</td>
<td>2.24</td>
<td>0.72</td>
<td>1.74</td>
</tr>
<tr>
<td>Behavioral Referent Subscales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposition/Defiance</td>
<td>2.55</td>
<td>0.72</td>
<td>2.51</td>
<td>0.71</td>
<td>0.64</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.32</td>
<td>0.78</td>
<td>2.15</td>
<td>0.69</td>
<td>2.80**</td>
</tr>
<tr>
<td>Lying</td>
<td>2.69</td>
<td>0.83</td>
<td>2.54</td>
<td>0.80</td>
<td>2.13*</td>
</tr>
<tr>
<td>Stealing</td>
<td>2.02</td>
<td>0.75</td>
<td>1.97</td>
<td>0.73</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Note. * p < .05, ** p < .01, N= 129

Table 4.9: How I Think Norms Compared to Adult Substance Abusers

Critical Items Review

Critical items Marijuana (N=116)

None

Critical Items Heroin (N=13)

None

Critical Items Alcohol (N=111)

(15) It’s no use trying to stay out of fights. (AW/PA) 27**
(30) Stores make enough money that it’s OK to just take things you need. (MM/S) .26**
(39) If someone is careless enough to loose a wallet, they deserve to have it stolen. BO/S) .22*

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Critical Items LSD (N=40)
(42) Getting what you need is the only important thing. (SC/OD) -.37*
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Crack Cocaine (N=59)
(3) Sometimes you have to lie to get what you want. (SC/L) -.28*
(6) If I made a mistake, it’s because I got mixed up with the wrong crowd. (BO/OD) -.26*
(7) If I see something I like, I take it. (SC/S) -.48**
(17) If you know you can get away with it, only a fool wouldn’t steal. (MM/S) -.26*
(39) If someone is careless enough to lose a wallet, they deserve to have it stolen. (BO/S) -.26*
(45) I have done bad things I haven’t told people about. (AR) -.40**
(51) I have taken things without asking. (AR) -.57**
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Cocaine Powder (N=60)
(18) No matter how hard I try, I can’t help getting in trouble. (AW/OD) -.28*
(19) Only a coward would ever walk away from a fight. (MM/PA) -.28*
(25) If a store or home owner gets robbed, it’s really their fault for not having better security. (BO/S) -.32**
(32) You should hurt people first, before they hurt you. (AW/PA) -.28*
(50) Sometimes you have to hurt someone if you have a problem with them. (BO/PA) -.36**
(53) Everybody steals-you might as well get your share. (AW/S) -.28*
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Opiates (N=26)
(37) Rules are mostly meant for other people. (SC/OD) .42*
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items PCP (N=7)
None
Critical Items Amphetamines (N=22)

None

Critical Items Valium/Benzodiazapines (N=36)

(2) I can’t help losing my temper a lot. (AW/OD) -.43*
(27) I have tried to get even with someone. (AR) –35*
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Inhalants (N=4)

(4) Sometimes I get bored. (AR) .96*
(46) When I lose my temper, it’s because other people make me mad. (BO/OD) – .95*
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Ketamine (N=5)

(21) It’s OK to tell a lie if someone is dumb enough to fall for it. (BO/L) -.91*
(37) Rules are meant for other people (SC/BO) -.97
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Critical Items Ecstasy (N=15)

(7) If I see something I like, I take it. (SC/S) -.61*
(17) If you know you can get away with it, only a fool wouldn’t steal. (MM/S) – .64**
(21) It’s OK to tell a lie if someone is dumb enough to fall for it. (BO/L) -.66**
(22) If I really want something, it doesn’t matter how I get it. (SC/S) -.52*
(23) If you don’t push people around, you always get picked on. (AW/PA) -.62**
(25) If a store or home owner gets robbed, it’s really their fault for not having better security. (BO/S) -.58*
(30) Stores make enough money that it’s OK to just take things you need. (MM/S) -.52*
(33) A lie doesn’t really hurt if you don’t know the person. (MM/L) –51*
(35) You might as well steal. If you don’t take it, somebody else will. (AW/S) – .57*
(39) If someone is careless enough to lose a wallet, they deserve to have it stolen. (BO/S) -.55
(43) You might as well steal. People would steal if they had the chance. AW/S) – .52*
(51) I have taken things without asking. (AR) -.58*
(52) If I lied to someone, that’s my business. (SC/L) -.54*

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

HIT Scales

The four response variables in the MANOVA are the HIT scales Self-Centered (Mean = 2.37, SD = .76), Blaming Others (Mean = 2.33, SD = .68), Minimizing/Mislabeling (Mean = 2.15, SD = .72), and Assuming the Worst (Mean = 2.24, SD = .72). An assumption of both MANOVA and MANCOVA models is that dependent variables are optimized when normally distributed.

