RELAPSE TO NARCOTIC ADDICTION: THE ROLE OF METHADONE IN MODIFYING CONDITIONED ABSTINENCE SYMPTOMS IN HUMANS

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CURRICULUM STUDIORUM

Nathan Mandelzys was born January 28, 1947, in Montreal, Quebec. He received the Bachelor of Arts degree in Psychology from Loyola College, Montreal, Quebec, in 1969. He received the Master of Arts degree from the University of Ottawa in 1973. The title of his Master's thesis was, An Investigation of Differential Pupillary and GSR Reactivity Between Groups Differing in Degree of Extraversion.

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ABSTRACT

Relapse to Narcotic Addiction: The Role of Methadone in Modifying Conditioned Abstinence Symptoms in Humans

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A review of the literature indicated that conditioned stimuli commonly associated with heroin usage not only act to maintain addiction, but are significantly related to relapse. Evidence was provided to show that conditioning to heroin associated stimuli occurs, that these stimuli are conditioned to arousal, and that the conditioning effects remain long after detoxification has been achieved.

Thirty-six addicts in treatment in methadone programs were randomly assigned to three experimental groups based on the experimental manipulations that they were to undergo. The three groups were an abstinent group, i.e. they received no medication prior to the experiment, a methadone group who received their daily dose of methadone, and a placebo group who received a quinine placebo. All group assignments were completed in a double-blind fashion. A control group of 12 non-addicts were also included in the study.

Behavioral and cognitive indices of arousal were gathered before and after the presentation of a set of heroin-related and neutral stimuli. The stimuli were in the form of photographic slides of common objects associated with heroin addiction, or scenes of landscapes and art objects.

The pre-post dependent variables included mood factors from the

Profile of Mood States, Opiate Withdrawal Scale scores, and Semantic Differential ratings of heroin and methadone. In addition, indices of heart rate activity, including tonic, phasic, and directional responses were recorded during the presentation of the slide stimuli.

The data indicated that on almost all of the pre-post measures there were significant differences in the direction of their being greater reactivity after the slide presentation. Between the groups, the data indicated that the abstinent and placebo groups, in general, had the greatest amount of reactivity to the slide stimuli. The cardiac acceleration and deceleration data, interpreted within Lacey's theoretical framework of stimulus intake and stimulus rejection, provided some support for the conditioned abstinence model of relapse. However, there were low intercorrelations between the different behavioral and physiological dependent variables, and to this extent the results were inconsistent.

The results were interpreted in terms of the role of conditioned reinforcers in relation to relapse, and the effects of these reinforcers on methadone maintenance treatment was also evaluated.

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INTRODUCTION

Opium derivatives, particularly morphine and heroin, have an extensive history of abuse worldwide, but especially in North America. For the greater part of this history, addiction to these substances was considered a problem that could best be dealt with through the criminal justice system. As a result, both treatment and research lagged far behind the spread of addiction. The early treatment methods that were developed to 'cure' narcotic addiction were often based more on speculation and a Samaritan attitude rather then on research data, and evaluation of the methods and results of these early treatment approaches were either sparse or totally non-existent.

In the last twenty years there has been a burgeoning of interest in the area of narcotic addiction. Evaluation data is now not only available, but exceedingly substantial, and most authorities in the area seem to feel that the relapse rate for heroin addicts who participate in treatment programs is excessively high. The success rate for methadone maintenance as a treatment modality for heroin addiction has been good while the addict remains in treatment ingesting his daily dosage of methadone, but relapse rates continue to be exceedingly high after the addict leaves the program. One of the reasons why methods to reduce these high relapse rates have lagged is because basic issues concerning the dynamics of heroin addiction have not been resolved.

Although there are many theories available which have attempted to explain the dynamics of heroin addiction and relapse, research data which have accumulated in the field suggest that the learning theory model offers a theoretical structure which is both able to incorporate existing data and

also be of heuristic value for future research. Leading proponents of the learning theory approach to drug addiction have been particularly concerned with conditioned reinforcers, that is, neutral stimuli which acquire reinforcing properties, and in general, they have taken the position that these variables have the ability to adversely effect the probability of abstinence. Conditioned reinforcers have been extensively investigated since the work of Hull (1943), and while evidence exists relating this concept to heroin addiction, there is little available research delineating the role that these variables play in human heroin addiction or the effect of methadone on these conditioned reinforcers.

The Problem and Purpose of this Study

The term 'craving' has often been discussed in addiction research, but it has seldom been adequately conceptualized, experimentally validated or tested critically under controlled laboratory conditions (Ludwig and Wikler, 1974). An expert committee of the World Health Organization noted that the concept has been invoked to describe many different clinical phenomena, such as (a) the onset of the excessive use of narcotics, (b) the behavior displayed while using narcotics, (c) relapse to narcotics after days or weeks of abstinence, (d) continuous daily use of narcotics, and (e) 'loss of control'. If all of these factors represent aspects of craving, it might be one of those terms which has lost its usefulness through too broad a definition. This study, while still attempting to retain the essence of the concept, specifically operationalizes the term by hypothesizing an arousal state as the basis of this craving, and uses a number of specific behavioral, cognitive and physiological measures to evaluate the degree of arousal.

This study accepts the classical conditioning process concerning secondary or conditioned reinforcers and assumes that stimuli associated with heroin use, regardless of whether they are interoceptive or exteroceptive, become conditioned reinforcers which gain arousal properties and which have the effect of facilitating heroin usage during a period of heroin abstinence.

More specifically, this study hypothesizes that conditioned reinforcers commonly associated with heroin use and withdrawal act to arouse the heroin addict, behaviorally, cognitively, and physiologically, and that this aroused state is significantly related to the concept of craving and to the instrumental behavior of heroin ingestion.

The success of methadone maintenance as a treatment modality which reduces or eliminates heroin usage will be interpreted within the context of the hypothesized view of the relationship between craving, stimulus cues, and conditioned reinforcers. This study attempts to add further information concerning the effects of methadone treatment. It attempts to assess the degree to which methadone is successful in reducing heroin usage, and also, some of the factors which are responsible for relapse after detoxification.

This study also attempts to provide information concerning the importance of stimulus situations in eliciting behavior, especially addictive behavior which is typically difficult to change in therapy.

The experiment will be designed to assess if significant differences exist in various correlates of arousal to heroin related and neutral stimuli in three well-defined groups of addicts in treatment and a control group of non-addicts. The three addict groups will be categorized according to their degree of craving during a fixed experimental time period. The effects of the slide stimuli will be assessed by employing a specific battery of

behavioral, cognitive and physiological indices.

The study proceeds within the framework of four chapters. A review of the theoretical background and relevant research findings which led to the formulation of the hypotheses to be investigated is presented. The primary emphasis throughout this entire section is that relapse is the major problem in addiction, and that investigation of the causal factors related to relapse can best be dealt with, at least from a research perspective, within the context of conditioned reinforcement theory. This is followed by a description of the instruments, procedure and statistical analyses employed in testing the hypotheses. The third and fourth chapters present the results, and interpretation of the data in relation to the theoretical problems and issues initially raised. A summary and conclusions of the research is also presented.

CHAPTER I

Review of the Literature

Introduction

In this chapter, relapse as a major problem confronting heroin addiction treatment programs is reviewed. Three popular theories of relapse which are, and have been influential in determining the direction of heroin addiction treatment are discussed. The classical and operant conditioning approaches to narcotic addiction are summarized, providing an historical overview of work done in the area. The onset of addiction, the nature of dependence, and the concepts of primary and secondary pharmacological reinforcement are dealt with within the context of Wikler's theory of conditioned abstinence. Finally, methadone maintenance as a treatment modality is reviewed, and the relationship that it has to the principles outlined in the previous sections is discussed.

Relapse as a Major Problem in Addiction

Relapse has been, and continues to be, the most persistent problem in the treatment of heroin addiction. Both methadone maintenance, and other therapies such as the use of narcotic antagonists, have been successful in eliminating or significantly reducing heroin use while the addict remains in treatment, but return to heroin consumption is high after discharge, even though in many cases the addict has made significant lifestyle changes. Regardless of whether the addict detoxifies himself, detoxifies in jail, detoxifies after a period of counselling and medical supervision in a methadone program, or is involved in treatment in a drug-free therapeutic community, the chances

of the addict avoiding readdiction are slim once abstinence is achieved (O'Donnell, 1965).

The conditions which involve relapse appear to primarily represent problems associated with the extinction of behavior at the social, psychological and physiological levels. It is, however, the most difficult part of opiate taking behavior to explain. Why, after he no longer needs to avoid withdrawal distress and after he has experienced firsthand the problems of being an addict, does he relapse? Indeed, there is a mythology among non-addicts to the effect that the rigors of a withdrawal syndrome are almost impossible to tolerate. However, while it is true that going 'cold turkey' is very unpleasant, it is apparently not that difficult an undertaking (Goldstein, 1972; Jaffe, 1965).

> With slow tapering, temporary substitution of long-acting narcotics, good medical supervision, and ancillary medications for tranquilization and sleep, withdrawal can be fairly painless. Indeed, all long term addicts have been through this process again and again. It is easy to understand why the addict on the street finds it difficult to give up heroin once he is 'hooked' and why he may lack the fortitude to endure the withdrawal sickness as long as heroin is readily available to 'cure' it. But how do we explain the typical instance of an addict who after a year or more of incarceration in a prison or a hospital without heroin, who has long since been withdrawn, starts the re-addiction cycle within hours, days or weeks after returning to his home environment? This is the key question. Otherwise, we could hypothetically withdraw all addicts within a few weeks, discharge them cured, and solve the addiction problem in short order. (Goldstein, 1975, p. 938).

It is interesting to note that almost all addicts who have been through the relapse cycle report a persistent craving for heroin long after detoxification has been completed. Brecher (1972) states that craving is a subjective feeling that may not be reported accurately by an addict. However, he feels that craving is a useful concept to explain relapse in the face of

persistent negative social consequences. The basis for relapse is not known but addicts report that relapse is related to heroin craving and that methadone reduces or eliminates this heroin craving (Dole, 1969). Since methadone also reduces or eliminates heroin acquisitive and ingestion behavior, it appears logical to assume that a relationship exists between these three variables: relapse, heroin craving and heroin acquisitive and ingestion behavior.

The literature points towards four general classes of explanation which have been employed in order to explain this relationship, invoking respectively, psychological factors, sociological factors, biochemical factors, and learning (conditioning factors). Although all four classes of explanation will be discussed it is the conditioning factors which form the primary focus of this review.

Psychological, Sociological and Biochemical Theories of Relapse

Psychological Theories. According to Teasdale (1973), personality factors could possibly operate in a number of ways in determining both susceptibility to addiction and probability of relapse. Theoretically, it could determine whether a person chose to associate with groups where drugs were available; whether, given the availability of drugs, the person chose to experiment with them; whether, having had some experience with them, the person persisted in using them, how soon and with how much conviction he would want to stop, and how successful his attempts would be.

The majority of research on personality factors in relation to addiction, maintenance and relapse has centered primarily on what has been referred to as the 'addiction-prone' personality. The main tenet with regard to those who advocate the addiction-prone personality is that persons who have taken narcotics had specific psychological weaknesses which were satisfied by heroin or other narcotics. In a review of the literature with regard to this

topic, Gendreau and Gendreau (1970) state that this type of personality constellation has been variously described as being (1) inadequate and passive, with associated neurotic traits (Ausubel, 1958; Eveson, 1963; Gerard and Kornetsky, 1955; Gilbert and Lombardi, 1967; Hill, Haertzen and Davis, 1962; Nyswander, 1956; Savitt, 1963; Scott, 1963; Wikler, 1952, Wikler and Rasor, 1953; Yahraes, 1963; Zimmering, 1952); (2) psychopathic (Felix, 1944; Gilbert and Lombardi, 1967; Hill, Haertzen and Glaser, 1960; Olson, 1964; Stanton, 1956); (3) less psychopathic than non-addict control groups (Gerard and Kornetsky, 1955; Hill et. al., 1962; Zimmering, 1952); (4) sexually maladjusted (Hoffman, 1964; Letendresse, 1968; Nyswander, 1956; Wikler, 1952; Zimmering, 1952); and (5) prone to anxiety and depressive traits (Ausubel, 1958; Eveson, 1963; Gilbert and Lombardi, 1967; Hill et. al., 1962; Van Kaam, 1968).

To this list can also be added more recent research which states that (1) addicts have greater anxiety than normals about personal drives (Zeidenberg, 1975); (2) addicts do not possess the basic psychological coping mechanisms ordinarily developed during adolescence (Jackman, 1973); (3) have greater feelings of frustration and anxiety (Sutker and Moan, 1972); (4) have an impairment in ego functioning as compared to normals (Pittel, 1972); and (5) have a sense of fearful despair (Howe, 1973).

Based on the above summary, it would be an understatement to say that research has not as yet confirmed a specific addictive personality pattern in spite of the great number of studies which have tried. Even the suggestion of an addictive personality is hypothetical in that no present measuring instruments(s) appear able to delineate with certainty what this pattern might be (Stratton, 1976). Moreover, even when the same test instrument has been utilized the results found are not consistent. For example, many MMPI studies, (Minnesota Multiphasic Personality Inventory, Hathaway and McKinley, 1951) have been carried out on various addict populations and compared to standard-

ized normal adult norms. The only real conclusion that seems safe to make is that opiate addict profiles exhibit a greater range and larger standard deviations from the mean as measured by the MMPI when compared with standardized adult norms (Hill et. al., 1962; Pittel, 1972; Sheppard, et. al. 1971; Sutker, et. al., 1972, 1973, 1974). Similar inconclusive findings have been obtained using the Eysenck Personality Inventory (or an earlier version, the MPI). Narcotic addicts, as described by the two personality dimensions do not appear to differ from normals on extraversion but score higher on neuroticism than normals though lower than neurotic or alcoholic subject samples (Halstead and Neal, 1968; Kaldegg, 1970; Martin and Inglis, 1965; Rosenberg, 1969).

Platt (1975), in an effort to clarify the issue did a study using the MMPI which attempted to avoid methodological and confounding problems that might have caused discrepancies reported in earlier work. Blind data collection and scoring procedures were used on 27 heroin addicts and 20 non-addict subjects. These two groups were compared on 34 personality variables and significant differences were found on seven of the variables. But, when education, I.Q., first arrest age, prior arrests, achievement test scores, religion, and marital status were used as covariates, Platt concluded that the significant differences failed to provide sufficient support for an addictive personality hypothesis.

In the most well-known study which has been critical of the addiction prone personality, Gendreau and Gendreau (1970) found no significant differences between the MMPI profiles of incarcerated addicts and non-addicts when two-tailed test comparisons were applied to the results. In summarizing their data they comment that,

> The negative results suggest that significant differences between addicts and non-addicts reported in previous studies may have been in part due to failure in sampling techniques. If the control subjects come from a similar socio-economic level as addicts and have a prior criminal record, they produce a personality profile markedly similar to addicts. (Gendreau and Gendreau, 1970, p. 21).

These comments support the earlier work of Stevenson, et. al. (1956). In a study of dependent and non-dependent prisoners, they found that although the heroin users were slightly less stable, objective and purposeful than the non-addict control prisoners, their personality traits resembled those of non-using prisoners more than they differed from them. They found few actual psychiatric disorders among the heroin dependent prisoners and concluded that the "tendency to classify addicts in various psychiatric catagories is, in our opinion, unwarrented. Addicts are basically normal people (Stevenson, et, al., 1956, pg. 25).

In a review article, Braught et. al. (1973) summarized the body of knowledge with regard to the addictive personality and concluded that there was a lack of systematic and theory-bound research, a gross lack of methodological rigor, and a complete lack of integration of findings with regard to the various studies. They also comment that the widespread use of unrepresentative, uncontrolled subject samples, and small-size observational data bases made it difficult for them to delineate the basic characteristics of the addictive personality, even if it existed.

In summary, then, the present evidence does not suggest that a highly differentiated 'addict personality' will be identified, and the failure of previous attempts to differentiate other deviant-specific personality configurations, such as the 'delinquent personality', make it seem highly unlikely. Perhaps the viewpoint put forth by Zubin and Katz (1966) is the most reasonable

one to accept at the present time. They suggest that the most tenable hypothesis of the relationship between heroin addiction and personality is that of independence, but once drug misuse has occurred, then the individual personality structure may well determine its direction and development.

Sociological Theories. Three sociological theories have been advanced to account for drug addiction and relapse. Lindesmith (1965, 1968) is one of the few theorists to explore this problem in depth and has provided the only theory that advances a complete explanation for both the cause of addiction and the etiology of relapse in sociological terms. He argues that before a person becomes addicted he must first undergo a withdrawal experience, learn to associate the distress with abstinence from the drug, and then take an active part in the alleviation of the distress by ingesting more opiates. Thereafter, habitual use is sustained by taking the drug to avoid withdrawal distress. Within this context, the same principles keep operating even after an extended period of time, thus accounting for relapse.

Winick (1962) has advanced the theory that by their mid-thirties most addicts spontaneously become abstinent and will no longer relapse. Addiction, beginning in adolescence tapers off when life stabilizes through some form of dynamic emotional homeostasis. That is, as the stresses of adolescence become less significant the addict feels less threatened, responds to these stresses less acutely, and tends to stop taking narcotics.

The Winick studies (1962) concentrated on the age of onset and length of addiction of 7,234 persons originally reported by the U.S. Federal Bureau of Narcotics during 1955 but not reported again as using drugs by the end of 1960. The data showed an approximate 2/3 drop-out rate (i.e. addicts removed from files). Ball and Snarr (1969) indicate from their work that the 'maturing out' process may be true for as many as 1/3 of all addicts. As well, the

Winick theory can be considered to have some support from relapse records presented by Duvall, Locke and Brill (1963). A sample of 453 patients selected from 1,359 discharged during a three year period were followed for five years. Although more than 97% relapsed at some time during these five years, by the end of the fifth year after discharge only an estimated 46% of the study group had relapsed to readdiction and 49% were totally abstinent.

The third theory is more a collection of studies on a similar theme than a formalized theory with constructs and hypotheses. The theory deals exclusively with social factors and has its roots in the differential association reinforcement theory of criminal and delinquent behavior as put forth by Sutherland (1947), and Sutherland and Cressey (1970).

A good example of the application of this theory to narcotic addiction can be seen in the work of Ray (1964). His analysis is concerned with describing and analyzing the social situations the addict encounters while he is abstinent, and evaluating the status dilemmas that arise out of the abstinent situation. He argues that the degree of abstinence is proportional to the extent that the ex-addict defines himself as a non-addict, and relapse will occur if and when he redefines himself as an addict. Studies by Strelinger et. al., (1973); Ross, (1973); and Randell (1973) provide some data in support of Ray's position in that they have all demonstrated that the greater the tendency to define himself socially as a non-addict, the greater the probability of abstinence.

In summary, there seems to be little doubt that sociological variables have an impact on motivation, therapeutic relationships, amenability to treatment, and probability of relapse. But, as with the personality theories, their specific functional relationship is not as yet well-defined.

Biochemical Theories. The biochemical need theory specifically deals with the maintaining conditions of heroin addiction and is partially supported by the relapse phenomena, detoxification difficulty, and the effects of methadone. Dole and Nyswander (1967) have put forth the proposition that addicts are suffering from a biochemical deficit or 'metabolic disease' which requires opiates to restore normal functioning. There are actually two components to this theory with the first being that certain individuals are either genetically or metabolically predisposed to opiate dependence, and the second being that the initial cycle of addiction brings about a permanent physiological change in some individuals. While both versions are plausible, it is only the second which has received any experimental support.

With regard to the genetic defect theory, we can easily hypothesize a pre-existing deficit, such as an abnormality in regulation of the synthesis, storage, or release of an essential neurotransmitter. Indeed, Nichols (1965) demonstrated that a liability to morphine addiction could be bred in rats, and Claghorn, Ordy and Nagy (1965) have shown that rhesus monkeys display individual differences in their desire to self-administer morphine. By extension, Dole and Nyswander (1967) argue that some people become addicts while others do not because of some physiological difference between these groups which accounts for the differential reactivity to heroin.

There are severe criticisms that can be made of this theory. For example, it implies that brain functioning would be somewhat abnormal, but the victim of the disorder would never realize exactly what was wrong until, by chance, he tried an opiate narcotic.

> Then, for the first time in his life, he would feel normal, and this experience would naturally lead him to useopiates regularly thereafter. It would be as though an undiagnosed diabetic accidentally discovered insulin. (Goldstein, 1975, p. 939).

However, as Chien et. al. (1964) and Robbins and Murphy (1967) point out, individuals become addicted when heroin is freely available, and when it is available a large proportion of those who try it become addicted. Bejerot (1972) has commented that the spread of heroin abuse and heroin addiction in middle and upper class families within the last ten years demonstrates that anybody can become a heroin addict. In general, heroin addiction seems to be related to heroin abuse, and heroin abuse seems to be related to the availability of the drug, curiousity level, peer pressure, and attitudes concerning drug usage (Le Dain, 1973).

The other related theory, that a permanent physiological change is induced by narcotics during the addiction cycle, is supported by evidence from a number of sources.

Martin (1971), summarizing a number of studies, comments that,

> following withdrawal of patients dependent on morphine and methadone, there is a long-lasting syndrome of physiological abnormalities which has been called protracted abstinence, which appears to be characterized by hyperresponsivity to stressful stimuli and which is associated with relapse to the drug of dependence. (Martin, 1971, p. 34).

In a similar vein, Russell (1971) comments that,

> intense subjective craving, so long regarded by the unsympathetic as 'merely psychological', may well be governed by physiological adaptive mechanisms in the hypothalamic reward system. (Russell, 1971, p. 2).

Other evidence comes from Di Palma (1970) and Jaffe (1970) who have demonstrated that body temperature, blood pressure, and sensitivity of the respiratory centre to carbon dioxide do not quite return to pre-addiction baselines even after an extended period of abstinence.

In animals, opioid substances have been shown to have a significant anti-release effect on acetylcholine (Paton, 1957; Paton and Zar, 1968); an anti-release effect on norepinephrine from post-ganglionic elements (Cairnia, et. al. 1961; Trendelburg, 1957); and on the turnover of serotonin concentrations in the brain (Way, 1968). Eidelberg (1976) summing up a recent review of the actions of opiates upon synapses states that,

> it is possible that the biphasic, or even polyphasic, sequence of development of some opiate actions may reflect a complex sequence of synaptic interference and rapidly developing over-compensating homeostatic adjustments. (Eidelberg, 1976, p. 97).

At the behavioral level, Goldberg and Schuster (1970) demonstrated that monkeys addicted to morphine, then withdrawn and kept drug free for many months, and finally challenged with a narcotic antagonist which would precipitate an acute withdrawal syndrome in a dependent animal, developed some withdrawal-like symptoms. However, in normal non-addicted animals the antagonist produced no discernable effects whatsoever. In other words, monkeys previously addicted appeared to have some persistent abnormality akin to the dependent state, even though overt evidence of dependence had long since disappeared. Cochin and Kornetsky (1964) reported that tolerance to the effects of a single morphine injection as measured by the hot plate reaction could be demonstrated for periods of up to one year following that single injection, and Green, Young and Godfrey (1951), in an early study, reported similar findings in the mouse using the tail flick as a measure of drug effect and several weeks as the elapsed time. Finally, Wikler and Pescor (1970) concluded that in the 'post-addict' rat a 'need' for an opioid persists for about one year after abrupt withdrawal of morphine, and that this need is based on what they call long term derangements of homeostasis.

In summary, Dole has suggested that the sustained use of opiates may produce a permanent 'hunger' for opiate narcotic drugs. Based on all of the evidence, he concluded that,

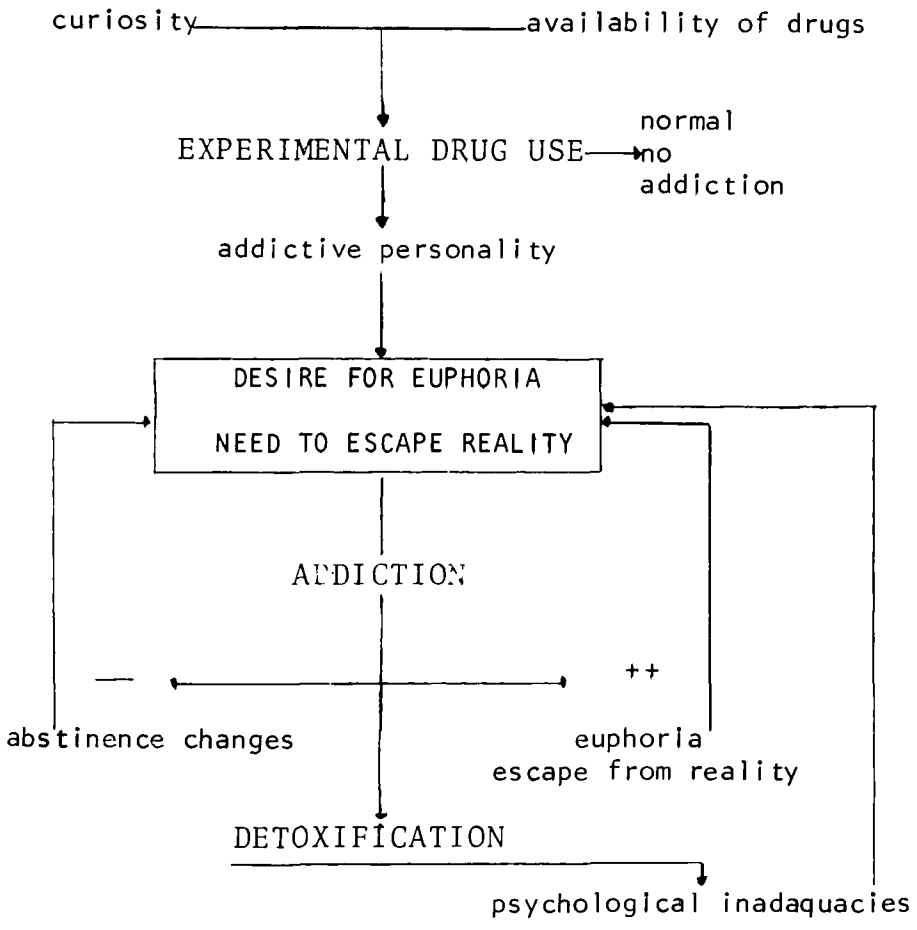
> Months after withdrawal of narcotic drugs, previously addicted animals will show a drive to ingestion of narcotic drugs. If human beings are similar to rats in their pharmacological response to narcotic drugs-as seems likely-then exposure to narcotic drugs in humans also leaves a pharmacological residue...My opinion is that heavy exposure to heroin induces metabolic changes. (Dole and Nyswander 1967, p. 22)

The evidence presented is of great importance, and because of this, these phenomena deserve much more intensive investigation, especially with respect to the possibility that opiate molecules or their metabolites remain bound to receptor sites for long periods of time.

