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Psychosocial Correlates of Methamphetamine Use

Greg Joseph Eisinger
University of Tennessee, Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Greg Joseph Eisinger entitled "Psychosocial Correlates of Methamphetamine Use." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science in Social Work, with a major in Social Work.

David Patterson, Major Professor

We have read this thesis and recommend its acceptance:

John Wodarski, William Nugent

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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PSYCHOSOCIAL CORRELATES OF METHAMPHETAMINE USE

A Thesis
Presented for the
Master of Science in Social Work
Degree
The University of Tennessee, Knoxville

Greg Joseph Eisinger
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DEDICATION

I dedicate this thesis to my parents, Barbara and Eugene Eisinger.
Without the guidance, support, and brilliant example of these two incredible people,
this high level of academic pursuit could never have been possible.
May they live long!

Acknowledgments

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Lastly, I would like to acknowledge the participants themselves, for giving their time, sharing their stories, and working so hard to fight this insidious addiction. Many of them are walking examples that recovery from this drug IS POSSIBLE and that it is a myth to say otherwise.

Abstract

Methamphetamine (MA) abuse is a devastating problem which has been sweeping the United States from west to east and has reached epidemic proportion in many areas. Literature on the drug itself, its history, and effects are reviewed. The current project aimed to examine the psychosocial correlates of MA use using Hudson's Multi-Problem Screening Inventory (MPSI).

The MPSI was given to a control group of undergraduate social work students (n=17) and a group of past-year MA users (n=15). All participants supplied demographic information and completed a questionnaire on their MA-use habits. Differences between users and non users were examined across the 27 domains of the MPSI, and subscales for which MA users exceeded the clinical cutting score were noted. In addition, the correlation between severity of craving for MA and MPSI scores was examined.

MA users differed significantly from non users on the depression, partner, child, and neighbor problems, aggression, fearfulness, ideas of reference, phobias, guilt, disturbed thinking, memory loss, and drug abuse subscales. MA users exceeded clinical cutting scores on all of these scales except child problems, fearfulness, and ideas of reference, in addition to self-esteem, sexual discord, personal stress, friend, school, and coworker problems, and confused thinking. Severity of craving was correlated with MPSI score on all MPSI scales *except*, self-esteem, sexual discord, mother, father, friend, coworker, school, and family problems, suicide, non-physical abuse, and alcohol abuse. Interesting findings regarding the control group are also discussed.

Preface

The study described in the following pages represents the author's first attempt at conducting original research. All the studying, practicing, and supervision in the world cannot truly prepare one for the practical aspects, frustrations, and challenges of designing and executing a valid empirical study. I am making this preface simply to point out that the experience of doing this project has taught me something at just about every single step of the process, things that would likely change the way I do things were I doing them over. While these "learning experiences" do not necessarily degrade the validity of the findings, they do account for some of the decisions that were made regarding the research question, recruitment, methodology, and analysis.

I would also like to point out the limited generalizability of this study. Although the specific limitations of this study are discussed at more length within the body of this paper, they should also be mentioned as a something of a disclaimer on what you are about to read. Some of these problems are: small sample size, unequal demographic characteristics between groups, regional isolation, poly-substance use by MA users, and the presence of substance use and clinical psychosocial pathology amongst non users. Though not completely damning for the validity of this study, these (and other) variables may have created illusory correlations or caused type II errors. Having stated the preceding, I would also like to acknowledge that this study *does* bring valuable, previously-unresearched information to the field and serves as a foundation for further research.

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Chapter 1:

Introduction and Background of the Methamphetamine Problem

What is Methamphetamine?

Methamphetamine (MA) is a powerful psychomotor stimulant of the central nervous system (CNS), the non-medical use of which has reached epidemic proportions in many areas across the nation (Miller & Kozil, 1991; Cunningham & Thielemier, 1995; Anglin, Burke, Perrochet, Stamper, & Dawud-Nouris, 2000). The chemical composition of MA nearly mirrors that of pseudoephedrine, a commonly-used, over-the-counter cold medicine (Center for Health and Health Care in Schools [CHHCS], 2004). The MA molecule, in fact, differs from pseudoephedrine and ephedrine by no more than the absence of a single atom of oxygen (R. Rawson, personal communication, March 20, 2006). As a result, MA can be easily synthesized in a home laboratory using very crude, commercially available, ingredients (Smith, 1969; Allen & Cantrell, 1989; Heischober & Derlet, 1989; Irvine & Chin, 1991). Instructions for making MA via a number of different methods can be obtained readily on the internet and other easily accessible locations (Murray, 1998). Today's MA commonly contains cocaine (Klatt, Montgomery, Namiki, & Noguchi, 1986), as well as other potentially hazardous contaminants.

MA can be smoked, swallowed in pill form, snorted, injected, or taken anally (Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). Intravenous use is associated with poorer outcomes and greater exposure to infectious disease. In fact, Rawson, Anglin, and Ling (2002) state, that "unless users begin injecting the drug, it may be possible for many individuals to take methamphetamine for a period of years before

intolerable negative consequences of the drug begin to occur" (p. 8). MA must be rendered a water-soluble powder (MA Hydrochloride [HCl]) if it is to be stable enough to be used (Derlet & Heischober, 1990). This snortable form of MA contains impurities and is commonly seen as a white or brown, odorless, crystalline powder known as "crank," "speed," or "chalk" (National Institute on Drug Abuse [NIDA], 1996). MA HCl can also be converted to a liquid form for injection. In order to do so, an oily form of MA known as "paste" or "base" is simply dissolved in water (National Drug and Alcohol Research Centre [NDARC], 2006). A more potent, smokable form of MA is also produced from the powder. According to Derlet & Heischober (1990), "once the methamphetamine HCl is produced, making ice involves a process analogous to making rock candy out of sugar" (p. 626). This form of the drug is pure and looks like clear, solid crystals often referred to as "ice," "crystal," or "glass" (NIDA, 1996). MA is typically smoked in a glass pipe (NDARC, 2006) or by making a small bowl out of aluminum foil, heating the foil from beneath with a lighter, and inhaling the smoke through a straw (Derlet & Heischober, 1990). An average dose of ice or the injectable base is .1 grams, sometimes called a "point" (NDARC, 2006). Users of the low-purity powder (MA HCl) typically use about .5 grams at a time (NDARC, 2006). A person smoking or injecting MA first experiences a blast of euphoric pleasure as a result of a large, rapid release of dopamine (Wesson & Smith, 1978; Gawin & Ellinwood, 1988; Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003; R. Rawson, personal communication, March 20, 2006). According to NIDA (1996), the user does not experience this initial intense rush when snorting or taking the drug orally. The desired main effects, which *can* be achieved exclusively in low doses

(Nordahl, Salo, & Leamon, 2003), include euphoria, increased wakefulness/alertness, reduced reaction time, decreased appetite, behavioral disinhibition, increased sexual desire, and perceived sexual performance (Derlet & Heischober, 1990; NIDA, 1996) as well as intensified emotions and altered self-esteem (Gawin & Ellinwood, 1988). The overall syndrome has been described as feeling similar to, and being clinically difficult to distinguish from, the intoxication produced by cocaine (Seiden, 1991). However, lasting somewhere between 7 and 17 hours (Cook, 1991), the duration of the high produced by MA dwarfs that of both powder and rock cocaine (by four, eight, or even ten times; Heischober & Derlet, 1989; Seiden, 1991) as well as d-amphetamine. This does not seem to be *substantially* affected by method of administration (Harris, Boxenbaum, Everhart, Sequeira, Mendelson, & Jones, 2003), although some report that the high from smoking and injecting wears off more quickly than snorting or ingesting orally (Derlet & Heischober, 1990). The effects are also experienced much more quickly when the drug is smoked or injected (within 5-10 seconds as opposed to 3-5 minutes for snorting and 15-20 minutes for ingestion ; Derlet & Heischober, 1990; NIDA, 1996; Office of National Drug Control Policy [ONDCP], 2003).

People who use MA have cited many different reasons for doing so. These reasons vary dramatically and include: decreased need for sleep/reduction of fatigue, improved social competence/confidence, weight-loss, self-medication of psychiatric symptoms, improved productivity, heightened creativity, peer pressure, and sexual enhancement (Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). However, these and other desired effects cited above, quickly transform to their opposites under

chronic use. The ravages of addiction to MA take an extremely powerful hold over its victims. As a surprising anecdote, given the disastrous effects of MA (which will be discussed at length in chapter 2), MA appears to carry less of a stigma on the street than other similar drugs (Pach & Gorman, 2002). This author speculates that this may be related to a historical neglect of MA in drug education and prevention campaigns regarding these consequences.

A Brief History of MA

The first synthesis of amphetamine (AP) occurred in 1887 (Murray, 1998); that of its derivative, MA, followed in 1919 (CHHCS, 2004). The term "AP's" refers to a class of stimulants containing amphetamine, dextroamphetamine, and MA. Although MA and AP are very closely related in terms chemical structure and psychophysical effects, MA has much more powerful effects on the central nervous system (NIDA, 2005). AP's entered the licit market in the form of a nasal inhaler prescribed to reduce the congestion associated with allergic rhinitis (Snyder, 1986; Murray, 1998); use in the treatment of narcolepsy began in 1935 (Murray, 1998). In the later 1930's, AP's became popular amongst college students, businesspeople, truck drivers, and athletes for its stimulant properties (Murray, 1998). During World War II, use of AP's went international as Canadian, German, and English soldiers found them useful in counteracting fatigue during combat (Spotts & Spotts, 1980). After the War, MA became extremely common in the US as well as Japan, Great Britain, and Sweden (Kramer, Fischman, & Littlefield, 1967; Inghe, 1969; Brill & Hirose, 1969). During the 50's and 60's, AP use continued to increase in the US, to an epidemic level in some areas of California (Smith, 1969). It was

during the 1960's that intravenous use came on the scene (Murray, 1998). Once the Controlled Substance Act of 1970 placed restrictions on the various supply chains of AP, users and dealers sought out a new source of product and found it in MA, which could be produced more easily (Derlet & Heischober, 1990).

Although illicit synthesis and distribution of MA had been occurring since the 1960's (Murray, 1998), clandestine laboratories began to spring up at an exponential rate throughout the 80's, particularly on (though not confined to) the west coast and Hawaii (Irvine & Chin, 1991). Before that time, MA production and distribution had been largely controlled by large, organized biker gangs like the "Hell's Angels," that created the substance from its precursor chemicals in remote areas in which the fumes could go unnoticed (Irvine & Chin, 1991; Drug Enforcement Agency [DEA], 1996; Rawson, Anglin, & Ling, 2002). Throughout the early 1990's, these groups started to be replaced by Mexican drug-cartels (DEA, 1996) and small, home-run, clandestine operations as the primary suppliers of American MA (Rawson, Anglin, & Ling, 2002). According to Pach and Gorman (2002), today's high-purity MA, produced using the red phosphorous method, is normally brought into the US by the Mexican-based organized traffickers, while lower-quality MA typically originates with the small, home-based laboratories and motorcycle gangs.

Although continually available previously, the illicit use of MA experienced a dramatic resurgence in the late 1980's and the 1990's (Miller & Kozel, 1991; Community Epidemiological Work Group, 2000). Certain authors with ears-to-the-ground on the west coast (Derlet & Heischober, 1990, among many others) were able to predict this trend as

it was just beginning. Others still saw warnings about the potential spread of MA as unfounded media and governmental scare-tactics, creating an unnecessary sense of public hysteria about the drug (Lauderback & Waldorf, 1993; Jenkins, 1994). As the statistics collected throughout the 1990's reveal, such warnings turned out not to be so unwarranted.

The number of people trying MA at some point in their lives increased by 150% in the second half of the 90's alone (Substance Abuse and Mental Health Services Administration [SAMHSA], 2000). Between 1991 and 1994, national MA-related emergency room visits jumped 256% (SAMHSA, 1995) according to one estimate, and 350% according to another (Molitor, Truax, Ruiz, & Sun, 1998). Admissions to treatment centers for MA-related reasons also increased drastically (Cannon, 1996), more than double, in fact, between 1992 and 1997 alone (SAMHSA, 1999). Between 1994 and 2000, seizure of clandestine laboratories in the US increased by 594% (DEA, 2001).

As the DEA (2006) and others (e.g. Fox, Kass, & Christeson, 2006) point out, the spread of the MA epidemic during the 1990's began on the west coast, and has quickly flowed eastward to encompass nearly the entire US. The one region which has yet to be overtaken by MA is the east coast, particularly northeast (SAMHSA, 2003; DEA, 2006).

A Public Broadcasting Service (PBS) documentary entitled *The Meth Epidemic* explores the history, present state, and future of the national MA epidemic (2005). In this film, the authors emphasize a trend in MA use during the 1990's. Although a steady increase is the overall pattern in the 1990's, it was shown that there were sharp decreases 1996 and 1999. Specifically, it was found that demand for MA (and the problems

associated with its use) covaries nearly perfectly with the average purity of the substance. In an interview, one of the researchers (PBS, 2006), Steve Suo, speculates on several explanations for this trend. First, when a drug is purer, its effects become more desirable. Conversely, when purity is low, people are less likely to become addicted to it. Finally, Suo states that market mechanisms similar to those of other commodities are at work. If someone is paying the same price for a gram of MA, they are likely to buy more when the effects are stronger and last longer. It is as if they are paying less for the same "amount" of high. According to Puder, Kagan, and Morgan (1988), street had MA become almost completely pure during the late 1980's. According to SAMHSA (2003), however, average purity decreased from 72% to 40% between 1994 and 2001.

Several governmental efforts have attempted to capitalize on this effect and control the supply and purity of MA by limiting access to precursor chemicals. Cunningham and Liu (2003) examined the impact of several of these large-scale legislative interventions targeting the MA problem on reducing MA-related hospital admissions. The first governmental initiative described was the Chemical Diversion and Trafficking Act of 1989. This law regulated the bulk, powder form of MA precursors pseudoephedrine and ephedrine. Following the passage of this act, MA-related hospital visits took a sharp decline which lasted for about two years (Cunningham & Liu, 2003). In 1995, the Domestic Chemical Diversion and Control Act continued this cause by regulating *products* in which ephedrine was the sole active ingredient. The steep drop in MA-users needing emergency medical care which followed lasted about six months (Cunningham & Liu, 2003). The Comprehensive Methamphetamine Control Act of 1997

took it one step further by regulating *any* product containing pseudoephedrine, regardless of the presence of other active ingredients and achieved a decline in emergency room admissions which lasted for about one year (Cunningham & Liu, 2003).

The Current National Impact of the Methamphetamine Epidemic

MA has been described by many as the worst drug problem in America currently (Jefferson, 2005; Fox, Kass, & Christeson, 2006; DEA, 2006). In 2003, there were more than twice as many amphetamine (including MA) users as cocaine users and more than three times as many as heroin users worldwide (United Nations Office on Drug and Crime, 2003). Rawson, Anglin, and Ling (2002) report that MA use worldwide is exceeded only by that of marijuana. SAMHSA (2005) reported a national past-year-use prevalence among persons age 12 and older of .6% in 2004. Having begun on the west coast and gradually spread eastward, many of the areas on and near the Pacific coast have been hit the hardest by the ravages of MA. Some areas of California, for example, had more admissions to treatment in 2001 for MA than for alcohol (Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003; California Department of Alcohol and Drug Programs, 2001). In some western states, such as Oregon, MA has also become the leading cause of property crime as well as the leading reason for children being removed from their homes (PBS, 2006). According to the ONDCP (2002), MA "accounts for 33 percent of domestic violence among drug sellers" as well as "substantial percentages of nonviolent crime (20 percent), violent crime (16%), prostitution (15 percent), and gang-related crimes (12 percent) among sellers" (p. 1). Despite the continued pervasiveness of MA use nationally, no increase in use was noted between 2002 and 2004 (SAMHSA, 2005). Encouragingly,

the number of clandestine labs seized actually *decreased* between 1999 and 2004 (NIDA, 2005).

Meth and HIV.

A vast amount of research has addressed the influence of MA on the spread of HIV and other infectious diseases (Frosch, Shoptaw, Huber, Rawson, & Ling, 1996; Anderson & Flynn, 1997; Gorman, Barr, Hansen, Robertson, & Green, 1997; Centers for Disease Control [CDC] 1998; Needle, Coyle, Cesari, Trotter, Clatts, Koester, Price, McLellan, Finlinson, Bluthenthal, Pierce, Johnson, Jones, & Williams, 1998; Gorman & Carroll, 2000; Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). Although transmission of pathogens is a concern with any intravenously administered drug, it is especially rampant with MA use. One study of individuals entering a substance abuse treatment facility found MA injectors three times more likely than injectors of other drugs to test positive for HIV (Harris, Thiede, McGough, & Gordon, 1993). No more recent information on this phenomenon was uncovered. However, this disparity is likely to persist due to the interplay of risk factors already commonly associated with intravenous drug such as sharing of dirty needles, and the increase in sexual desire (Klee, 1993), number of partners (Zule & Desmond, 1999), and sexual risk-taking behaviors (such as increased vaginal/anal intercourse and decreased condom use) commonly reported by MA users (Frosch, Shoptaw, Huber, Rawson, & Ling, 1996; Molitor, Ruiz, Flynn, Mikanda, Sun, & Anderson, 1999). The drug's status as a "sex-drug" among urban "men who have sex with men" (MSM), also plays a role (Mattison, Ross, Wolfson, & Franklin, 2001; Mansergh, Colfax, Marks, Rader, Guzman, & Buchbinder, 2001;

Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). The relationship between MA and HIV will be mentioned again in Chapter 3.

Prescribed use.