Assessment of that normality is measured by skewness and kurtosis of graphed variables. Skewness is the tilt (or lack of it) in a distribution. A common rule-of-thumb test for normality is to run descriptive statistics to get skewness and kurtosis, and then divide these by the standard errors. Skew should be within the +2 to -2 range when the data are normally distributed. Negative skew is left-leaning, positive skew right-leaning. Kurtosis is the peakedness of a distribution. Kurtosis also should be within the +2 to -2 range when the data are normally distributed. Negative kurtosis indicates too many cases in the tails of the distribution. Positive kurtosis indicates too few cases in the tails. Results indicate that all the scales on the HIT deviant from normality.
How-I-Think Scales Descriptive of Curves

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Skewness</th>
<th>Std. Error</th>
<th>Kurtosis</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>129</td>
<td>2.3686</td>
<td>.76401</td>
<td>.956</td>
<td>.213</td>
<td>1.889</td>
<td>.423</td>
</tr>
<tr>
<td>BO</td>
<td>129</td>
<td>2.3326</td>
<td>.68181</td>
<td>.885</td>
<td>.213</td>
<td>2.340</td>
<td>.423</td>
</tr>
<tr>
<td>MM</td>
<td>129</td>
<td>2.1542</td>
<td>.71999</td>
<td>1.022</td>
<td>.213</td>
<td>2.870</td>
<td>.423</td>
</tr>
<tr>
<td>AW</td>
<td>129</td>
<td>2.2424</td>
<td>.72240</td>
<td>.750</td>
<td>.213</td>
<td>1.012</td>
<td>.423</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.10: How-I-Think Scales Descriptive of Curves.

Figure 4.3: Self-Centered With Normal Curve.
Figure 4.4: Blaming Others with Normal Curve.
Figure 4.5: Minimizing/Mislabeling with Normal Curve.
The MANOVA/MANCOVA procedure is used to test the significance of the effects of the ranked drug classes on four dependent variables of the HIT. The five drug classes are Ecstasy, Alcohol, Opiates, LSD/Hallucinogens, and Amphetamines. The four HIT scales are Self-Centered, Blaming Others, Minimizing/Mislabeling and Assuming the Worst. MANOVA provides regression analysis and analysis of variance for multiple dependent variables by one or more factor variables or covariates. The factor variables divide the population into groups. Using this general linear model procedure, the null hypotheses are tested about the effects of factor variables on the means of various groupings of a joint distribution of dependent variables. Interactions between factors can
be investigated as well as the effects of individual factors. In addition, the effects of
covariates and covariate interactions with factors can be included. MANCOVA differs
from MANOVA in the use of covariates as a method of controlling extraneous influences
on the dependent variables. Since the research body on adults the HIT is relatively new,
AGE of subjects and number of substances used will be used as a covariate.

The minimum requirements for each cell within each independent must meet at
least the number of dependents variables. In this case, all cells meet requirements. In
addition, it is noteworthy that this model presents an unbalanced design. Designs that are
unbalanced tend to have lowered power and more likely to generate Type II errors
(accepting the null, when an actual significant difference exists). In cases where
independence are of concern researchers should employing a blocking factor, some form
of covariate analysis, or reduce level of significance to (.01 or even lower) (Hair,
Anderson, Tatham & Black, 1998). In this study, level of significance is reduced to .01
and both Age and number of drug classes used are entered as covariates to control for
independence and reduce error.
Box M

Box's M tests MANOVA's assumption of homoscedasticity using the $F$ distribution. If $p(M)<.01$, then the variances and covariances are significantly different. It is desirable that we want M not to be significant, rejecting the null hypothesis that the both are not homogeneous. The probability value of this $F$ should be greater than .01 to demonstrate that the assumption of homoscedasticity is upheld. In this case $p(M) = .644$ which is insignificant and we can accept the null hypothesis that groups do not differ.

Table 4.11: Between Factors Subject for Independent Variables.
The Levene's test of homogeneity of variance tests the assumption that each group category of the independent variable has the same variance on an interval dependent. If the Levene statistic is significant at the .01 level or better, the null is rejected that the groups have equal variances. The assumption of homogeneity are met for all scales.

The Levene's Test of Equality of Error Variances

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>.999</td>
<td>47</td>
<td>81</td>
<td>.493</td>
</tr>
<tr>
<td>BO</td>
<td>1.376</td>
<td>47</td>
<td>81</td>
<td>.103</td>
</tr>
<tr>
<td>MM</td>
<td>1.180</td>
<td>47</td>
<td>81</td>
<td>.254</td>
</tr>
<tr>
<td>AW</td>
<td>1.590</td>
<td>47</td>
<td>81</td>
<td>.033</td>
</tr>
</tbody>
</table>

Alphas = .01

Table 4.13: Assumptions: Levene’s Test of Equality of Error Variances.

The multivariate test in a MANCOVA simultaneously tests each factor effect on the dependent groups. Each factor (categorized drug class) and each covariate (Age) has a main effect, as does the intercept. Interactions among the factors are also assessed. For this study, a full model was completed, though because of size of the output, all main effects and only statistically significant interaction effects are presented.

SPSS offers four alternative multivariate significance tests. Hotelling’s Trace is commonly used for two dependent groups, and Wilks’ Lambda if there are more than two
groups. The Pillai's Trace is the sum of explained variances on the discriminant variates, which are the variables that are computed based on the canonical coefficients for a given root. Olson (1976) found Pillai’s Trace to be the most robust of the four tests and is sometimes preferred for this reason. Roy's Largest Root is an upper bound on F that yields a lower bound on the significance level. Because of the tendency to over-inflate significance it will not utilized in discussion. The Wilks' Lambda statistic will be utilized to report findings. The significance of the F tests show if that effect is significant.