A summary of the metabolic disease theory and its comparison with the psychological theories presented earlier is presented in Figure 1.

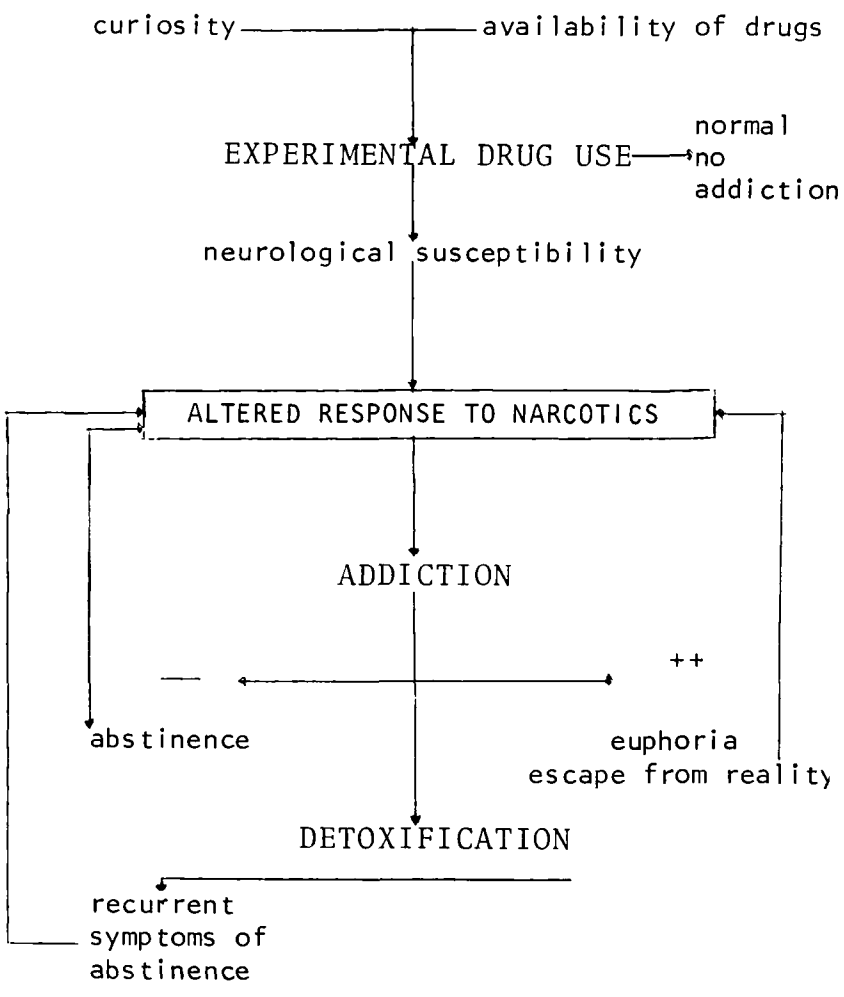
Figure 1. The metabolic theory according to Dole and Nyswander (1967) and comparison with psychological theories of addiction and relapse.

PSYCHOLOGICAL THEORY



SOCIAL AND PSYCHOLOGICAL DETERIORATION

METABOLIC THEORY



SOCIAL DETERIORATION

Conditioned Reinforcement Theory

Introduction. It has long been established that some drug reactions can be elicited by environmental stimuli that have been repetitively paired with drug administration. Classical and operant conditioning have been the two methodological approaches which have been utilized in order to investigate this relationship. Both methodologies focus mainly on the external environment, with the operant tending to focus on the effects of the environment on overt behavior, and the classical tending to monitor the effects of the environment on internal physiological and neurophysiological processes (Lynch et. al. 1973). These two methodologies have been described in great detail in a variety of texts (eg. Osgood, 1962; Deese, 1958).

The principal thrust of research on environmental interactions with drug effects has emerged from studies using operant conditioning techniques. Much of this research has been reviewed in depth in a series of reports (Jaffe, 1970; Kumar, Stoleman and Steinberg, 1970; Mello, 1968; Schuster and Villarreal, 1968; Wikler, 1971). The classical conditioning literature is primarily represented in two main reviews, Lynch et. al. (1973) and Lynch, Stein and Fertziger (1976). These two articles document in detail most of the available literature on classical conditioning components of drug effects with specific emphasis on narcotic and opiate drugs.

While both types of conditioning are relevent to this study, it is primarily the relationship between drug dependence, relapse and classical conditioning which is the most crucial to this investigation and it is this relationship which will now be reviewed.

Historical Overview. Classical conditioning of morphine effects can roughly be divided into three periods based on the hypotheses tested in the

various studies. The first epoch includes all studies from 1900 to 1936. During this period the chief interest was in the pharmacology of addiction (eg. Kolb, and MuMez, 1931; Kleitman and Crisler, 1927). These and other investigators were not precisely interested in narcotic addiction, but rather in the general question of the nature of conditional responding and the mechanisms involved in conditioning. The next period, roughly between 1936 and 1957, was hallmarked by a shift from concern solely with problems involving conditioning effects to questions about the relationship between conditioning variables in relation to withdrawal and relapse. The theoretical writings of this period and the research conducted marked a shift in emphasis so that now hypotheses revolved around the conditioning of the withdrawal phenomena. The research emphasized two central tenets: (1) that drug-seeking behavior was maintained because of the euphoriant or rewarding properties of addictive drugs, and (2) that drug seeking behavior was maintained in order to avoid the traumatic experiences involved in withdrawal (Lynch et. al., 1976). Perhaps the clearest statement of these two hypotheses was stated by Wikler (1948) when he noted,

> Lindesmith believes that the principal motivation to relapse and permanent 'addiction' is the discovery by the person who is physically dependent on morphine that this drug will relieve withdrawal symptoms. . . . he is then inclined to try the drug for relief of other physical discomforts. While such factors may contribute to the complex motivations for relapse, the pleasurable aspects of opiate addiction and the personality organization of the individual are of greater importance. (Wikler, 1948, p. 334).

In the third and current epoch of drug conditioning research concern has shifted from issues of drug conditioning to issues involving drug dependency. The primary experimental paradigms are ones in which the experimental subjects, primarily rats and primates, are first pretreated with a high dose of morphine

or some form of morphine derivative with a view to creating dependency. Then, after a fixed time period, the conditionability of withdrawal reactions precipitated either by narcotic antagonists or acute drug abstinence are evaluated. The inference made from these animal studies is that the avoidance of withdrawal motivates the human addict to the extent of keeping him or her dependent on narcotics. It is interesting to note at this point that the idea of the motivating power of avoidance of withdrawal reactions in maintaining drug seeking behavior helped contribute to the methadone maintenance concept. It was originally believed that methadone would not only help block withdrawal reactions, but also that the addict could gradually reduce the amount of methadone without experiencing withdrawal, and consequently, eventually become narcotic free (Dole and Nyswander, 1965).

In summary, a tremendous body of literature has accumulated with regard to classical conditioning factors in relation to narcotic addiction, maintenance and relapse. Wikler, however, is one of the few theorists to expound a full theory based on conditioning principles. It is his theory which forms the theoretical base for this study and it will be dealt with in all of its aspects in the following sections.

Wikler's Theoretical Position with Regard to Dependence and Relapse.

Introduction. Although it has undergone a number of revisions, Wikler's theory is primarily a two-factor learning theory which includes, (1) classical conditioning of physical dependence through repeated temporal contiguity between a specific environmental stimulus (or set of stimuli) and the occurrance of narcotic abstinence phenomena, and (2) reinforcement of instrumental activity (acquisition behavior) through repeated reduction by the drug of such abstinence phenomena as developed during intervals between doses (Wikler, 1965). This

formulation has been expanded further by the inclusion of additional concepts such as secondary reinforcement, pharmacological reinforcement, stimulus generalization, and reinforcement scheduling (Wikler, 1973, 1974, 1975).

The Onset of Addiction. According to Wikler (1973), the onset of drug using behavior in man is not neccessarily dependent upon the pharmacological effects of the drug in question. Rather, it would appear that peer-group pressures, and socio-economic and cultural conditions are much more salient. This view is consistent with that put forth by a number of other authors such as Blum (1969), Clausen (1957); Cohen (1965) and Le Dain (1973). In fact, if one is to stay within the framework outlined by Wikler with regard to the onset of addiction, then it would be more useful to employ the concept of a 'social career' as outlined by Becker and others (Becker, 1963; Goffman, 1961; Waldorf, 1973; Winick, 1962). The notion of 'career' permits the understanding of behavior patterns as developing in an orderly sequence that any individual, given the appropriate circumstances, may pass through, for example, experimental use, occasional use, and regular drug use. Attainment of each step in the sequence would be a neccessary, though not sufficient condition, for further career advancement, and the developmental process may be terminated or reversed at any stage. Viewed in this way, the reinforcement derived from drug use is social in nature rather than based upon observable pharmacological action (Wikler, 1971). In this sense, reinforcement factors only indirectly related to the pharmacological properties of narcotics come into play, at least during the onset of addiction and include, (1) a special language or argot, (Haertzen and Hooks, 1972); (2) a commodity market and pricing system, (O'Conner et. al. 1973); (3) a system of stratification and ethical codes, (Smith and Gay, 1973). In addition to these direct links

to the world of addiction, becoming an addict means that one gains a host of secondary reinforcement probabilities in accordance with the definitions that society has of this activity (Akers, 1973).

The Nature of Dependence. According to Wikler (1973), if an individual's motivations for using drugs are based upon social reinforcers then that individual is not drug-dependent, but rather "drug-culture dependent". Drug dependence can only be said to occur when continued drug use is clearly related to a specific interaction between physiological reactivity and the pharmacological actions of the drug in question. This is an important point both theoretically and in terms of this study since a clear distinction is made between psychic and physical dependence. Further operationalizing these concepts, Wikler suggests that,

> Reinforcement consequent on organismal-pharmacological interactions may be classified as 'direct' if, in our present state of knowledge, the sources of reinforcement are presumed not to have been engendered by the drug itself, or as 'indirect' if the sources of reinforcement are known to have been engendered by previous doses of the drug. In the senses just described, these two kinds of interactions can generate the process of 'primary' pharmacological reinforcement. In addition, events or 'stimuli' that had been temporally contiguous with such 'primary' reinforcement on repeated occasions can acquire 'secondary' (or 'conditioned') reinforcing properties, thereby generating 'secondary' pharmacological reinforcement. (Wikler, 1973, p. 21).

Thus, five basic postulates have been put forth, and include, (1) social reinforcers interacting with a host of other variables leading to the initiation of drug using behavior, this in turn leading to primary pharmacological reinforcement which can be thought of as (2) direct or (3) indirect. These reinforcement processes may become conditioned to exteroceptive and/or interoceptive stimuli, thus generating secondary pharmacological reinforcement, which can be either (4) direct or (5) indirect.

Direct Primary Pharmacological Reinforcement. Included among the many examples of direct primary pharmacological reinforcement are persistent drug using behaviors attributed by humans to drug produced 'highs', 'flashes', or 'rushes', and in animals equipped with intravenous self-injection devices to drug-produced 'reward' effects. This whole area has been reviewed by Riddell (1969) and Gossop (1976) in humans, and Schuster and Thompson (1969) provide evidence for these sources of reinforcement in a variety of mamallian species.

The conclusion that must be drawn from these studies is that narcotics are strong primary reinforcers that produce an experience that is valued by organisms. Goldstein (1972) described the experience of using heroin in this way.

> Within seconds the 'hit' (or 'flash') is felt. This, according to first-hand accounts, is an extraordinarily pleasurable sensation of explosive intensity, comparable (though by no means similar) to a sexual orgasm. It is followed by a slower sensation of spreading warmth suffusing the whole body, accompanied sensation of repose, tranquility, and 'floating'. Cares and anxieties are magically dissolved. The tranquil state lasts for a few hours. (Goldstein, 1972, p. 291).

The physiological concomitants of this direct primary pharmacological reinforcement is not exactly known at the present time, although Wise and Stein (1970) have suggested that it lies in the catacholamine content of neurons in rewarding systems.

It is not surprising that heroin would be a primary positive reinforcer if it produced such subjective sensations as have just been described. However, many drugs produce similar sensations and yet do not have the addictive potential that heroin does.

The tremendous addiction potential of heroin seems to be a product

of the interaction between increasing tolerance and physical dependence. Goldstein and Sheehan (1969) confirmed the idea that even a single dose of an opiate starts the process of increasing tolerance. The greater the tolerance level, then the greater the dose neccesary to produce the same direct primary pharmacological effect. In addition, once tolerance has been established the withdrawal syndrome sets in upon discontinuance of the drug. Thus, a second set of factors emerge which increase the reinforcement value of the drug. In this sense, heroin not only produces the primary positive reinforcement of euphoria, but also reduces an aversive state precipitated by its absence, and its ability to do this makes it similar to other positive reinforcers, once tolerance has been established.

Indirect Primary Pharmacological Reinforcement. Wikler (1973) has commented that while direct primary pharmacological reinforcement may maintain heroin addiction initially, the potency of such reinforcement declines rapidly with the development of tolerance and physical dependence, despite progressive escalation of daily doses. This phenomena is explicitly documented by Burroughs (1953). For this phenomenon, the conventional explanation is that the addict continues to take opiates to suppress or prevent the agonies of the opiate withdrawal syndrome (Lindesmith, 1968). In other words, the picture presented by Lindesmith and others is that an addict continues to take heroin to avoid abstinence symptoms and stay normal without achieving very much pleasure out of the whole addiction process. Wikler (1973, 1974) doubts this escape-avoidance conditioning paradigm. He suggests that if the whole cycle of addiction gives so little pleasure, then the addict would gradually withdraw himself from drugs, knowing from experience that although it is extremely unpleasant, nevertheless it could be accomplished. He could

then start taking heroin again and thus recapture the initially powerful euphoric effects, that is, direct primary pharmacological reinforcement, or, lead a life not plagued by the regular misery of withdrawal symptoms.

Wikler's explanation of why this does not occur is based on what he refers to as indirect primary pharmacological reinforcement. Evidence for this concept is derived from his intensive single-case investigation of experimental morphine re-addiction (Wikler, 1953), and from his so-called 'hustling' theory (Wikler, 1961).

The subject of the 1953 study, having acquired a high degree of tolerance to morphine by repeated self-injections, found that he could not regain the initial euphoric effects of the drug. However, over a period of time he found that there was a new source of reinforcement, that arising from the relief of withdrawal discomfort which developed towards the end of the intervals between injections. The subject drew the analogy that while a steak always tastes good, it tastes even better when one is hungry.

> The impression given is that opiate ingestion is not simply on an avoidance conditioning paradigm, to avoid the distress of abstinence, but that consumption of opiates in a state of abstinence leads to withdrawal relief which is experienced as pleasurable. (Teasdale, 1973, p. 120).

Another source of indirect reinforcement which is hypothesized to contribute to relapse are the conditioned reinforcers associated with the direct primary reinforcement. This conception is part of Wikler's (1961) 'hustling' theory in that hustling for the drug (operant behavior), while contingent for its maintenance on at least intermittent direct primary reinforcement, is reinforcing in it's own right. That is, the addict must engage in a long chain of behaviors leading to primary pharmacological reinforcement, and each component of the chain can be considered as an indirect reinforcer.

First, the drug must be obtained, and this may involve stealing prescriptions, feigning illness to a physician, or most probably, stealing to get the neccessary money to buy the drug from illegal sources. Then the addict must locate a source of supply. Once the drug is obtained the addict goes through a variety of rituals including making a tourniquet, inserting the needle in a vein, obtaining blood withdrawal, and finally ingesting the drug. All of these activities, especially those in close proximity to the injection of the drug are sources of indirect primary pharmacological reinforcement.

An example of the behavior chain implicit in Wikler's analysis of 'hustling' as a series of indirect primary reinforcers, can be seen in a description used by Jamrozy (1975) in a study designed to assess the role of interoceptive and exteroceptive stimuli in relation to relapse.

> Imagine yourself just beginning to wake up, you are perspiring and your nose is running a little bit. You get out of bed and your legs are so weak that you almost fall down. You go to the mirror, your eyes are so big, and wet, the pupils so large.
> You remember what happened last night, sharing your heroin with your best friend. You shot it all, ten bags and you shot it all. Nothing left and you are beginning to feel sick. You look around the room, see the walls, the furniture, the syringe.
> You pick up the phone and dial your dealer's number. It rings once, twice, three times, but no answer. . . . You call your friend, the one you shared your heroin with, but no answer.
> You throw on your clothes and stuff your last $40. into your pocket. You know where to go and you are riding there now, to the place where dope is always available. You shudder and feel clammy, your stomach is churning and you taste a little bile in your mouth. . . .
> You see him. You run over to him and he sees how sick you are. It's going to cost you but you don't care, you need it. He shows you five bags. You open one bag and taste it, it's good, real good. You buy four, you need at least four. . . .
> You go to a safe place, your hands are trembling but you manage to light the candle. You find the cap and pour the heroin into it. You add water and watch the heroin cook. It is going to feel so good.
> You put the cotton in and grab the syringe. You push the syringe into the cotton and draw in the heroin. You put the syringe between your

> teeth and wrap the elastic around your arm. You hit the vein with your closed hand...once...twice. You tap the bubble out of the liquid and look at the syringe. You slowly push the syringe into the vein. You feel it coming, the rush...it feels so good. (Jamrozy, 1975, p. 111-112).

Secondary Pharmacological Reinforcement: Direct and Indirect. The concept of secondary pharmacological reinforcement implies that relapse can be induced by secondary reinforcers which had previously acquired stimulus properties that evoke conditioned responses. These responses, according to Wikler (1973), are of two types: secondary direct which involve non-tolerant physically dependent individuals, and secondary indirect which involve tolerant physically dependent individuals. There are only fine distinctions between the two types of reinforcers, with both types, especially the latter, being accompanied by dysphoria (Wikler, 1973).

A good example of secondary direct pharmacological reinforcement is the view put forth by Kolb (1939). He states that "by building up a strong association between pleasure and pain and the taking of a narcotic he (the former opioid addict) becomes conditioned to taking one in response to most any situation that may arise (Kolb, 1939, p. 397). Likewise, the experimental data obtained by Schuster and Woods (1968) in the monkey may be interpreted as an example of secondary direct reinforcement. They found that the stimulus of a red light plus intravenous saline injection had acquired conditioned reinforcement properties that persisted for up to nineteen days after withdrawal and was effective in increasing the number of bar presses that would be produced by the organism.

Studies on relapse as a possible consequence of secondary, indirect pharmacological reinforcement are much more extensive. During the past fifteen to twenty years, considerable evidence from animal experiments has

accumulated (eg. Martin, et. al. 1963; Wikler, et. al. 1960, 1963, 1967, 1972). In humans, the results have been largely anecdotal although systematic research has been undertaken within the last five years (Campbell, Mandelzys and Mills, 1978; Jamrozy, 1975; O'Brien et. al. 1975, 1976; Teasdale, 1973).

Interoceptive and Exteroceptive Cues. Wikler (1973) has commented that secondary pharmacological reinforcement is dependent upon prior conditioning involving what he refers to as interoceptive and exteroceptive stimuli.

> It should be noted that craving (indicated also by the equivalent phrase, "need a fix") and relapse long after detoxification are attributed to remotivation by previously conditioned exteroceptive and interoceptive stimuli (or both) of classically conditioned central counteradaptations to the original, agonistic effects of opioids as well as reactivation of whatever the neural processes may be that underlies operant conditioning of drug seeking behavior (Wikler, 1973, p. 612).

In the conditioning process of becoming a heroin addict, it is therefore assumed that people, places, objects, complex stimulus situations, and internal stimuli, which are either typically or idiosyncratically found in the environment of the heroin addict during an experience with the primary reinforcer of heroin, acquire the power to elicit the same kinds of responses that heroin produces. Lynch et. al. (1973) writes,

> The early work on morphine classical conditioning revealed that environment is (i.e. conditional stimuli) also capable of eliciting morphine reactions. To be sure, it is reasonable to suggest that drug craving can result from sensations of impending withdrawal. It seems most justifiable, however, to suggest that drug craving can result from environmental signals that elicit morphine like reactions (i.e. morphine conditioning). We further are suggesting that some of these conditional reactions, once established, may be very difficult to extinguish or eliminate. (Lynch et. al. 1973, p. 217).

The early work that Lynch refers to dates back to Pavlov (1927) and involved the administration of morphine to dogs, resulting in the conditioned response of salivation and nausea occurring to the conditioned

stimulus. Since morphine (and heroin) increase sympathetic nervous system functioning both upon injection and during the deprivation state prior to injection, it seems reasonable that interoceptive and exteroceptive stimuli in close temporal proximity to these states, would be conditioned as well. That is, the physiological condition of arousal would be a fractional anticipatory goal response (Wike, 1966) of the total consumatory goal response of heroin use, and stimuli consistently paired with the total response would be conditioned to the physiological condition of arousal. Moreover, such interoceptive and exteroceptive stimulus cues would not produce a decrease in arousal because these states do not occur during the pairing of the stimuli and heroin use.

In reviewing the existing literature relating to physiological accompaniments of emotional behavior, Bandura (1969) stated that a common diffuse state of physiological arousal mediates many forms of emotional behavior and that different emotional states are identified and discriminated in terms of external rather then by somatic cues. That is, a person perceives a change in internal functioning by perceiving discrete physiological cues, but the identification of a particular emotion is determined by environmental cues. Thus, anger, joy, anxiety, excitement, etc., are all components of arousal, but the specific emotion tied to the arousal is determined by external cues. These cognitive interpretations are based on past experience and are learned through the same processes involved in any other discriminative learning.

Using this as a theoretical base, it therefore seems logical to assume that both interoceptive and exteroceptive stimulus cues are both related to heroin taking behavior and to relapse. For example, interoceptive stimuli similar to withdrawal symptoms can produce arousal states which may be cognitively

interpreted as anxiety, and exteroceptive stimuli may produce arousal states that are cognitively interpreted as excitement, or generally positive feelings. However, the reverse could be true depending on the cognitive interpretation that the individual places on the arousal state. However, regardless of the cognitive interpretation of the arousal state, it seems safe to assume that the arousal state and the interoceptive and exteroceptive cues which indicate that the arousal involves heroin, facilitate heroin taking behavior.

Evidence for the Concept of Secondary Pharmacological Reinforcement.

The evidence for the concept of secondary pharmacological reinforcement will now be presented. The animal evidence will be presented followed by the human studies. It should be pointed out that many of these studies contain components of both direct and indirect processes, but no distinction will be made as the difference is only a cursory one in terms of this review.

(1) Animal Evidence. Irwin and Seevers (1956) were among the first to provide experimental evidence that withdrawal-like signs could be elicited by a stimulus associated with injections of an antagonist. Rhesus monkeys were made dependent on a variety of narcotics and then underwent repeated antagonist induced withdrawal episodes. After this, the administration of the narcotic drugs was abruptly and completely terminated. The data indicated that even after 1-2 months, about 25% of the monkeys continued to show a response to the antagonist, with the response being similar to a withdrawal syndrome. In addition, the monkeys showed similar withdrawal-like signs when injections of saline solution were given in place of the antagonist. This data indicated that the effects of the antagonist (nalorphine) could be classically conditioned to injections of more neutral substances. In conditioning terms, the nalorphine injection can be viewed as an unconditioned stimulus, the withdrawal-like signs precipitated by nalorphine as unconditioned

responses, and the saline injections as conditioned stimuli.

This effect was more extensively investigated by Goldberg and Schuster (1967). As already mentioned, the drug nalorphine is a morphine antagonist, and precipitates withdrawal symptoms when administered to morphine dependent animals. In this study they demonstrated that a stimulus (tone) paired with a nalorphine infusion in physically dependent monkeys elicits withdrawal symptoms. In a second study, Goldberg and Schuster (1970) used a red light as a stimulus to precede administration of nalorphine. After a series of pairings, conditioned suppression of lever-pressing for food, heart rate decrease, vomiting, and excessive salivation ocurred during the presence of the red light. These experiments convincingly demonstrate the conditionability of stimuli to the withdrawal syndrome.

Schuster and Woods (1968) demonstrated that the stimulus of a red light plus intravenous saline injections had acquired conditioned reinforcement properties that persisted for an extended period of time after withdrawal. In addition, they found that the stimulus situation was effective in increasing the number of bar presses that would be produced by the organism. In a somewhat related study, Weeks and Collins (1968) reported that rats which had learned to bar press for intravenous injections of morphine rapidly resumed pressing after a four week abstinence period.

In a series of studies with rats, Wikler (1965), and Wikler and Pescor (1967, 1970), demonstrated that certain withdrawal signs can be elicited by environmental stimuli after the stimuli have been repeatedly associated with the withdrawal syndrome. In these studies Wikler used the frequency of 'wet dog' shakes (sudden brief body twitches) as the variable indicating withdrawal. The increases in 'wet dog' shakes also parallel other signs of the withdrawal

syndrome in rats such as increased activity, hypothermia, loss of body weight, and increased defacation and urination (Martin et. al. 1963; Wikler, 1963).

In the 1965 study, Wikler demonstrated that this abstinence sign is related to cages associated with morphine abstinence. Rats showed an increase in 'wet dog' shakes when they were returned to these cages after long drug-free periods. These conditioned increases in 'wet dog' shakes were observed over a period of one to five months following abrupt and complete termination of morphine treatment.