MA continues to be prescribed for the treatment of narcolepsy (Mitler, Hajdukovic, & Erman, 1993), obesity (King & Ellingwood, 1992), and ADHD (Kroutil, Van Brunt, Herman-Stahl, Heller, Bray, & Penne, in press). This practice, the extent of which is largely unknown, is quite controversial due to the high potential for redistribution, misuse, and addiction. However, as Kroutil, Van Brunt, Herman-Stahl, Heller, Bray, & Penne (in press) point out, the majority of misuse of prescribed stimulant medications involves drugs other than MA. This may be related to the relatively limited availability of prescription MA as compared with that of other drugs such as methylphenidate and dextroamphetamine.

Treatment.

It is also important to briefly discuss the treatment and prognosis of MA dependence. It has been a myth amongst the public, as well as certain researchers and treatment professionals, that full recovery from MA addiction is simply not possible. However, any investigation into the research on the subject quickly dispels this notion. Several studies comparing treatment outcomes for cocaine dependence versus MA, for example, found no major differences between the two groups (Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson, 1997; Rawson, Huber, Brethen, Obert, Gulati, Shoptaw, & Ling, 2000). While the unique physiological mechanisms by which MA addiction takes

its firm hold on the body create special challenges for recovery, they do not render it impossible.

Although an in-depth discussion of the specific treatments available for MA dependence is outside of the scope of this paper, several treatment models which have been associated with positive outcomes, will be mentioned briefly. The most well-known intervention is called the MATRIX model and is well-supported by empirical research (Shoptaw, Rawson, McCann, & Obert, 1994). According to Huber, Ling, Shoptaw, Gulati, Brethren, & Rawson (1997), the MATRIX model "is designed to integrate several disparate interventions into a comprehensive, structured approach. Elements of the treatment include individual therapy, relapse prevention and family education groups, urine testing, and 12-step program involvement" (p. 44). The treatment manual for this program is available (see Rawson, Obert, McCann, Smith, & Scheffey, 1989).

As of yet, the pharmacological treatment of MA dependence is largely confined to the symptoms of depression and psychosis induced by neurochemical/structrual damage, and the medical symptoms of overdose and acute withdrawal (R. Rawson, personal communication, March 20, 2006). Tri-cyclic antidepressants are commonly used to address the former (Wesson & Smith, 1978). One trial of the tri-cyclic antidepressant imipramine with 32 MA-dependent individuals, however, produced no significant changes in Beck Depression Inventory score, stimulant craving, self-report of time since last use of stimulants, or percentage of urinalyses positive for [the drug]" (Galloway, Newmeyer, Knapp, Stalcup, & Smith, 1994). However, antipsychotic medications such as chlorpromazine and haloperidol are helpful with the some of the symptoms of

withdrawal (Bell, 1973; Espelin & Done, 1968; Snyder, 1973). In regard to the physiological symptoms, Derlet & Heischober (1990) report that there has been some success in using phentolamine and nitroprusside to address MA-induced hypertensive crisis, and haloperidol to stabilize blood pressure.

Impact on children.

Unfortunately, given the frequency with which children are found by law enforcement living at MA labs, very little is known about the long-term consequences of inhaling MA vapors on children's health and development (CHHCS, 2004). Dixon & Bejar (1989) found that children whose mothers use stimulants during pregnancy are at heightened risk for brain injury, even in full-term births.

Johnson (2005) does an excellent job of describing the impact of this drug on children whose parents are users in his book entitled *Meth: The Home-Cooked Menace*. He states that "for children living with parents on meth, going hungry is just part of the bargain. Meth users don't eat because they don't get hungry, so they often forget that their kids needs" (p. 56). Johnson also points out that hallucinations, delusions, and increased libido often result in severe physical and sexual abuse of children. In addition, many children who are exposed to MA fumes in their homes actually test positive for the substance, triggering many of the same effects experienced by the users themselves (Johnson, 2005). Though largely unknown, the long-term effects of exposure to the fumes created by cooking MA are likely to be quite detrimental for development and health. Of course, these types of problems are mentioned because of the severe harm and trauma which they create for children. However, less devastating effects, such as lack of

structure, discipline, hygiene, affection, and distorted social learning, are equally notable and occur extremely frequently in the homes of MA users. Johnson (2005) describes one family in which two children, a two-year old and a four-year old, were found who had never learned to drink from a cup, use the toilet, or speak normally, and had rotted-out teeth.

Environmental impact.

A major concern regarding the current state of MA production is its deleterious effects on the environment in which it is cooked. According to Irvine and Chin (1991), "the chemicals used in the manufacturing process can be corrosive, explosive, flammable, toxic, and possibly, radioactive" (p. 36). These authors also point out that, due to the amateur status of MA cooks, they often use improper proportions of various ingredients, resulting in the creation of extremely toxic byproducts, which are typically not disposed of in an environmentally safe manner. The introduction of these chemicals, and other ingredients, to the air, ground, and the water table can produce hazardous conditions for residents of an entire community. The effects of MA production also have more localized effects. As several authors point out, once MA has been cooked in a house, it is difficult to *ever* get the smell completely out (Johnson, 2005). In addition, these lingering vapors themselves may be strong enough to be deadly for those who inhale them (Irvine & Chin, 1991).

Current governmental interventions.

Although federal response to the epidemic of MA use has been criticized as slow (Rawson, Anglin, & Ling, 2002), notable legislative progress has been made. As

mentioned, the passage of several laws (including the Controlled Substance Act of 1970, the Chemical Diversion and Trafficking Act of 1989, the Domestic Chemical Diversion and Trafficking Act of 1995, and the Comprehensive Methamphetamine Control Act of 1997) have been successful in producing significant, though short-lived, decreases in MA use. The Food and Drug Administration (Rados, 2004) has also recently helped to limit precursor access by banning the sale of any dietary supplement containing ephedrine. This policy, however, was precipitated by the adverse health effects of ephedrine, rather than its contribution to clandestine MA production, and data on its impact on MA availability is not available. The DEA (2006) reports that although federal initiatives have been successful in reducing the number of home-run clandestine laboratories by controlling precursors, it is not expected that this will greatly affect national MA use. This is because the Mexican cartels, which now control the majority of importation of MA, have the ability to increase production to a degree which offsets US government efforts. However, stiff legal penalties are also in place as deterrents for potential users. According to US representative Judy Biggert (HR4553: *The Club Drug Antiproliferation Act*, 2000), the current sentencing guidelines for possession of one gram of MA are equivalent to those for two kilograms of marijuana, substantially more severe than that of ecstasy and other drugs.

Included in the wording of the latest revision of the USA PATRIOT Act expected to be signed into law in 2006, the Combat Methamphetamine Epidemic Elimination Act will be "the most important meth bill that's ever been passed by the United States Congress" (Suo & Barnett, 2006, p. 1). Beginning on September 30, 2006, all products

containing pseudoephedrine must be kept behind the counter with buyers having to show identification in order to purchase them. Consumers will also be limited to purchasing 120 pills in a day and 300 pills in a month. This act goes one step further to combat mass-production of MA in other countries by enforcing economic sanctions against nations which allow importation of precursor chemicals beyond "legitimate demand" (Suo & Barnett, 2006).

Currently awaiting its day to be heard before the full House of Representatives, the Methamphetamine Epidemic Elimination Act (MEEA; 2005) seeks to "further regulate and punish illicit conduct relating to methamphetamine" (p.1). The provisions of this bill seek to impose stricter regulations and penalties on the domestic and international distribution of MA precursor chemicals (pseudoephedrine, ephedrine, phenylpropanolamine), toughen punishments for MA production and trafficking, increase monitoring of environmental effects of MA production, and provide grants to drug court programs, MA availability reduction initiatives in "hot spot" areas, and programs that help drug-endangered children.

As Rawson, Anglin, & Ling (2002) point out, regulation of the supply of precursor chemicals cannot be the only counterattack against this modern menace; complete elimination of the supply of chemicals like pseudoephedrine is simply not feasible due to their licit utility. It is also starkly stated in the above article that, "at present, there are few signs to suggest that the methamphetamine epidemic of the 1990's will simply become an unpleasant memory, as did the PCP epidemic of the 1970's" (p. 8). As Reuter and Caulkins (2003) point out, governmental effort now needs to focus on the

durability of the impact following legislative intervention. The authors point out the limited utility of MA-related emergency room admissions *alone* as an indicator of MA-use. They also state that other indicators give ambiguous results as to whether the governmental initiatives are having an effect at all. For example, "precursor control is a supply-side intervention that should drive up prices. As it becomes more difficult to find precursors, production costs rise until suppliers develop new sources (perhaps in other countries) or new technologies. Higher prices should lead to fewer persons using and/or lower quantities consumed per user" (Reuter & Caulkins, 2003, p. 1177). Price of MA, however, has been falling somewhat continually for the past 20 years (ONDCP, 2004). One further card in the hand of MA, is that it typically much less expensive than other similar drugs (Pach & Gorman, 2002), costing as little as 25% as much as cocaine (Rawson, Anglin, & Ling, 2002). As of 2003, one gram of low-grade MA could be bought on average for as little $50 (ONDCP, 2004).

Chapter 2:

A Review of the Known Correlates and Consequences of MA Use

Neurochemical

The devastating impact of MA use begins with its toxic effects on the body. Perhaps most destructive, is the way in which MA manipulates neurochemical characteristics of the human brain. The immediate effect of MA is a large release of dopamine (R. Rawson, personal communication, March 20, 2006) creating a consequent rush of pleasure, which has been described as sexual in nature (Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). This release represents six times that created by nicotine, three times that of cocaine (R. Rawson, personal communication, March 20, 2006), and as much as ten times that of an orgasm (Associated Press, 2004). MA also, however, essentially "clogs" dopamine reuptake pumps, causing a long-lasting depletion of dopamine in the vesicle (Wagner, Seiden, & Schuster, 1979; Wagner, Ricaurte, Seiden, Schuster, Miller, & Westly, 1980). Males may be more susceptible to this MA-induced depletion of dopamine than females (Wagner, Tekirian, & Cheo, 1993).

As a result of the blocked reuptake, dopamine begins to accumulate in the synapse. Dr. Richard Rawson states (personal communication, March 20, 2006) that while cocaine is known to produce a similar inhibitory effect on dopamine reuptake, MA goes even further by crossing the pre-synaptic cell wall to drive dopamine out into the synapse. This results in spontaneous firing and over-stimulation of the postsynaptic neuron and the creation of free radicals which damage the nerve terminals themselves (Scheel-Krueger, 1972; Pitts & Marwah, 1988). Dopaminergic neurotoxicity is the term

for the damage to dopamine receptors and terminal buttons that results from this buildup of cytoplasmic pools of dopamine in the synapse (Ricaurte, Guillery, Seiden, Schuster, & Moore, 1982; Wagner & Walsh, 1991).This condition has been associated MA use in both humans and rats in numerous studies (e.g. Kogan, Nichols, & Gibb, 1976; Fuller & Hemrick-Luecke, 1980; Ricaurte, Guillery, Seiden, Schuster, & Moore, 1982; Gibb, Johnson, & Hanson, 1990; Robinson, Yew, Paulson, & Camp, 1990; Itzhak, Gandia, Huang, & Ali, 1996).

MA impacts not only dopaminergic neuropathways, but nearly every neurotransmitter in the brain (Nordahl, Salo, & Leamon, 2003). MA also decreases the activity of tyrosine hydroxylase (an enzyme which inhibits the metabolism of catecholamines) and reduces the number of dopamine transporter pumps (Kogan, Nichols, & Gibb, 1976; Itzhak, Gandia, Huang, & Ali, 1996; McCann, Wong, Yokoi, Villemagne, Dannals, & Ricaurte, 1998). This loss of dopamine transporter pumps is associated with psychomotor impairment producing symptoms similar to those of Parkinson's Disease (Volkow, Chang, Wang, Fowler, Leonido-Yee, Franceschi, Sedler, Gatley, Hitzemann, Ding, Logan, Wong, & Miller, 2001) as well as a high likelihood of experiencing residual psychiatric symptoms such as psychosis (Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001). Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, and Mori (2001) found that this depletion of dopamine transporters, and consequent induction of psychiatric and psychomotor symptoms, may be persist long after cessation of use, especially when the duration of use was longer.

MA also has deleterious effects on areas of the brain other than those innervated by dopamine, such as the cortex (Eisch & Marshall, 1998; Deng, Ladenheim, Tsao, & Cadet, 1999; Stumm, Schlegel, Schafer, Wurz, Mennel, Krieg, & Vedder, 1999; Volkaw, Change, Wang, Fowler, Franceschi, Sedler, Gatley, Hitzemann, Ding, Wong, & Logan, 2001). The density of serotonin transporter molecules is reduced by repeated administration of MA, resulting in elevated aggression which may persist long after cessation of use (Sekine, Ouchi, Takei, Yoshikawa, Nakamura, Futatsubashi, Okada, Minabe, Suzuki, Iwata, Tsuchiya, Tsukada, Iyo, & Mori, 2006). Noradrenergic reuptake is also inhibited in the by the use of MA (Murray, 1998), with effects on cognition.

At a lecture entitled *The Nature of the National Methamphetamine Epidemic* (March 20, 2006), Dr. Richard Rawson described the pscyho-affective implications of the catecholamine depletion and nerve terminal damage for the brain's natural reward system. He states that a chronic MA user quickly begins to experience a diminished ability to feel pleasure and to be intrinsically reinforced by anything other than the release of dopamine achieved upon getting high. Journalist Dirk Johnson (2005) reports in his book *Meth: The Home Cooked Menace* that MA cravings are so powerful that users experience a Pavlovian effect in which the very thought of using causes a small dopamine release. He (and others; e.g. R. Rawson, personal communication, March 20, 2006) also points out that, after periods of 6-12 months or more of abstinence, many recovering MA addicts will regain these important neurochemical functions. Some research on rhesus monkeys, however, has found that the effects of MA-induced neurotoxicity can persist for as much as four years or more of abstinence as measured by decreased concentrations,

and reuptake, of dopamine and serotonin in several brain regions (Woolverton, Ricaurte, Forno, & Seiden, 1989).

Neuro-Structural

Thompson, Hayashi, Simon, Geaga, Hong, Sui, Lee, Toga, Ling, and London (2004) charted the structural brain damage associated with MA use using magnetic resonance imaging (MRI). They found a significant loss of gray matter (the part of the CNS containing neurons) in several areas of the limbic system (responsible for emotional responding), as well as excessive thickening and expanding of white-matter cells, in MA users. A reduction in hippocampal volume was also observed and correlated with impaired performance on a memory-recall task. The authors note the reversibility of these injuries is, as of yet, unknown.

Physical

The use of MA is also associated with numerous disturbing effects on the exterior of the body itself. One of the most tell-tale signs of a MA user is their teeth. Often termed "meth-mouth," the teeth of MA users become "blackened, stained, rotting, crumbling, or falling apart" (American Dental Association [ADA], 2005, p. 1) for a number of reasons. According to the ADA (2005), the drug itself is acidic, causing wear on the tooth enamel. The ADA also cites reduction of saliva, increased consumption of carbonated drinks, increased tendency to grind teeth, and extended periods of neglect of oral hygiene as factors in the "meth-mouth" syndrome.

In addition to dental consequences, MA use also frequently leads to the development of skin lesions created by compulsive picking at the skin caused by

delusional parasitosis, needle marks, and burns suffered during cooking the drug (Lineberry & Bostwick, 2006). The term "meth bugs" refers to a tactile hallucination of small insects crawling on and under the skin. MA users often scratch and pick at these "bugs" to the point of developing deep, open sores. So-called "track" marks are the "visible scarring of skin along surface vein areas due to repeated injection" and are associated with the use of *any* injection drug. This type of lesion has even been used as criteria for ensuring that all participants in a study are in fact injection drug users (Bluthenthal, Kral, Gee, Erringer, & Edlin, 2000). Finally, the production of MA in home-based clandestine labs uses flammable and explosive chemicals, the improper mixing of which can lead to violent chemical reactions (Hart, McChesney, Grief, & Schultz, 1972). For this reason, MA cooks are frequently treated in emergency rooms with severe burns which require immediate medical intervention (Lineberry & Bostwick, 2006). The volatile environments created by MA labs are a danger to, not only the cooks themselves, but their children, family members, and law enforcement officers.

Medical

MA use is associated with numerous harmful effects to the various systems of the body. Tachyphylaxis (rapid development of tolerance) is extremely common with MA (Smith, 1969) and long-time chronic users have been known to use as much as 5 - 15 grams per day. However, overdoses have been produced at dosages as low as 1.5 mg (Zalis & Parmly, 1963); this is likely an unusual case. Symptoms of overdose include agitation, anxiety, hallucinations, delerium, and seizures (Derlet & Heischober, 1990), as well as disorientation, hyperthermia, photophobia, orthostasis, and ataxia (Buffum &

Shulgin, 2001). Death via several different bio-mechanisms can occur (Kramer, Fischman, & Littlefield, 1967; Zalis, Lundberg, & Knutson, 1967; Conci, D'Angelo, Tampieri, & Vecchi, 1988). MA has been associated in a number of cases with stroke (Perez, Arsura, & Strategos, 1999; Wang, Hayashi, Chang, Chiang, Tsao, Su, Borlongan, & Lin, 2001). According to Perez, Arsura, & Strategos (1999), this condition is caused by either drug-induced exacerbation of preexisting hypertension leading to blood vessel rupture, or vasoconstriction resulting in arterial obstruction; cerebrovascular hemorrhage has also been attributed MA (Chyun, 1975; Salanova & Taubner, 1984).