Eta-squared is the proportion of the total variability in the dependent variable accounted for by the variation in the independent variable with covariates serving as a control. Eta is a coefficient of nonlinear association. For linear relationships, Eta equals the correlation coefficient (Pearson's r). For nonlinear relationships it becomes greater and the difference between Eta and r is a measure of the extent of nonlinearity of the relationship. Observed Power is the power of the particular test with .80 being the desired level (Lauter, 1978). Both Eta-Squared and Observed Power is included in the multivariate test.

With MANCOVA the slopes of the regression lines should be the same for each group formed by the categorical variables and measured on the dependents. The more this assumption is violated, the more conservative MANCOVA becomes and increases likelihood of Type I errors. Violation of the homogeneity of regressions assumption indicates an interaction effect between the covariates (Age) and (Number of drugs used) among the factors (Drug classes).

Results indicate that there is no violation of the homogeneity of regressions assumption (measurement error of the covariates) as Age $p = .182$ and Number of drug
classes used $p = .462$ with no interaction of covariates and independent variables.

Covariates should have a reliability coefficient of .80. The implications are that imperfect measurement reduces the statistical power of the F test for MANCOVA and for experimental data, there is a conservative bias (increased likelihood of Type II errors: thinking there is no relationship when in fact there is a relationship).

A review of the multivariate tests indicate that Ecstasy is significant with $F = 3.506$, $Wilks' \Lambda = .000$, $df = 12$, $Alpha level = .01$, and $Observed Power = 952$. Partial Eta Squared indicates that 15% of the total variability in the dependent variable is accounted for by the variations in Ecstasy categories controlling for Age and number of drugs used. All other scales were found to be not significant at the Alpha = .01 level: Alcohol, $F = 1.228$, $Wilks' \Lambda = .222$; Opiates, $F = 1.271$, $Wilks' \Lambda = .238$; LSD $F = 1.619$, $Wilks' \Lambda = .081$; Amphetamines $F = .833$, $Wilks' \Lambda = .622$.

Of the full model with five independent variables and two covariates no interaction effects were observed.
## Multivariate Tests

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>Hypothesis</th>
<th>Partial Eta</th>
<th>Observed</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.343</td>
<td>21.537(b)</td>
<td>4.000</td>
<td>.000</td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td>.657</td>
<td>21.537(b)</td>
<td>4.000</td>
<td>.000</td>
</tr>
<tr>
<td>Hotelling's Trace</td>
<td>.522</td>
<td>21.537(b)</td>
<td>4.000</td>
<td>.000</td>
</tr>
<tr>
<td>Roy's Largest Root</td>
<td>.522</td>
<td>21.537(b)</td>
<td>4.000</td>
<td>.000</td>
</tr>
<tr>
<td>Age</td>
<td>.078</td>
<td>1.602(b)</td>
<td>4.000</td>
<td>.182</td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td>.922</td>
<td>1.602(b)</td>
<td>4.000</td>
<td>.182</td>
</tr>
<tr>
<td>Hotelling's Trace</td>
<td>.084</td>
<td>1.602(b)</td>
<td>4.000</td>
<td>.182</td>
</tr>
<tr>
<td>Roy's Largest Root</td>
<td>.084</td>
<td>1.602(b)</td>
<td>4.000</td>
<td>.182</td>
</tr>
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<td>Drug N.</td>
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<td>4.000</td>
<td>.462</td>
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Table 4.14: Multivariate Test of Drug Classes.
The Tests of Between-Subjects Effects section of output gives the univariate ANOVA effects for factor, interaction and covariate. It provides a breakdown of each dependent variable as it relates to the independent variables. The results indicate several significant findings for a single drug class.

For the drug class Ecstasy, significance is found on three of the four scales of the HIT: \( F(BO) = 7.453, p = .001, df = 3, \text{Observed Power} = .880, \text{Partial Eta Squared} = .075; F(MM) = 4.774, p = .007, \text{Observed Power} = .657, \text{Partial Eta Squared} = .141; F(AW) = 6723, p = .002, df = 3, \text{Observed Power} = .791. \) The Self-Centered scale of the HIT is insignificant: \( F(SC) = 2.988, p = .102, df = 3, \text{Observed Power} = .285, \text{Partial Eta Squared} = .075. \)

The \textit{Partial Eta Squared} for Ecstasy indicates that nearly 20% (\textit{Partial Eta Squared} = .199) of the variation on the dependent variable, Blaming Others, is explained by the categories on Ecstasy. For the scales Assuming the Worst and Minimizing/Mislabeling the explanation is 17% and 14% respectively.

For all other drug classes, covariates and interaction effects there was a lack of significance.
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Table 4.15: Tests Between-Subjects Effects
Post Hoc Test

A Post Hoc Test is an analysis of the dependent variate to assess which of the dependent variables contribute to the overall differences indicated by statistical significance in the multivariate test. The covariates are removed from the model making it a MANOVA.

MANOVA is that if the overall F-test shows the centroid (vector) of means of the dependent variables is not the same for all the groups formed by the categories of the independent variables, post-hoc univariate $F$ tests of group differences are used to determine just which group means differ significantly from others (Hair et al., 1998). This helps specify the exact nature of the overall effect determined by the F test. Pairwise multiple comparison tests measures each pair of groups to identify similarities and differences.