Morphine dependent rats that had been injected with morphine for a six week period were deprived of the drug by Wikler and Pescor (1967) for one to two months. Following this prolonged period of abstinence from morphine, a drug solution (etonitazene) was made available and the amount consumed in a twelve hour period was measured as an index of the tendency to relapse. The data indicated that mean volumes of etonitazene consumed by post-addict rats were significantly greater than those consumed by non-addict controls. In a follow-up study using a similar design, Wikler and Pescor (1970) concluded that in the 'post-addict' rat a 'need' for opiates persists for about one year following abrupt withdrawal of morphine, "and that this 'need' is based on long-term derangements of homeostasis, although the physiological characteristics of such homeostatic derangement differ in the relatively short primary and more protracted secondary abstinence periods" (Wikler and Pescor, 1970, p. 375).

A number of methodological difficulties had arisen out of these studies, primarily dealing with separating the primary and conditioned effects of etonitazene. As a result, Wikler, Pescor, Miller and Norrell (1971) conducted a study in which anise-flavoured etonitazene and anise-flavoured water was used as a conditioned stimulus. When only anise-flavoured water was available

after discontinuance of morphine, the rats who had been conditioned with the anise-flavoured etonitazene drank more anise-flavoured water than the control group, while there were no significant differences among the groups in terms of plain water consumption. This indicated that the stimulus of anise-flavoured material was conditioned to the primary positive reinforcement of morphine and in the absence of morphine was a preferred substance, that is, it had acquired reinforcing properties and the positive valence of the morphine.

In another somewhat related experiment, Smith and Davis (1973) associated two stimuli with self-administration of morphine in rats, a buzzer and presence of the drug in the organism. In subsequent tests of the stimuli separately, there was a gradual decline in the behavior of bar pressing to obtain the morphine. When tested in combination as originally learned, the stimuli were able to maintain high behavioral control. When morphine was administered alone, without the contingency of the buzzer, lever pressing continued at a low rate.

Examining slightly different variables, Kumar (1972) found that morphine dependent rats came to prefer the place in which they repeatedly experienced relief of a a state of abstinence as a result of being placed there immediately following drug administration. In a similar vein, Miksic, Smith and Lal (1976) demonstrated that if a 'social experience' had been paired with the process of physical dependence, then there was significantly less morphine withdrawal aggression then in other groups who had either remained socially isolated throughout the addiction period, or were grouped both at the time of morphine injection and between injection intervals. Finally, in a reverse way of dealing with the issue, Marcus et. al. (1976) demonstrated that naloxone in adequate doses blocked the ability of morphine to impart secondary reinforcement properties to previously neutral stimuli

with which it had been paired.

One other key issue with regard to secondary pharmacological reinforcement is based on studies conducted by Garcia and Koelling (1966), Parker, Failor and Weidman (1973) and Frumkin (1976). In particular, Frumkin demonstrated that conditioned withdrawal occurs more readily to some stimuli than to others, and that there is quite likely a hierarchy of stimuli that are associated with secondary pharmacological reinforcement. He found that morphine dependent rats that underwent naloxone precipitated withdrawal in the presence of both gustatory and audiovisual stimuli subsequently avoided the taste cue, but not the audiovisual one. From his results and the results of Garcia and Koelling (1966), Frumkin concluded that, "it is highly unlikely that all aspects of the addict's complex behavior and environment associate equally with the unconditioned stimuli present during addiction and withdrawal" (Frumkin, 1976, p. 245).

The evidence presented here is only a portion of what has been produced in the last ten to fifteen years. However, what has been presented clearly indicates that classical conditioning effects are operating and exert a strong influence on resumption of heroin taking behavior after abstinence has been achieved.

(2) Evidence from Human Studies. Until the last five years, evidence for a relationship between conditioned reinforcers and heroin taking behavior was largely anecdotal. The best example of this type of work was presented by Vaillant (1969). For example, when nutmeg, which Vaillant describes as a non-narcotic stimulant, was smuggled into the addiction treatment centre at Lexington Hospital, the patients went through certain rituals, previously associated with heroin distribution, while dividing it among themselves.

At such times, some patients apparently experienced signs and symptoms characteristic of withdrawal (eg. watery eyes, runny nose, cramps, etc.). Another observation cited was that patients who had been abstinent for many months could experience acute craving and withdrawal symptoms while watching another patient receive an injection of narcotics. Although subjective, this information clearly provides evidence with regard to secondary pharmacological reinforcement by providing instances where withdrawal symptoms were conditioned to external stimuli.

Other evidence of this type has been reported by Ludwig and Lyle (1965) who observed that signs as well as symptoms of withdrawal could be produced in ex-addicts by means of hypnotic suggestion. Also, Dole and Nyswander (1965) reported that some addicts, even though they were maintained on very high doses of methadone, still reported symptoms of withdrawal in the presence of psychological stress.

The first systematic observations of this phenomenon were made by Wikler (1973) while he was examining the ability of nalorphine to precipitate withdrawal symptoms in opiate dependent subjects. After repeated nalorphine precipitated abstinence experiences, the subjects reported some withdrawal effects when saline was given instead of the nalorphine. As in the animal studies, presumably, conditioning had occurred.

Teasdale (1973) demonstrated the existence of conditioned abstinence in a small group (N=6) of drug-free heroin addicts by comparing their subjective response to viewing slides of drug-related and non-drug related stimuli. He found that drug-related stimuli produced a significantly greater increase in the Psychiatric Out-Patient Mood Scale tension and confusion factors, and on the total scores of the Addiction Research Center Inventory, Opiate With-

drawal Scale.

Mandelzys and Mandelzys (1974) collected self-report and physiological data in order to compare methadone patient's responses to slides of drug-related and neutral stimuli, pre and post methadone. The slide stimuli used were identical to those employed by Teasdale (1973). Comparisons done both within and between groups indicated that the drug-related slides evoked subjective symptoms normally experienced in opiate withdrawal. Significant differences were observed for three of the six Profile of Mood States factors, (tension, depression and fatigue), on the Addiction Research Center Inventory, Opiate Withdrawal Scale, and in GSR amplitude.

O'Brien and his colleagues (O'Brien et. al. 1974; O'Brien 1975a; O'Brien, 1975b) have done the most extensive work of both classical and operant conditioning in human opiate addicts. In one study (1975a), they were able to successfully condition narcotic abstinence symptoms experimentally in five out of eight subjects, the subjects being heroin addicts on methadone maintenance. The conditioning stimulus was an auditory tone, an odour (oil of peppermint), and an injection of saline. The unconditioned stimulus was an injection of a small dose of naloxone (0.05 to 0.2 mg), and the unconditioned response was a brief precipitated withdrawal syndrome. The conditioned response consisted of a subjective component (feelings of sickness, nausea, cramps and craving) and an objective component (including yawning, tearing, rhinorrhea, irregular respiration and transiently increased blood pressure). A second group of eight subjects (reported in O'Brien et. al. 1976) were conditioned using the procedure outlined above. This study, employing many more methodological controls, confirmed the results of the study just reported. As well, additional physiological measures showed evidence of

conditioning including, skin temperature decreases, heart rate changes, and respiratory rate changes.

Another facet of secondary pharmacological reinforcement investigated by O'Brien (1976) are the rituals involved in self-injection. When four detoxified addicts performed the 'cooking up' ritual with needles, syringes and a glasine bag, they showed an acute drop in skin temperature similar to that observed during narcotic withdrawal. In addition, a marked increase in 'craving responses' occurred as the skin temperature dropped.

In the same study, O'Brien also reported some anecdotal information which is of value to the topic. Apparently, color slides and video tapes of patients 'shooting up' evoked strong emotional responses in ex-addict counsellors and in some methadone treatment patients. These responses were defined either as 'sickness' or as craving by these individuals.

A number of other studies not directly related can also be seen as providing some data with regard to conditioned abstinence phenomena. Jones (1965) showed that post-addicts have lower recognition thresholds for tachistoscopically presented addict argot than for control words. Lyle, Miller and Monroe (1970) demonstrated that addict argot elicits distinctive associations in individuals under treatment for narcotic addiction, and that these associations are reliable indicators of identification with the addict subculture. Finally, Campbell, Mandelzys and Mills (1978) conducted a study in which the pupillary response to argot (heroin related) and neutral words was recorded prior to, and immediately after, the administration of methadone in a post-addict sample. The results suggested that withdrawal induced arousal, as a function of the secondary reinforcing properties of the argot words, was not entirely eliminated by methadone.

Summary of Wikler's Conditioned Abstinence Theory. The conditioned reinforcement, or as Wikler refers to it, conditioned abstinence theory of heroin dependence and relapse, has been elaborated upon at various symposia and in a variety of scientific publications for almost thirty years. The conceptual scheme was first proposed in 1948 in the form shown in Table 1 (Wikler, 1948). Subsequently, the formulation was modified to include the component of operant conditioning of drug-seeking behavior (Table 2, Wikler, 1961). In its present form (Table 3, Wikler, 1973), the dynamics of drug dependence and relapse are presented in terms of reinforcing processes, sources of reinforcement, reinforcing events and behavioral phenomena. In this formulation, the critical issues pertaining to the roles of classical and operant conditioning are stated under the headings, 'sources of reinforcement' and 'reinforcing events'. Craving and relapse after detoxification or after a period of abstinence are attributed to the reactivation of exteroceptive and interoceptive stimuli associated with the original addiction or with subsequent addiction periods (secondary pharmacological reinforcement, direct and indirect). These phenomena Wikler has called the conditioned abstinence syndrome.

The conditioned abstinence syndrome comes about after repeated pairing of the narcotic withdrawal syndrome with specific environmental stimuli. Eventually, the stimuli themselves (sights, sounds, smells, people, locations, situations, 'internal feelings', etc.) acquire the potential to precipitate signs and symptoms of withdrawal. Relief of these conditioned withdrawal symptoms may not only play a role in the maintenance of narcotic addiction, but more importantly, are hypothesized to be one of the key factors related to relapse.

Table 1

Conditional Response Concept of Interrelation of "Physical' and "Psychic" Dependence in Morphine Addiction[4]

Agent	Unconditional Stimulus (US)	Unconditional Response (UR)[1]	Subjective Concomitant (UR)	Agent	Conditional Stimulus (CS)	Conditional Response (CR)[2]	Subjective Concomitant (CR)
Food	Taste & Smell of food	Salivation	Hunger	Bell	Meaning of Sound	Salivation	Hunger with craving for specific food used in experiments
Electric shock	Pain	Defense Reactions	Fear or Rage	Bell	Meaning of Sound	Defense Reactions	Fear or rage directed towards shock
Atropine Drug acting peripherally)	Dryness of the mouth	Salivation	Thirst(?)	Injection	Meaning of injections	Salivation	Thirst with aversion to atropine
Aponmorphine[3] or morphine (In Dogs)	(By-passed)	Vomiting	Nausea	Injection	Meaning of injections	Vomiting	Nausea with aversion to apomorphine or morphine
Morphine (In Dogs)	Direct central emetic effects	Salivation	Nausea	Injection	Meaning of injections	Salivation	Nausea with aversion to morphine
Morphine in non-tolerant subjects	(By-passed)	Direct central effects of morphine	Sedation	Injection	Meaning of injections	Direct effect of morphine	Sedation, etc. with liking for or dislike of morphine
Morphine in tolerant subjects	Direct central effects of morphine	Abstinence changes	Anxiety	Injection	Meaning of injections	Abstinence changes	Anxiety with craving for morphine

[1]mainly subcortical [2]mainly cortical [3]drugs acting centrally

[4]From Wikler, 1948, p. 334.

Table 2

Dynamics of Drug Abuse (Instrumental Conditioning Paradigm)[1]

Phases	I Episodic Intoxication ("Euphoria")	II Pharmacogenic Dependence ("Addiction")	III Relapse after cure ("Habituation") Early	 Late
Discriminative Stimuli	More frequently: "Bad associates" Less frequently: medical contingencies	"Bad Associates"	Medical and law enforcement contingencies	"Bad associates" Sensorial effects of drugs
Reinforcement Processes Schedules	Occassional	Continuous or aperiodic	Extinction by "satiation" (not non-reinforcement)	Variable
Sources Primary	Anxieties (homeostatic, sexual) Curiosity Boredom Anhedonia	Mainly homeostatic and sexual anxieties induced by cellular "counter-adaptations" to repeated doses of "addicting" drugs	Same as in II but decreasing after peak	Conditioned sources of reinforcement, generated mainly in phases II & III (Early)
Secondary	"Anomie" Hostility	Status in "addict society"	Hostility Guilt	
Auxiliary	"Effort" factor	"Effort" factor intensified	Generalization of anxiety	
Behavioral phenomena	"Experimenting with drugs"	Progressive increase in dosage (tolerance) "Hustling" for drugs	Abstinence syndrome	Conditioned Abstinence phenomena (fragmentary)
Drug effects	Objectively unwarrented "sense of unusual well-being" "Indifference", "Elation"	Gratification of "craving"	Relief of abstinence-distress	As in I plus "drive" (Conditioned hustling?)

[1]From Wikler, 1961, p. 77

Table 3

Reinforcing Processes in Opioid Dependence[1]

Reinforcing Processes	Sources	Reinforcing Events	Behavior
I. Social			
Street corner society; slum 'big shots', cultist rituals and beliefs	need to belong; boredom; anhedonia; hostility to 'establishment'	acceptance by deviant subculture	drug-taking in accordance with rituals; affirmation of cultist beliefs
II. Primary Pharmacological			
A. Direct (non-drug-engendered = 'psychic dependence')	1. Intrinsic (cerebral drug-sensitive 'reward' systems?) 2. Developmental (personality), anxiety in particular situations	1. Relatively non-specific drug effects (release or blockade of NE, DA, ACh, etc. in brain 2. Specific pattern of agonistic actions of opioids	1. Subjective: 'high', 'thrills' (i.v. only) Objective: elated behavior 2. Subjective: 'content','relaxed' 'coasting' Objective: 'nodding', levelling' of performance
B. Indirect (drug-engendered = 'physical dependence')	early abstinence changes (manifest or detectable by subject's cerebral sensors); restlessness	suppression of early abstinence by next dose of opioid N.B. Tolerance has developed to 'directly' reinforcing effects of opioids	Subjective: 'craving' and satisfaction of 'craving' Objective: 'hustling' for opioids, increasing dose and frequency of opioid-taking (appetitively conditioned behavior
III. Secondary Pharmacological			
A. Direct B. Indirect (Both A and B, exteroceptive and interoceptive)	Classically conditioned CNS changes (counteradaptive to agonistic effects of opioids. A. Conditioned inhibition of CNS reward systems. B. conditioned abstinence changes	agonistic effects of opioids as in IIA and B. However, after IIA and B, suppression of conditioned abstinence is is more reinforcing	Subjective: A. 'feeling blue', disgusted. B. 'feel sick', got the flu, 'need a fix'. Objective: A. depressive behavior. B. Signs of opioid abstinence (conditioned); renewed 'hustling' RELAPSE

[1]From Wikler, 1973, pg. 20.

Methadone Maintenance: Brief History and Relation to Conditioned Abstinence

Methadone is a synthetic narcotic developed in Germany during World War II as an analgesic when supplies of morphine ran short of requirements (Isbell et. al. 1949). It has been used as a substitute to withdraw addicts from opiates since about 1950 (Le Dain, 1973). From 1963, Dole and Nyswander have used methadone systematically and extensively as a treatment tool for opiate addiction, and since then they have contributed a large body of information with regard to it's development as a treatment modality (eg. Dole and Nyswander, 1965, 1967, 1968, 1974, 1976).

Structurally, it only vaguely resembles morphine, yet its pharmacological properties are qualitatively similar, including the development of dependence (Drug Abuse Council, 1972; Goodman and Gilman, 1969). Methadone seems to act in two ways: (1) by relieving 'drug hunger' at dosage levels of approximately 40-60 mg. per day, and (2) by preventing the euphoric 'high' of self-administered heroin by the mechanism of 'cross-tolerance' at dosage levels of approximately 80-100 mg. per day (Meyer, 1972). These figures are very rough, as there is a large variability in dosage between individuals in order to achieve these effects.

Methadone presumably acts on the same sites as heroin and as a result, eliminates the primary positive reinforcement value of opiates by blocking the euphoric 'high' while eliminating the withdrawal symptoms at the same time. This phenomenon, often referred to as 'narcotic blockade (Goldstein, 1970) was verified in a study conducted by Dole and Nyswander (1966) when they demonstrated that methadone had the effect of blocking the euphoric and systematic effects of heroin.

A fuller description of the pharmacology and physiological effects of methadone is presented in Chapter II. As well, an excellent review of the

background, philosophy, development, treatment goals, and research of methadone maintenance, can be found in a paper by Langrod et. al. (1972).

The theoretical perspective with regard to the use of methadone as a treatment modality is well summed up by Goldstein (1972) when he says,

> . . . I believe that what methadone does, by stabilizing dependence and establishing a cross-tolerance, is to permit a motivated addict, who wishes to give up heroin in his normal environment, to do so, even though he lacks the resolve and perseverance to do this by simple abstinence. Addicts who enter methadone programs do so voluntarily. They have some motivation, therefore, however, ambivalent, to give up heroin use, or they would not have presented themselves for treatment (Goldstein, 1975, p. 946).

In terms of treatment, several advantages have been ascribed to methadone maintenance treatment programs (MMTP) including,

(1) Legality. The addict who enters a methadone maintenance program casts off his role as a 'junkie'.

(2) Low Cost. The addict does not have to spend all of his time attempting to acquire the necessary money to buy heroin (eg. Wikler's conception of 'hustling' for the drug).

(3) Oral Administration. Methadone maintenance treatment programs almost always administer the drug orally, thus eliminating many of the secondary reinforcers associated with the addiction ritual.

(4) Long Acting. Methadone is effective for approximately 24 hours and has another advantage in that it produces no extremes of effect. Thus, many of the primary pharmacological reinforcers associated with the heroin experience, such as the impact effect ('highs' or 'rushes'), or tranquilization effects ('nodding out') are eliminated.

(5) Stabilization. Since the same dosage of methadone can be maintained indefinitely, it is clear that no tolerance develops in the sense that it does with heroin.

(6) Cross-Tolerance. As was stated earlier, methadone blocks the effect of heroin so that an ordinary dose of heroin has no effect. That is, addicts who use heroin while ingesting methadone will not feel the euphoric effect of heroin unless they use heroin which is of considerably better quality than street heroin. In behavioral terms, this effect could be one factor in leading towards heroin using behavior becoming extinguished.

(7) Clinic Contact. A final theoretical benefit of methadone maintenance is that the addict is required to take the medication regularly in order to avoid going through withdrawal. This usually means daily clinic attendance, thus ensuring regular contact with the program staff, a contact that could theoretically be used to carry out all of the interventions necessary to bring about real alterations in lifestyle and behavior. It is success, or lack of success, in this final aspect which is the most crucial, and where the principles of conditioned abstinence theory can be most related to the problem.

Methadone maintenance treatment programs have been on-going in an organized fashion for about fifteen years in the United States and for about eight to ten years in Canada. In spite of all of the positive aspects as outlined above, the data reveals that only moderate success has been achieved (for reviews see Brecher, 1972; Le Dain, 1973; Dole and Nyswander, 1976; Smart et. al. 1977; Stratton, 1976).

In one well-documented study, Stimmel, Rabin and Engel (1973), reported on the success of 146 dischargees from a total of 490 patients admitted to a methadone treatment program between March, 1969, and October, 1972. Only 8% were drug free once detoxified. Ninety two percent (N=25 or 17% of total) of those discharged due to rule violations returned to heroin. Seventy five

percent (N=36 or 25% of total) of those arrested reverted to heroin. Seventy percent (N=74 or 51% of total) of the voluntary discontinuations returned to heroin. Of the six patients completing treatment (4% of the total), only three were still drug free at the time of last reporting, 42 months later. In another study, Lloyd, Katon, DuPont and Rubenstein (1973) found that only 15.3% of their population was successful, when the criteria of success was reaching 5 mg. of methadone and leaving treatment or spending additional time in treatment in an abstinence modality. Finally, Lowenson and Langrod (1973), found that less than ten percent of those who completed medical detoxification with methadone remained drug free after a six month follow-up.

Among the most recent data, is that reported by the Methadone Data Center in New York City (reported in Dole and Nyswander, 1976). They conducted a follow-up program to determine the most recent status of persons who left treatment in 1974. From the pool of approximately 6,000 names of persons who entered treatment in 1972 and subsequently left treatment, a sample of 204 persons were located and classified. Of these, 138 (68%) were found to have relapsed to use of heroin or other narcotics, either intermittently or continuously. Of the 138 persons, 36 had returned to a maintenance program for further treatment. At the time of the follow-up interview, each person who had become re-addicted was offered help in returning to treatment; all but four people rejected the offer. In addition, 32 persons (16%) were seriously alcoholic, 16 (8%) were addicted to sedatives or were using cocaine, 53 (25%) had been arrested, and 19 (9%) had died. Only 22 people (10%) of the total sample of 204 could be classified by a lenient standard as being in satisfactory status (i.e. having no legal problems, and not using heroin, other major drugs of abuse, or alcohol).

Dole and Nyswander (1976) commenting on these data state that,

> These preliminary data re-emphasize the poor prognosis of addicts after detoxification, especially those with a long history of addiction. Methadone maintenance, as part of a supportive program, facilitates social rehabilitation, but methadone treatment clearly does not prevent opiate abuse after it is discontinued, nor does social rehabilitation guarantee freedom from relapse. (Dole and Nyswander, 1976, p. 2118).

A recent study by Smart et. al. (1977) is among the only evaluative data which has been presented on methadone programs in Canada. The study was a four-year follow-up of 102 patients seen at the Addiction Research Foundation's Narcotic Dependence Program in Toronto. It was found that at the fourth year, 11.8% were non-users, 26.5% were on a treatment program, 18.6% were still addicted, 12.7% were in jail, and 14.7% had died (presumably from drug abuse). In 15.7% of the cases the outcome was unknown. In general terms it could be said that 46.0% were failures or unimproved (jail, dead, addicted), 26.5% were still in treatment and therefore no evaluation could be made. Of the 37.5% that were left, if one subtracts out those individuals on which no information could be obtained, then the success rate is somewhere in the 20-25 percent range.

It appears therefore, that as long as the heroin addict remains in treatment, on a stabilized dose in a methadone program, success in terms of heroin abuse and lifestyle change is high. However, once the addict is detoxified or even during the process of detoxification, success as measured by stability and abstinence drops rapidly. Jamrozy (1975) comments that,

> The factors that make methadone so successful while the addict is stabilized and drinking his daily dosage are lost once the addict begins to detoxify. That is, heroin again becomes a powerful primary positive reinforcer which can be effective at low methadone dosages, and heroin associated stimuli can again cause craving. (Jamrozy, 1975, p. 55).

Relapse and Readdiction. Once an addict's support system is lost because of graduation from a methadone program or release from jail, the abstinence problem becomes a severe one. If he was in jail, in a therapeutic community (eg. Synanon), or in a methadone program, then his drug using behavior was either curtailed totally or severely limited. In addition, significant lifestyle changes may have occurred in terms of educational and vocational level, family relationships, etc. However, the addict begins to remember the more pleasant aspects of heroin addiction, stress states (interoceptive stimuli) are interpreted as withdrawal, and the addict continually comes into contact with a host of stimuli previously associated with heroin usage (exteroceptive stimuli). He may return to, or still lives with addicted friends, he may see others 'shooting up', or he may return to areas where he once 'hustled' for drugs. These stimuli continually impinge upon the addict, and so long as he is aroused by these stimuli, then the possibility of relapse is ever-present.

Jamrozy (1975) comments that like conditioned fear, the addict may try to avoid such stimuli. However, the interoceptive and exteroceptive stimuli may lead to an arousal state which can only be reduced (at least in terms of the addict's thinking) by returning to heroin taking behavior. Wikler (1974) refers to this process as 'cognitive mislabelling', and suggests that the return to heroin usage under such circumstances is due to an association between the use of heroin and the reduction of arousal. However, regardless of the rationalization used by the addict, he nevertheless relapses to heroin abuse.

An excellent illustration of this phenomenon is provided by O'Brien (1976) in a description of one of his own cases.

> The patient was a 28 year-old man with a ten year history of narcotic addiction. He was married and the father of two children. He reported that, while addicted, he was arrested and incarcerated for six months. He reported experiencing severe withdrawal during the first 4 or 5 days in custody, but later, he began to feel well. He gained weight, felt like a new man, and decided that he was finished with drugs. He thought about his children and looked forward to returning to his former job. On the way home after his release from prison, he began thinking of drugs and feeling nauseated. As the subway approached his stop, he began sweating, tearing from his eyes and gagging. This was an area where he had frequently experienced narcotic withdrawal symptoms while trying to acquire drugs. As he got off the subway, he vomited onto the tracks. He soon bought drugs, and was relieved. The following day he again experienced craving and withdrawal symptoms in his neighbourhood, and he again relieved them by injecting heroin. The cycle repeated itself over the next few days and soon he became readdicted. (O'Brien, 1976, p. 533).

As can be seen from this case history, there was no pharmacological reason for this man to return to heroin use. Moreover, it quite likely took very little time for him to return to his pre-jail level of heroin usage. The entire cycle had accomplished little for him other than to strengthen the conditioning that already existed, and make abstinence even more difficult the next time because of the expectation of failure.

Summary and Conclusions.

The focus of this review has been on conditioning effects in relation to drug abuse. More specifically, an attempt was made to provide evidence with regard to the formulation that conditioned stimuli commonly associated with heroin use, not only act to maintain addiction, but more importantly, act as key factors in the etiology of relapse. It was not suggested that arousal to heroin associated interoceptive and exteroceptive stimuli causes relapse, but rather, that the probability of abstinence is greatly reduced because of them. Evidence was provided to show that conditioning to heroin associated stimuli occurs, that these stimuli are conditioned to physiological arousal, and that the conditioning effects remain long after abstinence has been achieved. The

role of methadone in possibly acting as an intervening variable in this process was discussed.

Overview of the Experiment

In this study, 36 addicts in treatment in three methadone programs were randomly assigned to three groups based on the experimental manipulations that they were to undergo. The three groups were an Abstinent group, i.e. they received no medication prior to the experiment, a Methadone group who received their daily dose of methadone, and a Placebo group who received a quinine placebo. All group assignments were completed in a double-blind fashion. A control group of 12 non-addicts were also included in the study.