Greenwell and Brecht (2003) conducted a highly controlled, retrospective study of self-reported general health status among MA users between 18-52 years old. It was found that the presence of a health condition is predicted, as would be expected, by age as well as prolonged MA use. Other research, however, has found that MA users are no more likely than users of other drugs to experience adverse health consequences (Anglin, Kalechstein, Maglione, Annon, & Fiorentine, 1998). Menstrual irregularities and reproductive difficulties have been associated with MA use in women (Pach & Gorman, 2002).

Continued MA use puts a strain upon the cardiovascular and respiratory systems. Some common symptoms include tachycardia, hypertension, vasoconstriction, cardiac dysrhythmia (Leschner, 2000), chest pain (NIDA, 1996), palpitations, and dyspnea (Derlet & Heischober, 1990). Pulmonary edema and reduction of lung capacity have also been associated with MA use, especially when the drug is smoked (Hong, Matguyama, & Nur, 1991). Less common side-effects include hyperthermia, convulsions (NIDA, 1996;

Hoffman, & Lefkowitz, 1993), rhabdomyolysis (breakdown of skeletal muscle and its consequent contamination of the blood stream; may lead to renal failure; Chan, Chen, Lee, & Deng, 1994; Lan, Lin, Yu, Lin, & Chu, 1998), choreoathetosis (an involuntary tic; Rhee, Albertson, & Douglas, 1988), and myocardial infarction (Hong, Matsuyama, & Nur, 1991).

Acute withdrawal symptoms last for several weeks and include severe craving, anhedonia, anergia, and dysphoria (Watson, Hartman, & Schildkraut, 1972; Gawin, Byck, & Kleber, 1986; King & Ellinwood, 1992; Hyman, 1996). Many of these symptoms however, persist for much longer (about 6-12 months) after abstinence from use (R. Rawson, personal communication, March 20, 2006).

As mentioned, MA use is a risk factor for HIV contraction (Baberg, Nelesen, and Dimsdale, 1996; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005). MA users who are also MSM are at markedly higher risk for contracting HIV (Chesney, Barrett, & Stall, 1998; Molitor, Truax, Ruiz, & Sun, 1998; Weber, Chan, George, Hogg, Remis, Martindale, Otis, Miller, Vincelette, Craib, Masse, Schechter, LeClerc, Lavoie, Turmel, Parent, & Alary, 2001); this risk is even further exacerbated when the primary route of administration is injection, due to unsafe injection practices (Molitor, Ruiz, Mikanda, & Sun, 1996; Bluthenthal, Kral, Gee, Lorvick, Moore, Seal, & Edlin, 2001; Pach and Gorman, 2002). This problem, however, affects not only MSM, but increasingly so, heterosexual males (Molitor, Ruiz, Mikanda, & Sun, 1996) and women as well (CDC, 1999).The increased tendency to engage in risky behaviors when under the influence of MA also contributes to transmission (Frosch, Shoptaw, Huber, Rawson, & Ling, 1996).

MA has been correlated with an increased rate of selling sex for money or drugs (Molitor, Ruiz, Mikanda, & Sun, 1996). HIV-infected MA users are also at increased risk contracting other sexually transmitted diseases such as genital warts, gonorrhea, syphilis, and Hepatitis B and C (Shoptaw, Reback, & Freese, 2002; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005) as a result of risky behaviors.

Psychiatric

Users of AP's have been found to be more likely to have a history, as well as a family history, of a psychiatric disorder than non users (Baberg, Nelesen, and Dimsdale,1996). Chronic use of MA is correlated with depression (Kalechstein, Newton, Longshore, Anglin, van Gorp, & Gawin, 2000; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005), increased impulsivity (Richards, Sabol, & de Wit, 1999), anxiety and hypervigilance (Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001), stereotypy and compulsivity (King & Ellinwood, 1992; Murray, 1998), and very often induces long-lasting psychosis including paranoid ideation, delusions (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001), and formication (tactile hallucinations of bugs on/under skin; NIDA, 1996; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005). Suicidal and homicidal ideation are also common (NIDA, 1996; Kalechstein, Newton, Longshore, Anglin, van Gorp, & Gawin, 2000). Many researchers have noted that the symptoms of full blown cases of MA psychosis are clinically indistinguishable from those of schizophrenia (Bell, 1965; Smith, 1969; Snyder, 1973; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa,

Futatsubashi, Takei, & Mori, 2001; Nordahl, Salo, & Leamon, 2003). As chronic MA psychosis can lead to the onset of paranoid schizophrenia, some authors have even questioned where to draw the line in the fuzzy boundary between the two conditions (Flaum & Schultz, 1996). Bell (1973) was able to induce these symptoms using MA in 14 AP-dependent psychiatric patients. These symptoms persist for 1-2 days on average (Bell, 1973), but may remain for much longer in some users (Nordahl, Salo, & Leamon, 2003). MA psychosis can be spontaneously reproduced by a relapse after a long period of abstinence from use (Sato, Chen, Akiyama, & Otsuki, 1983). Sato, Numachi, and Hamamura (1992) describe three types of clinical outcomes for MA psychosis after termination of use: transient, prolonged, and persistent. Commonly described as "tweaking," Lineberry and Bostwick (2006) describe the syndrome of a MA user coming off of the drug as, "a dangerous combination of restless anxiety, irritability, fatigue, and dysphoria." In order to avoid these symptoms, users commonly seek out more of the drug. In combination with the decreased need for sleep associated with MA use, this pattern has been known to keep users awake for as many as 3-6 days or more, usually using the drug every couple of hours (Murray, 1998).

Griffith, Cavanaugh, and Oates (1969) induced psychosis in four healthy males by administering 10 mg of AP intravenously every hour. Murray (1998) does an excellent job of summarizing the fascinating progression of the psychosis observed in that study:

> Clear-cut psychosis appeared within 120 hours of drug administration; for two of the four participants, symptoms were clear within 24 hours of drug administration. The first reaction was euphoria. After 50 mg, depression appeared,

> followed by hypochondriacal symptoms and an aversion to food that was so great that they had to be pushed to eat. None of the participants slept during the first 24 hours. All were lucid and in good contact with reality. About eight hours before development of unequivocal psychotic symptoms, they became taciturn and would not discuss their feelings or thoughts. They asked guarded questions about the room and noises. Onset of florid psychiatric symptoms, paranoid ideation, and hallucinations was usually abrupt. (p. 231)

In a 2005 study, Peck, Shoptaw, Rotherman-Fuller, Reback, and Bierman examined the medical, behavioral, and psychiatric correlates of MA dependence in 155 MSM, 98 of which were HIV positive, 57 of which were not. The profile of *current* psychiatric comorbidity for the sample (as evaluated using the Structured Clinical Interview for DSM-IV; Spitzer, William, Gibbon, & First, 1995), was as follows: 31% had *some* non substance-use-related Axis I diagnosis; 28.4% had some mood disorder; 20% currently met criteria for a substance-induced disorder other than abuse or dependence; 18.7% had some anxiety disorder; 14.9% met criteria for antisocial personality disorder; and 2.6% had bipolar I disorder. Bristol (2000) found that abuse of AP's is correlated with development of social phobia.

A number of studies have shown detrimental effects on cognitive performance following sustained use. Rogers, Everitt, Baldacchino, Blackshaw, Swainson, Wynne, Baker, Hunter, Carthy, Booker, London, Deakin, Sahakian, and Robbins (1999) discovered that chronic users of AP's demonstrate delayed and impaired decision making abilities similar to those seen in patients with damage to the orbital prefrontal cortex.

Several studies have found that MA-dependent individuals exhibited reduced cognitive inhibition, creating distractibility and impaired attentional processing and auditory discrimination (Iwanami, Kanamori, Suga, Kaneko, & Kamijima, 1995; Salo, Nordahl, Possin, Leamon, Gibson, Galloway, Flynn, Henik, Pfefferbaum, & Sullivan, 2002). Simon, Domier, Carnell, Brethen, Rawson, & Ling (2000) examined cognitive impairment in current MA users and found significant deficits on several tasks including recall, digit symbol, Stroop color words, and Trail Making B. These authors also, however, discovered normative performance on recognition tasks, Trail Making A, Wisconsin Card Sort, backward digit span, and the FAS test of verbal fluency. Additional cognitive deficits associated w/ MA use include impaired learning capabilities, psychomotor speed, and information processing ability (Meredith, Jaffe, Ang-Lee, & Saxon, 2005). Other research indicates that MA use may decrease the user's sensitivity to reinforcement delay and amount (Pitts & Febbo, 2004). This effect may relate to the damage to the brain's natural reward system cited earlier and helps to account for the difficulties experienced by MA users during recovery. Impairment in memory has also been correlated with MA use (Thompson, Hayashi, Simon, Geaga, Hong, Sui, Lee, Toga, Ling, and London, 2004), especially as users become abstinent (Kalechstein, Newton, and Green, 2003). Mewaldt and Ghoneim (1979), on the other hand, demonstrated that acute administration of MA can actually improve memory performance on certain tasks.

Demographic

Murray (1998) states that a typical MA user is a "white, lower middle-income, high-school educated young adult, between 20 and 35 years of age" (p. 233). Baberg,

Nelesen, and Dimsdale (1996) sought to describe the demographic characteristics of the typical AP user and also found that most were young, white, male, unmarried, uninsured, and unemployed individuals. In contrast to many other drugs, however, MA users appear to be more equally male and female (Rawson, Huber, Brethren, Obert, Gulati, Shoptaw, & Ling, 2000). Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson (1997) looked at the demographic characteristics of 500 MA users (47.7% daily users) and found a 60-40 ratio of males to females, a significantly less dramatic split than the 69% male cocaine-using group (n = 224) in the same study. Gorman, Clark, Nelson, Applegate, Amato, and Scrol (2003) speculate that the issues leading to and resulting from MA use for women may differ substantially for those of men.

In the Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson (1997) study, 80.5% of the 500 MA users were caucasian, compared to only 16.7 % Hispanic, and 1.9% African American. Pach and Gorman (2002) found a less dramatic concentration of white users (67%; n = 1016) and indicate that use among black and Hispanic individuals is increasing. Rawson, Anglin, and Ling (2002) note that MA use among Asian populations is also on the rise. SAMHSA's (2005) National Survey on Drug Use and Health, however, indicate that MA use is most prevalent among native Hawaiian/Pacific Islanders, persons of two or more races, and American Indian/Alaskan natives. In fact, MA use by whites was less than one-third as prevalent as use among the Hawaiian/Pacific Islander group. Of course, the ethnic composition of the region being examined impacts the distribution of races observed among MA users.

Of the MA users in Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson's (1997) study 25.8% were currently married, 25.3% had been previously married, and 48.9% had never been married. In regard to employment, the largest portion of the sample (61.6%) was not currently working, as compared with 27.5% full-time employees, and 10.8% part-timers, 1997). David Jefferson, author of the Newsweek magazine cover story on MA entitled *America's Most Dangerous Drug* states, "the highly addictive stimulant is hooking more and more people across the socioeconomic spectrum: soccer moms in Illinois, computer geeks in Silicon Valley, factory workers in Georgia, gay professionals in New York" (2005). As such, MA use is not just a problem of the poor and blue collar individuals. Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson (1997) also found that MA users were, on average, more than two years younger than cocaine users at the time of first use ($\text{x-bar}_{\text{MA users}} = 21.4$). According to SAMHSA (2006), the average age upon admission to treatment in 2003 was 30.6.

Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson (1997) also recorded the preferred route of administration for each participant. The following distribution was found: 55.4% - intranasal; 22.6% - multiple non-injection routes; 13.5% - injection use; 7.2% - smoking; and 1.2% - oral. In a much larger sample of MA users entering treatment in the state of California ($n = 64, 006$), it was found that 54.6% of users snorted the drug and 20.9% were IV users (Cannon, 1996). SAMHSA (2006) reports a recent shift in this distribution, indicating that nationally 56% of users prefer smoking, 22% prefer injection, 15% prefer inhalation, 6% prefer oral administration, and 1% prefer another method. Preferred route of administration has been said to vary greatly from

region to region (Galloway, Marinelli-Casey, Stalcup, Lord, Christian, Cohen, Reiber, & Vandersloot, 2000; ONDCP, 2002).

Psychosocial

As of the present, little research has *specifically* aimed at profiling the psychosocial correlates of MA (though they have been largely uncovered in many other ways). Thus, information in this area is somewhat sparse and often inferential.

Many studies and self-reports have indicated that MA is highly correlated with a loss of inhibitions and an increase in risky behaviors. Perhaps one of the riskiest behaviors commonly engaged in by MA users is driving while under the influence of the substance. Logan, Fligner, & Haddix (1998) found that, among 146 MA-related fatalities, 14 % percent were related to traffic accidents. Logan (1996) found that MA induces a number of behaviors which severely impair the individual's ability to drive safely including fatigue, hypersomnolence, erratic driving, weaving, and speeding. An increase in sexual desire, perceived performance, and activity during MA intoxication has also been supported by a great amount of data (Gawin, 1978; Bell & Trethowan, 1961; Klee, 1993). This leads to risky sexual behaviors such as greater number of sex partners, more commonly practiced anal sex, and less frequent condom use (Molitor, Truax, Ruiz, & Sun, 1998; Pach & Gorman, 2002). Gorman, Clark, Nelson, Applegate, Amato, and Scrol (2003) found MA use in women to be correlated with sex work (i.e. stripping, pornography, prostitution) as well as chaotic family histories.

MA has become particularly prevalent and influential in the population of MSM (Wainberg, Kolodny, & Drescher, 2006). The 2001 Urban Men's Health Study, reported

that more than 10% of MSM surveyed in both Los Angeles and San Francisco endorsed MA use (Stall Paul, Greenwood, Pollack, Bein, Crosby, Mills, Binson, Coates, & Catania, 2001). MA has become an especially common feature at urban dance-parties known as "circuit parties." Typically attended by MSM, as many as one third of attendees at these events report using MA (Reback & Grella, 1999; Mattison, Ross, Wolfson, & Franklin, 2001; Mansergh, Colfax, Marks, Rader, Guzman, & Buchbinder, 2001).

Yet another unfortunate psychosocial characteristic which is common amongst MA users is interpersonal violence (Pach & Gorman, 2002). Cohen, Dickow, Horner, Zweben, Balabis, Vandersloot, and Reiber (2003) examined this phenomenon in a sample of 1016 MA users enrolled in a multi-site treatment project. Their findings were startling. 85% of the women, and 70% of men, surveyed reported being victims of physical violence. Men were most likely to experience violence from strangers, friends, and parents, while the most common source for women was partners. According to these authors, "interpersonal violence is a characteristic of the lifestyles of the *majority* of persons entering treatment for MA dependence." Although inferences can be made, this study did not address the likelihood of the MA users themselves being perpetrators of violence. The authors also note that the extent to which MA specifically (as compared with other drugs) contributes to this phenomenon. As was mentioned previously, parenting skills appear to diminish very quickly with MA addiction. As such, child abuse and neglect are very common features of the homes of MA users (Altshuler, 2005). This abuse includes exposure to toxic chemicals and fumes as well as more straightforward physical and sexual abuse and neglect. As mentioned, homicidal ideation as well as

suicidal ideation (self-directed aggression), are also known correlates of MA use (NIDA, 1996; Kalechstein, Newton, Longshore, Anglin, van Gorp, & Gawin, 2000). In a study of 146 deaths in which MA was detected in the blood, 27% had resulted from homicide and 15% from suicide (Logan, Fligner, & Haddix, 1998). Baberg, Nelesen, and Dimsdale's (1996) study found AP users more likely than non-users to be admitted to the hospital for suicide attempts. Moril, Itol, Kita, Toshiko, and Sawaguchil (2004) found that high doses of MA induced self-injurious behavior when administered to rats.

Some additional psychosocial consequences may be more universal to drug users in general. These include job loss and interpersonal problems (Morgan & Beck, 1997). Though not specifically delineated, Pach and Gorman (2002) found that a number of social, educational, and occupational difficulties are highly associated with MA use. These types of problems may relate to "amotivational syndrome," a symptom typically associated with marijuana use, but also apparent as a residual symptom of MA abuse (Ashizawa & Saito, 1996). Polysubstance abuse is also quite common amongst MA users. Huber, Ling, Shoptaw, Gulati, Brethren, and Rawson (1997) found that the most commonly co-abused substance amongst 500 MA users was marijuana (56.2% reporting use in the past year). Surprisingly lower numbers, however, were found for cooccurring alcohol abuse. Just 22.5% of this sample reported using alcohol more than once weekly (compared to 31.1% of cocaine users), and an astonishing 33.8% reported that they never use alcohol (compared to 20.1% of cocaine users). 10.8% of the MA-using group also reported using cocaine, and 6.4% had used hallucinogens or PCP within the past year. Only 4.6% had used opiates and 2.8% had used barbiturates. In the study by Peck,

Shoptaw, Rotherman-Fuller, Reback, and Bierman (2005) referenced earlier, just 11% of 155 MA-dependent MSM met criteria for alcohol abuse or dependence and 12.9% met criteria for dependence for a substance other than amphetamines.

Chapter 3:

Purpose, Hypothesis, and Procedures

Purpose

The purpose of the present study was to determine the extent of the influence that MA use exerts on psychosocial functionality as measured by the 27 subscales of the Multi-Problem Screening Inventory (MPSI; Hudson, 1990). The areas assessed by this instrument include: depression, self-esteem, partner problems, sexual discord, child problems, mother problems, father problems, personal stress, friend problems, neighbor problems, school problems, aggression, problems with work associates, family problems, suicide, non-physical abuse, physical abuse, fearfulness, ideas of reference, phobias, guilt, work problems, confused thinking, disturbing thoughts, memory loss, alcohol abuse, and drug abuse. A second purpose of this study was to generate information which would equip addictions treatment practitioners with some *a priori* information about the MA-using clients that come through their doors. Although these individuals will have likely accumulated much of this knowledge through their practice with these clients and research on the topic, this study provides a consolidated resource to which counselors can easily turn in order to organize and solidify their expectations for areas to address during intake interviews as well as potential targets and obstacles of treatment.