The use of a *Bonferroni adjustment* is made when there are multiple dependents. Some univariate tests might be significant due to chance alone, i.e., the nominal .05 level is not the actual alpha level. Researchers can adjust the nominal alpha level; Actual alpha = 1 - (1-alpha1)(1-alpha2)...(1-alphan), where alpha1 to alpha-n are the nominal levels of alpha for a series of post hoc tests. For instance, for a series of 4 tests of the scales SC, BO, MM and AW at the nominal alpha level of .01, the actual alpha would be estimated to be 1-.99^4 = .039. The *Bonferroni* adjustment states that the alpha level should be adjusted for the number of tests utilized. Adjusted alpha level in any separate test is defined as the overall alpha level divided by the number of tests (adjusted alpha = [(overall alpha)/(number of tests)]) (Hair et al.1998). In this study, the *Bonferroni adjustment* that follows is calculated as adjusted alpha = .0125.
Results indicate that the ranked categories for Ecstasy differ on levels of the dependent variables. For Self Centered, the category of high users (1) differ significantly from low users (3) and non-users (4) with mean differences of 1.6389, alpha = .006 and 1.5517, alpha = .000, respectively. Hence, an increase of drug rankings on ecstasy from Non-User (4) to High User (1) results in an increase of 1.6 on the HIT scale Self Centered. There is no significant differences between the Low Users (3) and Non Users (4) alpha = .028; yet larger differences exist for Non-Users than Low Users when compared to High Users suggesting that the size of the standard error of these close pairs is an influence. Some differences are also present between moderate ecstasy users (2) and Non-Users (4) with a Mean Difference of .7659 and \( p = .028 \). This is cautiously observed as it exceeds adjusted alpha of .0125.

For the scale, Blaming Others, significant mean differences exists for several rankings comparing to High Users (1) to Moderate Users (2) Mean Difference = 1.5179, \( p = .001 \); and Low Users (3) Mean Difference = 2.000, \( p = .000 \), and Non-Users (4) Mean Difference = 1.6952, \( p = .000 \). No significant differences were found between Moderate Users (3) and Low Users (4), and Low Users (3) to Non Users (4).

For the scale, Minimizing/Mislabeling, the findings indicate differences between High Users (1) as compared to Low Users (2) Mean Difference = 1.6111, \( p = .003 \); and Non Users (4) Mean Difference = 1.5244, \( p = .000 \).

On the scale Assuming the Worst, again, significant differences are found when comparing High Users (1) to the other categories of usage; Low Users (3) Mean Difference = 1.6394, \( p = .002 \); and Non Users Mean Difference = 1.5574, \( p = .000 \).
## Multiple Comparisons: Bonferroni

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Table 4.16: Bonferroni Post Hoc Analysis.
Estimated Marginal Means of Self Centered

Figure 4.7: Estimated Marginal Means For Self-Centered
Figure 4.8: Estimated Marginal Means For Blaming Others.
Figure 4.9: Estimated Marginal Means For Minimizing/Mislabeling.

Figure 4.10: Estimated Marginal Means For Assuming The Worst.
CHAPTER 5

DISCUSSION

The goal of this study is to identify if patterns of cognitive distortions are unique to specific types of substance abusers. It is the hope that this study provides a contribution to the existing body of literature on the treatment of substance abuse. The uniqueness of this research and the need for it are as follows:

1. There is no research exists on criminogenic cognitive distortions of substance abusers. Relapse and recidivism rates are high among this population and a need exists for research that advances an understanding of contributing factors.

2. The HIT is an established adolescent psychometric instrument that has just recently been utilized with adults and a new body of norms are needed.

3. The authors of the HIT have future plans to research this instrument with substance abusers (Barriga, personal communication, March 22, 2005).

This dissertation seeks to identify which of the five ranked drugs classes identified in the CompDrug database predict cognitive distortions as measured on the How I Think Questionnaire? The hypothesis formally stated is:
**H₀:** There is no difference between the five categories of self-reported frequency of drug usage on the measure of cognitive distortion controlling for age and number of drugs used.

**H₁:** There are significant differences between the five categories of self-reported frequency of drug usage on the measure of cognitive distortion controlling for age and number of drugs used.

This question is answered by utilizing demographic drug usage information on 129 male court referred subjects participating in a residential treatment program. Drug usage information measured subject’s self-reported most frequently utilized drugs in ranked order for 13 drug classes. This ranked data was collapsed into categories of High Use (1), Moderate Use (1), Low Use (3) and No-Use (4). The categorized drug classes are the predictor variables and the scores on the four cognitive distortion scales are the response variables. The variables Age and Number of Drugs Used served as covariate measures to reduce standard error in a General Linear Model (GLM). Multivariate Analysis is also known as MANOVA, and MANCOVA when covariates are used.

**Review of Results**

**Demographic information**

**Age**

Both the current age of the subject at the time of assessment and the age of the first use of a given substance of abuse were included in analysis. The Mean age for subjects in this study is 33.89 years old ($SD = 8.72$), with the largest grouping in the 25-34 and 35-44 year old age bracket.
Patterns of Polysubstance Abuse

There are four analyses conducted that to discern patterns of usage: (a) A descriptive analysis of drug endorsements and age of first use; (b) A Pearson R Correlation matrix of substance usage in categories of Use vs. No Use; (c) A Spearman Rank Correlation matrix of drug rankings; (d) A cluster analysis based upon categories of Use vs. No Use.