Behavioral and cognitive indices of arousal were gathered before and after the presentation of a set of heroin-related and neutral-stimuli, and various indices of cardiac activity were gathered during the presentation of the slide stimuli. The stimuli were in the form of photographic slides of common objects associated with heroin addiction, or scenes of landscapes and art objects.

The behavioral indices of arousal included the Profile of Mood States, POMS, (McNair, Lorr, and Droppleman, 1971), and the Addiction Research Center Inventory, Opiate Withdrawal Scale, OPW, (Haertzen and Meketon, 1968). The POMS was chosen because it is sensitive to the mood states that characterize withdrawal and it is able to detect mood changes attributable to psychoactive drugs. The OPW was chosen because it measures the individual's reactivity, general discomfort and physical distress to the withdrawal of opiates. In addition, the scale is highly correlated with the short term effects of methadone.

The cognitive indices of arousal included various components of the Semantic Differential. Here the assumption was made that there was a relationship between the physiological state of the addict and the cognitive

state and that part of the hypothesized arousal effect of the slide stimuli could be assessed by evaluating the cognitive state by measuring the attitude and meaning of the concepts of heroin and methadone. The issue was to assess whether different levels of arousal, and/or heroin related slide stimuli could alter response tendencies on this measure.

Various indices of heart rate activity were chosen as the physiological dependent variables. It was felt that heart rate was the most adaptable to the kind of experimental procedure employed in this study (eg. easily time-locked, fast responding), and its use was supported by a solid theoretical and empirical base. Most importantly, however, was that it was bi-directional in terms of its responsivity to various classes of stimuli.

Hypotheses to be Tested

Based on what has been discussed, the hypotheses attempt to examine the relationship between the previously described behavioral, cognitive and physiological correlates of arousal, heroin related stimuli, and the possible effect that methadone has in modifying this arousal. More specifically, the problems posed for investigation can be defined in terms of two general questions.

(1) Can stimuli previously associated with a range of heroin-related activities elicit behavioral and physiological arousal in addicts in treatment.

(2) Closely related, and following from this is the question of what effect methadone has in either modifying, altering, or reducing the behavioral and physiological arousal that may be elicited by these slide stimuli.

The pivotal point in these two questions, and a third issue to be dealt with, is whether the degree of arousal elicited by the heroin-related stimuli is related to the withdrawal experience. The functional relationship between these variables has been described in terms of conditioning factors.

It was suggested that conditioning to heroin associated stimuli does occur, and that the stimuli are conditioned to physiological arousal. The assumption to be tested however, is whether this prior conditioning has residual effects, and whether it acts to arouse the addict who is trying to remain abstinent, thereby increasing the probability that heroin taking behavior will reoccur.

For the purposes of clarity, the hypotheses which follow have been broken down into two groups as defined by the nature of the dependent variables.

Behavioral Hypotheses.

(1) If stimuli previously associated with a range of heroin related activities elicit arousal, then we would expect addicts in treatment to manifest elevated scores on the Profile of Mood States, the Addiction Research Center Inventory, Opiate Withdrawal Scale, and the evaluative and potency factors of the Semantic Differential, when scores on these measures are compared before and after the presentation of a set of heroin related and neutral slide stimuli.

(2) If addicts in an abstinent condition (ie. no drug) are experiencing the greatest amount of arousal, then this should manifest itself in terms of elevated scores in the pre-slide condition, and, in addition, this group should experience the greatest amount of arousal to the stimuli, both heroin-related and neutral as measured by the post-slide dependent variable scores.

(3) If there is a placebo effect, then addicts who receive the placebo should experience a significantly lesser amount of arousal then those in the abstinent condition, as both the pre and post slide dependent variable scores should be attenuated by the placebo administration.

(4) If methadone is effective in modifying, altering or reducing this arousal, then these differences should be specific to the methadone group, who should experience the least amount of initial arousal in the pre-slide

condition, and the least amount of arousal to the slide stimuli as assessed by the post-slide dependent variable scores.

(5) The non-addict control group should be experiencing the least arousal in the pre-slide condition. In the post-slide condition they should be experiencing considerable arousal, but less then the abstinent or placebo groups.

Physiological Hypotheses.

(6) While the subjects are viewing the slides various indices of cardiac activity including tonic, phasic, and directional responses will be recorded. If conditioned abstinence phenomena are operational but are attenuated by the effects of methadone, then addicts in an abstinent condition should exhibit cardiac response patterns indicative of the greatest amount of arousal to the slide stimuli. Addicts who receive the placebo should experience the next greatest amount of arousal while viewing the slide stimuli. The group who receives methadone should be experiencing the least amount of arousal to the slide stimuli as assessed by the indices of cardiac activity. The control group should experience considerable arousal to the slide stimuli, but significantly less then the abstinent or placebo groups.

CHAPTER II

Methodology

Introduction

This study was conducted in May and June of 1975 at three regional methadone clinics in Montreal, Quebec; and in St. Catherines and Niagara Falls, Ontario. (See Appendix 3 for clinic information). Control group subjects were tested at the University of Ottawa. The sample consisted of three groups of addicts who, at the time of the study, were receiving methadone treatment for heroin addiction, and a group of non-opiate users who resided in the Ottawa area.

Subjects

The sample consisted of 48 subjects of which 36 were heroin addicts in treatment and 12 of whom were non-addicts. The 36 addicts were randomly assigned to one of three groups (1,2, or 3) in accordance with the experimental manipulations that they were to undergo, and the 12 non-addicts, the Control group, were assigned to group 4. The criteria for admission to the three addict groups were as follows: (1) the subject had to be at least 18 years of age, but no older than 30, (2) the subject had to have been using heroin on a regular basis for at least 12 months prior to admission to the program with a minimum injection rate of at least once per day, (3) the subject had to have been registered in the methadone program for at least 12 weeks prior to the day of testing. The criteria for admission to the control group were as follows: (1) the subject had to be at least 18 years of age, and (2) the subject had to attest to the fact that he or she had never taken a 'hard' drug such as an opiate narcotic, speed, etc.

For the addict groups, 10 subjects were obtained from the Methadone

Clinic, Royal Victoria Hospital, Montreal, Quebec; 15 from the Methadone Clinic, Greater Niagara General Hospital, Niagara Falls, Ontario; and 15 from the methadone clinic, Addiction Research Foundation, St. Catherines, Ontario. Of these 40 subjects, four had to be eliminated due to equipment failure, lack of cooperation, etc. All subjects in the addict groups were paid $15.00 for their participation. The subjects in the Control group participated voluntarily although a few of them received experimental credit for participating.

Data with regard to biographical information are presented in Table 4. The data indicated that even though there had been random assignment to the groups (except for the Control group), the groups were relatively well-matched in terms of age, sex and marital status, and were divided along the lines of what should be expected for the variables of education and most frequent activity in the last six months.

Data with regard to drug taking and methadone history are also presented in Table 4. For the addict groups, a one way analysis of variance indicated that there were no between group differences in terms of the age at which they first tried any drug, the age at which they tried heroin, the length of time to become addicted, the total amount of time taking heroin, and the length and frequency of use of the most intensive period of heroin use.

Although the within group variances were large, there were no significant differences between the groups when the following methadone variables were considered: total amount of time on methadone maintenance, initial dose of methadone, and present dose of methadone. As well, the groups appeared relatively well-matched on a number of other variables on which an analysis of variance could not be accomplished.

Table 4

Biographical, Drug Taking and Methadone History of the Subject Groups

I. Biographical Information

Variable	Group	Mean	S.D.	F ratio
Age	1	23.75	3.92	0.68
	2	24.42	2.81	
	3	23.33	2.90	
	4	23.67	1.84	

Variable	Group	Males	Females
Sex	1	9	3
	2	9	3
	3	10	2
	4	9	3

Variable	Group	Single	Married	Divorced	Other
Marital Status	Addicts	50%	22%	11%	17%
	Control	67%	25%	--	8%

Variable	Group	1-8	9-13	Technical	University
Education	Addicts	5%	77%	5%	13%
	Control	--	50%	16%	34%

Variable	Group	School	Working	Unemployed
Most frequent activity in last 6 months	Addicts	3%	36%	61%
	Control	33%	56%	11%

II. Drug Taking History (Addict Groups)

Variable	Group	Mean	S.D.	F ratio
Age at which first tried any drug	1	14.2	2.55	0.75
	2	15.6	2.93	
	3	15.2	2.34	

Table 4 (cont'd)

Variable	Drug	(N)	(%)	
First drug tried	Marijuana	25	69	
	LSD	5	14	
	Heroin	2	6	
	Solvents	2	6	
	Speed	1	3	
	Barbit.	1	3	
Variable	**Group**	**Mean**	**S.D.**	**F ratio**
Age at which first tried heroin	1	17.6	3.59	1.00
	2	18.9	2.14	
	3	17.3	2.86	
Variable	**Group**	**Mean**	**S.D.**	**F ratio**
Length of time to become addicted (months)	1	8.17	6.41	0.17
	2	9.46	3.29	
	3	8.42	6.63	
Variable	**Group**	**Mean**	**S.D.**	**F ratio**
Total amount of time taking heroin (months)	1	59.33	26.74	0.35
	2	60.33	20.23	
	3	51.83	30.42	
Variable	**Group**	**Mean**	**S.D.**	**F ratio**
Length of most intense period of heroin use (months)	1	16.08	12.70	0.51
	2	20.00	12.40	
	3	15.17	10.30	
Variable	**Group**	**Mean**	**S.D.**	**F ratio**
Frequency of use during this period (times per day)	1	5.00	2.08	0.28
	2	4.50	1.66	
	3	4.50	1.65	

Table 4 (cont'd)

Variable	Group	Traficking	Theft	Prostitution	Working
Means of support of habit during this period	1	59%	30%	6%	6%
	2	51%	33%	10%	6%
	3	49%	37%	7%	7%
	Mean	53%	33%	8%	6%

Variable	Group	Mean	S.D.	Range
Number of attempts to 'kick' heroin	1	3.92	4.19	1-10
	2	3.16	4.65	2-12
	3	2.67	3.52	1-15

Variable	Group	Legal	Loss of Contacts	Tired of Lifestyle	Family Reasons
Reason for termination of heroin use	1	37%	25%	20%	18%
	2	32%	32%	20%	16%
	3	30%	28%	25%	17%
	Mean	33%	28%	22%	17%

Variable	Group	'Cold turkey'	Excessive Alcohol	Other Drugs	Imprisonment
Method used when attempting to 'kick' voluntarily	1	65%	13%	18%	4%
	2	68%	10%	16%	6%
	3	66%	15%	11%	8%

III. Methadone History
(Addict Groups)

Variable	Group	Mean	S.D.	F ratio
Total amount of time on methadone (months)	1	18.67	13.29	0.85
	2	21.75	17.35	
	3	17.44	15.27	

Variable	Group	Mean	S.D.	F ratio
Initial dose of methadone at this clinic (mg.)	1	49.17	25.15	0.71
	2	50.42	23.49	
	3	39.58	21.26	

Table 4 (cont'd)

Variable	Group	Mean	S.D.	F ratio
Present dose of methadone (mgs.)	1	47.92	21.42	0.55
	2	46.25	21.69	
	3	48.00	21.65	

Variable	Group	Normal	Tired	'Stoned'
Subjective experience when methadone is having it's maximum effect	1	90%	10%	0%
	2	93%	7%	0%
	3	97%	0%	3%

Variable	Group	Not very	Moderately	Very	Extremely
How helpful is methadone in helping you overcome your addiction	1	31%	37%	20%	12%
	2	34%	38%	18%	10%
	3	35%	38%	21%	6%

IV. Drug Taking History
(Control Group)

1.

Variable	Yes	No
Ever used a 'hard' drug (eg. heroin)	0%	100%

2.

Variable	Once a week	Once a Month	Last six Months	Never
Alcohol use	40%	33%	37%	0%

3.

Variable	Once a week	Once a Month	Last six Months	Never
Marijuana use	0%	50%	33%	17%

4.

Variable	Know 1 or 2	Know more than 5	Do not know any
Contact with heroin addicts	33%	0%	67%

Thus, the assumption was made that their conditioned responses to the drug-related stimuli would not be due to their time in treatment during which extinction of these responses might have occurred.

Stimuli

The stimuli were heroin-related, neutral and 'filler' 35 mm. colour slides. The heroin-related and neutral slide stimuli were obtained from Farrall Instruments, Grand Island, Nebraska. These slides were all professionally produced, and had been utilized in a variety of clinical and experimental situations related to drug research (Farrall, 1973).

Heroin-related slide stimuli. The 25 heroin-related slides were drawn from a pool of 75 and pertained to various aspects of heroin ingestion, including hard drug apparatus, pictures of needles, 'spoons', 'bags' of heroin, various types of 'works', etc., males and females preparing and injecting heroin, couples injecting each other, and group situations after heroin ingestion. Four independent raters, knowledgeable with regard to heroin addiction (two were ex-addict counsellors in a clinic), judged the 75 slides in terms of appropriateness. From their independent judgements the 25 that were the most affective, realistic, and best suited to the hypotheses of the study were chosen. All of the raters were briefed in advance with regard to the hypotheses of the study. A description of each of these slides in the order that they were viewed is presented in Table 5.

Neutral Slide Stimuli. The 25 neutral stimulus slides were drawn from a pool of 75 and depicted scenes of houses, landscapes, seascapes, streets in San Francisco, and various works of art. These slides were recommended as being the most appropriate to use with the drug-related slide stimuli (W. Farrall, Personal Communication, 1975). The same four raters judged the 75 slides in terms of interest value and stimulus complexity in comparison with the heroin-

related slide stimuli. A description of each of these slides in the order that they were viewed are presented in Table 5.

'Filler Slides'. Fifty-six filler slides were constructed out of a gelatin sheet. A gelatin sheet is the material that is used to cover the lights in a theatre or playhouse in order to change the lighting patterns. It is basically a transparent piece of plastic in a particular colour. The slides that were constructed were a relaxing pastel shade of blue and were used in an attempt to stabilize the subject's baselines in-between the stimulus presentations. The particular colour was chosen with a view to being both relaxing and as equivalent as possible to the luminous reflectance of the heroin-related and neutral slide stimuli.

Two carousels were used for the slide presentations, with one housing the heroin-related slide stimuli and the other the neutral slide stimuli. Each slide, whether it was heroin-related or neutral, was separated by a filler slide, so that the sequence was: filler slide, stimulus slide, filler slide, stimulus slide, and so on. Three filler slides preceded the actual experimental procedure, which served to accustom the subject to the experimental situation and presented an opportunity for the experimenter to make final calibrations to the equipment. Each stimulus slide was presented for thirty seconds, with the interslide interval, during which the filler slides were presented, also being 30 seconds.

Table 5

Description of the Slide Stimuli: Heroin-Related Slides

Slide Number	Description
1	Close-up of a needle held between a person's fingers.
2	Close-up of a syringe ('works') being held in an injecting position.
3	Close-up of a needle and a syringe of poor quality put together and partially filled.
4	Close-up of a 'street-fit', that is, a needle attached to an eyedropper. The apparatus is partially filled.
5	Group scene of four men and two women in a dingy apartment, sitting on the floor, with one of the men 'shooting up' and the others looking on.
6	A much closer view of the same man 'shooting up'.
7	A very close view of the same man with his arm tied with a thin rubber hose and a needle in his arm.
8	The same apartment much later in the day with the same six people present, candles are burning. The six people are 'nodding out'.
9	Male injecting female, both appear to be very 'spaced out'.
10	Female injecting male. (Same people as in slide 9).
11	A woman is injecting a man whose arm is tied up with a rubber hose and his arm is very emaciated in that it has a lot of marks and scars from previous injections.
12	Same type of scene as in slide 11, but with a different couple and with the man injecting the woman.
13	Same couple in the same scene (slide 12), but a much closer view.
14	Close-up of a man with his arm tied with a rubber hose. He has cut himself with a razor blade in order to get a better 'hit'. The razor blade is in his other hand and there is some blood running down his arm.
15	Same man as in slide 14. He is now in the process of injecting himself and there is blood running down his arm.
16	Close-up of a man preparing heroin for injection by heating the powder in a spoon with a small amount of water.
17	Same man, but now his arm is tied and he is injecting himself.
18	Close-up of a man drawing morphine out of a labelled bottle with a home-made 'kit' (needle and eyedropper).
19	Close-up of the same person injecting himself in the thigh.

Table 5 (Cont'd)

Description of the Slide Stimuli: Heroin-Related Slides

Slide Number	Description
20	Close-up of a man injecting himself with his arm tied with a belt; a woman is watching in the background.
21	Same person in the same position (slide 20), but a much closer view.
22	Same scene, but now the woman is injecting herself.
23	Three very 'spaced-out' people (two men and one woman). Post-injection debris is on the floor; a bottle cap, an empty heroin container, etc. One of the men is cooking heroin in preparation for an injection.
24	Close-up of the same scene, particularly on the man preparing the heroin for injection.
25	Scene of the same three people, much later, appearing to be in a euphoric state.

Table 5 (Cont'd)

Description of the Slide Stimuli: Neutral Slides

Slide Number	Description
1	Seaside scene with a white lighthouse in the bacground (coast of Maine).
2	An abandoned, desolate looking farm house on the Prairies.
3	Busy street in San Francisco with people getting on cable cars.
4	View out the front window of a bus which is crossing a bridge on a very sunny day.
5	Scene of a busy shopping and theatre area of San Francisco at night.
6	Scene on a fishing boat which is out at sea.
7	An old three mast schooner which is docked in calm water.
8	Scene down a narrow alley with interesting paintings on the walls.
9	An abandoned Prairie farmhouse with bleached grey walls.
10	An aerial photograph of a city with freeways in the foreground.
11	A large potted plant viewed through a narrow slit of light.
12	An historic village with dirt streets and heritage buildings.
13	An historic lamp post viewed at dusk with a large sculpted eagle on top of it.
14	An antique, very ornate chandelier.
15	The inside of a cave looking out towards sunlight.
16	A spiral staircase viewed from the bottom with a skylight at the top.
17	A cluster of very bright yellow flowers on a hillside.
18	A very large, somewhat grotesque, wood sculpture of a rhinocerous.
19	A funeral scene at a beautifully landscaped cemetary.
20	A beach, with a number of boats and a partially constructed boathouse.
21	A close-up of icicles hanging from a roof with a completely blue sky in the background.
22	Ornate shrubery and plants beside a stone wall.
23	A farmhouse set back from a dirt road.
24	A Siamese cat sitting on a mantlepiece viewing a reflection of itself in a large mirror.
25	A large stuffed elephant behind glass in a museum.

Psychological Instruments

A number of measures were employed in order to assess the behavioral components of arousal that were of interest in this study.

Profile of Mood States. The Profile of Mood States (POMS) is a 65 item adjective rating scale representing the refinement of over 100 different adjective scales by means of repeated factor analyses. The concept of mood as specified by the authors (McNair, Lorr and Droppleman, 1971) is similar to that proposed by Skinner and succintly stated by Nowlis and Nowlis (1956). That is, mood is regarded as a concept with the status of an intervening variable in that it is "an organismic state definable in terms of knowledge of the antecedent conditions, perception of the interoceptive and exteroceptive cues which accompany the event, and feedback from the environment" (McNair and Lorr, 1964, p. 620).

The instrument was chosen because it is sensitive to the mood states that characterize withdrawal and it is able to detect mood changes attributable to psychoactive drugs (Haertzen and Hooks, 1969; McNair et. al. 1971).

In constructing the instrument, the authors established a set of 55 scales (adjectives) based on the work of Nowlis and Green (1957) and Sells et. al. (1956). Scales were added or subtracted from this original set on the basis of a series of six factor analytic studies. A number of the studies involved administering the test prior to therapy, and at weekly intervals, in order to gather data with regard to the effects of various drugs on therapy outcome (Lorr et. al. 1961; Lorr and McNair, 1964; Lorr, McNair and Weinstein, 1964). The present form of the POMS was administered at the intake evaluation of 350 male and 650 female outpatients between 1966 and 1969, and it is this data which formed the final standardization sample.

The measure has been utilized in several heroin related research studies including Greenwald et. al. (1973), Teasdale (1973), Mandelzys and Mandelzys,

(1974) and Price et. al. (1975). It has also been used in a number of other drug related investigations including Mirin et. al. (1971), Nathan et. al. (1970), and Pillard and Fisher (1967).

Five mood factors as described by McNair, Lorr and Droppleman (1971) were utilized and included:

(1) Tension/Anxiety (T): This factor is defined by scales descriptive of heightened musculoskeletal tension and includes overt and covert symptoms of somatic tension, as well as observable psychomotor manifestations. This factor had 9 items.

(2) Anger/Hostility (A): This scale is defined by scales representing a mood of anger and antipathy towards others. The principal defining scales relate to feelings of intense, overt anger, milder feelings of hostility and sullen and suspicious behavior. This factor had 12 items.

(3) Depression/Dejection (D): Factor D appears to represent a mood of depression accompanied by a sense of personal inadaquacy. It is best defined by scales indicating feelings of personal worthlessness, futility regarding the struggle to adjust and a sense of emotional isolation from others. This factor had 15 items.

(4) Vigor-Activity (V): This factor is defined by adjectives suggesting a mood of vigourousness, ebullience and high energy. The factor consists of 8 items.

(5) Fatigue-Inertia (F): Factor F represents a mood of weariness, inertia, and low energy level. While negatively related, F and V are independent factors and not bi-polar. The factor has 7 items.

According to the authors, the factors are highly stable. Internal consistency, as measured by Kuder Richardson (20) reliabilities, for the six factors varies from .84 to .95. The factorial structure has been replicated

six times. Construct validity has been obtained in studies of psychotherapy, in the induction of emotion with anxiety-inducing films, and in the assessment of various drug effects. Since mood tends to be labile, especially in studying drug effects, test-retest reliabilities are appropriately low, ranging from .65 for vigor to .74 for depression.

In this study, two forms of the test were used with the adjectives being identical but the order being randomized differently for each form in order to reduce the effects of response set. Each subject was asked to rate how well each of the POMS adjectives described how he or she was feeling 'RIGHT NOW' on a five point intensity scale, ranging from 'not at all' (0), to 'extremely' (4). Raw scores for each scale were converted to T scores utilizing the norms provided by the authors.

The sixth mood scale provided by the authors (confusion/bewilderment) was not utilized in this study, as past research (Mandelzys and Mandelzys, 1974) indicated that it was the least reliable.

The test was completed both pre and post slide presentation for all four groups. One of the POMS forms together with the male and female T score norms are presented in Appendix 1.

Opiate Withdrawal Scale. The Addiction Research Center Inventory Opiate Withdrawal Scale (Haertzen and Meketon, 1968) was derived by administering the 550 item Addiction Research Center Inventory to two groups of addicts undergoing treatment and differentiating those items of the larger test which separated those subjects experiencing withdrawal from those not experiencing such symptoms. The Opiate Withdrawal Scale (long form) was created in this way. A short form of the OPW was created by only including those items on which the significance of the difference between the groups was .01 or less. It was this form which was used in the present investigation.

According to Haertzen and Meketon (1968), the test is designed to measure the individual's reactivity, general discomfort and physical distress. The focus is primarily upon the subject's appraisal of his psychological and physiological responses to the withdrawal of opiates.

The particular relevance of this instrument to the type of experimental procedure adopted in this study is attested to by the fact that scores on the scale were highly correlated with having received or not having received methadone for withdrawal, and were also correlated with time and intensity of withdrawal in another group of subjects who had been experimentally addicted to heroin (Hill et. al. 1963; Haertzen, 1966).

The test consisted of 29 items concerning immediate subjective experiences of interpersonal relations, mood, sensation, perception, cognition, drive and physiological symptoms (Haertzen and Meketon, 1968). Two forms of the test were used with the items being the same but the order being randomized. Each item was rated on a five point intensity scale including: none (0), weak (1), average (1.5), strong (2), and very strong (2.5). The test was completed both pre and post slide presentation by the three addict groups. One of the Opiate Withdrawal Scale forms is presented in Appendix 1.

Semantic Differential. The Semantic Differential (SD) was originally constructed as a technique to investigate the dimensions of meaning (Osgood, Suci, and Tannenbaum, 1957). A by-product of its widespread usage (Snider and Osgood, 1969) has been its employment as a tool in measuring attitudes as well as meaning (Heise, 1970). Indeed, Osgood et. al. (1957) have commented that attitudes are one of the major dimensions of meaning.

The general hypothesis underlying the technique is that the meaning of a concept for an individual not only includes those aspects which he can easily

state (denotative meaning), but also more obscure and subtle connotative meanings which are more difficult to describe. Through a factor-analytic study of the ratings of many different objects and concepts on a multitude of bi-polar adjective scales, Osgood et. al. (1957) established three general classes of meaning. The largest cluster consists of adjectives that are evaluative, such as good-bad and pleasant-unpleasant, and it is this factor which corresponds to what Krech et. al. (1962) refer to as the valence of the attitude components. A second cluster has adjectives that seem to share strength or potency ideas such as strong-weak or hard-soft. The third factor is called activity because its adjectives express motion and/or action.

The test has been readily adapted to various concepts and has been widely used in educational, sociological and psychological research, with over 1,000 articles reporting its use by 1971 (Boshier, 1971). Despite the popularity of the technique, it is only recently that researchers in the drug abuse field have recognized its potential utility. Richman and Trigg (1972) compared the attitudes of methadone patients who remained in treatment with those who became drop-outs. Robbins (1972) assessed heroin addicts' views of heroin, methadone, LSD, amphetamines and marijuana, and McShane and Christenson (1973) reported differences between methadone patients in their attitudes towards a number of drug-related concepts as a function of length of stay in a treatment program. Other studies using the Semantic Differential in drug-related experimental situations include those of Lincoln et. al. (1973), McLeod and Priest (1977), Newmeyer (1976), Simpson and Koening (1975), and Tzeng and Skafidas (1975).