Hypothesis

The overall hypothesis of the current study is that MA will have a statistically significant effect on psychosocial functionality. This hypothesis must, however, be broken down due to the nature of the data collected. Psychosocial functionality will be

divided into the 27 areas of the MPSI and will not itself be measured directly. Further, the "effect" of MA will be divided into three separate "sub-hypotheses." Based on the information obtained through literature reviewed above, it is predicted that differences between the experimental and control group will appear in nearly every area of the MPSI. Thus, for each and every subscale, hypothesis #1 will be stated as: The MA-using group will report a mean score which is higher that that of the non MA-using group, to a statistically significant degree. Additionally, however, there are areas in which mean scores for the MA-using group are expected to lie above the clinical cutting score, indicating a "problem" for that scale. For most of the 27 scales, the cutoff score is 30. The only exceptions are the suicide scale (with a cutoff score of 15) and the physical abuse scale (with a cutoff score of 5). To sum up these predictions, hypothesis #2 applies only to the subscales listed below and is stated as: The MA-using group will report mean scores on certain scales which lie above the clinical problem threshold. These specific predictions are delineated and justified below:

Depression - Given the devastating neurochemical impact of MA use on mood modulating transmitters such as dopamine and serotonin, symptoms of depression are likely to be characteristics of nearly all of our MA users. In addition, the individuals surveyed are, for the most part, currently abstinent from MA, meaning that they are no longer experiencing the mood enhancing properties previously obtained through use. As this abstinence is less than one year old for these individuals, it is also likely that natural mood regulation has not yet returned to them.

Self-esteem - As a correlate of depression, decreased self-esteem is expected to be

a problem for many of the MA using individuals. This likelihood is also increased by the decline of physical appearance associated with MA use, cited earlier.

Child problems - Given the horrific circumstances under which many of the children of MA addicts live, it is expected that the experimental group will score high in this area. Questions which comprise this construct in the MPSI refer to mostly relational issues such as "I wish I did not have this child," and "I dislike my child," etc. (Hudson, 1990, p. 2).

Personal stress - The lives of MA users are often filled with anxiety. They worry about where there going to get their next fix, making ends meet, losing their jobs, homes, and children, being discovered by the police, and losing control of their lives. As cited, these types of fears often turn into full blown paranoia. It is thus assumed that the MA-using group will exhibit clinically significant problems in this area.

Aggression - MA use is highly correlated with being a victim of interpersonal violence and loss of inhibitions. In addition, MA has become a leading cause of violent crime. All indications, whether empirically-based or anecdotal, seem to imply that MA users are likely to exhibit heightened aggression.

Suicide - As another correlate of depression, it is hypothesized that suicidal ideation will be pronounced among MA users. The prolonged period of biological reparation during which recovering MA users are biochemically unable to experience pleasure or reward makes resorting to suicidal ideation and intent more and more likely.

Physical & non-physical abuse – As was cited in regard to several studies earlier, MA users at an extremely high risk for being victims of physical abuse. It is predicted,

based on the statistic that 85% of women and 70% of men entering treatment for MA abuse have been victims of physical violence (Cohen, Dickow, Horner, Zweben, Balabis, Vandersloot, and Reiber, 2003), that this area will be of particular concern for MA users. Further, as non-physical abuse often precedes, follows, and co-occurs with physical violence, that area is also expected to correlate with MA use.

Fearfulness, ideas of reference, confused thinking, and disturbing thoughts – As features of paranoia and psychosis it expected that abstinent MA users will show elevated MPSI scores in each of these areas when compared with non-MA users. According to the lecture by Dr. Richard Rawson cited earlier (personal communication, March 20, 2006), the development of these features happens more often than not in chronic users.

Guilt – The behavior of a person addicted to MA is often limited to several goals, such as obtaining more of the drug, keeping oneself alive, and keeping oneself out of jail. As such, people in recovery are likely to be extremely ashamed of some of the things that they have done in these pursuits, including stealing, neglecting children, or hurting those that they have cared about. It is thus expected that guilt will be a common problem amongst the group of recovering MA users.

Work Problems – As a result of the extreme physical and behavioral consequences of prolonged MA use, the emergence of problems at work seems probable. As mentioned previously, however, many individuals (especially those that do not inject the drug) are able to hold steady jobs for many years while using. Some even use the drug for its work performance-enhancing properties. This construct on the MPSI, however,

relates more to attitude toward work, than job performance or stability. Thus, significant problems are predicted in this area.

Memory Loss – Users of most drugs are prone to blackouts as well as impairment of working memory function, and MA is no exception. In addition research on the drug's effects on hippocampal volume indicate that deficits in this domain are quite likely.

Alcohol & Drug Abuse – Intuitively, one would assume that individuals in treatment for MA use will report clinically significant problems on the scale for drug abuse. The common practice of polysubstance abuse increases this likelihood. Finally, although most research indicates that no more that 1/3 – 1/5 of MA users also consume a significant amount of alcohol, it is expected that sufficient problems associated with alcohol use will be reported to cross the cutoff threshold for this subscale as well.

Finally, a hypothesis is made regarding the connection between degree of addiction to MA and psychosocial functionality. Since no empirically validated instrument for evaluating strength of addiction was administered, this analysis will be limited to the results of the question on the MA-use questionnaire which asked participants to rate the severity of the cravings that they experience for MA on a 1-5 scale. Hypothesis #3 is thus stated as: There will exist a positive correlation between severity of craving for MA reported and score on each of the 27 subscales of the MPSI. For individuals in the control group who report having never used MA, severity of craving was assumed to be the lowest possible (a score of "1" – virtually no craving).

Procedures

Source of participants.

It must first be stated that the execution of this study was approved in writing by the institutional review board of the University of Tennessee, the committee for this thesis, as well as each of the agencies involved. As mentioned, this study compares individuals with a history of MA use with those that have never used the drug. Inclusion in the MA-using group was established on the basis of being over the age of 18 and having used the drug within the past year. This group was assembled from caseloads of current clients at several substance abuse treatment agencies located in the east Tennessee region. Although a number of different agencies granted approval to participate in this study, only two ended up supplying participants. The Council for Alcohol and Drug Abuse Services (CADAS), located in Chattanooga, TN, supplied the majority (13) of participants for the MA-using group. Specifically, these individuals were currently in treatment through the OASIS, a residential half-way house program for individuals transitioning from prison back to community life. The remaining two individuals were recruited through Genesis Recovery Center in Lake City, TN, a voluntary residential drug and alcohol rehabilitation facility. Thus, although individuals in the experimental group must have used MA within the past year, it is *presumed* that they are not currently using. However, the length of abstinence, as well as the duration of previous use, is unknown. The comparison group in this study was established based on being over the age of 18 and having *never* used MA. This group was assembled through the University of Tennessee College of Social Work's undergraduate program. Members of both groups

were permitted to be both male and female, and were not selected or excluded on the basis of any specific cultural, racial, or ethnic background or socioeconomic status. Procedures for recruitment of both groups are described in detail in the next chapter.

Instruments.

The three instruments used in this study were the MPSI (Hudson, 1990), a methamphetamine-use questionnaire, and a demographic information sheet. Hudson and McMurtry (1997) examined the reliability and validity of each of the 27 subscales. It was found that the scales which comprise the MPSI have "good to excellent reliability," and that the instrument itself is "strong enough in terms of its measurement error characteristics to recommend it for use in a wide range of research applications," and is "acceptable in terms of its content, factorial, and construct validity" (p.95). No research was found on the appropriateness of the clinical cutting scores used on the MPSI. The methamphetamine-use questionnaire (Appendix A) and the demographic information sheet (Appendix B) were created by the researcher specifically for the current study. As such, no information as to the psychometric properties of these instruments exists.

Recruitment.

Potential participants for the experimental group were surveyed through oral communication with supervisors at the treatment agencies cited previously. These individuals were then asked to check computer records of client roles, and consult clinical staff, to identify persons with a history of methamphetamine use. It is noted that the identification of MA users was unexpectedly challenging. Nearly every substance abuse-related agency in the Knox County, TN area was contacted in regard to this study.

Innumerable conversations were had with directors of agencies who stated that they rarely saw MA users, as crack was still the primary drug problem in this area. This may be attributable to the current state of the eastward spread of MA, having not yet fully overtaken the TN area, or the fact that crack still tends to be dominant in *urban* areas over other stimulants due to its price and availability. Only once the search for participants was extended to surrounding areas were MA users finally located. Even then, users were identified only one, or a few, at a time; it was painstaking to assemble even the relatively small sample used in this study.

Each participant was then approached during a regularly scheduled treatment session by his or her treatment professional and informed about this study. The participant was told at this time that the study was part of a master's thesis on drug use and that they met the requirements for voluntary participation. They were also informed that the study would require about one hour of their time and that they would receive $10 incentive (in the form of a gift certificate, valid for the purchase of licit goods only) to compensate them for participation. In order to assure that no coercion to participate, positive or negative, was introduced by staff, the client was simply asked if they would allow the researcher to contact them by phone to discuss the study further. As such, the person's therapist was never aware of whether or not the client had agreed to participate. At the time of this initial meeting with agency staff, the client was asked to sign a brief consent form giving the treatment professional permission to transmit his or her name and phone number to the researcher by telephone (or in person).

Upon receiving confirmation of permission to contact the client from the treatment professional, the researcher did so by phone, and spoke to the individual about the study. No answering machine or voice mail messages were left regarding the study. Once verbal consent to participate was obtained, a meeting was scheduled at which written consent was obtained and the instruments were administered. This meeting took place at a location within the agency in which the individual's treatment professional was unlikely to observe it.

Individuals in the control group, recruited through the University of Tennessee's College of Social Work, were solicited in a slightly different manner. In order to open the study to as many students as possible, a flier was distributed via email to all students enrolled in undergraduate social work courses. These fliers informed students of the $10 incentive, the survey-based format, and the required time commitment and asked that interested students contact the researcher by email to schedule an appointment time. In addition to circulation of fliers, the researcher presented the study (initially providing only the same information included on the flier) in the undergraduate class of Ms. Heather Parris, MSSW, once again asking that interested students volunteer via email. At the agreed upon time, the principal investigator met the student in student lounge in Henson Hall.

Administration.

At the time of the scheduled appointment, the participants met the researcher in private, at the agreed-upon location, to discuss the specifics of the study including the purpose, the nature of the questions to be asked, and the associated risks and protective

measures, and were given the opportunity to be left alone to consider and sign the informed consent statement (Appendix C). At this time, the participant was also given the study information sheet. Once the informed consent form was signed, it was be collected by the researcher, placed into a locked briefcase. The consent forms were never attached to, and never referred in any way to, a specific data sheet.

The office in which this meeting took place was average sized (approximately 12-15' x 12-15') and was in a location in which the participant's treatment professional, or professor, was unlikely to witness the meeting. The office was set to a comfortable temperature and had a minimal number of distracting items in view. Before the participant arrived, the researcher will have ascribed an arbitrary identification number to the participant identification sheet, the demographic information sheet, both of the survey instruments, and the manila envelope into which the results were eventually placed by the client. The participant was greeted in a friendly and welcoming manner, seated with at least a 1' x 1' writing surface in front of them, and then briefing was begun by reading section one of the briefing script (Appendix D).

Next, the participant was given the manila envelope and the demographic information sheet and read section two of the briefing script. Then, the participant was given time to fill out the demographic information sheet. Next, the researcher explained that testing was going to begin by reading section three of the briefing script.

The participant was then given time to fill out the MPSI and the Methamphetamine-Use Questionnaire in private. When finished, he or she met the researcher, obtained the $10 gift certificate, and was free to go. With the participant still

present, the researcher collected the manila envelope, placed a tamper-evident sticker onto the seal, and placed it into the locked briefcase containing the informed consent sheet. At no time was the briefcase out of the sight of the researcher or left unlocked. The sealed manila envelope was then placed in a secure filing cabinet at the researcher's home office and was never be opened by the researcher.

Computerization and analysis of data.

The final step in this procedure was the statistical analysis of the data. The computerization of the data was done by a third-party assistant so that the researcher never saw the data sheets for an individual and would have thus not been able to, under subpoena, connect any individual to any set of responses by any means. This research assistant was made to sign the research team member's pledge of confidentiality form. Data was entered into a Microsoft Excel file using a secure computer located in the social work building (Henson Hall). Data was never saved to the computer's hard drive. Instead, a USB flash-drive stick was used. The data sheets, of course, never contained any participant identifiers and the variables, as they were entered into the computer, were labeled using nonsense syllables rather than the actual variable names. In addition, the computer being used was password and firewall protected, and any internet connection was disabled prior to use. During data entry, the office door was kept closed and locked and no visitors were admitted. After computerization of data was complete, the assistant placed the data sheets back into the manila envelopes, sealed them with a new tamper-evident sticker, placed them into a locked briefcase, and returned them to the researcher along with the flash dive containing the Excel files. The paper data sheets will be kept in

a secure filing cabinet at the researcher's home office for five years following the completion of the study, at which time they will be shredded. Once the researcher had received the password-protected USB flash-drive stick containing the raw data, he scored the MPSI's and performed the statistical analysis at his home office. Once again, analysis of data took place in private, and was never saved to the computer's hard drive. This computer as well was password and firewall protected. MPSI's were scored according to the procedures included with the instrument. Subscales on which a respondent had skipped 20 or more percent of the questions were considered missing. Frequencies were calculated for the occurrence of substance use, gender, race, and marital status. Descriptive statistics were computed for age, severity of craving, and scores for each group on each MPSI subscale. Differences in means were examined between meth users and non users across each of the 27 subscales of the MPSI using independent samples *t*-tests. Correlation between severity of MA cravings and MPSI subscale score was calculated using the Spearman rank-order correlation method.

Chapter 4: Results

Missing Data

For the demographic information questionnaire and the MA-use questionnaire, no missing data was observed. On the MPSI, however, a significant amount of missing data needed to be addressed. Table 1 shows the percentages of missing MPSI data for the MA and non MA-using groups on each subscale. For the most part, these gaps were expected based on the instructions given to respondents to answer with an "x" when an item or a subscale did not apply to them. As a result of this *systematic*, or meaningful, punctuation of the data set, the concepts of random versus non-ignorable missingness did not apply. Consequently, statistical methods such as mean substitution, multiple imputation, etc., did not make sense. Rather, one of two scenarios seemed the most plausible and led the researcher to two distinct methods of handling the problem:

The first possibility was that the respondent left a subscale blank because the *construct itself* did not apply to them. For example, a participant who did not have children would have no basis for responding to the "child problems" subscale. This type of missing data, as would be expected, was much more common than the next. The subscales which were placed into this category of missing data were: partner problems, sexual discord, child problems, mother problems, father problems, friend problems, neighbor problems, school problems, problems with work associates, and work problems. In order to more accurately examine the effects of MA, cases which did not contain data for these scales were excluded from the analysis through list-wise deletion. The reason that this was done is that it is of more use to know what kind of problems MA-users that

Table 1

Missing Values by Group (%)

Subscale	MA Users	Non MA Users
Depression	0	0
Self-Esteem	0	0
Partner Problems	60	11.8
Sexual Discord	66.7	23.5
Child Problems	46.7	76.5
Mother Problems	26.7	5.9
Father Problems	13.3	17.6
Personal Stress	0	0
Friend Problems	0	0
Neighbor Problems	33.3	17.6
School Problems	67.7	0
Aggression	0	5.9
Work Associates	26.7	17.6
Family Problems	0	0
Suicide	0	0
Non-Physical Abuse	0	11.8
Physical Abuse	0	17.6
Fearfulness	0	0
Ideas of Reference	0	0
Phobias	0	0
Guilt	0	0
Work Problems	33.3	23.5
Confused Thinking	0	0
Disturbed Thinking	0	0
Memory Loss	0	0
Alcohol Abuse	0	47.1
Drug Abuse	0	47.1

DO have children are having with them, than to assume that those without children would have "0" problems with them if they did. The limitation of this method of handling the missing data is that the sample size for several of these scales was greatly reduced.

In a second pattern of missing data, it was believed that the respondent felt that the subscale did not apply to them based on the lack of a given trait or problem. In other words, rather than responding with the lowest possible scores for depression, a "happy" participant may have simply skipped that scale thinking, "depression does not apply to me." The subscales which fall into this category of missing data were: depression, self-esteem, personal stress, aggression, family problems, suicide, non-physical abuse, physical abuse, fearfulness, ideas of reference, phobias, guilt, confused thinking, disturbed thinking, memory loss, alcohol abuse, and drug abuse. For these types of scales, it was assumed that lack of response indicated lack of problem in that area and a "0" was substituted for that case. The reason for doing so was to ensure that individuals WITH problems in these areas were not overrepresented as a result of the lack of response by other participants. The limitation of this procedure was that it required that an inference be made about the reason someone did not respond, and as to what they might have responded had they done so.

Participants

In all, 35 individuals were surveyed for this study and 32 were included in data analysis. The three individuals excluded had indicated that they had used MA in their lifetime, but not within the past year. As these individuals did not meet criteria for inclusion in either group, their data was not included in this analysis. However, an

additional analysis was conducted including these individuals in the MA-using group and no major alterations in results were obtained. Of the remaining 32, 15 were considered past-year MA users and 17 were considered non-MA users. Two of participants included in the MA-using group reported MA use within the past 30 days.