The age of initiation of drug use found is consistent with that in the literature. Both alcohol, and to a greater extent, marijuana, are considered “gateway” substances that often lead to more serious substance abuses (Kelley, Denny, & Young, 1999). Prevention models frequently attempt to inoculate youth at these ages with education and peer-to-peer intervention with delay of usage onset often recognized as risk reduction (Kandel, Yamaguchi, & Chen, 1992). The age of initiation also provides a “slice of time” with regard to addiction. The most addictives substances, Cocaine ($Mean = 21.71, SD = 6.23$), Heroin ($Mean = 23.38, SD = 5.43$), and Crack Cocaine ($Mean = 25.26, SD = 6.86$) are initiated after several years of involvement in the abuse of substances and were found to be the three substances with oldest ages of initiation. A review of Ketamine, with a small number of subjects ($N = 5$), indicates outliers that influence the standard deviation ($Mean = 17, SD = 10.29$). The number of drugs used ranged from 1 to 10 with a $Mean = 3.89, SD = 2.26$ indicating that Polypharmacy use is the norm.

There are marked differences between the Spearman Rank Correlations of drug classes compared to the Use vs. No Use categories. While Use vs. No Use indicated more significant correlations many were found not significant in the Spearman Rank Matrix. It is possible that the frequency of usage vary based upon availability of the substance in
the market, or possibly that preferences change the longer an individuals’ drug career progresses. It is also important to note that the demographic drug assessment did not include a time element, e.g., use within 30 days, but rather, a overall lifetime use. Progression of drug use is an individual dynamic and subjects develop addiction at different rates.

A review of the cluster analysis indicated that many of the subjects did have favorites in their choice of substances to use. Several clusters emerged that supported findings of the correlation matrix: (1) Ketamine, Ecstasy, PCP and Inhalants; (2) Opiates, Valium and LSD; (3) Crack Cocaine and Powder Cocaine; (4) Alcohol and Marijuana; and (5) Heroin and Amphetamines.

Norms

The HIT was designed to assess cognitive distortions among the adolescent population. A comparison of results was done with adult substance abusers in this study to contribute to future HIT usage with adults. T-Tests were conducted to determine if significant difference existed between groups. Results indicated that four scales differed from the normative group $p < .05$; Anomalous Responding ($Mean = 2.83, SD = .78, T = 7.35, P = .01, DF = 128$), Minimizing/Mislabeling ($Mean = 2.15, SD = .72, T = 2.52, P = .5, DF = 128$), Physical Aggression ($Mean = 2.15, SD = .65, T = 2.80, P = .01, DF = 128$) and Lying ($Mean = 2.54, SD = .80, T = 2.13, P = .05, DF = 128$). Each of the four scores were lower than the norms. There is insufficient data to draw a conclusion about using the HIT with adults at this time. Use with adult populations is considered experimental until significant studies are conducted. Unfortunately, none of the adult studies provide sufficient information to conduct T-Tests with this population.
The review of the critical items provides an item review with Pearson r by drug class. Ecstasy appears to have the most items with 13 items in the test being statistically significant. Surprisingly Marijuana, Heroin, PCP, and Amphetamines didn’t have any endorsements that can be interpreted. It is possible that no cognitive distortions are associated with usage of these substances.

Self-Report of Substance Usage

Subjects in this study were requested to complete demographic intake information that included identifying substances of abuse they have utilized in a ranked frequency. Thirteen drug categories were provided in a forced-choice format requiring subjects to identify the ranked order. Of those categories, five were included in the model. There are several notable influences with regard to review of the literature on self-reports. First, all subjects were involved in the criminal justice system, and while such approaches to measurement are common, offenders are often the least reliable population to work with (Gray & Wish, 1999; Simon, 1999). It is possible that since the subjects are in a residential treatment facility that the type of physical environment may have had an impact.

All residents in the facility were also subject to onsite drug and alcohol screening. In addition to random drug screens, upon arrival back to the facility from work or an errand, subjects completed an alcohol screening. In cases of home visits, new arrivals, and prolonged absences, a drug screen was also required. In the event of a positive screen, subjects experience sanctions within the programs rules. With this type of testing environment and potential contingencies in place, it is possible that there was an increase in response accuracy of the self-report (Sherman & Bigelow, 1992).
The demand characteristics of the self-report used in the study presents with several implications. The report was self-administered by subjects provided by staff that had also completed their initial drug, health, and vocational assessments. Self-Questionnaires have been found to provide a higher endorsement of substances utilized compared to that of clinician administered questionnaires (Turner et al., 1992). The structure of the questions did not limit subjects to a specific temporal proximity that has been found to also increase accuracy (McNagy & Parker, 1992). It is possible that modifications to the scaling as well as the temporal considerations in the questions could provide very different data.

Cognitive Distortions and Drug Use

MANCOVA

A MANCOVA model was used to discern if certain categories of substances arranged by self-reported frequency are related to patterns of cognitive distortions. The variables age and number of substances used served as covariates in the model to reduce error. A subsequent univariate Test Between the Subjects and Post Hoc analysis were conducted. A total of five independent and four dependent variables were included in the model with a consistent alpha = .01.