The present study applied the Semantic Differential technique to the perception of heroin and methadone. The general question under investigation, was what differences are there in the meaning of these drugs under the experimental conditons of this study? The issue was to assess whether different

levels of arousal, or heroin related slide stimuli could alter response tendencies on this measure.

Twenty four word pairs were chosen from those used in various studies, including Osgood et. al. (1957), Robbins (1972), and Simpson and Koening (1975), to measure the concepts of heroin and methadone. Twelve scales were chosen for the evaluative dimension with the criteria being that the scales be as relevant as possible to the concepts under consideration, and that they load highly on the evaluative dimension with minimal loading on the remaining factors. Twelve word pairs were also chosen to represent the potency factor, and these scales were selected according to the same criteria that were used for the evaluative factor. The scales that best met these standards are presented in Table 6, which also shows the loadings on the other main factors.

The 24 scales were presented in a random order on a seven point continuum modelled after Osgood's format. To reduce the effects of response set, the left-right order of half of the word pairs was reversed on the rating form. Two forms were constructed and the measure was completed both pre and post slides presentation for the three addict groups. The order of presentation of the concepts, that is, heroin and methadone, was also randomized as much as possible.

A Semantic Differential was also completed by the Control group after they had viewed the slide stimuli. The concepts employed were the heroin related and neutral slides that they had viewed. As with the addict groups, the left-right order of half of the word pairs was reversed, and the order of presentation of the concepts was alternated subject by subject.

Examples of the Semantic Differential forms completed both by the addict groups and the Control group are presented in Appendix 1.

Table 6

Factor Loadings of the Semantic Differential Scales[1]

Scale	Evaluative	Potency
Safe-Dangerous	1.00	.00
Good-Bad	.88	.05
Beautiful-Ugly	.86	.09
Clean-Dirty	.82	-.05
Pleasant-Unpleasant	.82	-.05
Happy-Sad	.76	-.11
Healthy-Sick	.69	.17
Bright-Dark	.69	-.13
Wise-Foolish	.57	.06
Relaxed-Tense	.55	.12
Full-Empty	.51	.28
Sane-Crazy	.48	-.07
Humorous-Serious	-.05	.97
Small-Large	.06	.62
Light-Heavy	-.36	.62
Weak-Strong	.19	.62
Peaceful-Ferocious	-.46	.58
Soft-Hard	-.48	.55
Gentle-Violent	.25	.50
Narrow-Wide	-.20	.48
Feminine-Masculine	.14	.47
Shallow-Deep	.27	.46
Thin-Thick	-.06	.44
Impotent-Potent	.33	.40

[1]Table adapted from Osgood, Suci and Tannenbaum (1957)

Attitude Towards Addicts Scale. An attitude towards addicts questionnaire was administered to the Control group both pre and post slide presentations. The questionnaire was based on one employed by Chien et. al. (1964) and attempted to assess attitudes towards the use of heroin, image of the heroin user, and general information and beliefs about heroin addicts. The measure was used as a further attempt to appraise the effects of the heroin-related slide stimuli on the Control group. The eight questions were presented on a 5 point scale ranging from strongly agree to strongly disagree. The scale is presented in Appendix 1.

Physiological Instruments

Various components of the cardiac response were the physiological dependent variables of interest in this study. Of the 40 subjects that were tested 37 well-recorded and scorable records were obtained for the addict groups. By eliminating one subject from one of the groups, the final sample of 36 was created.

To obtain the heart rate changes that occurred during the experiment, three ECG electrodes (plate type), manufactured by the Nihon Kohden Corporation, were placed on the subject, one on the inner surface of each wrist, and a ground electrode on the subject's right leg just above the ankle and midway between the shin and the calf. The electrodes and recording sites of the subject's skin were first cleansed with acetone and then a layer of Beckman-Offner electrode paste was applied. The electrodes were then securely attached. The electrode leads were jointly connected to an adapter jack which in turn fed into a Beat-By-Beat Ratemeter, Model BBR4 (Micromed Instruments Company). This apparatus measured pulse rate, and converted it into rate per minute

at each pulsation of the heart.

The output from the ratemeter was (1) presented visually on a Tel-equipment Oscilloscope, Model D52, (2) was recorded on one channel of a Watanabe Multi-Corder, Model MC611-S61, and (3) was stored for future computer analysis on magnetic tape using one channel of a Thermonic Tape Recorder (Model T-3000).

Stimulus Presentation Apparatus. The stimulus source consisted of a Kodak Carousel, Auto Focus, 850H slide projector. The slide projector was controlled by a Lafayette IV Bank Repeat Cycle Timer, Model 50408 (Lafayette Instruments Corporation). Outputs from the IV Bank Timer fed into one of the channels of the Watanabe Multi-Corder, thus serving as a precise event marker, and to Channel 2 of the tape recorder where this trigger information was stored on tape.

The projector was mounted on a Fairchild Table, Type 7030 (Dumont Laboratories), which had the advantage of having a completely adjustable swivel top. The viewing distance between the projector and the 8' by 8' screen (5.95 M^2) was approximately 12 feet (3.7 M), and the viewing distance of the subject from the screen was approximately 8 feet (2.4 M) in all four testing locations.

In order to prevent extraneous room noise (eg. the sound of the equipment), subjects wore headphones (ARC Model K60) through which they heard white noise presented at a comfortable level (White Noise Generator, Model 15012, Lafayette Instruments Corporation).

Nature of the Heart Rate Response and Quantification Methods

As with skin conductance, excellent methodological and empirical work has been done with the cardiac system. A great deal is known, for example, about the effects of physical intensity and rise time of the stimulus (eg. Graham and Clifton, 1966; Graham and Jackson, 1970), about the scoring of heart rate change data (eg. Brown, 1967; Lang and Hnatiow, 1962; Lewis, 1975; Venables and Martin, 1967), and about the typical heart rate response to a variety of situations (eg. Lacey, 1969; Lewis, 1975; Sroufe and Waters, 1977).

The major theoretical development specifically pertaining to heart rate change dates back to Darrow (1929a, 1929b), and later to Davis (eg. Davis, Buchwald and Frankmann, 1955), but it has been most fully elaborated by Lacey and his colleagues.

Lacey's hypothesis has been elaborated at various symposia and in a variety of scientific publications for almost twenty years, and few psychophysiological hypotheses have generated both as much interest and controversy. Since its initial formulation, it has been the subject of considerable debate (at least six major review articles), and has provided the framework for countless studies employing heart rate as the dependent variable.

In its simplest form the hypothesis states that acceptance of the environment or attention to an external stimulus is associated with heart rate deceleration, whereas rejection of the environment, or attention to internal cues (associative processes) is associated with heart rate acceleration. Acceptance of the environment implies "ease of environmental intake" (Lacey et. al. 1963, p. 165), and rejection of the environment implies primarily a filtering out "of irrelevant stimuli that have distraction value for the

organism" (Lacey, 1967, p. 35). As well, Lacey et. al. (1963) suggested that the intake-rejection phenomenon was not dichotomous, but rather, ordered itself along a continuum which varied according to the nature of the task. For example, their RULES task, which neccessitated both intake and rejection, yielded physiological measures intermediate to the pure intake and the pure rejection tasks.

Related to the intake-rejection continuum is a second set of variables suggested by Lacey et. al. (1963), that of pleasantness-unpleasantness. They suggested that psychophysiological evidence supported the notion that pleasant stimuli, that is, those that the organism wants to take in from the environment, produce a cardiac deceleration, and unpleasant stimuli, those which the organism wants to reject, produce a cardiac acceleration. Again, stimuli may be ordered along the pleasant-unpleasant continuum such that stimuli judged intermediate in pleasantness yield physiological measures which are intermediate in magnitude when compared to the pleasant and unpleasant stimuli. The role of affect in this system is apparently to mediate attention, in that pleasantness theoretically tends to lead one to take in the environment, and unpleasantness the opposite.

Controversy has surrounded the hypothesis, in particular with regard to what can cause acceleration and the role of affect in mediating the cardiac response. With regard to the first point, Obrist et. al. (1970); Campos and Johnson (1966); and Elliott (1972) have shown that a variety of other factors can cause acceleration; and Hare et. al. (1970, 1971, 1976); Prigatano and Johnson (1974); and Weisenfeld, Klorman and Austin (1974), among others, have reported results which are clearly contradictory to the pleasantness-unpleasantness hypothesis.

Still, the major generalizations from Lacey's formulations hold quite well. Indeed, Hahn (1973) and others who have extensively reviewed the

literature, emphasize that the general tenets of the hypothesis appear to be supported despite the diversity of design and emphasis of the many experiments that have used the hypothesis as a theoretical base.

Pattern and Reliability of the Accelerative and Decelerative Responses. A triphasic heart rate pattern (deceleration, acceleration, deceleration) has been found in the majority of studies which have attempted to relate cardiac activity to different types of variables, especially those studies which have dealt either with different aspects of attention, or in reaction time experiments. In addition, manipulation of stimulus parameters such as feedback (Lacey and Lacey, 1966), uncertainty (Higgins, 1971; Jennings et. al. 1971), and task requirements (Jennings, et. al. 1971) have been accompanied by changes in both the magnitude and latency of the triphasic response.

A study by Libby, Lacey and Lacey (1973) is highly relevant to this investigation in terms of establishing both the pattern and reliability of the heart rate responses. Thirty slide stimuli, rated on 22 Semantic Differential scales, were shown to a group of subjects while heart rate and other physiological variables were recorded. They found a highly reliable progressive deceleration during the first 5 seconds of exposure to the slide stimulus, followed by a slow but progressive acceleration for the next ten seconds. Moreover, the average phasic response curves were highly reproducible, whether measurements were taken at the beginning, middle or end of the experiment, and, as well, these average response curves were not dependent on the basal heart rate at the time of measurement.

Pre-Experiment versus Pre-Trial Baselines. Over and above the periods chosen for assessment of the acceleration and deceleration responses, one must also choose what the basal measure is to be. A relatively common procedure in

many heart rate studies is to assess the effects of a manipulation relative to a steady state established prior to experimental periods. This pre-experiment baseline strategy has been adopted in many heart rate studies (eg. Lang and Twentyman, 1974; Schwartz, Shapiro and Tursky, 1971; Scott et. al. 1973). The assumption in these studies has been that if one anchors the physiological response in time, then a standard can be created against which change induced by independent variable manipulation can be assessed. However, according to Blankstein, Zimmerman and Egner (1976), a potential weakness of this method is that it leaves open the possibility that the baseline changes, or that the baseline is not representative of the resting level at the point of stimulus inception.

> In the typical laboratory session tonic HR may change drastically as a function of time in the laboratory. Depending upon the S's apprehension about the forthcoming experiment, the novelty of the situation, his motivation, physical condition, position in the chair, and many other factors, his HR may be high or low within his general range and then habituate throughout the experiment. If a within-subject control design is used and HR is assessed relative to a pre-experiment baseline, it must be shown that no baseline change occurs during subsequent periods. (Blankstein, et. al. 1976, p. 163).

However several investigators have noted the occurrence of a shifting baseline (eg. Blanchard et. al. (1972); Brener and Hothersall, (1966); Wells, 1973). Elliott (1970) reviewed data relevant to resting heart rate and reported that mean cardiac rate in male subjects for initial rest periods of 5 minutes or less averages 75 bpm. He concluded that "any study reporting a resting rate of 80 bpm or better with reasonable N must be considered to have some unrelaxing properties" (Elliott, 1970, p. 157). One of the few studies which has used heart rate as a dependent variable with drug addicts is one reported by Prystav (1976). As part of his study he recorded resting heart rate in 20 drug addicts during two sessions. The

average resting heart rate during these periods was 83.6 and 87.1 bpm. In two other earlier studies he obtained similar results (Prystav, 1974a, 1974b).

These data suggest that heart rate assessed against pre-experiment baselines fails to take account of habituating heart rate levels and favours finding large magnitude decelerations and relatively small accelerations. Furthermore, the magnitude of decrease found may be relatively greater when the subject is at an inordinately high baseline to begin with and the shift is large.

In order to deal with this problem a running baseline assessment should be employed as this would appear to circumvent the methodological shortcomings of the fixed baseline assessment.

Method of Quantification. The records for each subject were scored for the last ten seconds of the prestimulus period (i.e. last ten seconds of the filler slide), and the first twenty seconds of the stimulus period. Ten values, at one second intervals, were averaged to yield a mean value for the tonic or basal period and a mean value for the stimulus period. The arithmetic difference between the rest and stimulus periods were computed for each slide.

(1) Base Level. Base level or tonic heart rate was determined by the method described above. Thus, 25 basal levels were determined for each set of slides.

(2) Deceleration. Stimulus acceptance or attention during the slide presentations was operationally defined as the deceleration component of the cardiac response. This was calculated as the arithmetic difference between the base level and the maximum point of deceleration during the first 20 seconds of the stimulus period, The base level used for the scoring was the

base level for the preceding filler slide, which was not neccessarily the overall mean baseline of heart rate.

(3) Acceleration. Cardiac acceleration was taken during the experiment as a measure of environmental rejection or the degree to which subjects 'tuned out' the experimental slides. Heart rate was measured as the difference between the base level for each slide and the maximum point of acceleration during the first 20 second viewing period after stimulus onset.

In addition to these variables, a number of other heart rate scores were computed and these will be discussed in the next chapter. The scoring procedure outlined is identical to that employed by Okulitch (1973), and similar to that reported by Edwards and Alsip (1969) and Libby, Lacey and Lacey (1973). As in the study by Okulitch (1973), no arbitrary latency period was set in recording the acceleration and deceleration responses as it was felt that there would be a large amount of variability in the latency of the triphasic heart rate response.

Advantages and Disadvantages of utilizing Heart Rate as the Dependent Variable. A number of different physiological measures could have been chosen as the dependent variable, but it was felt that heart rate was the most appropriate for a number of reasons. Firstly, it is easily recorded and the strong cardiac signal is readily converted to digital form. Secondly, it is a relatively fast responding system and could therefore be time-locked to the particular type of experimental procedure employed in this study. Thirdly, as reviewed earlier, its use is supported by a solid theoretical and empirical base. The vast majority of studies have demonstrated that heart rate deceleration will occur when subjects focus their attention on the external environment, view an 'arousing' pictorial stimulus, or even in anticipation of a noxious stimulus (Lacey and Lacey, 1973). Similarly, heart rate acceleration occurs in most cases of

'inward attention', or when the subject becomes muscularly tense. It also occurs during acute or ongoing stress, for example, the cold pressor test (eg. Lovallo, Parsons and Holloway, 1973; Prystav, 1976), or confrontations with an aversive situation (eg. Hare and Blevings, 1975). Sroufe and Waters (1977) comment that,

> While there is not a psychological interpretation for every fluctuation of heart rate, in concert with concurrent overt behavioral measures, psychological interpretation of heart rate changes, especially those of large magnitude, can be validated. (Sroufe and Waters, 1977, p. 20).

The two main advantages of heart rate, its sensitivity and its capacity for bi-directional change, are also sources of significant methodological difficulty. That is, heart rate changes occur not only to the stimulation under investigation, but are also effected by changes in respiration or EMG (eg. Clynes, 1960; Obrist et. al. 1970). With regard to respiration, previous investigations (eg. Lacey and Lacey, 1965; Porges and Raskin, 1969), led Libby et. al. (1973) to comment that "respiratory changes cannot be said to be the sole, or even primary cause, of the cardiac deceleration seen during attention to external stimuli (Libby et. al., 1973, p. 277). Likewise, EMG has been found to be not as dominant a variable as was first thought. For example Sroufe et. al. (1973) produced consistent results to indicate that accelerations associated with stereotypic finger flicking were significantly greater than those occurring during random intervals of the same duration but in a non-stimulus situation. As well, a number of other studies have demonstrated that the EMG activity which occurs is not correlated with either the speed or the magnitude of the heart rate response to the stimulus (eg. Elliott 1976, Ginsberg, 1970).

In summary, perhaps Sroufe and Waters (1977) best sum up the relationship between, respiration, muscle tension and heart rate, when they state that,

> this relationship . . . need not reduce the value of heart rate as a dependent variable as long as its relationship to independent variables is lawful. If heart rate reliably decelerates during attention and accelerates during stress, whether such changes are mediated by muscle tension (or respiratory effects) is irrelevant to psychological interpretations in most cases. That is, the question of whether heart rate is instrumental in the deployment of attention or in response to intense stimulation is generally secondary to its value as a reliable correlate. (Sroufe and Waters, 1977, p.19).

The Placebo Effect

The medical use of placebos, that is, unspecified stimuli, is not new. Placebos were used therapeutically and were considered a 'commonplace method' in the Quincy Lexicon (1787). Following this, there are only isolated references until the early 1950's (Shapiro et. al., 1968), but since then the tool has become an important procedure in the study of both the behavioral and pharmacological effects of drugs.

In the last thirty years, because of the widespread and apparently successful use of placebos, there have been many attempts to define the phenomenon. Fischer and Dlin (1956) define it as "the agent employed with or without some ritual, but always with the suggestion or implication of its power or helpful properties" (p. 504). Out of Beecher's studies (Beecher, 1955, 1959, 1960) an operational definition of the term placebo as applied to the study of drug actions has evolved. He views it as an aid in distinguishing drug actions from the effects of suggestion and as a controlling factor in the unbiased assessment of results. An essential element of this definition is that the placebo must be used in a double blind fashion, that is undetectable as a placebo by both the experimenter as well as by the subject.

With regard to the range of placebo reactivity, Beecher (1955) reported data on 15 studies. He found that the range of placebo reactivity (i.e. effectiveness) was 35.2 percent, plus or minus 2.2 percent. Kurland (1960) evaluated the range of placebo reactivity reported in a sampling of studies. A range of

4 to 52 percent was found, and the observation was made that there was no study utilizing placebos in which some degree of reactivity was not reported. Lasagna, Laties and Dohan (1958) presented data to indicate that the subjective response to a placebo can mimic certain actions of active drugs such as 'peak effects', 'cumulative effects', and 'carryover effects'. In another study, Laties and Weiss (1963), it was demonstrated that psychiatric out-patients being treated for anxiety could not distinguish between meprobamate and a placebo. In more recent work, Stallone et. al. (1974, 1975) found in studies employing lithium carbonate versus a placebo, that although their subjects had been told that they had a 50-50 chance of receiving either lithium or a placebo, 55/57 (96%) guessed that they had received lithium, whereas only 35/57 (61%) had in fact received it. In a related study, Marini et. al. (1976) also working with lithium carbonate, found that subjects receiving placebo medication could not identify it at better than chance levels, and, more importantly, on a weekly symptom checklist there were no differences between the lithium and placebo groups on average lithium target symptoms reported during four week pre and post medication control periods. Finally, Davis, Gosenfeld and Tsai (1976), reviewing 25 studies that had used placebos in comparison with maintenance anti-psychotic drugs in relation to relapse, concluded that only 705 out of 1346 patients (52%) on placebos relapsed.

Roueche (1972) summarizing a review of the placebo literature comments that,

> . . . the existence of the placebo effect is clearly beyond dispute. It owes nothing to the imagination but its origin. Its reality has been abundantly demonstrated by the many double-blind control experiments whose results are now on record. So, almost as abundantly, has its range. The palliative powers with which suggestion can invest placebos are extraordinarily broad. Their reach surpasses that of the powers inherent in the great majority of genuinely robust drugs. It extends potentially throughout the spectrum of psychophysiological distress. (Roueche, 1972, p. 9).

Interestingly, however, there is a noticeable absence of double-blind placebo studies with regard to the effects of methadone. According to Axelson (1977), there are a paucity of published reports using human subjects in which the pharmacological effects of methadone have been evaluated in relation to placebo effects. This conclusion is also supported by Berkowitz (1976) in his review of the pharmacokinetics of methadone.

Some data however, has been reported at the level of clinical practice. Dole and Nyswander (1968) occasionally gave patients who came in for their daily dose of methadone a placebo instead (quinine dissolved with orange juice instead of methadone and orange juice). They found that their patients could not tell the difference, and not until hours later, when withdrawal symptoms began to appear, did they realize that they had not received methadone.

Berry (1972) found no significant differences on a variety of variables in response to widely differing doses of methadone, including a placebo, when these doses were administered blindly. Finally, Resnick et. al. (1975), using a rapid withdrawal technique, reduction of methadone dose by 50 percent per day followed by one week of placebo administration, found no indication of loss of appetite, sleep difficulties, loss of energy, chills, abdominal pain or nausea in their placebo group.

Pharmacokinetics and Pharmacological Effects of Methadone and Quinine

In terms of the experimental manipulations of this study, methadone was the active drug in question, and quinine (quinine sulfate) was utilized as the placebo.

Methadone. Methadone (methadone hydrochloride) is a bitter, white crystalline powder which is soluble in water and incompatible with alkaline solutions (Jaffe, 1969). The pharmacological actions of methadone are qualitatively identical to those of morphine. These effects of methadone have been extensively reviewed by Wikler (1958) and include effective analgesic activity, sedation

and significant effects on smooth muscle activity. According to Jaffe (1969), the effects of methadone on the cardiovascular system are not prominent. That is, methadone does not interfere with the cardiovascular reflexes and the ECG remains unchanged except for the occasional appearance of sinus bradycardia.

(1) Absorption. Methadone absorption begins rapidly following acute or chronic oral administration (Inturrisi and Verebely, 1972a, 1972b) with the drug detected in the plasma within 30 minutes after administration. Peak levels of absorption in brain tissue occur within one to two hours (Way and Adler, 1960).

(2) Distribution and Metabolism. The concentration of methadone in the plasma of methadone maintained subjects was studied by Inturrisi and Verebely (1972a). They observed peak plasma levels to occur between 2 and 4 hours after oral administration of the drug.

(3) Half-Life. The elimination half-life of methadone averaged 25 hours and ranged from 13 to 47 hours (Inturrisi and Verebely, 1972a). This data was confirmed (Verebely et. al., 1975) in 12 additional patients. In both studies there were striking individual differences, with values for the plasma half-life ranging from 13 to 40 hours with an average of 22 hours.

(4) Effects of Route of Administration. There is strong evidence that the metabolism of methadone is greater following oral administration than following intramuscular administration. This was demonstrated by Inturrisi and Verebely (1972b), who found that the ratio of urinary metabolites to unchanged methadone was four times greater after oral than after intramuscular administration.

(5) Effects of Dose and Sex. Baselt and Casarett (1972) reported the effects of dose and sex on methadone excretion. As the dose of methadone was increased, the percentage excretion of both methadone and its metabolites also increased in the urine. Women have a higher urinary metabolite to methadone than men, suggesting that they may biotransform methadone faster (Berkowitz, 1976).

Quinine. Quinine (quinine sulfate, N.F.) was the placebo that was employed in this study. It is a white microcrystalline powder that has a bitter taste which is extremely intense and persistent, and is soluble in water in the ratio of 1:500 (Goodman and Gilman, 1969). It has few effects on the central nervous system other than to cause very mild analgesia and antipyresis. Small doses of quinine have little effect on the normal heart rate and blood pressure in man, and do not significantly alter the ECG (Goodman and Gilman, 1969).

(1) Absorption. Quinine is readily absorbed when given orally. Absorption occurs mainly from the upper small intestine and peak plasma levels occur within 3-4 hours after a single oral dose (Goodman and Gilman, 1969; Brodie, Baer and Craig, 1951).

(2) Excretion and Metabolism. The main channel of excretion of quinine is in the urine where it can be detected within 15 minutes after oral ingestion and reaches its maximal concentration within 4 hours (Goodman and Gilman, 1969).

(3) Behavioral Effects. In small doses, such as those used in this study, it has no significant behavioral effects whatsoever (Goodman and Gilman, 1969).

Placebo Preparation.

All patients at all three clinics received their methadone dissolved in approximately 4 oz. of Tang or similar orange juice. The medication was dispensed either in 6 oz. Dixie Cups (Montreal Clinic), or in 4 oz. labelled bottles (Niagara Falls and St. Catherines clinics). An example of the labelling procedure used at one of the clinics is presented in Appendix 2. The procedure to match the quinine placebo to the methadone medication proceeded as follows:

(1) 200 mg. quinine sulfate capsules (Parke-Davis) were dissolved in water in the ratio of 1:900 by the hospital pharmacist.

(2) Ten bottles containing 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 and 5.5 cc. of quinine were prepared and to this 4 oz. of Tang or similar orange juice

was added. The orange juice was always identical to the brand used by the Clinic.

(3) Ten bottles containing 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 mg. of methadone together with 4 oz. of juice were prepared either by the hospital pharmacist or a staff member.

(4) Six judges were chosen for the purposes of matching the methadone to the placebo. These included two ex-addicts who were now counsellors at the clinics, a psychiatric nurse and a non-ex-addict counsellor from the clinics, and two people not connected with the clinics who had no experience whatsoever with methadone.

(5) The method of equivalents, in a broad sense similar to the psychophysical method of average error (Guilford, 1954) was the judgement procedure employed. The procedure involved the judge tasting a specified methadone dose presented to him/her on a cotton swab which had been dipped into the solution. After this he tasted the 10 quinine solutions which were also administered on cotton swabs. He was then asked to rate which quinine solution was equivalent in taste to the standard, that is, the methadone dosage. The same procedure was followed for all methadone dosages although different presentation schedules for the methadone dosages were constructed for each judge. The degree of concordance between the six judges was quite high, especially for those methadone dosages at the extremes.

(6) From the cumulative ratings of the judges the following dosage schedule was constructed:

Dosage of Methadone	Dosage of Quinine
10-19 mg.	1.0 cc.
20-29 mg.	1.5 cc.
30-39 mg.	2.0 cc.
40-49 mg.	2.5 cc.
50-59 mg.	3.0 cc.
60-74 mg.	3.5 cc.
75-89 mg.	4.0 cc.
90-110 mg.	5.0 cc.

Experimental Procedure

The procedure consisted of five phases for the three addict groups and three phases for the Control group. A basic outline of the procedure is presented in Figure 2. For the addict groups the procedure was double-blind in that neither the experimenters nor the subjects knew the group assignments.

Addict Groups.