Analysis of income differences between groups was not conducted due to inherent differences between these two groups which rendered such information irrelevant. First, the control group's status as students made placing them in the position of being an indicator of a typical non-MA user's income nonsensical. This is because many students do not have income at all. In addition, it is unclear whether or not numbers collected from this group included the student's parents' income. Finally, a number of the MA-using individuals indicated distribution of MA as either their primary or a supplemental income. This made extrapolation of the person's licit income impossible. All of these factors distorted the reliability of assuming a person's income to be a representation of their socio-economic status, the variable of true interest.

Across the demographic variables that *were* analyzed, the two groups were quite different. The demographic information collected is summarized in Table 2. Exactly in line with the findings of other research, the MA users were 60% male, 40% female (n = 15). The non MA-using group (n = 17) was 100% female. This reflects the largely (94.1%) female student body within the University of Tennessee, Knoxville College of Social Work's undergraduate program in general (data includes only juniors and seniors; G. Cox, personal communication, July 7, 2006). The average age for MA users was 32.9 (SD = 9.8), as compared with 23.7 (SD = 7.5) for non users. Between-group differences

Table 2

Demographic Information

	MA Users	Non Users
Age		
Mean	32.90	23.70
SD	9.80	7.50
Gender (male=1)*	0.60	0.00
Ethnicity (white=1)*	1.00	0.59
Marital status (married=1)*	0.13	0.29

* For ease of reading, the marital status and ethnicity variables were rendered dichotomous, indicating married versus unmarried and white versus non-white. For these, and for gender, the numbers listed are the proportions of respondents reporting the trait coded "1."

were also dramatic for marital status and racial/ethnic background. 53% of MA users were divorced or separated and 33% were single, while only 13% reported being married. The non users were 71% single and 29% married, with no respondents reporting being divorced or separated. 100% of the MA-using group was Caucasian. Slightly more racial diversity was observed in the control group with 59% Caucasian, 29% African American, and 12% reporting both Caucasian *and* African American genealogy.

The average severity of craving score (on a 1-5 scale) for MA users ($n = 15$) was 2.93 (SD = .88), with a score of 3 indicating a moderate craving. As non-MA users ($n = 17$) reported, or were assumed to have, no cravings for the substance, there existed a statistically significant difference between the two groups according to an independent samples t-test [$t(30) = -9.040$, $p = .000$]. Table 3 displays the distribution of drugs (other than MA) regularly used by each group. 73.3% of MA users reported that they consider MA their "primary drug of choice" meaning that they "use it much more regularly than the others." The most commonly co-abused substance among MA users was marijuana (47.1% reporting use), closely followed by cocaine (46.7% reporting use). Amongst non users, abstinence from drugs and alcohol was the most common response (47.1% of respondents), followed by alcohol and marijuana (35.3% of respondents reporting use for each). Non users were, in fact, slightly more likely to use alcohol than MA users.

Results of Hypothesis Tests

Table 4 summarizes the descriptive statistics collected and indicates that scales on which either group exceeded the clinical cutting score. To compare the mean scores of MA users with those of non users, an independent samples t-test was conducted for each

Table 3

Percentage of Respondents Reporting Substance Use

Substance	MA Users	Non MA Users
MA/AP	100	0
Alcohol	33.3	35.3
Marijuana	47.1	35.3
Cocaine	46.7	0
Crack	20	0
Heroin	6.7	0
Hallucinogens	26.7	5.8
Prescription Pills	40	5.8
None	20	47.1

Table 4

Summary of Descriptive Statistics

	MA users			Non users		
Subscale	*n*	Mean	SD	*n*	Mean	SD
Depression	15	42.5	17.1	17	26.3	13.2
Self-Esteem	15	33.1	14.4	17	30.6	13.1
Partner Problems	6	56.8	26.0	15	20.9	23.5
Sexual Discord	5	36.8	17.0	13	30.2	16.2
Child Problems	8	9.7	7.3	4	25.3	11.4
Mother Problems	11	20.8	20.2	16	24.6	17.6
Father Problems	13	23	18.0	14	26.7	24.7
Personal Stress	15	43.1	23.6	17	27.4	22.8
Friend Problems	15	31.3	14.0	17	23.8	16.7
Neighbor Problems	10	59	24.4	14	36.0	22.8
School Problems	5	46.1	26.9	17	30.9	12.6
Aggression	15	30	23.6	17	9.4	8.1
Work Associates	11	32.6	19.9	14	23.4	15.1
Family Problems	15	29.8	21.9	17	32.4	19.6
Suicide	15	6.4	11.4	17	4.3	7.5
Non-Physical Abuse	15	13.1	23.2	17	6.2	9.5
Physical Abuse	15	1.4	3.6	17	0.0	0.0
Fearfulness	15	20.4	11.9	17	8.4	8.3
Ideas of Reference	15	25	17.6	17	4.9	6.7
Phobias	15	32.9	14.6	17	16.6	11.3
Guilt	15	44.3	19.6	17	18.3	18.2
Work Problems	10	27.2	14.5	13	21.1	12.1
Confused Thinking	15	49.5	23.3	17	18.5	17.2
Disturbed Thinking	15	31.6	25.1	17	14.8	18.9
Memory Loss	15	37.1	26.6	17	12.9	10.1
Alcohol Abuse	15	20.5	27.6	17	5.8	11.2
Drug Abuse	15		26.5	17	2.4	4.9

Note. Scores above the clinical cutting score are shaded

MPSI subscale. Results of these tests are shown in Table 5. For each of these tests, alpha was set at .05 due to the exploratory nature of this study and the associated desire to avoid type II errors. For this same reason, no adjustment of significance level (such as Bonferroni's correction) for multiple tests was computed. However, the exclusion of this adjustment procedure produced an approximately 75% chance that at least one type I error exists in the results reported. This is, however, likely an overestimate of the probability of type I error, as the equation used to compute this figure assumes that all 27 tests are independent of one another, an assumption which is certainly not valid. This high type I error rate was deemed acceptable due to the lack of serious consequences associated with a false detection of a difference.

As a result of the employment of list-wise deletion on certain subscales, the *n* value was reduced in some of the analyses. Thus, the *n* which was *actually* used in each analysis is reported for each group on each subscale. To analyze the correlation between the ordinal variable severity of craving and MPSI subscale score, a Spearman rank-order correlation was used; alpha was set at .05 for this test as well. Results of these tests appear in Table 6.

Depression – A mean depression score of 42.5 (SD = 17.1) was obtained for the MA-using group ($n = 15$). This was 16.2 points higher than the mean of 26.3 (SD = 13.2) obtained for the non MA-using group ($n = 17$), indicating a statistically significant difference [$t(30) = 3.02$, $p = .005$). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for depression, with the mean score for MA users lying 12.5 points above the clinical cutting score. Hypothesis #3 was also supported

Table 5

Results of t-tests

Subscale	*t*	df	p
Depression	3.021	30	0.005
Self-Esteem	0.517	30	0.609
Partner Problems	3.076	19	0.006
Sexual Discord	0.761	16	0.458
Child Problems	-2.935	10	0.015
Mother Problems	-0.515	25	0.611
Father Problems	-0.438	25	0.665
Personal Stress	1.907	30	0.066
Friend Problems	1.360	30	0.184
Neighbor Problems	2.362	22	0.027
School Problems	1.818	20	0.084
Aggression	3.226	16.9	0.005
Work Associates	1.323	23	0.199
Family Problems	-0.355	30	0.725
Suicide	0.619	30	0.540
Non-Physical Abuse	1.087	18.1	0.291
Physical Abuse	1.482	14	0.161
Fearfulness	3.320	30	0.002
Ideas of Reference	4.163	17.5	0.001
Phobias	3.558	30	0.001
Guilt	3.896	30	0.001
Work Problems	1.099	21	0.284
Confused Thinking	4.314	30	0.000
Disturbed Thinking	2.154	30	0.039
Memory Loss	3.334	17.5	0.004
Alcohol Abuse	1.926	18	0.070
Drug Abuse	9.712	14.8	0.000

Note. Statistically significant findings are shaded

Table 6

Results of Rank-Order Correlation for Severity of Craving

Subscale	*n*	Rho	p
Depression	32	0.447	0.005
Self-Esteem	32	0.019	0.459
Partner Problems	21	0.606	0.002
Sexual Discord	18	0.157	0.267
Child Problems	12	-0.602	0.019
Mother Problems	27	-0.099	0.311
Father Problems	27	-0.083	0.34
Personal Stress	32	0.301	0.047
Friend Problems	32	0.27	0.067
Neighbor Problems	24	0.454	0.013
School Problems	22	0.214	0.169
Aggression	32	0.589	0
Work Associates	25	0.322	0.058
Family Problems	32	-0.135	0.231
Suicide	32	0.046	0.402
Non-Physical Abuse	32	-0.116	0.263
Physical Abuse	32	0.338	0.029
Fearfulness	32	0.562	0
Ideas of Reference	32	0.752	0
Phobias	32	0.581	0
Guilt	32	0.61	0
Work Problems	23	0.407	0.027
Confused Thinking	32	0.654	0
Disturbed Thinking	32	0.417	0.009
Memory Loss	32	0.553	0.001
Alcohol Abuse	32	0.07	0.353
Drug Abuse	32	0.865	0

Note. Statistically significant findings are shaded

for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for depression ($r_s = .447$, $p = .005$). Severity of cravings, thus, accounted for 20.0% of the variance observed for depression.

Self-esteem - A mean self-esteem score of 33.1 (SD = 14.4) was obtained for the MA-using group ($n = 15$). This was 2.5 points higher than the mean of 30.6 (SD = 13.1) obtained for the non MA-using group ($n = 17$). This difference, however, was not statistically significant [$t(30) = .517$, $p = .609$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #2 was confirmed for self-esteem, with the mean score for MA users lying 3.1 points above the clinical cutting score. The mean score for non MA users on this scale, however, was also above the clinical cutting score, by .6 points. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and self-esteem was observed ($r_s = .019$, $p = .459$).

Partner problems – A mean partner-problems score of 56.8 (SD = 26.0) was obtained for the MA-using group ($n = 6$). This was 35.1 points higher than the mean of 20.9 (SD = 23.5) obtained for the non MA-using group ($n = 15$), indicating a statistically significant difference [$t(19) = 3.076$, $p = .006$). This allowed for a rejection of null hypothesis #1 on this scale. Though not hypothesized, the mean score for MA users was 26.8 points above the clinical cutting score for this scale, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for partner problems ($r_s = .606$, $p = .002$). Severity of cravings, thus, accounted for 36.7% of the variance observed for partner problems.

Sexual Discord - A mean sexual-discord score of 36.8 (SD = 17.0) was obtained for the MA-using group (n = 5). This was 6.6 points higher than the mean of 30.2 (SD = 16.2) obtained for the non MA-using group (n = 13). This difference, however, was not statistically significant [$t(16) = .761$, $p = .458$). Thus, null hypothesis #1 failed to be rejected for this scale. Though not hypothesized, the mean score for MA users was 6.8 points above the clinical cutting score for this scale. The mean score for non MA users on this scale, however, was also above the clinical cutting score, by .2 points. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and sexual discord was observed ($r_s = .157$, $p = .267$).

Child problems - A mean child-problems score of 9.7 (SD = 7.3) was obtained for the MA-using group (n = 8). This was 15.6 points *below* the mean of 25.3 (SD = 11.4) obtained for the non MA-using group (n=4), indicating a statistically significant difference in the *opposite* direction of that which was expected [$t(10) = -2.935$, $p = .015$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #2 was not substantiated for child problems, as the mean score for MA users was 20.3 points below the clinical cutting score. Though much closer, the non MA-using group did not exceed the cutting score either. Hypothesis #3 was rejected for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for child problems, in the opposite direction expected ($r_s = -.602$, $p = .019$).

Mother problems - A mean mother-problems score of 20.8 (SD = 20.2) was obtained for the MA-using group (n = 11). This was 3.8 points *below* the mean of 24.6 (SD = 17.6) obtained for the non MA-using group (n = 16). This difference, however,

was not statistically significant [$t(25) = -.515$, $p = .611$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and mother problems was observed ($r_s = -.099$, $p = .311$).

Father problems - A mean father-problems score of 23.0 (SD = 18.0) was obtained for the MA-using group ($n = 13$). This was 3.7 points *below* the mean of 26.7 (SD = 24.7) obtained for the non MA-using group ($n = 14$). This difference, however, was not statistically significant [$t(25) = -.438$, $p = .665$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and father problems was observed ($r_s = -.083$, $p = .340$).

Personal stress - A mean personal-stress score of 43.1 (SD = 23.6) was obtained for the MA-using group ($n = 15$). This was 15.7 points higher than the mean of 27.4 (SD = 22.8) obtained for the non MA-using group ($n = 17$). This difference, however, fell just below the threshold of statistical significance [$t(30) = 1.907$, $p = .066$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #2, however, was confirmed for personal stress, with the mean score for MA users lying 13.1 points above the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for personal stress ($r_s = .301$, $p = .047$). Severity of cravings, thus, accounted for 9.1% of the variance observed for personal stress.

Friend problems - A mean friend-problems score of 31.3 (SD = 14.0) was obtained for the MA-using group (n = 15). This was 7.5 points higher than the mean of 23.8 (SD = 16.7) obtained for the non MA-using group (n = 17). This difference, however, was not statistically significant [$t(30) = 1.360$, p = .184). Thus, null hypothesis #1 failed to be rejected for this scale. Though not hypothesized, the mean score for MA users fell 1.3 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and friend problems was observed (r_s = .270, p = .067).

Neighbor problems - A mean neighbor-problems score of 59.0 (SD = 24.4) was obtained for the MA-using group (n = 10). This was 23.0 points higher than the mean of 36.0 (SD = 22.8) obtained for the non MA-using group (n = 14), indicating a statistically significant difference [$t(22) = 2.362$, p = .027). This allowed for a rejection of null hypothesis #1 on this scale. Though not hypothesized, the mean score for MA users fell 29.0 points above the clinical cutting score, indicating the presence of a significant problem. The mean score for non MA users on this scale, however, was also above the clinical cutting score, by 6.0 points. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for neighbor problems (r_s = .454, p = .013). Severity of cravings, thus, accounted for 20.6% of the variance observed for neighbor problems.

School problems - A mean school-problems score of 46.1 (SD = 26.9) was obtained for the MA-using group (n = 5). This was 15.2 points higher than the mean of

30.9 (SD = 12.6) obtained for the non MA-using group (n = 17). This difference, however, was not statistically significant [$t(20) = 1.818$, p = .084). Thus, null hypothesis #1 failed to be rejected for this scale. Though not hypothesized, the mean score for MA users fell 16.1 points above the clinical cutting score, indicating the presence of a significant problem. The mean score for non MA users on this scale, however, was also above the clinical cutting score, by .9 points. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and school problems was observed ($r_s = .214$, p = .169).

Aggression - A mean aggression score of 30.0 (SD = 23.6) was obtained for the MA-using group (n = 15). This was 20.6 points higher than the mean of 9.4 (SD = 8.1) obtained for the non MA-using group (n = 17), indicating a statistically significant difference [$t(16.9) = 3.226$, p = .005). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for aggression, with the mean score for MA users lying precisely *at* the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for aggression ($r_s = .589$, p = .000). Severity of cravings, thus, accounted for 34.7% of the variance observed for aggression.

Work associates - A mean work-associates score of 32.6 (SD = 19.9) was obtained for the MA-using group (n = 11). This was 9.2 points higher than the mean of 23.4 (SD = 15.1) obtained for the non MA-using group (n = 14). This difference, however, was not statistically significant [$t(23) = 1.323$, p = .199). Thus, null hypothesis

#1 failed to be rejected for this scale. Though not hypothesized, the mean score for MA users fell 2.6 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and problems with work associates was observed (r_s = .322, p = .058).

Family problems - A mean family-problems score of 29.8 (SD = 21.9) was obtained for the MA-using group (n = 15). This was 2.6 points *below* the mean of 32.4 (SD = 19.6) obtained for the non MA-using group (n = 17). This difference, however, was not statistically significant [$t(30)$ = -.355, p = .725). Thus, null hypothesis #1 failed to be rejected for this scale. Though not hypothesized, the mean score for *non MA users* indicated presence of a significant problem in this area, falling 2.4 points above the clinical cutting score. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and family problems was observed (r_s = -.135, p = .231).

Suicide - A mean suicide score of 6.4 (SD = 11.4) was obtained for the MA-using group (n = 15). This was 2.1 points higher than the mean of 4.3 (SD = 7.5) obtained for the non MA-using group (n = 17). This difference, however, was not statistically significant [$t(30)$ = .619, p = .540). Thus, null hypothesis #1 failed to be rejected for this scale. Further, hypothesis #2 was rejected for suicide, with the mean score for MA users lying 8.6 points below the clinical cutting score. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and suicide was observed (r_s = .046, p = .402).

Non-physical abuse - A mean non-physical abuse score of 13.1 (SD = 23.2) was obtained for the MA-using group (n = 15). This was 7.1 points higher than the mean of 6.2 (SD = 9.5) obtained for the non MA-using group (n = 17). This difference, however, was not statistically significant [$t(18.1) = 1.087$, p = .291). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #2 was not substantiated for non-physical abuse, as the mean score for MA users was 16.9 points below the clinical cutting score. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and non-physical abuse was observed (r_s = -.116, p = .263).