All assumptions for MANOVA and MANCOVA were met: Box M $p(M) = .644$, Levene's Test of Equality of Error Variances, SC = .493, BO = .103, MM = .254, AW = .033, Homogeneity of Regressions Assumption, Age = .182, Number of Drugs Used = .462. The covariates served to reduce error in the linear combinations and in the independence in the predictor variables.
Results indicated a rather significant difference for Ecstasy users compared to all other drug users: $F = 3.506$, Wilks' Lambda $= .000$, $df = 12$, Alpha level $= .01$, and Observed Power $= 952$. The findings were rather robust considering that the small sample size for that category ($N = 15$) and the unbalanced designs both reduce power (Hair et al., 1998). In preliminary models this significant main effect for Ecstasy was evident when alpha was reduced to .001 and when other drug classes were added. There were no other main effects or interaction effects for any drug class.

Partial Eta Squared indicated that 15% of the total variability in the linear combination of dependent variable is accounted for by the variations in Ecstasy categories controlling for Age and number of drugs used.

The Tests of Between-Subjects Effects section of output gives the univariate ANOVA effects for factor, interaction and covariate. It provided a breakdown of each dependent variable as it relates to the independent variables. The results indicate several significant findings for Ecstasy.

Significance for Ecstasy is found on three of the four scales of the HIT: $F(BO) = 7.453$, $p = .001$, $df = 3$, Observed Power $= .880$, Partial Eta Squared $= .075$; $F(MM) = 4.774$, $p = .007$, Observed Power $= .657$, Partial Eta Squared $= .141$; $F(AW) = 6723$, $p = .002$, $df = 3$, Observed Power $= .791$. The Self-Centered scale of the HIT is insignificant: $F(SC) = 2.988$, $p = .102$, $df = 3$, Observed Power $= .285$, Partial Eta Squared $= .075$; alpha $= .01$.

The Partial Eta Squared for Ecstasy indicates that nearly 20% of the variation on the dependent variable, Blaming Others, is explained by the categories on Ecstasy. For
the scales Assuming the Worst, 17% and Minimizing/Mislabeling 14% of the variation on the dependent variable is explained.

A Post Hoc analysis was conducted utilizing the Bonferroni adjustments. An adjusted alpha level was calculated at .0125. Results on the Bonferroni Post Hoc indicated which levels of usage of Ecstasy usage related to mean changes in the four HIT scales. Results indicate significant differences between the means on all four scales. For several scales, significance was not established in close measures between some categories of rankings. For example, on the scale Blaming Others, No significant differences were found between Moderate Users (3) and Low Users (4), and Low Users (3) to Non Users (4). The Bonferroni is a conservative measure with lower power. When combined with small cells of unbalanced design, the detection of differences between categories decrease. Additionally, Post Hoc Tests with a univariate measure, at least on SPSS, don’t allow for the control of covariates (sources of error). It is also plausible that there is no difference in cognitive distortions between these users.

Theoretical Implications of Cognitive Distortions and Ecstasy

From this study we can cautiously reject the null hypothesis. The results of this study raise serious questions, why certain cognitive distortions are associated with the use of Ecstasy? Ecstasy is a serotonergic neurotoxin in animal studies. Of all the substances utilized in the model, Ecstasy, even in light users, is the quickest to produce long-term damage in brain functioning (Parrott & Lasky, 1998). In a longitudinal over the course of 18-months, during which subjects abstained from usage, there was no recovery of initial cognitive impairments (Gouzoulis-MayFrank, 2005). Parrot and Lasky (1998) found
long-term deficits in cognitive processing in subjects who used Ecstasy as little as 10 times. Morgan, McFie, Fleetwood, and Robinson (2004) found that both current and ex-ecstasy users who averaged 2-years of abstinence, exhibited elevated psychopathology and behavioral impulsivity compared with polydrug users and controls. Serotonin is the main neurotransmitter affected by ecstasy. Serotonin is implicated in mood regulation, pain, sleep regulation, and appetite. It is possible that cognitive distortions are the result of rapid and prolonged neurochemical changes in serotonergic functioning in ecstasy users.

The work of Gibbs and cognitive distortions raises several issues with respect to this research. The HIT and the theoretical underpinnings are based upon the social information processing theories. This theory also referred to as sociomoral reasoning or sociomoral development, espouse that a bias modifies general schemata and knowledge structures that protect the self-esteem and ego from damage when engaging in deviant behavior. This bias according to Crick and Dodge (1994), comprises the ongoing processing of information in terms of encoding, mental representations, goal clarification, accessing and generating potential responses, selecting a response, and evaluating responses and perpetuates deviant and aggressive behavior. For example, the HIT scale Assuming the Worst, illuminates the psychodynamic of “Hostile Attributional Bias” where an offender projects onto the victim that they possess malicious intent toward the offender, thereby justifying some deviate or aggressive act. In essence, it is the polarity of the “rose-colored glasses” where the offender processes social information in shades of threats toward themselves and corroborates their hostile view of the world.
In this study, ecstasy users scored significantly higher on self-serving cognitive distortions compared to users of drug classes that are often considered “harder” and more commonly associated with crime. Historically, the research has found on how these distortions in children are associated with parental rejection and physical abuse (Palmer, 1996), parental disciplinary practices (Boyes & Allen, 1993), social deprivation, poverty, and criminal parents (Deater-Deckard & Dodge, 1997).