Phase 1: All subjects who had volunteered to participate were informed in advance with regard to the general nature of the experiment (see Appendix 3 for information sheet), and the day of their appointment. Upon arriving at the clinic at his usual daily time, the subject was catagorized into one of three groups in a random fashion by one of the clinic personnel. When possible, this person was either an off-duty nurse or a secretary, and was only responsible for subject assignment, having no other contact with anyone directly involved in the study (i.e. other staff members directly involved, the subjects or the experimenters). On occasion, other non-clinic personnel were assigned this task depending on the amount of work that the clinic had at the time. This individual gave the subject an indentification slip which contained their name, a code number, and space for 5 signatures. The identification slip was a perforated piece of paper so that the subject's name and code number could be detached from the bottom part which contained the space for the signatures.

The subject then went to the drug dispensing station where he was given either the Placebo (Group 1), his daily dose of methadone (Group 2) or no medication at all (Group 3) depending on the randomly assigned code numbers. The staff member who was responsible for dispensing the methadone then tore off the top part of the identification slip, filed it, and signed the blank

bottom part which was then given to the subject. This staff member was the pivotal link in the study since he knew the subject assignments. Thus, great care was taken in explaining the procedure to these people so that they could be as objective as possible in their dispensing role.

After receiving either the drug, placebo or no medication at all, the subject waited approximately 30-45 minutes at the clinic.

Phase 2: At all three clinics the interview and testing rooms were either in a separate part of the clinic or in an entirely different building. The second phase which took between 30-45 minutes, consisted of an interview during which the biographical information, and drug and methadone history were obtained. The consent form was explained and completed during this period (See Appendix 3 for Consent Form). After suitable instructions were given, the subject went to another room where he completed the Profile of Mood States, Opiate Withdrawal Scale, and the Semantic Differential. His identification slip was then signed by the interviewer.*

Phase 3: At all three clinics, a quiet, well-ventilated room was used as the laboratory for recording the physiological data. The subject was seated upright in a comfortable armchair and the previously described electrodes were attached. If the subject asked any questions about the process or displayed any anxiety, then the subject was reassured as much as possible and was told that the entire procedure would be explained at the end of the experiment. The subject was asked to relax as much as possible, and to refrain from moving, talking or smoking during the experiment.

The room was then darkened and the physiological apparatus activated. The physiological tracings were monitored and any neccessary adjustments of

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* To clarify, it should be noted that the interviewer, that is, the individual administering the tests, and the experimenter (the individual recording the physiological data), were separate people.

the electrode placings were made at this time. With the projector light on, ten minutes were alloted for the baselines of the physiological responses to become stabilized, after which the tape recorder, timer, and slide projector were activated. After this, the experimenter did not interact with the subject again until the mid-way point, unless a piece of equipment failed or the subject refused to cooperate.

A stimulus slide would appear on the screen for a 30 second duration, followed immediately by a filler slide for 30 seconds. This alternating sequence of stimulus and filler slides was repeated until the complete set of either drug-related or neutral slides was completed. A timed three minute break then followed during which the slide tray was changed. The subject was allowed to move and talk freely during this period. The same procedure was then followed by the second set of slides. Counterbalancing was achieved by changing the order of the slides, that is, drug-neutral, neutral-drug, after every six subjects, as it was arranged that blocks of six subjects would contain 2 subjects from each group. Thus, although the interviewer and the experimenter did not know which subjects were in which groups, they did know that one day's testing (6 subjects) would contain 2 subjects from each group.

This entire phase took approximately 60 minutes, at the end of which the lights were turned on and the headphones and electrodes were removed from the subject. The experimenter then signed the subject's identification slip.

Phase 4: This phase was similar to the second phase in that it consisted of an interview and the completion of tests. The interview basically consisted of a series of questions designed to assess the subject's awareness of whether or not he had received a placebo. The questioning was as indirect as possible and was based on the method described by Shapiro, Wilensky and Struening (1968). As in Phase 2, the tests consisted of the Profile of Mood States, the Opiate

Withdrawal Scale, and the Semantic Differential. An attempt was made to have the subject complete the test material as soon as was possible after viewing the slide stimuli. Upon completion, the interviewer signed the identification slip and the subject returned to the clinic.

Phase 5: Those subjects in Groups 1 and 3 received their regular daily dose of methadone and those in Group 2 received the placebo. The identification slip was then signed by one of the clinic personnel and the subject then returned it to the interviewer whereupon he or she was paid.

Control Group. In terms of Figure 2, the Control group participated in Phases 2,3, and 4. All testing was conducted at the Faculty of Psychology, University of Ottawa.

Phase 2: This phase took approximately 30 minutes and consisted of an interview during which the biographical and drug taking data were obtained, and the Profile of Mood States and attitude towards addicts scale were completed.

Phase 3: This phase was identical to that described for the addict groups except that the experimenter manipulated the slide order in a non-blind fashion. That is, the blocks of slides, drug-neutral, neutral-drug, were changed after each subject.

Phase 4: During this period the subjects completed the Profile of Mood States, Semantic Differential rating of the slides, and the attitude towards addicts scale.

Figure 2. Outline of the experimental procedure.

PHASE	1	2	3	4	5
APPROXIMATE TIME	30 min	30 min	60 min	20 min	10 min
GROUP 1 ADDICTS	Administration of Placebo	Interview and completion of POMS, OPW and Semantic Diff.	Viewing of heroin and neutral slides Physiological Recording	Interview: drug awareness, and completion of POMS, OPW and Semantic Diff.	Administration of Methadone
GROUP 2 ADDICTS	Administration of Methadone	Interview and completion of POMS, OPW and Semantic Diff.	Viewing of heroin and neutral slides Physiological Recording	Interview: drug awareness, and completion of POMS, OPW and Semantic Diff.	Administration of Placebo
GROUP 3 ADDICTS	No drug administration ('Abstinent Condition')	Interview and completion of POMS, OPW and Semantic Diff.	Viewing of heroin and neutral slides Physiological Recording	Completion of POMS, OPW and Semantic Diff.	Administration of Methadone
GROUP 4 CONTROL	----------	Interview and completion of POMS, and attitude towards addicts scale	Viewing of heroin and neutral slides Physiological Recording	Completion of POMS, Semantic Diff. and attitudes towards addicts scale	----------

Experimental Design and Statistical Analyses

The dependent variables can roughly be thought of as falling into two broad categories: behavioral and physiological.

The scoring of all data was done independently by at least two judges. To eliminate experimenter bias, scoring was performed without prior knowledge of the group placement. Two sets of scores were obtained with regard to the physiological data, from which inter-rater reliability estimates were computed.

For the hypotheses involving the behavioral dependent variables, a two factor analysis of variance with repeated measures on one factor was employed (Winer, 1971, p. 518-532). The two factors considered were groups (1, Placebo, 2, Methadone, 3, Abstinent, and 4, Control); and Time (pre and post slides). Repeated measures were taken on the second factor. The dependent variables were as follows: (1) the five mood factors from the Profile of Mood States, (tension, depression, anger, vigor and fatigue), (2) the T and total scores from the Opiate Withdrawal Scale, and the scales from the Semantic Differential. For part of the Semantic Differential data the second (repeated) factor was not time, but concepts (heroin and methadone). As described earlier some analyses involved all of the groups, some only the three addict groups, and others (eg. the Semantic Differential data), involved separate statistical analyses for the addict and control groups.

A small proportion of the heart rate data also involved a two-way analysis of variance with repeated measures. For this analysis the two factors considered were groups (Placebo, Methadone, Abstinent and Control), and stimulus classes. The stimulus class factor was created by breaking down the 25 heroin-related slide stimuli into three groups according to the material they represented. A *t* test for correlated groups

was used in order to assess the possibility of significant differences for the Control group, on both the Semantic Differential and on the attitude towards addicts scale.

For the hypotheses involving the physiological dependent variables, four levels of the Group factor (Placebo, Methadone, Abstinent and Control), and two levels of the stimulus factor (drug slides and neutral slides) comprised the principal independent variables. A third variable, a product of the experimental design, was that of order (i.e. the order that the slides were presented, drug-neutral or neutral-drug). As has sometimes been observed when two sets of stimuli are presented in succession, there is a progressively diminishing response to the stimuli, which effects the dependent variable reactivity scores for the set of stimuli which are presented second. Ordinarily this effect is either confounded with the response of interest, or treated by employing designs which do not involve repeated measures (Winer, 1971). Since it was crucial to present both sets of stimuli to all subjects, a modified Latin Squares design was adopted which entailed the additional independent variable of order of presentation (Winer, 1971).

This design (Winer, 1971, p. 727-736), considers all factors to be fixed, and the group factor and the subjects within groups to be random. All interactions with the group and subject effects are considered negligible. This modified Latin Squares design utilizes the same square for all four levels of the group factor. Within each of the squares are confounded the same components of the stimulus type and order interactions, while the same components of the groups stimulus types and order interactions are confounded in the differences between squares. Thus full information is provided on all main effects as well as some components of both the stimulus type-order and group-

stimulus type-order interactions.

To exclude chance findings, a conventional level of significance (p .05) was used as the basis for the rejection of null hypotheses. When the overall test yielded a significant F value post hoc procedures using the Newman-Keuls technique were applied to locate the source of differences (Winer, 1971; Keith , 1969). When the interaction was significant then simple main effects testing was undertaken according to the method suggested by Winer (1971), p. 733-735. The homogeneity of variance assumption was assessed by using the F_{max} test proposed by Hartley (Winer, 1971, p. 206-208). Finally, the relationship between selected variables of interest was established by using the Pearson r.

All analyses were conducted on a PDP 11/10 computer (Digital) using a specifically designed statistical package.

CHAPTER III

Presentation of Results

Introduction

Means and standard deviations for all raw scores for the various analyses are presented in Appendices 4 and 5. Tables of crucial importance to understanding the results are presented within the body of the chapter, and those of supplementary interest are presented in Appendix 6. Methods of calculation for the Newman-Keuls procedure and for the simple main effects analyses are presented in Appendix 7.

The results are presented in the same order as the hypotheses were presented, that is, the behavioral followed by the physiological data.

Behavioral Results

Profile of Mood States. The mean tension factor T scores for the four groups pre and post slide presentation were 55.83 and 54.16 for the Placebo group, 54.08 and 51.58 for the Methadone group, 59.67 and 64.50 for the Abstinent group, and 45.25 and 45.92 for the Control group. Analysis of variance results, shown in Table 7, indicated that there was a significant difference between the groups, $F(3,44) = 11.64$, p .05. No other significant differences were observed. The Newman-Keuls procedure applied to the group means revealed that the score of the Control group was significantly lower than the scores of the three addict groups, indicating a lower amount of expressed tension. Among the three addict groups, the Abstinent group was significantly different from either the Placebo or Methadone groups, in the direction of a greater degree of expressed tension. No significant difference was observed between the Placebo and Methadone groups.

The mean depression factor T scores for the four groups pre and post slide presentation were 54.50 and 50.58 for the Placebo group, 54.42 and 48.67

for the Methadone group, 56.58 and 54.48 for the Abstinent group, and 51.75 and 47.75 for the Control group. The analysis of variance revealed no significant differences between the groups, F (3,44) = 2.65, p .05. A significant difference was found between the administration times however, F (1,44) = 12.86, p .05. These data indicated that although there were no differences between the groups, there was an overall effect such that there was significantly more expressed depression after viewing the slide stimuli than before. A significant interaction was not observed, F (3,44) = 0.49, p .05. The analysis of variance summary table for the depression factor is presented in Table 8.

For the anger/hostility factor the means for the four groups were 56.25 and 53.08 for the Placebo group, 52.50 and 45.67 for the Methadone group, 55.91 and 59.08 for the Abstinent group, and 50.67 and 45.83 for the Control group. The analysis of variance (Table 9) revealed that a significant difference between the groups was observed, F (3,44) = 5.04, p .05. The Newman-Keuls procedure indicated that the Control group was significantly different from the Abstinent group in the direction of having a lower amount of expressed anger and hostility. No differences were found between the Control group and either the Placebo or Methadone groups. Among the addict groups, the score of the Abstinent group was significantly higher than the Methadone group, but not significantly different from the Placebo group. The overall effect of the B factor (administration time) was also significant, F (1,44) = 4.69, p .05. This result indicated that when the total sample was considered, there was significantly more anger and hostility after viewing the slides than before ($\bar{x}$ pre = 50.92, $\bar{x}$ post = 53.83).

No significant differences either between the groups or the administration times were observed for either the vigor or fatigue factors. The means for the four groups on the vigor factor were 47.08 and 44.92 for the Placebo

group, 41.92 and 44.92 for the Methadone group, 48.25 and 44.50 for the Abstinent group, and 52.45 and 47.92 for the Control group. For the fatigue/ inertia factor the means for the four groups were as follows: Placebo = 54.41 pre, and 54.08 post slides, Methadone = 51.25 and 51.50, Abstinent = 54.67 and 56.33, and Control = 51.75 and 51.91. The ANOVA tables for these two factors are found in Tables 10 and 11.

Figures 3 and 4 present a summary of the total Profile of Mood States data pre and post slide presentation. In addition, the Newman-Keuls summary tables for the group main effect on the tension and anger factors are to be found in Appendix 6.

From these data several conclusions can be drawn: (1) when a significant difference occurred between the groups it was consistently in terms of the Control group being significantly lower (i.e. having less mood disturbance) than the three addict groups. (2) Within the addict groups the Abstinent group experienced significantly more mood disturbance than the other addict groups. (3) The pattern of responsiveness and overall results between the Placebo and Methadone groups are similar. (4) When a time effect occurred, it was always in the direction of a significantly greater amount of mood disturbance after viewing the slide stimuli.

Table 7

Analysis of Variance of Profile of Mood States Tension Factor, Pre and Post Slide Presentation for the Four Groups (Placebo, Abstinent, Methadone and Control)

Source of Variation	SS	df	MS	F ratio
Between Subjects	7512.50	47		
A (Groups)	3323.50	3	1107.83	11.64*
Subjects within groups	4189.00	44	95.20	
Within Subjects	2330.00	48		
B (Administration Times)	2.66	1	2.66	0.05
AB	194.34	3	64.78	1.34
B x Subjects within Groups	2133,00	44	48.48	

*$F_{.95}$ (3,44) = 3.21

Table 8

Analysis of Variance of Profile of Mood States Depression Factor Pre and Post Slide Presentation for the Four Groups (Placebo, Methadone, Abstinent and Control)

Source of Variation	SS	df	MS	F ratio
Between Subjects	2809.97	47		
A (Groups)	429.72	3	143.24	2.65
Subjects within Groups	2380.25	44	54.10	
Within Subjects	1670.00	48		
B (Administration Times)	368.19	1	368.19	12.86*
AB	42.22	3	14.07	0.49
B x Subjects within Groups	1259.59	44	28.63	

*$F_{.95}$ (1,44) = 4.06

Table 9

Analysis of Variance of Profile of Mood States Anger Factor Pre and Post Slide Presentation for the Four Groups (Placebo, Methadone, Abstinent and Control)

Source of Variation	SS	df	MS	F ratio
Between Subjects	5572.50	47		
A (Groups)	1424.84	3	474.95	5.04*
Subjects within Groups	4147.66	44	94.26	
Within Subjects	2456.00	48		
B (Administration Times)	204.16	1	204.16	4.69**
AB	336.50	3	112.17	2.58
B x Subjects within Groups	1915.34	44	43.53	

*$F_{.95}(3,44) = 3.21$

**$F_{.95}(1,44) = 4.06$

Table 10

Analysis of Variance of Profile of Mood States Vigor Factor Pre and Post Slide Presentation for the Four Groups (Placebo, Methadone, Abstinent and Control)

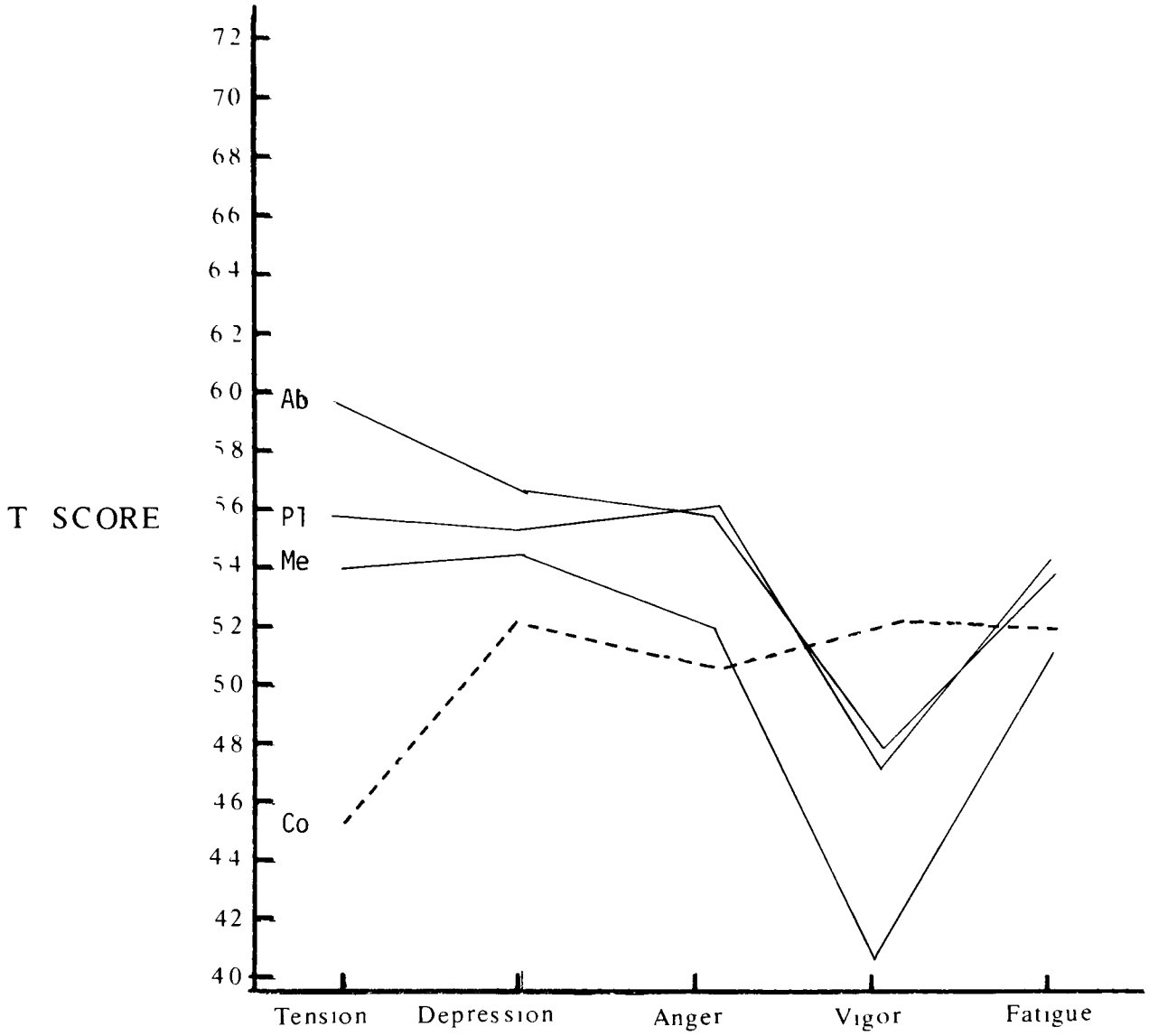
Source of Variation	SS	df	MS	F ratio
Between Subjects	3518,48	47		
A (Groups)	557,19	3	185.73	2.76
Subjects within Groups	2961,30	44	67,30	
Within Subjects	1615,50	48		
B (Administration Times)	82,50	1	82,50	2.73
AB	205,55	3	68.52	2.27
B x Subjects within Groups	1327.45	44	30.17	

Table 11

Analysis of Variance of Profile of Mood States Fatigue Factor Pre and Post Slide Presentation for the four Groups (Placebo, Methadone, Abstinent and Control)

Source of Variation	SS	df	MS	F ratio
Between Subjects	4061.97	47		
A (Groups)	278.00	3	92.67	1.08
Subjects within Groups	3783.97	44	86.00	
Within Subjects	1535.50	48		
B (Administration Times)	4.56	1	4.56	0.13
AB	13.31	3	4.44	0.13
B x Subjects within Groups	1517.63	44	34.49	

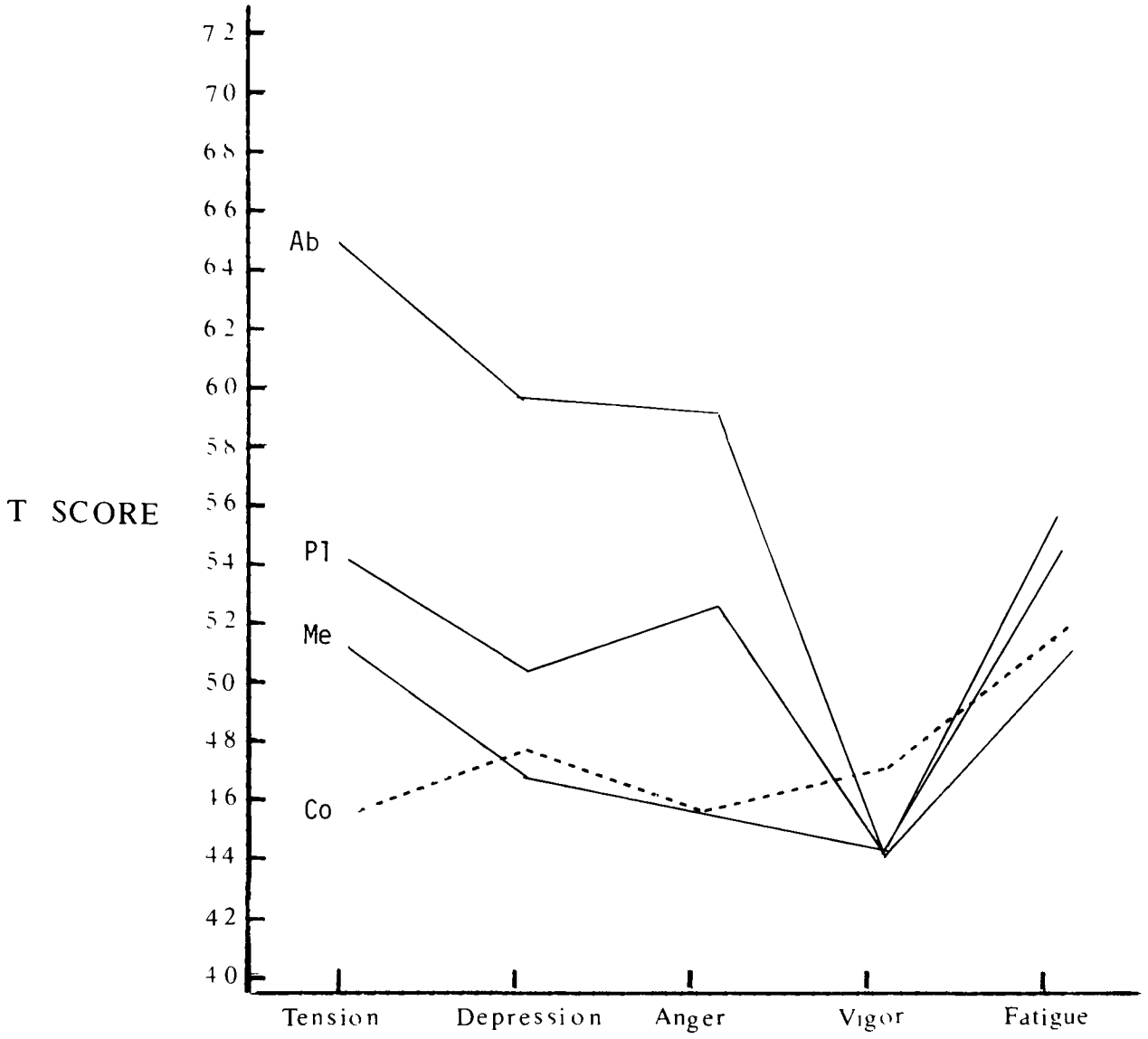
Figure 3. T Scores for the five Profile of Mood State Factors for the four groups in the Pre Slide Condition.



Profile of Mood States Factor

Me = Methadone Group
Pl = Placebo Group
Ab = Abstinent Group
Co = Control Group

Figure 4. T Scores for the five Profile of Mood State Factors for the four groups in the Post Slide Condition.



Profile of Mood States Factor

Me= Methadone Group
Pl = Placebo Group
Ab= Abstinent Group
Co= Control Group

Addiction Research Center Inventory, Opiate Withdrawal Scale.

Two types of analyses were employed in evaluating the Opiate With-Drawal Scale data. The first used the normalized T scores provided by Haertzen and Meketon (1968). Forthis analysis, the mean converted score was 50, with a standard deviation of 10. However, this analysis, while comparable with the standardization sample, necessitated the loss of a substantial amount of information because responses are only analyzed in terms of a two-catagory, yes-no scoring scheme. Therefore, in order to more specifically define the experiences related to opiate withdrawal a total score analysis was also employed. This was done by assigning a numerical weight to the five options allowed in Haertzen and Meketon's (1968) original study. Thus, the none catagory was scored as (0), weak as (1), average as (1.5), strong as (2) and very strong as (2.5). These criteria of the withdrawal effect were employed because it was felt that this finer distinction might have a stronger likli-hood of being related to physiological and psychological withdrawal as assessed by the measure.

(1) T Score Analysis: For comparison purposes with the standardization sample, all items marked 'none' were scored as 0, and all other items were scored as 1.

The mean Opiate Withdrawal Scale T scores for the three addict groups pre and post slide presentation were 64.33 and 66.08 for the Placebo group, 66.67 and 69.00 for the Methadone group, and 78.33 and 68.42 for the Abstinent group. Since the mean for the standardization sample was 50.00, it can clearly be seen that all three addict groups were always experiencing a significant amount of withdrawal, regardless of drug administration or slide presentation.

The analysis of variance, presented in Table 12 indicated that there

were no significant differences between the groups, F (2,33) = 2.81, p .05, or between the completion times (pre and post slides), F (1,33) = 1.26, p .05. The interaction however, was significant, F (2,33) = 5.29, p .05. Analysis of simple main effects for the interaction are found in Appendix 6. The experimental data rejected the hypothesis of no significant difference between the groups, but only when observations were considered before slide presentation. That is, in the pre-slide condition the Abstinent group was experiencing significantly more subjective withdrawal than either the Placebo or Methadone groups. In addition, there was a significant pre-post difference for this group in that they were experiencing significantly more subjective withdrawal symptoms before the slides were presented. These results are presented in Figure 5.