Physical abuse – Surprisingly low problems were reported by each group for problems with physical abuse. A mean physical-abuse score of 1.4 (SD = 3.6) was obtained for the MA-using group (n = 15). This was 1.4 points higher than the mean of 0.0 (SD = 0.0) obtained for the non MA-using group (n = 17). This difference was not statistically significant [$t(14) = 1.482$, p = .161). Thus, null hypothesis #1 failed to be rejected for this scale. Further, hypothesis #2 was rejected for physical abuse with the mean score for MA users lying 28.6 points below the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for physical abuse (r_s = .338, p = .029). Severity of cravings, thus, accounted for 11.4% of the variance observed for physical abuse.

Fearfulness - A mean fearfulness score of 20.4 (SD = 11.9) was obtained for the MA-using group (n = 15). This was 12.0 points higher than the mean of 8.4 (SD = 8.3) obtained for the non MA-using group (n = 17), indicating a statistically significant

difference [$t(30) = 3.320$, $p = .002$). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2, however, was not substantiated for fearfulness, with the mean score for MA users lying 9.6 points below the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for fearfulness ($r_s = .562$, $p = .000$). Severity of cravings, thus, accounted for 31.6% of the variance observed for fearfulness.

Ideas of reference - A mean ideas-of-reference score of 25.0 (SD = 17.6) was obtained for the MA-using group ($n = 15$). This was 20.1 points higher than the mean of 4.9 (SD = 6.7) obtained for the non MA-using group ($n = 17$), indicating a statistically significant difference [$t(17.5) = 4.163$, $p = .001$). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2, however, was not substantiated for MA users on the fearfulness scale, with their mean score lying 5.0 points below the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for ideas of reference ($r_s = .752$, $p = .000$). Severity of cravings, thus, accounted for 56.6% of the variance observed for ideas of reference.

Phobias - A mean phobias score of 32.9 (SD = 14.6) was obtained for the MA-using group ($n = 15$). This was 16.3 points higher than the mean of 16.6 (SD = 11.3) obtained for the non MA-using group ($n = 17$), indicating a statistically significant difference [$t(30) = 3.558$, $p = .001$). This allowed for a rejection of null hypothesis #1 on this scale. Though not hypothesized, the mean score for MA users fell 2.9 points above

the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for phobias ($r_s = .581$, $p = .000$). Severity of cravings, thus, accounted for 33.8% of the variance observed for phobias.

Guilt - A mean guilt score of 44.3 (SD = 19.5) was obtained for the MA-using group ($n = 15$). This was 26 points higher than the mean of 18.3 (SD = 18.2) obtained for the non MA-using group ($n = 17$), indicating a statistically significant difference [$t(30) = 3.896$, $p = .001$). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for guilt, with the mean score for MA users lying 14.3 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for guilt ($r_s = .610$, $p = .000$). Severity of cravings, thus, accounted for 37.2% of the variance observed for guilt.

Work problems - A mean work-problems score of 27.2 (SD = 14.5) was obtained for the MA-using group ($n = 10$). This was 6.1 points higher than the mean of 21.1 (SD = 12.1) obtained for the non MA-using group ($n = 13$). This difference, however, was not statistically significant [$t(21) = 1.099$, $p = .284$). Thus, null hypothesis #1 failed to be rejected for this scale. Further, hypothesis #2 was rejected for work problems with the mean score for MA users falling 2.8 points below the clinical cutting score. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant

correlation between self-reported severity of craving and MPSI score for work problems (r_s = .407, p = .027). Severity of cravings, thus, accounted for 16.6% of the variance observed for work problems.

Confused thinking – A mean confused-thinking score of 49.5 (SD = 23.3) was obtained for the MA-using group (n = 15). This was 31.0 points higher than the mean of 18.5 (SD = 17.2) obtained for the non MA-using group (n = 17). This difference was extremely significant [$t(30)$ = 4.314, p = .000). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for confused thinking, with the mean score for MA users lying 19.5 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for confused thinking (r_s = .654, p = .000). Severity of cravings, thus, accounted for 42.8% of the variance observed for confused thinking.

Disturbed thinking - A mean disturbed-thinking score of 31.6 (SD = 25.1) was obtained for the MA-using group (n = 15). This was 16.8 points higher than the mean of 14.8 (SD = 18.9) obtained for the non MA-using group (n = 17), indicating a statistically significant difference [$t(30)$ = 2.154, p = .039). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for disturbed thinking, with the mean score for MA users lying 1.6 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-

reported severity of craving and MPSI score for disturbed thinking ($r_s = .417$, $p = .009$). Severity of cravings, thus, accounted for 17.4% of the variance observed for disturbed thinking.

Memory loss - A mean memory-loss score of 37.1 (SD = 26.6) was obtained for the MA-using group ($n = 15$). This was 24.2 points higher than the mean of 12.9 (SD = 10.1) obtained for the non MA-using group ($n = 17$), indicating a statistically significant difference [$t(17.5) = 3.334$, $p = .004$). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for memory loss, with the mean score for MA users lying 7.1 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing a significant correlation between self-reported severity of craving and MPSI score for memory loss ($r_s = .553$, $p = .001$). Severity of cravings, thus, accounted for 30.6% of the variance observed for memory loss.

Alcohol abuse - A mean alcohol-abuse score of 20.5 (SD = 27.6) was obtained for the MA-using group ($n = 15$). This was 14.7 points higher than the mean of 5.8 (SD = 11.2) obtained for the non MA-using group ($n = 17$). This difference, however, was not statistically significant [$t(18) = 1.926$, $p = .07$). Thus, null hypothesis #1 failed to be rejected for this scale. Hypothesis #2 was also rejected for alcohol abuse, with the mean score for MA users falling 9.5 points below the clinical cutting score. Hypothesis #3 was not supported for this scale as no significant correlation between severity of craving and alcohol abuse was observed ($r_s = .070$, $p = .353$).

Drug abuse - A mean drug-abuse score of 69.7 (SD = 26.5) was obtained for the MA-using group (n = 15). This was 67.3 points higher than the mean of 2.4 (SD = 4.9) obtained for the non MA-using group (n = 17). This difference was extremely significant [$t(14.8) = 9.712$, p = .000). This allowed for a rejection of null hypothesis #1 on this scale. Hypothesis #2 was also confirmed for drug abuse, with the mean score for MA users lying 39.7 points above the clinical cutting score, indicating the presence of a significant problem. Hypothesis #3 was also supported for this scale, with the Spearman's Rho test showing an extremely significant correlation between self-reported severity of craving and MPSI score for drug abuse (r_s = .865, p = .000). Severity of cravings, thus, accounted for 74.8% of the variance observed for drug abuse.

Chapter 5: Discussion

Summary of Findings

Table 7 summarizes the findings of this study in terms of which of the three hypotheses were supported for each scale.

Hypothesis #1, that on each subscale, the MA-using group would report a mean score higher than that of the non MA-using group, to a statistically significant degree, was supported for the following scales: depression, partner problems, child problems, neighbor problems, aggression, fearfulness, ideas of reference, phobias, guilt, confused thinking, disturbed thinking, memory loss, and drug abuse. Hypothesis #1 was not supported for: self-esteem, sexual discord, mother problems, father problems, personal stress, friend problems, school problems, work associates, family problems, suicide, non-physical abuse, physical abuse, work problems, and alcohol abuse.

Hypothesis #2, that the MA-using group would report mean scores which lay above the clinical problem threshold for depression, self-esteem, child problems, personal stress, aggression, suicide, non-physical abuse, physical abuse, fearfulness, ideas of reference, guilt, work problems, confused thinking, disturbed thinking, memory loss, alcohol abuse, and drug abuse, was supported for the following subscales: depression, self-esteem, personal stress, aggression, guilt, confused thinking, disturbed thinking, memory loss, and drug abuse. This hypothesis was not supported for child problems, suicide, non-physical abuse, physical abuse, fearfulness, ideas of reference, work problems, and alcohol abuse. However, there were additional areas to which hypothesis #2 was not applied, but in which MA users' average scores fell at or above the clinical

Table 7

Summary of Hypotheses Supported

	Hypothesis		
Subscale	#1	#2	#3
Depression	yes	yes	yes
Self-Esteem	no	yes	no
Partner Problems*	yes	yes	yes
Sexual Discord*	no	yes	no
Child Problems	yes**	no	yes**
Mother Problems	no	no	no
Father Problems	no	no	no
Personal Stress	no	yes	yes
Friend Problems*	no	yes	no
Neighbor Problems*	yes	yes	yes
School Problems*	no	yes	no
Aggression	yes	yes	yes
Work Associates*	no	yes	no
Family Problems	no	no	no
Suicide	no	no	no
Non-Physical Abuse	no	no	no
Physical Abuse	no	no	yes
Fearfulness	yes	no	yes
Ideas of Reference	yes	no	yes
Phobias*	yes	yes	yes
Guilt	yes	yes	yes
Work Problems	no	no	yes
Confused Thinking*	no	yes	yes
Disturbed Thinking	yes	yes	yes
Memory Loss	yes	yes	yes
Alcohol Abuse	no	no	no
Drug Abuse	yes	yes	yes

Note. Hypothesis #1 was that there would be a statistically significant difference in MPSI score between groups. Hypothesis #2 was that MPSI scores for MA users would exceed clinical cutting scores for certain MPSI subscales. Hypothesis #3 was that severity of craving for MA would be positively correlated with MPSI scores. Areas with all three hypotheses supported are shaded.
* = areas in which MA users exceeded clinical cutting scores that were not predicted
** = a reverse relationship was found

cutting score. These areas were: partner problems, sexual discord, friend problems, neighbor problems, school problems, work associates, and phobias. Finally, there were several scales on which the *non-MA using group's* scores fell above the clinical cutting scores. These areas were: self-esteem, sexual discord, neighbor problems, family problems, and school problems.

Hypothesis #3, that there would exist a positive correlation between severity of craving for MA reported and score on the each of the 27 subscales of the MPSI, was supported for the following scales: depression, partner problems, child problems, personal stress, neighbor problems, aggression, physical abuse, fearfulness, ideas reference, phobias, guilt, work problems, confused thinking, disturbed thinking, memory loss, and drug abuse. Thus, this hypothesis was *not* supported for: self-esteem, sexual discord, mother problems, father problems, friend problems, school problems, work associates, family problems, suicide, non-physical abuse, and alcohol abuse.

Interpretation of Results

In order to integrate the findings associated with the three questions asked by this study, it seems most useful to begin by examining areas in which significance was obtained in all three areas. The areas for which MA users differed significantly from non users, exceeded clinical cutting scores, *and* on which craving for MA had a significant effect were: depression, partner problems, neighbor problems, aggression, phobias, guilt, confused thinking, disturbed thinking, memory loss, and drug abuse. These are all life areas on which MA itself has the strongest effect. These areas are discussed in order of the magnitude of the problem as measured by the clinical cutting scores of the MPSI.

Areas in which significance was obtained on one or two of the research questions are addressed next. Finally, areas in which no significant results were obtained are discussed. Areas that did *not* show support for all three hypotheses are discussed in no particular order.

Areas with all three hypotheses supported.

Drug abuse - The area in which MA users exceeded the clinical problem threshold by the greatest amount was drug abuse. This finding is logically congruent with the fact that these individuals are using a drug which, as previous research has noted, carries with it many problems and complications. The construct of drug abuse as assessed on the MPSI relates to issues surrounding reason for use, situations in which use is likely to occur, and consequences associated with use. The findings in this area are intuitive and no alternative explanations or implications for them are speculated.

Neighbor problems - The next area associated with the most severe elevation of MPSI score was neighbor problems. As the MPSI conceptualizes these problems, they are exclusively relational issues such as liking neighbors and being liked by them and desire to be part of the neighborhood, versus a different neighborhood. To the researcher's knowledge, this is an original finding which does not relate specifically to any existing research. Possible reasons for relational problems that MA users experience with their neighbors are many and variegated. It should first be noted, that MA use can often be quite easy to detect as a result of the distinctive aroma (assuming that it is smoked or cooked), the physical effects, and the erratic and often paranoid behavior of the user. Thus, a user may be looked down upon in his or her neighborhood simply due to

the stigma associated with drug use. The behavior of a MA user may also appear strange or dangerous to non-using neighbors resulting in avoidance. In addition, paranoia, irritability, and aggression may result in incidents in which fights or arguments with neighbors arise. The disturbed sleep patterns of MA users may also cause conflict with neighbors as a result of the individual's being active at all hours of the night, potentially disturbing the sleep of others. Finally, it is noted that a clinically significant score in this area was also obtained for the non-MA using group. This finding suggests reconsideration of the norming of this scale with the population at large or examination of the cause of severe neighbor problems in a "normal," non-MA using population. As speculation for the elevated scores of non users, the stresses and disruptions associated with dorm and "college apartment" style living may be to blame. Clinically, the findings for MA users in this area beg clinicians to be aware of environmental issues which may influence or exacerbate use and which may be obstacles to an individual's successful reintegration to the community following incarceration.

Partner problems - The partner-problems subscale of the MPSI assesses perceived quality and status of the respondent's relationship (presumably, a romantic one). Although no previous research has addressed the issue of partner-relationship problems specifically, information *has* been generated which can help to explain MA users' elevated scores in this area. For example, it was cited previously that the occurrence of interpersonal violence is an extremely common characteristic of the lives of MA users (Pach & Gorman, 2002; Cohen, Dickow, Horner, Zweben, Balabis, Vandersloot, & Reiber, 2003). In addition, increased number of sexual partners (Molitor,

Truax, Ruiz, & Sun, 1998; Pach & Gorman, 2002) and increased risk of transmission of sexually transmitted diseases (Shoptaw, Reback, & Freese, 2002; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005) are also common correlates of MA use. Paranoia associated with MA use may also contribute to disharmony with one's partner. Finally, the fact that MA users' scores for sexual discord fell, on average, above the clinical cutting score, is likely another contributor to problems with partners. However, it is also noted that the process of list-wise deletion caused sample size for users to be greatly reduced on this scale. The finding that MA users were less likely to have a partner, to be currently sexually active, and that 87% of them were not married, is itself significant. The information collected in this area has implications similar to those cited above in regard to neighbor problems. A highly unhappy or tempestuous relationship could easily become a trigger for use or relapse. In addition, problems in this area may be exacerbating depression, self-esteem, aggression, or physical/non-physical abuse. Thus, partner relationships seem to be a key area for focus during initial assessment, as well as for continued monitoring.

Confused thinking - Confused thinking is an area in which the elevated scores observed in this study came as no surprise. The questions on this subscale seem to address confusion itself, mental organization, and impaired cognition. As was cited previously, impaired cognition is a known correlate of MA use (Iwanami, Kanamori, Suga, Kaneko, & Kamijima, 1995; Rogers, Everitt, Baldacchino, Blackshaw, Swainson, Wynne, Baker, Hunter, Carthy, Booker, London, Deakin, Sahakian, & Robbins, 1999; Simon, Domier, Carnell, Brethen, Rawson, & Ling, 2000; Salo, Nordahl, Possin,

Leamon, Gibson, Galloway, Flynn, Henik, Pfefferbaum, & Sullivan, 2002). In addition, such symptoms are typical of the disorganization of thought associated with psychosis, a near inevitability for chronic MA users (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001; R. Rawson, personal communication, March 20, 2006). MA's effects on neurochemistry in the neo-cortex (Eisch & Marshall, 1998; Deng, Ladenheim, Tsao, & Cadet, 1999; Stumm, Schlegel, Schafer, Wurz, Mennel, Krieg, & Vedder, 1999; Volkaw, Change, Wang, Fowler, Franceschi, Sedler, Gatley, Hitzemann, Ding, Wong, & Logan, 2001) may account for some of this confusion. No alternative explanations are ventured for the elevated scores in this area. Clinically, these results identify a barrier to nearly any modality of treatment. A person who cannot organize their thoughts or trust their own perceptions is not likely to fully understand what is being told to them by a counselor. It may be more helpful then to avoid cognitive behavioral (and other similarly mentally-demanding techniques) in favor of less complex therapies which employ very simple concepts and appeal to a person on an intuitive, spiritual, or emotional level, rather than a rational one. This may assist in delaying relapse until a person's cognitive faculties begin to return to them.

Guilt - The guilt subscale is focused on personal shame, internal attributions for things that have gone wrong, and regret/remorse for previous behavior. The researcher is not aware of any previous research which has correlated MA use with severe feelings of guilt. It is speculated that because individuals trapped in their addition to MA often do things (such as lie, steal, and abuse) which they would have, before onset of dependence,

found morally reprehensible, a strong sense of regret and guilt is predictable. The fact that some of these feelings may be internalized helps to explain elevated problem scores for depression and self-esteem. It may be productive to these individuals for their counselors to assist them in re-attributing some of these behaviors to the drug itself, their addiction, or the situations in which the drug's grip landed them.

Depression - The finding that depression is a significant problem for recovering MA users falls right in line with previous research (Kalechstein, Newton, Longshore, Anglin, van Gorp, & Gawin, 2000; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005). Based on neuropsychological research, this effects seems clearly attributable to neurochemical mechanisms associated with MA use which have been solidly established (Kogan, Nichols, & Gibb, 1976; Wagner, Seiden, & Schuster, 1979; Wagner, Ricaurte, Seiden, Schuster, Miller, & Westly, 1980; Fuller & Hemrick-Luecke, 1980; Ricaurte, Guillery, Seiden, Schuster, & Moore, 1982; Gibb, Johnson, & Hanson, 1990; Robinson, Yew, Paulson, & Camp, 1990; Itzhak, Gandia, Huang, & Ali, 1996; R. Rawson, personal communication, March 20, 2006). Of course, one alternative explanation for the results in this areas obtained in the current study is that the depression observed is situational, rather than MA-use related. For example, the individuals in the MA-using group were necessarily in residential treatment, restricted by such things as curfews and level systems. These individuals were also, almost universally, recently released from prison. Any number of complications, disappointments, and stresses associated with this status may have contributed to elevated scores for depression. Clinically, the findings obtained in this area identify a potentially severe obstacle to

treatment. As depressed mood may be a precipitant, as well as a result of, MA use, a continually perpetuating cycle is in place. A person often chooses to use, or relapses, in order to feel better and as a result, they feel worse. Thus, psychiatrists and counselors must be prepared to address depression as a prerequisite for treating the addiction.