This raises additional questions regarding whether ecstasy users self-select this drug of abuse based upon personality traits and upbringing. Research supports that substance abusers as a whole frequently can have common upbringing and personality traits (Taylor, 2005), though identifying specific developmental characteristics and traits and to a specific substance of abuse have been absent from the literature. Hence, the premise that ecstasy users self-select this drug with preexisting cognitive distortions resulting from upbringing experiences is lacking. It is ironic though, and worth researching, why a substance that attracts users based upon its ability to make users feel more insightful, social connected, harmonious with others (Ter Bogt & Engels, 2005); and is known as the “love drug” because of euphoric ability to reduce social boundaries is at the same time associated with increasing degradation of healthy social information processing? It is plausible that a cycle of continued usage, reinforcement, and increasing salience of the MDMA experience is perpetuated by a concomitant deteriorating ability to experience normal social rewards. Additional research is needed in this area.

A recent study identified that ecstasy users, commonly associated with college students, are increasingly becoming involved in the criminal justice system with users having a greater number of arrests and higher rates of incarcerations than non-using
arrestees (Hendrickson & Gerstein, 2005). If these users present for treatment, they may likely present with unique needs in treatment. In this study, subjects scored higher on the scale Blaming Others compared to others users. This cognitive distortion can be viewed similar to the substance abuse dynamic “denial” often found in the treatment setting. The implications are that individuals court ordered to treatment candidates may present with some unique issues regarding engagement and acceptance of treatment.

While the model in this study is inadequate in design and method to explain why ecstasy use in these subjects experienced a pattern of cognitive distortions, clearly additional research is needed to replicate findings and explore the implication for treatment settings.

**Increased Drug Usage and Cognitive Distortions**

Subjects who self-reported greater substance usage in this model (Alcohol, MDMA, Opiates, Amphetamines, LSD) were also associated with increased levels of measured cognitive distortions for High and Moderate users on three of the four scales, Blaming Others, Minimizing/Mislabeling, and Assuming the Worst. Differences were also established between High users and Low and Nonusers establishing a somewhat linear relationship. For categorical difference between Low users and Nonusers, no significant findings were established. Part of this may be explained by the lower power of the Bonferroni Adjustment and error because are excluded. It is also possible that little difference exists between self-reported Low users and Nonusers. The scale Self-Centered, which is considered a primary scale, failed to detect differences among levels of the independent variable. The main focus of the research was to detect if unique cognitive distortions are present based upon type and frequency of substance utilized. In summary,
the results indicate robust findings for the drug MDMA on three of the four scales, and for the overall model, a linear relationship exists among self-reported High, Moderate, and Low.

The results support that increased levels of drug usage are associated with increased levels of criminogenic cognitive distortions. Substance abuse and criminal activity both interact dynamically in the relapse and recidivism cycle. Failure to address this phenomenon despite participation in drug treatment will result in decreased treatment efficacy.

Limitations of the Study

There are several limitations to this study that are critical to interpretations of results and the ecological validity. Most importantly, this study is an Ex Post Facto analysis done without the benefit of a control group. Such a limitation narrows applicability of the results to other populations. Nor does this study espouse a cause-effect relationship between the use of Ecstasy and the presence of certain cognitive distortions.

An additional limitation is that the use of self-reports present with many measurement challenges as addressed in the earlier literature review. A plethora of extraneous variables interact with self-reports in determining veracity, and as the literature bears out, it is difficult, if not at times impossible, to get accurate self-report drug use information.

This study’s ranking of self-report drug frequency is accessing the subjects’ perception of most frequent drugs used. Perceptions vary both over time and with regard
to context of assessment. In addition, the demographic drug rankings were a forced choice measure. Hence, it is plausible that an individual, when using drugs, indulges in the use of two substances simultaneously. If habitually administered in such fashion, the ranking for both drugs theoretically should be a “one” on the scale.

The statistical measures of MANCOVA failed to detect differences in any other drug classes than ecstasy. There are several factors that provide plausible explanations. The use of an unbalanced design decreases the statistical power of the model, increasing Type II error, with the result that key main effects may have been undetectable. The low error measurement of the covariates and violation of that assumption decreases power and increases the likelihood of Type II errors.

The use of covariates was necessary based on the nature of the independent variables and extraneous confounding. It is also possible that the sample size of 129 subjects with a 5 x 2 x 4 model decreased power as well.

The How I Think Questionnaire (HIT) was originally designed for use with adolescents and no adult norms are available. It is possible that future research on the construct validity with adults may prove significant measurement error. The conclusion being that the models employed in this study may have accurately detected an inaccurate measure of adult cognitive distortions.

In addition, because of the lack of a control group and random assignment, the findings with regard to Ecstasy are narrowly limited to the subjects in this study. Other Ecstasy users in non-drug treatments settings, females, or non-offenders, or different age categories, may not show the same pattern of cognitive distortions. Thus, ecological and predictive validity is extremely limited.
A final concern rests with the degree of independence of the predictor variables. There are no MANOVA tests for independence for predictor variables, and lack of independence among observation are difficult to eradicate in many designs (Hair et al., 1998). Many subjects utilized multiple drugs classes (Mean = 3.89, SD = 2.26). For that reason, a full analysis of other drug classes could not be undertaken. To counteract the independence among predictor variables, a covariate of the Number of Drug Classes used was included in the model. In a future study, an increase in sample size would likely allow for the categorization of a subpopulation within each category of drug classes and thereby controlling independence through selection.