(2) Total Score Analysis: As previously stated, it was felt that this analysis would be a more sensitive indicator of withdrawal than the T score analysis in that it provided for a wider range of responsiveness (5 catagories versus the nominal catagories of 'yes' or 'no'). The mean Opiate Withdrawal Scale total scores for the three groups pre and post-slide presentation were 14.50 and 14.58 for the Placebo group, 17.00 and 17.33 for the Methadone group, and 21.92 and 15.92 for the Abstinent group. The analysis of variance indicated that there were no significant differences between the groups, F (2,33) = 2.01, p .05. A significant difference was found between the completion times (pre and post slides), F (1,33) = 4.20, p .05. That is, the groups were experiencing significantly more withdrawal symptoms before the slides were presented than after they were presented. A significant interaction was also observed, F (2,33) = 5.20, p .05. Simple main effects analysis for the interaction indicated that there were no differences between the groups either pre or post slides. However, there was a significant difference between the pre and post scores for the Abstinent group (B at al). A

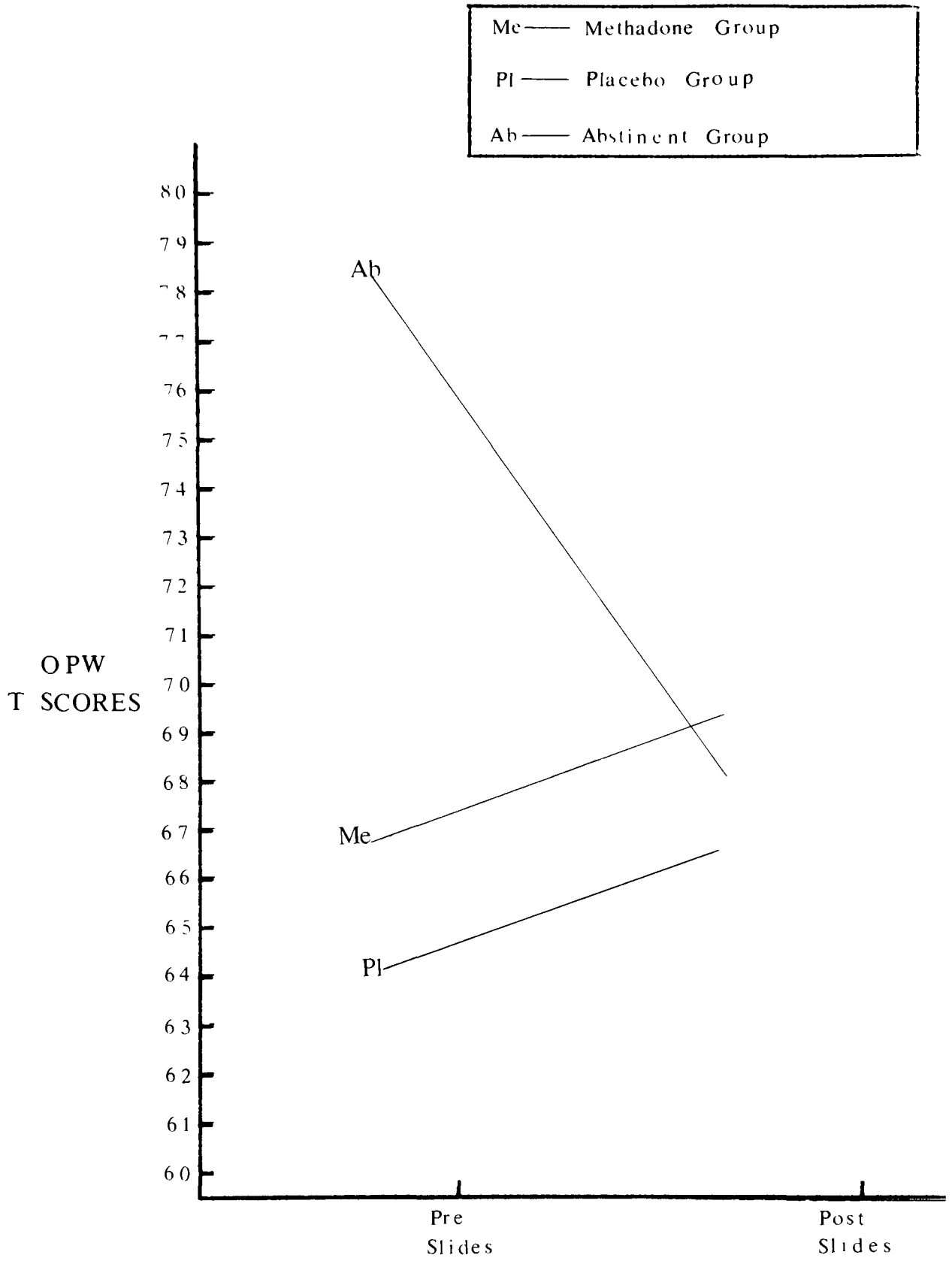
Table 12

Analysis of Variance of Opiate Withdrawal Scale T Scores, for the Placebo, Methadone, and Abstinent Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	5732.28	35		
A (Groups)	834.36	2	417.18	2.81
Subjects within Groups	4897.92	33	148.42	
Within Subjects	2427.00	36		
B (Administration Times)	68.06	1	68.06	1.26
AB	573.02	2	286.51	5.29*
B x Subjects within Groups	1785.92	33	54.12	

*$F_{.95}$ (2,33) = 3.28

Figure 5. T Scores for the Opiate Withdrawal Scale for the Three Addict Groups, Pre and Post Slide Presentation.


Me —— Methadone Group
Pl —— Placebo Group
Ab —— Abstinent Group
OPW
T SCORES
80
79
78
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
60
Ab
Me
Pl
Pre
Slides
Post
Slides

summary of these results are presented in Table 13 and Appendix 6.

The correlation between the T scores and total scores for the Placebo group was .94 pre-slide and .67 post-slide, .65 and .67 for the Methadone group, and .84 and .77 for the Abstinent group.

The overall results from the Opiate Withdrawal Scale analysis indicated that all three groups were always experiencing a significant amount of withdrawal, regardless of drug administration or slide presentation. Secondly, the slide stimuli only appeared to have a significant effect upon the Abstinent group, but in the direction opposite to that which was expected. That is, there was a significant decrease in experienced withdrawal for this group after viewing the slide stimuli. Thirdly, although not significant, there nevertheless was an increase in experienced withdrawal for the Placebo and Methadone groups between the pre and post slide administrations of the test.

Table 13

Analysis of Variance of Opiate Withdrawal Scale Total Scores, for the Placebo, Methadone and Abstinent Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	2141.37	35		
A (Groups)	232.75	2	116.37	2.01
Subjects within Groups	1908.62	33	148.42	
Within Subjects	706.50	36		
B (Administration Times)	62.35	1	62.35	4.20*
AB	154.36	2	77.18	5.20**
B x Subjects within Groups	489.79	33	14.84	

*$F_{.95}(1,33) = 4.13$

**$F_{.95}(2,33) = 3.28$

Semantic Differential. The Semantic Differential data was analyzed in two ways in order to evaluate the hypotheses. The first analysis was a pre-post analysis and was undertaken solely to evaluate the effects of the slide stimuli. The second analysis was a concept analysis and was undertaken in order to assess the possible differences in meaning of heroin and methadone to the addict. In interpreting the means, a low score (less than 4) indicates that the drug tended to be viewed in terms of its positive evaluative aspects, eg. good as opposed to bad, or happy as opposed to sad. For the potency factor, a low score indicates that the drug tended to be viewed in terms of its less potent qualities, eg. soft as opposed to hard, or gentle as opposed to violent.

(1) Effect of the Slide Stimuli: Pre-Post Analysis. The means for the evaluative factor for the concept of heroin for the three addict groups were 4.45 pre and 5.12 post for the Placebo group, 5.19 and 5.90 for the Methadone group, and 3.70 and 4.50 for the Abstinent group. Analysis of variance on the data indicated that there was a significant difference between the groups, F (2,33) = 6.56, p .05, and between the administration times (pre and post), F (1,33) = 13.20, p .05, although a significant interaction was not observed, F (2,33) = 0.03, p .05. For the group factor the Newman-Keuls procedure indicated that the Methadone group viewed heroin as being significantly more negative than did the Abstinent group. No other differences between the groups were observed. The time factor indicated that heroin was viewed as being significantly more negative after the slides were presented than before ($\bar{x}$ pre = 4.45, $\bar{x}$ post = 5.17). A summary of this data is presented in Table 14.

The means for the evaluative factor for the concept of methadone for the three groups were 2.50 pre and 2.92 post for the Placebo group, 3.42 and

3.33 for the Methadone group, and 3.17 and 3.33 for the Abstinent group. The analysis of variance (Table 15) indicated a significant difference between the groups, F (2,33) = 7.09, p .05. The Newman-Keuls showed that the Placebo group viewed methadone significantly more positively than either the Abstinent or Methadone groups. No other differences were observed. No significant time (pre-post) or interaction effects were noted, F (1,33) = 2.22, and F (2,33) = 0.18, p .05, respectively. A summary of the post hoc analysis for the group main effect, on the evaluative factor for the concepts of heroin and methadone are found in Appendix 6.

For the potency factor, the means for the concept of heroin for the three groups were 4.76 pre and 5.25 post for the Placebo group, 4.58 pre and 4.75 post for the Methadone group, and 4.25 pre and 4.58 post for the Abstinent group. No significant difference between the groups was observed, F (2,33) = 1.36, p .05. A significant difference between the times was indicated however, F (1,33) = 7.24, p .05, with heroin being viewed as being significantly more potent after the slides were presented than before. A significant interaction was not indicated, F (2,33) = 0.57, p .05. This data is summarized in Table 16.

The means for the potency factor for the concept of methadone for the three groups were 4.25 pre and 4.33 post for the Placebo group, 3.58 and 4.58 for the Methadone group, and 4.33 and 4.25 for the Abstinent group. No significant difference between the groups was observed, F (2,33) = 0.23, p .05. A significant pre-post slide difference was observed with methadone viewed as being significantly more potent after the slides were presented than before, F (1,33) = 10.25, p .05. In addition, a significant interaction was found, F (2,33) = 12.23, p .05. Analysis of simple main effects for the

interaction revealed that methadone was viewed as being significantly more potent post-slides only for the group that had actually received the drug (Gp. 3, Methadone group). A summary of these data are presented in Table 17 and Appendix 6. An overview of the four pre-post analyses is presented in Figure 6.

For the pre-post analyses the results indicated that: (1) the Methadone group evaluated the concept of heroin significantly more negatively than the Abstinent group, but not differently from the Placebo group, (2) the Placebo group evaluated methadone significantly more positively than either the Abstinent or Methadone groups, (3) Heroin was viewed as being both significantly more negative and more potent after the slides were presented than before. This was an overall effect which was exhibited by all three groups. (4) Heroin was viewed with the same potency pre and post slides, but methadone was viewed as being significantly more potent after the slides were presented than before. (5) While heroin was viewed as being significantly more negative after the slides were presented, this was not the commonly held evaluation for methadone. Rather, for methadone, the slides had no significant effect in that methadone was viewed basically in the same way both pre and post slides.

Table 14

Analysis of Variance of the Semantic Differential Evaluative Factor Scores, Pre and Post Slide Presentation, for the Concept of Heroin, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	88.37	35		
A (Groups)	25.16	2	12.58	6.56*
Subjects within Groups	63.21	33	1.92	
Within Subjects	33.12	36		
B (Administration Times)	9.45	1	9.45	13.20**
AB	0.05	2	0.02	0.03
B x Subjects within Groups	23.62	33	0.72	

*F (2,33) = 3.28

**F (1,33) = 4.13

Table 15

Analysis of Variance of the Semantic Differential Evaluative Factor Scores, Pre and Post Slide Presentation for the Concept of Methadone, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	19.83	35		
A (Groups)	5.96	2	2.98	7.09*
Subjects within Groups	13.87	33	0.42	
Within Subjects	7.14	36		
B (Administration Times)	0.40	1	0.40	2.22
AB	0.74	2	0.37	2.03
B x Subjects within Groups	6.00	33	0.18	

*F (2,33) = 3.28

Table 16

Analysis of Variance of the Semantic Differential Potency Factor Scores, Pre and Post Slide Presentation, for the Concept of Heroin, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	57.77	35		
A (Groups)	4.39	2	2.20	1.36
Subjects within Groups	55.38	33	1.62	
Within Subjects	10.57	36		
B (Administration Times)	1.85	1	1.85	7.24*
AB	0.29	2	0.14	0.57
B x Subjects within Groups	8.43	33	0.26	

*F (1,33) = 4.13

Table 17

Analysis of Variance of the Semantic Differential Potency Factor Scores, Pre and Post Slide Presentation for the Concept of Methadone, for the Three Addict Groups

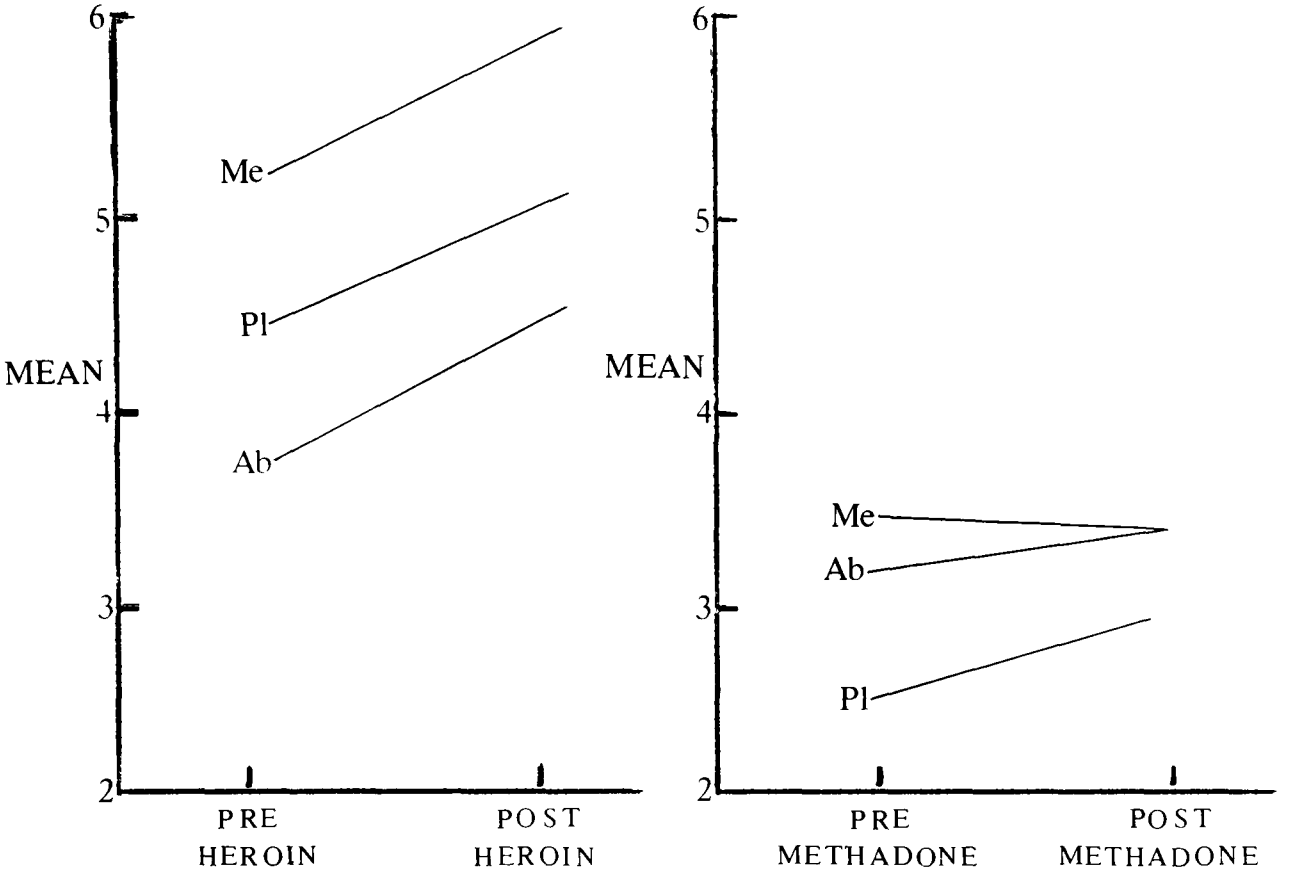
Source of Variation	SS	df	MS	F ratio
Between Subjects	67.83	35		
A (Groups)	0.93	2	0.46	0.23
Subjects within Groups	66.90	33	2.03	
Within Subjects	11.10	36		
B (Administration Times)	1.68	1	1.68	10.25*
AB	4.01	2	2.00	12.23**
B x Subjects within Groups	5.41	33	0.16	

*F (1,33) = 4.13

**F (2,33) = 3.28

Figure 6. Summary of the Semantic Differential Pre-Post Analyses

EVALUATIVE FACTOR

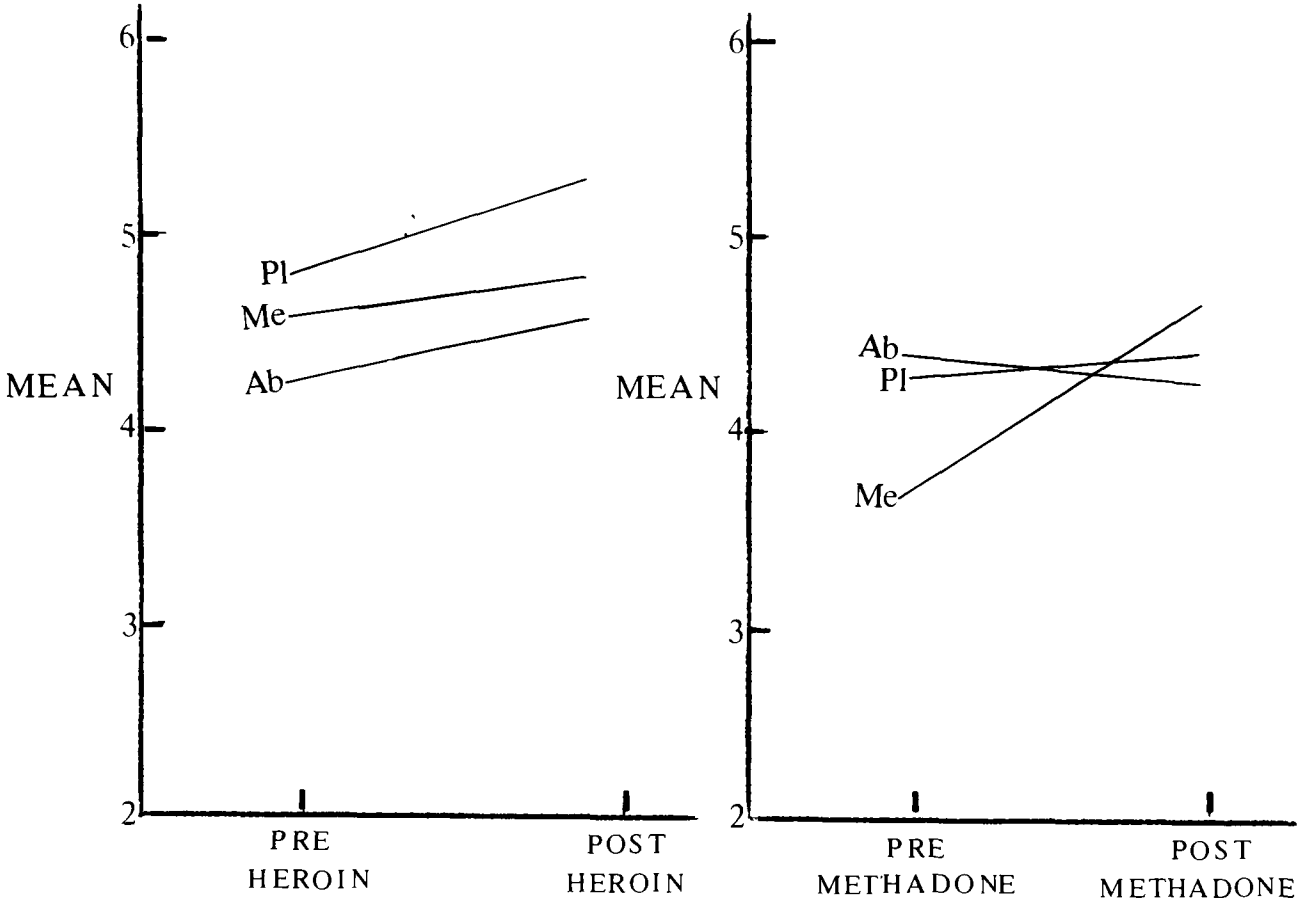


Me —— Methadone Group

Pl —— Placebo Group

Ab —— Abstinent Group

POTENCY FACTOR



Me— Methadone Group

Pl— Placebo Group

Ab— Abstinent Group

(2) Comparison of Heroin and Methadone: Concept Analysis. The means for the evaluative factor for the concepts of heroin and methadone pre-slide presentation were 4.46 and 2.52 for the Placebo group, 5.19 and 3.44 for the Methadone group, and 3.70 and 3.14 for the Abstinent group. Analysis of variance results indicated that there was a significant difference between the groups, F (2,33) = 3.90, p .05, between the concepts, F (1,33) = 48.21 p .05, and for the interaction as well, F (2,33) = 4.43, p .05. The Newman-Keuls procedure applied to the groups factor indicated that the Methadone group was significantly different from either the Abstinent or Placebo groups. The difference was in terms of the Methadone group evaluating both drugs significantly more negatively. The concept factor indicated that heroin was evaluated as being significantly more negative than methadone (heroin, $\bar{x}$ = 4.45, methadone, $\bar{x}$ = 3.03). A summary of this data is provided in Table 18. Simple main effects for the interaction (Appendix 6) indicated that the groups were significantly different from each other in terms of their evaluations of heroin (A at b1), but not for their evaluations of methadone. Also, heroin was rated significantly more negatively than methadone for the Placebo and Methadone groups, but not for the Abstinent group. For this group there were no significant differences in their evaluation of the two drugs in the pre-slide condition.

The same analysis was completed on the post-slide Semantic Differential scores for the evaluative factor. The means for the concepts of heroin and methadone for the Placebo group were 5.12 and 2.91, for the Methadone group they were 5.90 and 3.34 and for the Abstinent group the means were 4.50 and 3.30 respectively. The analysis of variance, summarized in Table 19, indicated that there was a significant difference between the groups, F (2,33) = 5.60, p .05, between the concepts of heroin and methadone, F (1,33) = 237.69, p .05,

and in the group-concept interaction, F (2,33) = 10.10, p .05. In terms of the concept factor, heroin was evaluated as being significantly more negative than was methadone (heroin, $\bar{x}$ = 5.17, methadone, $\bar{x}$ = 3.18). It should be noted in this case that although a conventional level of significance of p .05 was set for this study, in this particular analysis the F ratio was so large that the difference in the evaluation of heroin and methadone after viewing the slides was beyond p .01 [-10.] The Newman-Keuls procedure applied to the group factor data indicated that overall the Methadone group evaluated the drugs in a significantly more negative fashion than either the Abstinent or Placebo groups. The Newman-Keuls summary tables for both the pre and post slide analyses are presented in Appendix 6. Simple main effects for the interaction yielded the following results: (1) the groups were significantly different from each other in terms of their evaluation of heroin, (2) no significant difference was observed between the groups when they were evaluating methadone, (3) there was a significant difference for all three groups in terms of their evaluations of heroin and methadone with heroin always being evaluated as being more negative.

The means for the potency factor for the concepts of heroin and methadone pre-slide presentation were 4.76 and 4.30 for the Placebo group, 4.62 and 3.60 for the Methadone group, and 4.22 and 4.37 for the Abstinent group. The analysis of variance (Table 20) indicated that there were no significant differences between the groups, F (2,33) = 0.57, p .05. A significant difference was observed between the concepts of heroin and methadone, F (1,33) = 11.46, p .05. These results indicated that heroin was viewed as being significantly more potent before the slides were presented then was methadone ($\bar{x}$ heroin = 4.53, $\bar{x}$ methadone = 4.09). A significant interaction was also observed, F (2,33) = 6.87, p .05. Analysis of the interaction revealed

that there were no significant differences between the groups either in their assessments of heroin (A at b1) or in their assessments of methadone (A at b2). Within the groups it was observed that both the Placebo and Methadone groups viewed heroin as being significantly more potent than methadone (B at a1 and B at a2). However, no significant difference was observed for the Abstinent group. The simple main effects summary table is found in Appendix 6.

Post-slides the means for the potency factor for the concepts of heroin and methadone were 5.22 and 4.37 for the Placebo group, 4.78 and 4.57 for the Methadone group, and 4.56 and 4.26 for the Abstinent group. The analysis of variance indicated that there were no significant differences between the groups, $\underline{F}$ (2,33) = 0.59, $\underline{p}$ .05. A significant difference was found between the concepts of heroin and methadone, $\underline{F}$ (1,33) = 12.27, $\underline{p}$ .05, with heroin being viewed as significantly more potent in the post-slide condition than was methadone ($\bar{x}$ heroin = 4.85, $\bar{x}$ methadone = 4.40). A significant interaction was not observed, $\underline{F}$ (2,33) = 2.38, $\underline{p}$ .05. A summary of the post-slide potency factor analysis is to be found in Table 21. An overview of the four concept analysis is found in Figure 7.

For the concept analyses the results indicated that: (1) heroin was always viewed as being significantly more negative than was methadone, however, it was also always viewed as being significantly more potent, (2) the Methadone group evaluated both drugs significantly more negatively, both pre and post slides, (3) there were no significant differences between the groups in terms of perceived potency, (4) the pattern of responding for the Placebo and Methadone groups was quite similar, but dissimilar to the perceptions of the Abstinent group.