Memory loss – As assessed by the MPSI, elevated scores on this scale seem to indicate impairment in working memory, as opposed to amnesia. The questions asked probe a number of different areas in which such impairment may be a nuisance or a more serious problem. Conflicting evidence exists in the literature regarding MA's effects on memory performance. Thompson, Hayashi, Simon, Geaga, Hong, Sui, Lee, Toga, Ling, and London (2004) found hippocampal damage and detrimental effects on recall in MA users. The evidence obtained in the current study, though limited by the self-report nature of the data, appear to support the conclusions of these authors. Mewaldt and Ghoneim (1979), however, found that acute administration of MA can actually *improve* performance on recall tasks. Memory loss observed in the current study may relate to hippocampal damage cited above, or the sustained state of intoxication in which MA users frequently remain for several days/weeks. Kalechstein, Newton, and Green (2003) found that impairment in memory function is very common among MA users, especially as they begin their recovery. Perhaps then, withdrawal of the memory stimulating properties of the drug leaves the users with neurochemical deficits which render memory tasks more difficult. It is also possible that *sustained* use itself accounts for the impairment observed. Though clinical implications of this finding may be superficial

(such as the clients' ability to keep track of therapy sessions, therapy homework, work schedules, etc.), the finding itself is important.

Phobias – Perhaps one of the most surprising findings of this study was the clinically significant mean score of MA users for phobias. This finding is, however consistent with the paranoid ideation associated with MA-induced psychosis. Although a small amount of research has correlated AP use with social phobia (e.g. Bristol, 2000), little has shown a strong connection in this area, and none (to the researcher's knowledge) has identified other specific phobias as a concern for MA users. The fact that MA is often used as a social lubricant helps to explain how social phobia might tie into the topic at hand. However, the construct of phobia on the MPSI is quite broad and clearly intends to assess the presence of a number of *different* specific phobias. It does not seem that symptoms of social phobia alone would account for such elevated scores as were observed. In looking at the scores of individual users, the researcher noted that questions on which MA users reported significant fears were not exclusive to social phobias and included claustrophobia (small spaces), aviophobia (flying), xenophobia (strangers), isolophobia (being alone), agoraphobia (open spaces), asthenophobia (fainting), etc. Beyond the paranoia associated with MA psychosis (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001; R. Rawson, personal communication, March 20, 2006), which may help to explain some of these phenomena, no other explanation is currently postulated. The clinical implications in this area will vary depending on what type(s) of phobia(s) the client is reporting. However, it seems in general that treatment aimed at the reduction of

anxiety may help these individuals to avoid seeking out MA as a type of escape behavior and may lubricate the recovery process for certain people.

Disturbed thinking – The MPSI scale for disturbing thoughts specifically assesses the extent to which a person's own thoughts are unsettling to *them,* as well as the persistence of these thoughts. To the author's knowledge, no previous study has produced data on MA's effects on this area. However, given the paranoid psychosis which frequently results from MA dependence (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001; R. Rawson, personal communication, March 20, 2006), it is not surprising that users had a clinically significant score in this area. The reports and poetry of MA users describe the drug as something of a demon, putting thoughts in their heads and making them do things that would never have done otherwise. Clinically, the findings in this area urge practitioners to be vigilant in their assessment of psychosis with MA users. In addition, newly abstinent MA users may require treatment which resembles that of schizophrenia more closely than that of traditional addictions counseling.

Aggression – The MPSI construct of aggression consists of questions about aggressive interactional style and intimidation, as well as physical violence itself. As increased incidence of interpersonal violence is a common correlate of MA use (Pach & Gorman, 2002; Cohen, Dickow, Horner, Zweben, Balabis, Vandersloot, & Reiber, 2003), the clinically significant scores recorded in this area are not surprising. However, it is possible that aggression is a preexisting condition which tends to lead to "self-medication" type use of MA, rather than a result of use. Regardless of which preceded

the other, the presence of elevated aggression is a condition which will likely cause an individual to either end up hurt, or in prison. Of course, less severe consequences of aggression are also likely to occur such as alienation of friends, family, and others, and job loss. Thus, it is of utmost importance that this symptom be addressed in treatment. Helping these individuals to learn assertive coping mechanisms will lead to better outcomes across life domains in the long run.

Areas with two hypotheses supported.

Child problems – This area is one which quite startling, and completely unexpected, findings were obtained. Although neither test group exceeded the clinical cutting score for this scale, it was found that a statistically significant difference between groups existed in the *opposite* direction of that expected. This means that individuals *not* using MA were found to have *more* problems with their relationships with their children than MA users. There are several plausible explanations for this finding. First, as this was a variable for which list-wise deletion was used to address missing data, sample size for its analysis was greatly reduced ($n_{\text{ma users}} = 8$; $n_{\text{non-ma users}} = 4$). Thus, confidence in applying this finding to any population (MA-using or otherwise) is very low. Secondly, it could be the case that individuals who skipped this subscale were in fact saying "I have no problems with my kids," rather than "I have no kids," the latter of which was the statistical assumption. However, given the mean age of 23.65 for this group, and the fact that 71% of control group participants were single, it seems unlikely that this was the case. When the *t*-test was conducted on this variable with "0's" being inserted in cases for which the scale was skipped, however, the means of the two groups were much closer

($M_{ma\ users}$ = 4.9, $M_{non\text{-}ma\ users}$ = 6.0), and much further from the clinical cutting score, especially in the case of non-users. It was also observed for this scale, through the Spearman rank-order correlation test, that severity of craving was negatively correlated with child problems to a significant degree. This, however, was contingent upon the observed means and this effect disappeared when, as was done above, "0's" were substituted for missing scores. It was also surprising, however, how few problems with children were reported by MA users, given the research on the topic. This likely relates, however, to the fact that the MPSI construct of child problems is focused on perception of, or attitude towards, the relationship with the child as opposed to more interactional issues like abuse, neglect, or the child's behavior. An interesting follow-up study might survey children of MA users in regard to problems with their parents. As it is the researcher's opinion that the inverted findings on this scale do not accurately represent the reality of the situation, no clinical implications are drawn from them.

Personal stress – It was also surprising that hypothesis #1 was *not* supported for personal stress. The finding on hypothesis #2 was, however, indicated that MA users *are* in fact having significant problems in this area. This is consistent with the stressful lifestyle maintained by many MA users, as well as anxiety which has been identified by previous research (Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005). The questions on this subscale relate mostly to a feeling of being on the verge of losing control or having a "breakdown." The reason that the between-groups difference was not substantially significant was that, once again, scores for the non-MA using group were also elevated. The clinical problem threshold was not surpassed for non users, but it was

closely approached. Although it seems reasonable that undergraduate students would report elevated stress relating to their studies, etc., for such a magnitude of stress to average out to near-significance across 17 non-MA using individuals draws into question the norming of this scale in regard to the general population. The clinical implications of this finding may be pharmacological, indicating that an anxiolytic medication may be appropriate for these individuals. In addition, the teaching of life skills, such as organization and scheduling, as well as relaxation techniques may be helpful as these individuals go through treatment. The reduction of anxiety and stress may help individuals in recovery to avoid using as an escape behavior.

Fearfulness – For the fearfulness scale, MA users' scores differed significantly from non users', and were found to be significantly correlated with severity of craving. This construct on the MPSI refers to irrational, non-specific fears and their impact on functioning. There is no research known to the author which has identified fearfulness as a correlated of MA use. This fear may relate to the paranoia associated with MA psychosis (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001; R. Rawson, personal communication, March 20, 2006). MA users did not exceed the clinical problem threshold and, in fact, fell short of it by 10 points. This tells us that MA users are having significantly more free-floating fear than non users (especially when cravings are more intense), but not to a degree that it is severely interfering with functioning. The implication of this finding is that clinicians need to be aware of the potential for problems in this area, but not overly focused on it. Also implied is the importance of building a therapeutic relationship

characterized by trust with these individuals in order to provide reassurance of their safety.

Ideas of reference – It was found that for this subscale, MA users' scores were significantly higher than non users', and that they were strongly influenced by severity of craving. MA users, however, fell short of the clinical cutting score by 5 points on average. This scale assesses the degree to which the respondent feels that other people are talking about them, focused on them, or "out to get them" in some way. Given the frequent onset of paranoid psychosis in MA users (Ellinwood, 1969; Sekine, Iyo, Ouchi, Matsunaga, Tsukada, Okada, Yoshikawa, Futatsubashi, Takei, & Mori, 2001; R. Rawson, personal communication, March 20, 2006), it is not surprising that users showed elevated scores for these types of delusions. Non users, as would be expected, reported very low scores in this area. The fact that the MA users in this study were in recovery for some period of time, allowing time for the acute psychosis to begin to decline, may explain why scores obtained were not above the cutting score. However, given the near-significance of the scores, clinicians certainly need to be assessing this area thoroughly at intake. This is also, once again, an indication that psychiatric symptoms may need to be stabilized before any progress in treatment of the addiction can be made.

Areas with only one hypothesis supported.

Self-esteem – For the self-esteem subscale, only hypothesis #2 received support. This scale assesses the individuals' perception of themselves, as well as their impression of others' perceptions of them. Though no research, to the author's knowledge, has addressed the self-esteem of MA users, such a finding is consistent with literature on the

prevalence of depression in this population (Kalechstein, Newton, Longshore, Anglin, van Gorp, & Gawin, 2000; Peck, Shoptaw, Rotherman-Fuller, Reback, & Bierman, 2005). It is also intuitive based on the extreme decline of physical appearance experienced by many MA users, as well as the finding that significant guilt and shame is often a problem for users. Perhaps the most notable finding in this area was the fact that the mean score for non-MA users' a*lso* fell above the clinical cutting score. This likely explains why hypothesis #1 was not supported in this area. Had the control group exhibited more normative levels of self-esteem, the difference between groups would have been more dramatic. However, barring some unknown variable in the control group which accounted for the clinically significant self-esteem problems observed, this finding, once again, brings into question the norming of this scale in regard to the general population. For MA users, the findings on self-esteem urge clinicians address issues underlying drug use in addition to the addiction itself. People that do not like themselves, are unlikely to show concern for their own physical safety and health. It is also another example of a continually perpetuating cycle in which a person may use in order to feel better about him or herself and, as a result, lose the ability to feel good about *anything*.

Sexual discord – Findings in this area were significant only concerning hypothesis #2, in regard to clinical cutting scores. However, it was interesting that *both* groups' mean scores fell above the cutting score for this scale. This subscale is aimed at assessing respondents' perceptions of the quality of their sex life, as well as their impressions of their partners' perceptions thereof. It was not hypothesized that MA users would report significant problems in this area due to the findings of previous research which indicate

sexually *enhancing* properties of the drug (e.g. Gorman, Clark, Nelson, Applegate, Amato, & Scrol, 2003). Other than anecdotal reports (Associated Press, 2004), the author is not aware of any empirical research which has indicated sexual dysfunction as an outcome of sustained use. However, it is perhaps more concerning that undergraduate social work students are having, on average, clinically significant dissatisfaction with their sex lives. This scale was one for which sample size was greatly reduced for MA users (presumably due to lack of current sexual activity; $n = 5$), but not significantly for non users ($n = 13$). Thus, this finding for non users may hold true when applied to a larger undergraduate population. This issue begs further research and, once again, draws into question the norming of the MPSI on this scale. No clinical implications are derived from these findings.

Friend problems – For this subscale, the only significant finding was that MA users' mean score fell just above the clinical cutting score. This scale assesses the individual's attitude toward their friends, as well as the quality of relationship with those friends. No previous research has addressed this area. The problems observed in this area could be viewed as precipitants of MA use for its social lubricating properties. However, it seems more likely that they represent an alienation of friends that has occurred as a *result* of use, for any number of reasons. Clinically, this finding indicates the need to assess, and to help develop, adequate social support for individuals in recovery. It is also important to assess the influence that MA-using friends are having upon the client's use and help the individual to remove him or herself from social situations which are likely to trigger relapse.

School problems – This was yet another area in which interesting findings for the control group were obtained as well as for the experimental group. This scale is directed toward the individual's attitude toward school content, the experience of school in general, and his or her own performance at school. Though no previous research was identified which evaluated MA users regarding school problems, it is intuitive based on cognitive deficits, poor sleep habits, and psychosis that they would report significant problems in this area. Although sample size was greatly reduced for MA users on this scale (presumably because they were not attending school; $n = 5$), the amount by which they exceeded the cutting score (16.1 points) was significant. Also significant, however, was the fact that non users *also* exceeded the problem threshold (though only by .9 points). Had more "normative" levels of school problems been found in the control group, the MA-using group's scores would likely have supported hypothesis #1. This scale is yet another for which norming is brought into question by the results obtained. If 17 "randomly" selected students report clinically significant scores on school problems, what is considered a "normal" amount of problems with school? Implications for the findings regarding MA users on this scale involve connecting individuals interested in pursuing education with resources which will assist them in developing effective study habits, with the goal of improving attitude and performance in school.

Work associates – The only significant finding for the problems with work associates scale was a mean score for MA users which was above the clinical problem threshold. This scale assessed the individual's relationships with coworkers. Though no previous research has addressed this area, and no hypothesis was made for it, this finding

is somewhat intuitive given the relational problems which appear to run through the lives of MA users. This finding has implications for transitioning clients in treatment back into the workplace. These individuals needs assistance in developing social skills which will allow them to get along with coworkers to a degree sufficient to keep them employed.

Family problems – The family problems scale was another in which unexpected, and counterintuitive, findings were obtained. It seems that in this area, MA users actually reported *fewer* problems than the control group, though not to a statistically significant degree. The non users mean score, however, did in fact exceed the clinical cutting score. The method of handling missing data made very little difference in this case. When "0's" were substituted for missing data, rather than employing list-wise deletion, the mean for non users was unchanged, and that of MA users was only increased by one point (though that *did* cause MA users to exceed the clinical cutting score). The near-significant mean score obtained for MA users is intuitive based on alienation of family members as a result of relational problems, as well as potentially hurtful or damaging behaviors, associated with MA dependence. The finding regarding the non-MA using group has implications regarding the norming of this scale, as there does not seem to be any systematic reason why these individuals should be reporting clinically significant family problems. For MA users, this finding once again urges clinicians to assist these individuals in developing a level of social support and nurturance sufficient to help them through their recovery.

Work problems – The work problems scale was the only one for which correlation between severity of craving and MPSI score was the *only* significant finding. Neither group exceeded the clinical cutting score and the difference between groups was not

statistically significant. This subscale addresses the individual's attitude toward their job and workplace environment, especially their supervisor. Though the only research in this area refers to the increased incidence of job loss among MA users (Morgan & Beck, 1997; Pach & Gorman, 2002), it is intuitive that more severe cravings would result in greater problems at work. This finding tells us that as recovery progresses and cravings become less severe, these individuals are likely to report an improved attitude toward their work environment. Clinicians can use this information to assist recovering MA addicts in learning strategies for controlling, or handling appropriately, their cravings (and the behavioral symptoms associated with them) while at work.

Areas in which no hypotheses were supported.

Mother and father problems – It is notable that *non*-MA users averaged four points higher than users on each of these scales. However, as the clinical cutting scores were not exceeded and statistical significance in between-groups differences in means was not reached, no meaning is read into this finding.

Suicide – Although it was hypothesized that MA users would exceed the clinical cutting score in this area, it is, in retrospect, logical that such a finding was not obtained. This is because, more than likely, individuals that entered the treatment center reporting active suicidal ideation would have been identified at intake and placed into a more intensive or restrictive program than the ones from which users were surveyed. The mean score obtained for users was not significantly higher than that of non users and severity of craving for MA did not appear to impact suicidality.

Physical and non-physical abuse- Given the research on the prevalence of interpersonal violence among MA users (Pach & Gorman, 2002; Cohen, Dickow, Horner, Zweben, Balabis, Vandersloot, & Reiber, 2003), and the finding of the present study of elevated levels of aggression among users, it is quite surprising that such low numbers were obtained in these areas. However, there may be a logical explanation for why these numbers may have been underrepresented in this population. Both of these subscales refer to abuse originating with the person's partner. Very few of the MA users, it is assumed, currently had partners. This statement is based on the fact that 87% of users were either single or divorced, and the fact that only six people (out of 15) felt that the *partner problems* scale was applicable to them. Thus, a user who skipped the physical and non-physical abuse scales may have been saying, "I don't have a partner," rather than "I don't experience abuse from my partner." When list-wise deletion was used in place of substitution of "0's," the mean score for non-physical abuse exceeded the cutting score and the mean for physical abuse was increased by 8.6 points. Thus, it seems plausible that for MA-using individuals that *did* have a partner, non-physical abuse may have been a significant problem. Also notable on these scales is the fact that the lowest score possible, a "0," was obtained for physical abuse among non users. This indicates that not a single individual in the control group reported the slightest problem in this area.

Alcohol abuse – The subscale for alcohol abuse also returned no significant findings. However, the low incidence of consumption of alcohol observed (33.3% of MA users, 2% less than that of non users), and the subthreshold MPSI score for this scale DO fit in with the findings of other research (Huber, Ling, Shoptaw, Gulati, Brethren, and

Rawson, 1997; Peck, Shoptaw, Rotherman-Fuller, Reback, and Bierman, 2005). However, had equal variances been assumed for the *t*-test on alcohol abuse, MA users would have been shown to have significantly more problems in this area than non users ($p = .053$).