Conclusion

This research presents many interesting concepts, some novel, and others reiterated in the literature. The essence of a substance abusing offender is that two psychopathology disorders are present both interacting to perpetuate a cycle of relapse and recidivism. Successful treatment, similar to other that of other dual-disorders, involves treatment of both conditions. Treatment approaches to substance abusers are numerous, lesser for the offender, and scant for a unified treatment approach of both. The application of prosocial approaches addressing cognitive distortions by Barriga et al. (2001) combined with complimentary drug treatments approaches in breaking this cycle need to be researched.

An expected finding in this study is that most subjects had engaged in polysubstance usage sometime during their drug careers. Controlling for this event in the model was challenging, and a likely source of error. It is common in the literature to find
numerous studies that explore the impact of a single substance of abuse, e.g., crack cocaine, on some psychosocial variable, with no control for any other drugs usage in the subjects’ history. This approach appears to be the norm in the literature.

Finally, the piecing together of brain-behavior paradigms, the work and goal of a community of scientists, requires that each of the domains are broken down in its most elementary unit before making inferences between the domains. Neuroscience and psychopharmacology have made significant advances in the understanding of drug abuse on neural networks. The topic of cognitive distortions among substance abusers addresses the behavior portion of the paradigm. It is hoped that some small part of this research serves as a piece of that bridge building material for the greater community.
REFERENCES


124


APPENDIX A

HOW I THINK QUESTIONNAIRE
How I Think (HIT) Questionnaire

Name

Date

Age

Circle one: Male / Females

Administered by

Please don’t turn this page until it’s time to begin.

Each statement in this questionnaire may describe how you think about things in life. Read each statement carefully, then ask yourself, “Is it fair to say that this statement describes my thinking during the last 6 months?” Your answers will be kept private.

Mark your answers on the sheet. Don’t say them out loud.

Any questions?

OK, turn the page and begin.
1. People should try to work on their problems.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

2. I can’t help losing my temper a lot.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

3. Sometimes you have to lie to get what you want.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

4. Sometimes I get bored.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

5. People need to be roughed up once in a while.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

6. If I made a mistake, it’s because I got mixed up with the wrong crowd.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

7. If I see something I like, I take it.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

8. You can’t trust people because they will always lie to you.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

9. I am generous with my friends.
   AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
   STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

10. When I get mad, I don’t care who gets hurt.
    AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
    STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

11. If someone leaves a car unlocked, they are asking to have it stolen.
    AGREE AGREE AGREE DISAGREE DISAGREE DISAGREE
    STRONGLY AGREE AGREE SLIGHTLY DISAGREE SLIGHTLY DISAGREE

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7-26-04

Michael Klein, Ph.D.
The Ohio State University
Rehabilitation Services
215 Pomerene Hall
1760 Neil Avenue
Columbus, Ohio 43210

Re: Utilization of Research Data

Dear Dr. Klein:

Robert F. Dalton has permission to access and use archival data from our residential treatment program for research and dissertation purposes. The data includes demographic and assessment information (excluding names and identifying information) covering the time period of January 1999 to January 2001. If you have any questions please contact me.

Sincerely,

Franklin D. Hurt Ph.D.
Clinical Director

700 Bryden Road, Columbus, Ohio 43215-4804
APPENDIX C

PERMISSION FROM RESEARCH PRESS
PERMISSION IS GRANTED TO:  
Robert F. Dalton  
11951 Center Village Road  
Westerville, Ohio 43082-9224  

DATE: August 5, 2005

FOR THE USE OF:

HOW I THINK QUESTIONNAIRE; one table from the HOW I THINK MANUAL)

IN THE FORTHCOMING WORK:

Doctoral dissertation

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APPENDIX D

HUMAN SUBJECTS REVIEW
To: Michael Kline  
Date: September 6, 2005  

2005E0456 COGNITIVE DISTORTIONS ASSOCIATED WITH TYPE AND FREQUENCY OF SUBSTANCE ABUSE USAGE, Michael A. Kline, Robert F. Dalton, Physical Activities and Educational Services

The protocol was determined to be exempt in category: 4

The research has been approved for the following waivers

- Waiver of written consent

The Ohio State University has assured the Federal Government and the Department of Health and Human Services that all research activities related to human subjects will be guided by the ethical principals of the Belmont Report.

As principal investigator, you are reminded of the following responsibilities:

- This approval is contingent on acceptance of ultimate responsibility for the ethical performance of the research and the protection of the rights and welfare of human subjects.
- No research activities may be initiated without IIRB review or determination of exemption from LRB review.
- You are reminded that you must promptly report any problems to the Office of Responsible Research.
- No procedural changes may be made in exempt research.
- You are also reminded that the identity of the research participants must be kept confidential unless the subject specifically consents to the reporting of personally identifying information

Date: September 6, 2005
Signed: Toni Colvin.  
Administrator responsible for the determination of exemption

Exempt Approval letter (08.05)