Chapter 6: Conclusions, Limitations, and Recommendations for Further Research

Conclusion

Methamphetamine is a devastating drug which has taken the nation by storm, and for which the myriad disastrous effects are still being uncovered. This study is evidence that, despite the vast amount of research which has examined this substance over the past 30-or-so years, there is still much which is unknown. The "umbrella" question stated in the purpose section which inspired and directed all of the complex methodology employed, was, "what influence does MA use exert on psychosocial functionality?" The short answer to this question is, "a significant amount of influence." The areas in which MA's effects were demonstrated *most* strongly by: (1) mean scores for users differing significantly from non users; (2) mean scores exceeding clinical cutting scores; *and* (3) showing covariance with severity of craving for MA, were: depression, partner problems, neighbor problems, aggression, phobias, guilt, confused thinking, disturbed thinking, memory loss, and drug abuse. In addition, however, MA users *either* differed significantly from non users *or* exceeded the clinical problem threshold (the two *main* concerns of this study), or both, on 20 of the 27 subscales of the MPSI. Furthermore, several of the seven areas in which no significant results were obtained, were close enough to significance to warrant further investigation into the topic. As for the tertiary question of this study regarding the correlation of severity of craving for MA and psychosocial functionality, significance was attained on 16 of the 27 subscales.

Although many of the findings of the current study concur with previous research, and none seem to contradict it, there were also areas of concern for MA users discovered which have not yet been specifically identified or explored by previous research. Some of these areas, however, could be predicted based on previous research, such as relational problems (with friends, coworkers, neighbors, and partners), school problems, and work problems. Others such as guilt, phobias, and sexual discord, however, appear to represent unique findings. In addition, some of the findings regarding the control group and the MPSI itself may prove to be useful in directing future research on the topic. The limitations of the current study, as well as some of the areas identified which require replication and further exploration, are discussed below.

Limitations

Although the limitations of this study were many, they do not necessarily degrade the validity of the results obtained. They do, however, beg caution in their interpretation. Perhaps the most limiting, though unavoidable, factor was the inability to isolate the independent variable. 80% of subjects in the MA-using group were also regularly using substances other than MA. This means that it is impossible to attribute as much of the variance observed to MA alone as would have been possible with individuals exclusively using MA. To compound this limitation, 52.9% of the control group was ALSO regularly using some substance. As there is no way to "subtract" the effects of these substances from the results obtained, we were actually comparing MA users to a group which may be experiencing psychosocial problems of their own related to the use of these other drugs. However, it can be assumed that the occurrence of substance use observed in the

control group closely resembles that which would be found in any population of undergraduate college students. In addition, the non-MA using group also reported significant "pathology" on several of the MPSI's subscales, as indicated by mean scores which exceeded the clinical problem threshold. This effect narrowed the contrast between MA users scores and what may have been observed in a group with more normally distributed problems.

The disparity of certain traits between the two groups surveyed also seems to be something of a limitation. First, mean age for the two groups was disparate by nearly 10 years. Secondly, there was a great amount of contrast between groups regarding gender (MA users were 60% male, non users were 100% female) and race (MA users were 100% Caucasian, non users were less than 60% Caucasian). Substantial differences also existed in marital status, with MA users being MUCH more likely to be divorced/separated than non users. Thirdly, there are inherent "subcultural" differences between a population of post-incarceration recovering drug users and one made up of individuals who have chosen to (and were financially able to) pursue secondary education. Although these specific differences were not examined and are thus not speculated upon, they do seem intuitive as well as noteworthy. Fourth, it is also unknown, as explained previously, what differences in socioeconomic status existed between the two groups. Given well-established information on the effects of poverty on any number of variables, this information would have been quite useful. Finally, in a more ideal version of this study, MA users would have been compared with several groups made up of users of drugs other than MA. This is because certain problems observed may be correlated with drug

abuse and dependence in general and may not be specific to MA. It would have been more enlightening (though vastly more complex) to compare the effects of dependence on MA with dependence on crack cocaine, for example, or heroin. All of the above-mentioned factors introduced the potential influence of variables extraneous to the desired independent variable, MA use.

Another constraint on the generalizability of these results was small sample size. As a result of difficulties in finding and gaining access to MA users in the Knoxville area, a sample of 15 users for each group became the goal. It was heard over and over again in the quest to find participants for the experimental group "MA hasn't really entered the urban areas of East Tennessee yet; crack cocaine is still the main drug of concern here." To exacerbate the problem of sample size, many cases had to be dropped through the process of list-wise deletion as a result of missing data. Although doing so was the method which made the most sense on variables (such as sexual discord) which had the potential of being inapplicable to certain individuals, this practice DID result in several (four) subscales for which *n* was below 10 for MA users. This had much smaller of an effect on sample size for the control group, for which nearly all scales were either complete or able to be inferred. It is also noted that the necessity of making such inferences (e.g. – assigning zeroes to individuals who skipped certain scales which seemed to indicate that the scale did not apply to them due to lack of the *trait* in question, like depression) is also a limitation of this study. It seems, however, that few studies are conducted which do not require *some* kind of statistical "guesswork" be done. It is

maintained that the inferences made were logical and had little effect on the overall results.

The final limitation of this study which must be mentioned relates to the design of the demographic information sheet and the MA-use questionnaire. First, a certain amount of "unnecessary" information was generated which was not used in the analyses conducted. This information includes: number of members in household, occupation, average combined household income, frequency of MA use within the past 30 days, frequency of cravings for MA, and frequency of use of substances other than MA. Secondly, and more importantly, was the exclusion of several questions which would have been invaluable to the analyses conducted. No question was asked which assessed the duration of MA use or the duration of abstinence from use. Given that much of the current research on MA use is written in terms of duration of use, the former variable would have lubricated the placement and analysis of this study amongst other similar research. The latter question would have allowed for analysis of the effects of sustained abstinence on the abatement of psychosocial difficulties. In addition, no information about route of administration was obtained. Questions in this area were originally included, but were removed due to the potential for introducing a user to a method of taking the drug with which he or she was previously unfamiliar. Given the differences cited earlier in the physiological and psychophysical effects associated with smoking crystal MA versus injecting the drug or snorting the low purity powder, such information would have allowed for interesting analysis of the degree to which such differences are transferred into the psychosocial realm.

Recommendations for Further Research

First, a full replication of this study is recommended to ensure the accuracy and generalizability of the findings. In doing this, it is recommended that stricter controls are placed on extraneous variables (such as gender ratio, income, pathology, substance use, etc.) for each group, in order to allow for greater isolation of the independent variable in question. In future replications, it is recommended that special attention be paid to the areas in which differences have been identified in the present study that have not been shown or implied by previous research. These areas were sexual discord, feelings of guilt, and phobias. Investigation into the etiology of the guilt and phobias observed is also needed. It is also recommended that a similar study be conducted with the control group being replaced by users of other drugs such as AP, crack, cocaine, and heroin. This will allow for even further isolation of MA's effects as they compare with those of other drugs.

The number and magnitude of problems reported by members of the control group in this study were astonishing. Areas in which control group members *exceeded* clinical cutting scores were neighbor problems, family problems, self-esteem, sexual discord, and school problems. In addition, there were areas in which non users did not exceed, but closely approached (exceeded 25), clinical cutting scores. These areas require further investigation and include: personal stress, parent problems, depression, and friend problems. Further research is needed to confirm the presence of these problems, as well as to investigate their etiology. Inquiry as to whether the results obtained are attributable to a random anomaly of the sample, the influence of substance use in the sample,

characteristic of the larger population, or a miscalculation in the setting of clinical cutting scores on the MPSI, is needed.

It was very surprising in this study that such low scores were reported by MA users for child problems. As this finding does not, based on previous research, seem to accurately represent the difficulties MA users experience with their children, further investigation is recommended. It is also recommended that research in this area be conducted from the perspective of the child. Similarly, the lack of problems noted for physical and non-physical abuse were unexpected and may require further investigation.

Finally, the literature on suicidality of MA users seems to be rather inconclusive. Although the findings of the present study do not indicate severe problems with suicidal ideation, anecdotal evidence (as well as *some* research) seems to suggest that successful suicides *are* common among MA users. Further investigation into this area is advised.

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Appendix

Appendix A:

Methamphetamine-Use Questionnaire

Appendix A

Methamphetamine-Use Questionnaire

*PLEASE CIRCLE OR FILL IN THE BEST RESPONSE

1. Have you ever used methamphetamine in any form?

Yes No

2. If yes, have you used methamphetamine within the last year?

Yes No

3. If yes, have you used methamphetamine within the last 30 days?

Yes No

4. If yes, approximately how many times have you used methamphetamine within the last 30 days? _____ times

5. If you use methamphetamine regularly, approximately how often do you use?

A. several times per year
B. once per month
C. several times per month
D. once per week
E. several times per week
F. daily

6. Do you experience cravings for methamphetamine?

Yes No

7. If yes, describe your cravings using the following scale:

1	2	3	4	5
virtually no craving	craving is easily ignored	moderate craving	severe/persistent craving	uncontrollable craving

8. If you answered yes to question #5, how often do you experience these cravings?

1	2	3	4	5
almost never	at least once per month	at least once per week	daily	constantly

9. Do you regularly use any drugs other than methamphetamine?

Yes No

10. If yes, please indicate which drugs you currently use (circle all that apply):

A. Alcohol E. Heroin

B. Marijuana F. Hallucinogens (LSD, PCP, mushrooms, etc)

C. Cocaine G. Prescription pills

D. Crack H. Other (please specify) _____

11. If you answered yes to question #9, do you consider Methamphetamine your primary drug of choice (i.e. you use it much more regularly than the others)?

Yes No

12. If you answered yes to question #9, please write in approximately how often you use each in the blank:

A. Alcohol_____ E. Heroin_____

B. Marijuana_____ F. Hallucinogens_____

C. Cocaine_____ G. Prescription pills_____

D. Crack_____ H. Other (please specify)_____

Appendix B:

Demographic Information Sheet

Appendix B

DEMOGRAPHIC INFORMATION SHEET

Age_____

Sex_____

Marital Status_____

Number of Members in Household_____

Ethnic/Racial Background (choose the closest answer):

White/Caucasian_____ **Asian**_____

African American_____ **Pacific Islander**_____

Latino/Hispanic_____ **American Indian**_____

Other (please specify)_____

Occupation_____

Average Combined Household Income:

Under $15,000/yr_____ **$15,001-20,000/yr**_____

$20,001-30,000/yr_____ **$30,001-50,000/yr**_____

$50,001-75,000/yr_____ **Over $75,001/yr**_____

****FOR OFFICE USE ONLY (do not write below this line)****

Participant Identification #_____

Accepted for Study_____

Appendix C:

Informed Consent Statement

Appendix C

INFORMED CONSENT STATEMENT:
Psychosocial Correlates of Methamphetamine Use

INTRODUCTION/PURPOSE

You have been invited to participate in a research study on methamphetamine (meth) use. The goal of this study is to look for the effects that meth use has on behavior. In doing so, we will help therapists to better assist people dealing with meth addiction. To do this, we will have meth-users and non-users, tell us about their meth-use habits and other areas of their lives. We will then look for problem areas associated with increased meth use.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

Your involvement in this study will require no more than one hour of your time. The procedure for conducting this study is as follows:

I. Obtain informed consent from participant
II. Obtain demographic information from participant
III. Complete the Multi-Problem Screening Inventory
IV. Complete the Meth-Use Questionnaire

The questions asked in this study will relate to:

Meth-use; depression; self-esteem; partner problems; sexual problems; child, mother, father, and family problems; stress; problems with friends, neighbors, and co-workers; school problems; aggression; suicide; abuse; fear; guilt; thoughts; memory; and alcohol and drug use.

RISKS

Risk to you in this study is considered minor and unlikely and falls into the category of psychological risks:

Test anxiety/discomfort – you will be treated warmly, assured of your confidentiality in giving responses, allowed to skip any question which creates discomfort, and left alone while completing the surveys. In addition, if you are currently seeing a therapist for any reason, you will be encouraged to discuss with them any issues that may arise during your participation in this study.

BENEFITS

The main benefit to of this study is in learning more about the effects that meth use has on human behavior. This information will be of use to therapists in understanding and assisting their clients who are users. Non-meth users will benefit from this enhancement of the treatment system in place to help their loved ones or others who may be users.

Participant's initials_____

CONFIDENTIALITY
All information that you give us will be kept strictly confidential. It will be viewed only by those professionals directly involved in carrying out the research. Information which could identify you will be kept separate from test results, in a secure, locked location. No data will be transmitted electronically or saved on a computer's hard drive. There will be NO WAY to connect you to your responses. In addition, in contacting you about this study, no answering machine or voice-mail messages will be left.

COMPENSATION
You will receive a $10 gift certificate when you finish filling out the surveys.

EMERGENCY MEDICAL TREATMENT
The authors of this research and the University of Tennessee are in no way liable for any injury or other medical claims incurred during participation in this study. You hereby waive all rights to compensation for medically related charges.

CONTACT INFORMATION
If you have any questions or comments about this study (or you experience negative effects as a result of participating) you may contact the principal researcher Greg J. Eisinger through UT's College of Social Work at (865) 974 – 6481, or by email at **geisinge@utk.edu**. If you have questions about your rights as a participant feel free to contact the UT's Office of Research Compliance Officer at (865) 974 3466.

Participation
Your participation in this study is voluntary; you may decide not to participate without penalty. If you decide to participate, you may change your mind at anytime without penalty and without loss of benefits to which you are otherwise entitled such as services at Helen Ross McNabb. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

CONSENT
I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature_____ Date_____

Researcher's signature_____ Date_____

Appendix D:

Script for Briefing of Participants

Appendix D

Script For Briefing of Participants

Section 1

You are here because you have agreed to participate in a study on drug use. This study is part of a University of Tennessee student's master's thesis and may appear in several professional publications in the future. Your name will never be used in this study, and NO OTHER INFORMATION WILL BE USED WHICH COULD POSSIBLY CONNECT YOU TO YOUR RESPONSES. The consent form that you just signed is the only document that will ever bear your name, and it will never be attached to, or refer to, your responses. In addition your responses will not even be viewed by myself. Every precaution has been taken to ensure that no authorities, or anyone else, will be able to connect you to your responses or take legal action against you as a result of participating in this study. You may also withdraw from the study at any time without penalty. You will receive a $10 gift certificate to McDonalds or Wal-Mart when you are finished with your participation in about 45 minutes, and you will never be contacted again.

Section 2

Now, I will ask you to give us some information about yourself. Please answer each question with the response which most closely matches how you identify yourself. We also ask that you DO NOT write your name anywhere on this form. When you are finished, place the form into the manila envelope.

Section 3

At this time, we will begin the testing portion of the study. You will be asked to fill out

two different surveys. The first is an assessment of general functioning which will ask you questions about 27 areas of your life. Please DO NOT WRITE YOUR NAME anywhere on this sheet. This questionnaire is designed to obtain information about a wide range of possible problem areas. Answer each item as carefully and accurately as you can by placing a number beside each one as follows: 1 = none of the time; 2 = very rarely; 3 = a little of the time; 4 = some of the time; 5 = a good part of the time; 6 = most of the time; and 7 = all of the time. You can refer to this scale on each page of the survey as well. You may discover that some of the items do not apply to you or your personal situation. For any such item, please enter an "x" but do not leave the item blank. For example, if the question asks about your children and you have none, please place an "x" in the answer blank. When you begin to complete the items on this questionnaire you will see that you can very easily make yourself look as good or bad as you wish. Please do not do this. It is extremely important for you to provide that most accurate answers possible. The most important thing for us is that you are made to feel at ease, and that you read carefully, and respond honestly to, each question, as your responses will not be held against you or made known to anyone outside of this study. However, you may also choose not to answer any question which makes you uncomfortable. Any such question you may simply leave blank. This first test will take about 30-40 minutes. When you are finished, you may move on to the second survey. This 12-item questionnaire will ask you about your habits in regards to methamphetamine use. Again, please feel free to respond

honestly or not to answer a question if it makes you feel uncomfortable. Please DO NOT WRITE YOUR NAME on this sheet either. This quick survey should only take about 5-10 minutes. When you are finished, please place the two surveys into the manila envelope and seal it. You may bring the envelope back to the place where we met I will be waiting to give you your $10 reward. You will not be contacted again after this. I will now leave you alone to complete these surveys, so that I cannot see your responses. Do you have any questions before we begin? Thank you very much for your participation in this study, you may now begin.

Vita

Greg Eisinger was born in Tampa, FL in 1982. After living all over the country, his family settled in the Chicagoland area, where he began his academic pursuits. Following two years of general education at Benedictine University in Lisle, IL, he obtained a B.A. in psychology from the University of Tennessee in 2003, graduating Summa Cum Laude and a member of Psi Chi, the National Honor Society in Psychology. Interested in mental health, primarily evaluation and treatment of adolescent/young adult populations, he recently fulfilled all requirements for the M.S.S.W. degree with a clinical concentration at the University of Tennessee and will graduate with honors in 2006. Greg was hired directly out of his master-level internship, where currently works as a child and adolescent therapist at a community mental health agency. He still plans to pursue either a Ph.D in clinical psychology or a PMHNP in the near future. Greg also has one co-authorship with Dr. John Wodarski from their work together during his first year of graduate study:

Wodarski, J.S. & Eisinger, G.J. (in press). Ch. 4: Finding a place for research content in social work education. In J.S. Wodarski (ed.). *Social work education: An evidence-based approach.* New York: Haworth Press.