Table 18

Analysis of Variance of the Semantic Differential Evaluative Factor Scores for the Concepts of Heroin and Methadone, Pre Slide Presentation, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	62.95	35		
A (Groups)	12.03	2	6.01	3.90*
Subjects within Groups	50.92	33	1.54	
Within Subjects	67.57	36		
B (Concepts)	36.17	1	36.17	48.21**
AB	6.65	2	3.32	4.43*
B x Subjects within Groups	24.76	33	0.75	

*F (2,33) = 3.28

**F (1,33) = 4.13

Table 19

Analysis of Variance of the Semantic Differential Evaluative Factor Scores for the Concepts of Heroin and Methadone, Post Slide Presentation, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	28.28	35		
A (Groups)	7.16	2	3.58	5.60*
Subjects within Groups	21.11	33	0.64	
Within Subjects	87.41	36		
B (Concepts)	71.42	1	71.42	237.69**
AB	6.07	2	3.03	10.10*
B x Subjects within Groups	9.92	33	0.30	

*F (2,33) = 3.28

**F (1,33) = 4.13

Table 20

Analysis of Variance of the Semantic Differential Potency Factor Scores for the Concepts of Heroin and Methadone, Pre Slide Presentation, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	63.66	35		
A (Groups)	2.12	2	1.06	0.57
Subjects within Groups	61.52	33	1.86	
Within Subjects	17.64	36		
B (Concepts)	3.47	1	3.47	11.46*
AB	4.16	2	2.08	6.87**
B x Subjects within Groups	10.00	33	0.30	

*F (1,33) = 4.13

**F (2,33) = 3.28

Table 21

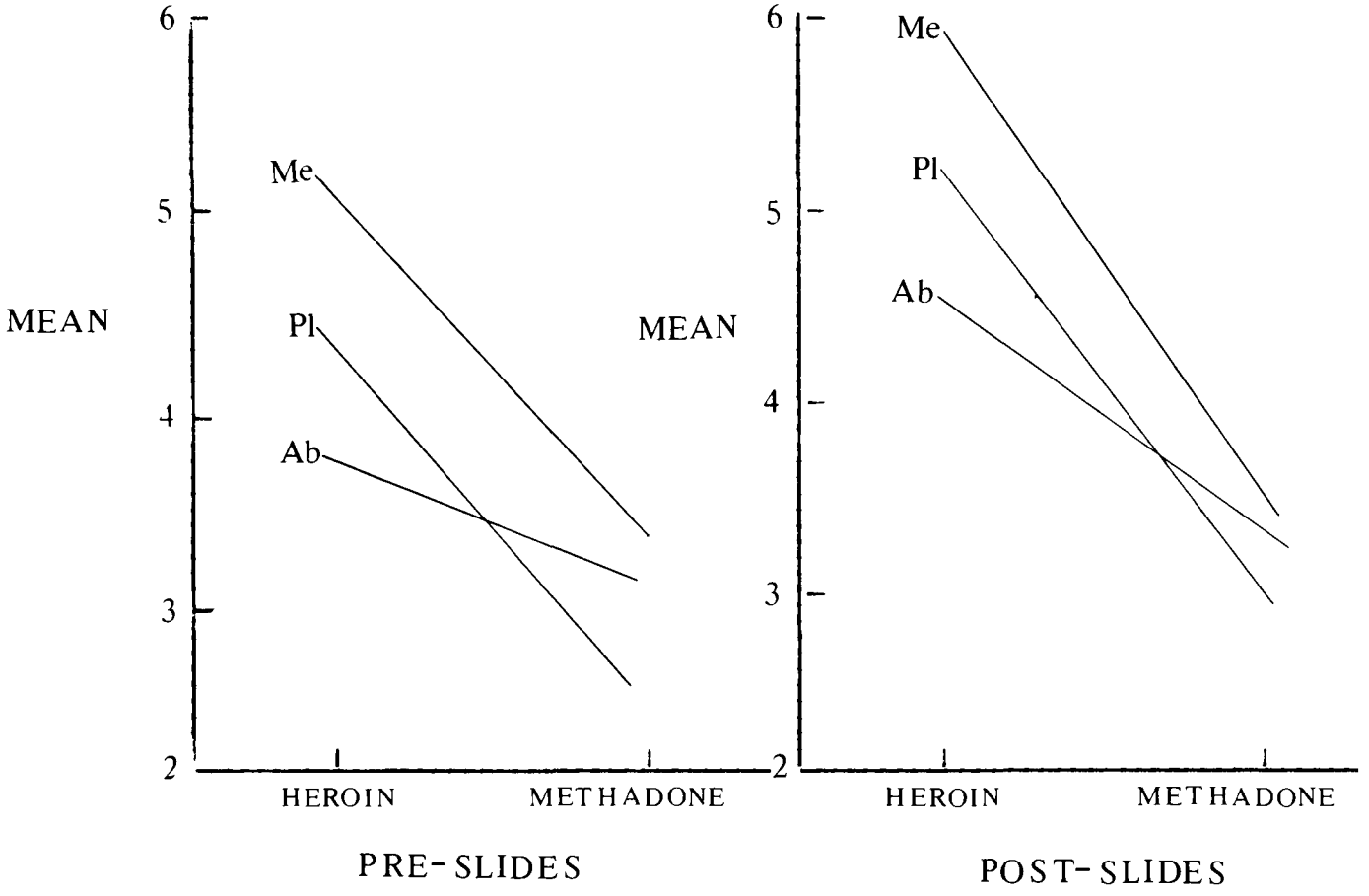
Analysis of Variance of the Semantic Differential Potency Factor Scores for the Concepts of Heroin and Methadone Post Slide Presentation, for the Three Addict Groups

Source of Variation	SS	df	MS	F ratio
Between Subjects	54.51	35		
A (Groups)	1.89	2	0.95	0.59
Subjects within Groups	52.61	33	1.59	
Within Subjects	15.14	36		
B (Concepts)	3.71	1	3.71	12.27*
AB	1.44	2	0.72	2.38
B x Subjects within Groups	9.99	33	0.30	

*F (1,33) = 4.13

Figure 7. Summary of the Semantic Differential Concept Analyses

EVALUATIVE FACTOR

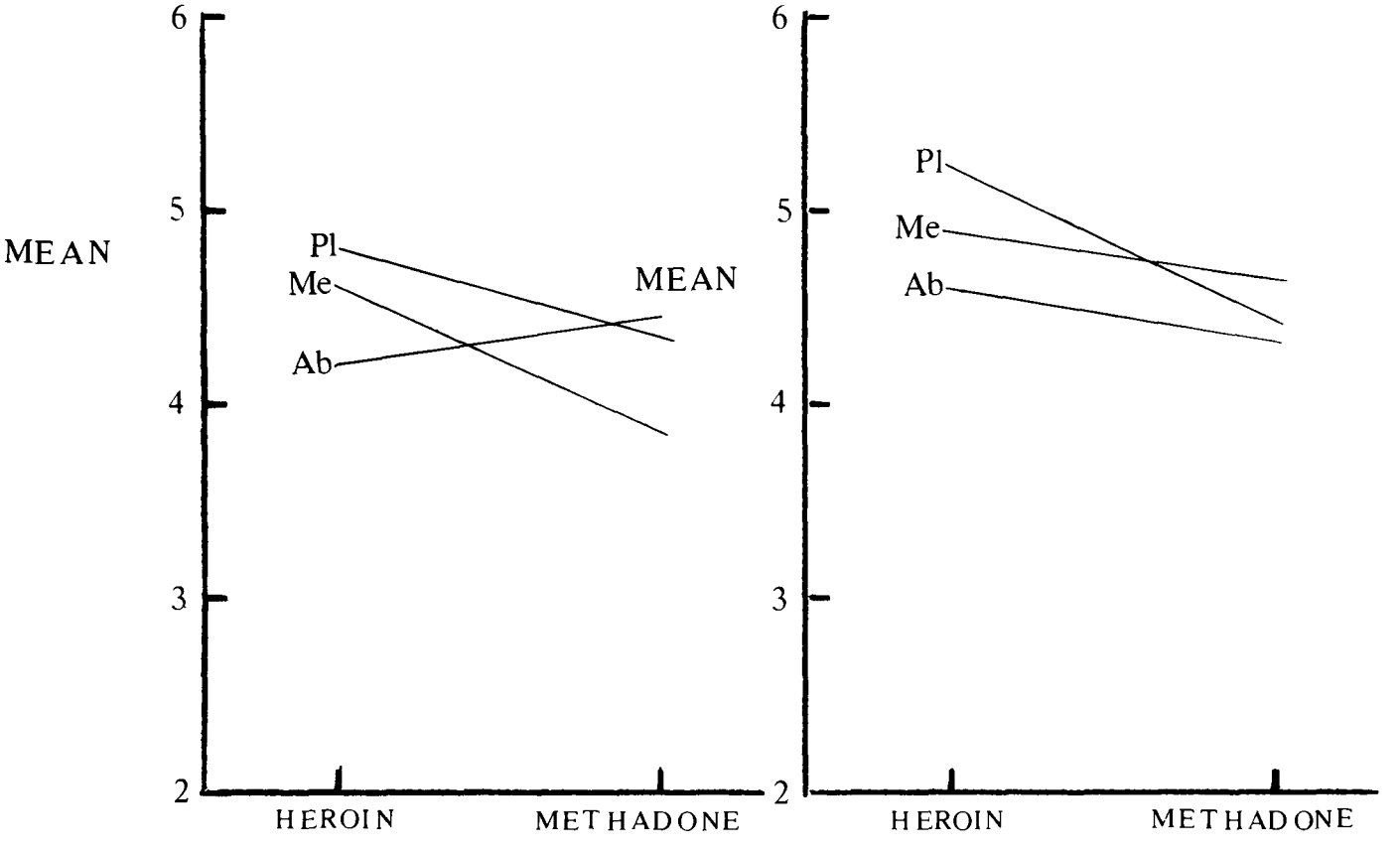


Me——Methadone Group

Pl——Placebo Group

Ab——Abstinent Group

POTENCY FACTOR



Me —— Methadone Group

Pl —— Placebo Group

Ab —— Abstinent Group

Semantic Differential-Control Group. The Semantic Differential was completed by the Control group after they had viewed the slide stimuli. The same 24 word pairs were used but instead of the concepts being heroin and methadone they were the heroin related and the neutral slide stimuli. As for the other analyses, a low score (less than 4) indicates that the group of slides tended to be viewed in terms of their positive evaluative aspects and less potent qualities.

The mean for the evaluative factor for the heroin related slide stimuli was 5.90 and for the neutral slide stimuli it was 2.32. A t test for correlated groups (Keith, 1969) indicated there was a significant difference, t (11 df) = 16.99, p .05. This result indicated that the heroin related slide stimuli were evaluated as being far more negative than were the neutral slide stimuli. For the potency factor the mean for the heroin related slides was 4.62 and for the neutral slides it was 3.45. A t test indicated that this difference was significant, t (11 df) = 1.82, p .05. This analysis indicated that the heroin related slides were viewed as significantly more potent than the neutral slides.

Attitude Towards Addicts-Control Group. The attitude towards addicts scale was completed by the Control group both pre and post slide presentation. A score above 20 on the scale indicates a negative attitude and low image of the heroin user. The mean pre-slides score was 29.77 with a standard deviation of 3.79. Post-slides the mean was 30.08 with a standard deviation of 3.64. A t test for correlated groups indicated no significant pre-post difference, t (11df) = 0.48, p .05. This result indicates that the Control group had a very negative attitude toward heroin users pre-slide presentation and this attitude was not altered after viewing the slides, rather, it increased slightly, though not significantly.

Physiological Results

Tonic (Basal) Indices of Cardiac Activity. Tonic heart rate was defined according to the definition given by Elliott (1970) in which he states that it is meant to apply to the "HR during an experimental condition that is intended to induce a motivational state in a subject that is maintained over a relatively substantial period, say of ½ minute or more" (Elliott, 1970, p. 212). Furthermore, he distinguishes between these tonic periods and the shorter phasic periods, "in which briefer changes frequently occur in anticipation of a wide variety of stimuli" (p.212). In establishing these operational definitions Elliott refers to an article by Malmo and Belanger (1967) as providing a distinction between tonic and phasic heart rate. According to these authors, tonic refers to background activity, or the overall base level of heart rate upon which are superimposed short-term or phasic changes.

Baseline data on heart rate was obtained during the one minute period prior to the administration of a set of slide stimuli. This was either the 10th minute of the resting period prior to the administration of the first set of slide stimuli, or, the first minute after the three minute break at the half-way point (see Experimental Procedure, pg. 82). The calculations were based on six 10 second intervals with the average of the six measurements being used in calculations. Baseline heart rate for the different subject populations under the different stimulus conditions and orders is presented in Appendix 5. In order to determine whether there were any differences in tonic heart rate levels between subject populations, a three-way, repeated measures, latin squares analysis of variance (Winer, 1971, pg. 727-736, 'Plan9') was carried out on these data. As indicated in Table 22, there were no significant differences between the groups, $F(3,40) = 1.44$, p .05, or between whether the basal

Table 22

Analysis of Variance of Tonic (Basal) Heart Rate Scores for the Drug and Neutral Slide Stimuli in the Two Orders of Presentation for the Four Groups, Placebo, Methadone, Abstinent and Control

Source of Variation	SS	df	MS	F ratio
Between Subjects	2501.94	47		
C (Groups)	235.88	3	78.63	1.44
Rows (AB Between)	37.50	1	37.50	0.68
C x Row (ABC Between)	37.06	3	12.35	0.23
Subjects within Groups	2191.50	40	54.79	
Within Subjects	3034.00	48		
A (Orders)	937.50	1	937.50	19.76*
B (Slide Types)	30.38	1	30.38	0.64
AC (Order x Groups)	131.25	3	43.75	0.92
BC (Slides x Groups)	37.38	3	12.46	0.26
(AB)'	0.00	0	0.00	0.00
(ABC)'	0.00	0	0.00	0.00
Error (within)	1897.50	40	47.44	

*F (1,40) = 4.08

measurements were taken before the drug or neutral slides, F (1,40) = 0.64, p .05. A significant order effect was observed, however, F (1,40) = 19.76, p .05. This difference was in the direction of heart rate being significantly greater before the second set of stimuli than before the first. Since there were no significant differences in basal heart rate data between the four groups, no correctional statistical procedures were necessary (Okulitch, 1973). These results indicated that although there was a strong tonic heart rate order effect, there were no differences between the groups in tonic heart rate. Also, the effect was not contingent upon the type of slide stimuli that they had seen.

(1) Filler Slides. Three filler slides were presented prior to the administration of either the drug or neutral slide stimuli. These filler slides (for a description see page 54) were presented to increase baseline stabilization and to provide additional information with regard to tonic heart rate activity. Three analyses were conducted on these data and included a pre-slide, post-slide and a difference score analysis. For the pre-slide analysis, 10 values at one second intervals corresponding to the 10 second interval prior to slide onset were averaged to yield a mean value. For the post-slide analysis, 20 values corresponding to the 20 second period after stimulus onset were averaged to yield a mean post-stimulus value. The arithmetic difference between the pre and post-slide stimulus mean values for each slide was computed as the uncorrected difference score. Since all analyses were conducted only on the raw data, there was no need to correct these difference scores. It should be noted that uncorrected difference scores were used instead of autonomic lability scores (Lacey and Lacey, 1962) "because they more concretely communicate the actual data of the experiment (Libby, Lacey and Lacey, 1973, p. 277).

Means and standard deviations for the filler heart rate data, pre-slide,

post-slide, and for the uncorrected difference scores are presented in Appendix 5. For the post-slide analysis, no significant difference was observed between the groups, F (3,40) = 1.34, p .05. A significant difference was observed between the orders, however, with heart rate for the second presentation of filler slides being significantly greater than for the first presentation, F (1,40) = 23.52, p .05. The results were identical post-slides with no significant difference being observed between the groups, F (3,40) = 1.15, p .05 but a significant difference being observed between the orders, with heart rate during the second presentation of filler slides being significantly greater than during the first presentation, F (1,40) = 22.84, p .05. These results are the same as those presented for the other basal data in that there was neither a group effect nor a slide effect, but there was an order effect.

No significant difference either between the groups, F (3,40) = 1.21, p .05, or between the orders was observed for the difference scores, F (1.40) = 2.89, p .05. These data are summarized in Appendix 6.

It should be noted that basal heart rate values were high in comparison with many heart rate studies where the mean basal level is in the 72-78 beats per minute range. However, the heart rate scores are well within the limits reported in the two other studies which have used heart rate as a dependent variable with drug addicts. In this study, the mean basal heart rate values for the four groups were as follows: Abstinent = 80.8, Placebo = 83.9, Methadone = 81.0, and Control = 79.7. In Prystav's (1976) study, the basal heart rate for his addict groups were as follows: 82.6, 84.6, 87.2, and 87.0 bpm. In the study by Okulitch (1973) the basal heart rate scores for the addict group under three different punishment conditions were: 89.8, 89.3, and 85.1 bpm. Interestingly, in his study the basal heart rate for his non-addict control group was even higher than for his addict groups (87.7, 90.9 and 84.5 bpm).

Phasic Components of Cardiac Activity. The phasic heart rate components consisted of three different sets of dependent variables, pre-stimulus, post-stimulus and difference scores.

The pre-stimulus period was operationally defined as the mean of the 10 second period immediately prior to the presentation of a slide stimulus, either drug or neutral. Thus, it was actually the last 10 seconds of the preceding filler slide. The means and standard deviations of the pre-stimulus heart rate for the different subject populations under the different stimulus conditions and orders are presented in Appendix 5. Analysis of variance of the pre-stimulus heart rate scores (Table 23) indicated that there were significant differences between the groups, F (3.40) = 3.33, p .05 and between the slide types, F (1,40) = 6.07, p .05. The slide types x order interaction, or what Winer (1971) refers to as Rows was also significant, F (1,40) = 4.97, p .05. No further analysis was undertaken with regard to this interaction since no hypothesis was formulated with it in mind, and it was only of cursory interest in the overall scope of the study.

The Newman-Keuls procedure applied to the group main effect indicated that there was an overall significant difference between the Control group and the three addict groups in pre-stimulus heart rate, with the Control group heart rate being significantly lower than the three addict groups. Within the three addict groups no significant differences were observed. With regard to slide type, heart rate for the neutral slides was significantly greater than for the drug slides in the pre-stimulus condition. This result was more a product of the experimental design then an experimental effect and was due to the significant slide x order interaction. That is, when the neutral slides followed the drug slides then there was significantly more pre-stimulus heart rate reactivity

than in the other order. Thus, it appears that when the drug slides were presented first they acted as a 'primer' for increased reactivity for the neutral slides which followed.

The post-stimulus period was operationally defined as the mean of the first twenty second period immediately following the onset of a slide stimulus, either drug or neutral. The means and standard deviations of the post-stimulus heart rate for the different subject populations under the different stimulus conditions and orders are presented in Appendix 5. The pattern of the analysis of variance, presented in Table 24 is almost identical to that of the pre-stimulus heart rate data. There were significant differences between the groups, F (3,40) = 3.52, p .05, with heart rate for the Control group being significantly lower than for the three addict groups, and no significant difference being observed between the three addict groups. The Newman-Keuls summary tables for the pre and post stimulus group main effects are found in Appendix 6. A significant difference was also observed between the slide types, F (1,40) = 7.85, p .05, with heart rate for the neutral slides being significantly higher than for the drug slides in the post-stimulus condition.

The finding that the pre-stimulus and post-stimulus (response) analyses were very similar is not surprising since the scores that they were based upon were highly correlated (Pearson r = + .716). What was operating here was what Wilder (1957) refers to as the Law of Initial Value (LIV). That is, the size of the post-stimulus (response) score was correlated with the pre-stimulus level. Lacey and Lacey (1956, 1962) and Benjamin (1963) have proposed a method of correction by utilizing an analysis of covariance which should yield response scores which are free of the influence of the pre-stimulus level. This solution has been challenged by a number of investigators (eg. Wenger, et. al. 1961,

Surwillo and Arenberg, 1965, Lykken and Venables, 1971, Venables and Christie, 1973). While it would have been desirable to employ some form of correction analysis, no single type of statistical treatment has been demonstrated to be the most appropriate. More importantly, with regard to this study, is that some sort of correctional analysis may have given spurious results because of the ideosynchratic types of independent and dependent variables which were employed. In this regard Montagu and Coles (1966) comment that,

> . . . if an experiment has been designed to compare the responsiveness of a standard stimulus on two groups differing in arousal level, the use of a unit of measurement that has been selected because it is independent of background level may defeat the object of the investigation. (Montagu and Coles, 1966, p. 264).

The uncorrected difference score was operationally defined as the arithmetic difference between the pre and post stimulus mean values, and this score was computed for each slide for both the drug and neutral slide stimuli. The means and standard deviations of the difference scores for the different subject populations under the different stimulus conditions and orders are presented in Appendix 5, and the analysis of variance summary table is presented in Table 25. No significant differences were observed either between the groups, slide types, orders or for any of the interactions.

Table 23

Analysis of Variance of Pre-Stimulus Heart Rate Scores for the Four Groups, Placebo, Methadone, Abstinent and Control under the Two Stimulus Conditions and Orders of Presentation

Source of Variation	SS	df	MS	F ratio
Between Subjects	3889.19	47		
C (Groups)	690.25	3	230.08	3.33*
Rows (AB Between)	343.69	1	343.69	4.97**
C x Row (ABC Between)	89.81	3	29.94	0.43
Subjects within Groups	2764.44	40	69.11	
Within Subjects	1060.75	48		
A (Orders)	6.69	1	6.69	0.32
B (Slide Types)	128.81	1	128.81	6.07**
AC (Order x Groups)	48.88	3	16.29	0.77
BC (Slides x Groups)	28.19	3	9.40	0.44
(AB)'	-0.25	0	0.00	0.00
(ABC)'	0.19	0	0.00	0.00
Error (within)	848.19	40	21.20	

*F (3,40) = 2.84

**F (1,40) = 4.08

Table 24

Analysis of Variance of Post-Stimulus Heart Rate Scores for the Four Groups, Placebo, Methadone, Abstinent and Control, under the Two Stimulus Conditions and Orders of Presentation

Source of Variation	SS	df	MS	F ratio
Between Subjects	3964.13	47		
C (Groups)	740.75	3	246.92	3.52*
Rows (AB Between)	326.63	1	326.63	4.66**
C x Row (ABC Between)	90.81	3	30.27	0.43
Subjects within Groups	2805.94	40	70.15	
Within Subjects	1099.94	48		
A (Orders)	3.50	1	3.50	0.18
B (Slide Types)	152.88	1	152.88	7.85**
AC (Order x Groups)	70.88	3	23.69	1.21
BC (Slides x Groups)	93.69	3	31.23	1.60
(AB)'	1.00	0	0.00	0.00
(ABC)'	-1.06[a]	0	0.00	0.00
Error (within)	779.06	40		

*F (3,40) = 2.84

**F (1,40) = 4.08

[a]This value is due to a rounding-off error by the computer

Table 25

Analysis of Variance of Heart Rate Difference Scores for the Four Groups, Placebo, Methadone, Abstinent and Control, under the Two Stimulus Conditions and Orders of Presentation

Source of Variation	SS	df	MS	F ratio
Between Subjects	56.23	47		
C (Groups)	2.22	3	0.74	0.60
Rows (AB Between)	0.18	1	0.18	0.15
C x Row (ABC Between)	4.38	3	1.46	1.18
Subjects within Groups	49.44	40	1.24	
Within Subjects	27.42	48		
A (Orders)	0.99	1	0.99	1.62
B (Slide Types)	0.59	1	0.59	0.96
AC (Order x Groups)	0.31	3	0.10	0.17
BC (Slides x Groups)	1.05	3	0.35	0.57
(AB)'	0.00	0	0.00	0.00
(ABC)'	0.00	0	0.00	0.00
Error (within)	24.48	40	0.61	

Cardiac Acceleration. Cardiac acceleration was taken during the experiment as a measure of environmental rejection or the degree to which the subjects 'tuned out' the experimental slides. Heart rate acceleration was measured as the difference between the mean pre-slide heart rate for each experimental slide (actually the last 10 seconds of the filler slide), either drug or neutral, and the maximum point of acceleration during the first 20 second period after slide stimulus onset. The base level used for the analysis was the base level for each slide, which was not necessarily the overall mean baseline of heart rate. The mean accelerative heart rate scores for the different subject populations under the different stimulus conditions and orders are presented in Appendix 5. Analysis of variance on this data indicated that the overall group effect was not significant at the p .05 level but approached significance, reaching the p .07 level, F (3,40) = 2.63, p .05 (Table 26). The overall means for the four groups were, Abstinent = 5.88, Placebo = 7.24, Methadone = 5.27 and Control = 5.10. A significant difference was observed between the slide types, F (1,40) = 4.43, p .05, with cardiac acceleration for the drug slides being significantly greater than for the neutral slides. A significant within subjects groups x slide types interaction was also observed, F (3,40) = 6.91, p .05. Simple main effects for this interaction are found in Appendix 6. This analysis revealed that there were significant differences between the drug and neutral slides for the Abstinent and Placebo groups in terms of their being greater cardiac acceleration to the drug slides, and for the Control group in terms of their being greater cardiac acceleration to the neutral slides. No differences between the drug and neutral slides were observed for the Methadone group.

When differences between the four groups were analyzed only at the level of the drug slides it was observed that there were significant differences between the Placebo group and the Methadone and Control groups in the direction

of significantly greater heart rate acceleration for the Placebo group. A significant difference was not observed between the Placebo group and the Abstinent group in heart rate acceleration for the drug slides. A significant difference was also observed between the Abstinent group and the Control group with the Abstinent group exhibiting significantly greater heart rate acceleration. No other significant differences were observed. Details of this analysis are provided in Appendix 6.

No differences between the four groups were observed when only the neutral slides were considered. Figure 8 provides graphic illustration of this key analysis.

In general these results indicate that the Placebo and Abstinent groups had a significantly greater amount of cardiac acceleration to the drug slides than did the Methadone group or the Control group of non-addicts.

Table 26

Analysis of Variance of the Cardiac Acceleration Responses for the Four Groups, Placebo, Methadone, Abstinent, and Control, under the Two Stimulus Conditions and Orders of Presentation

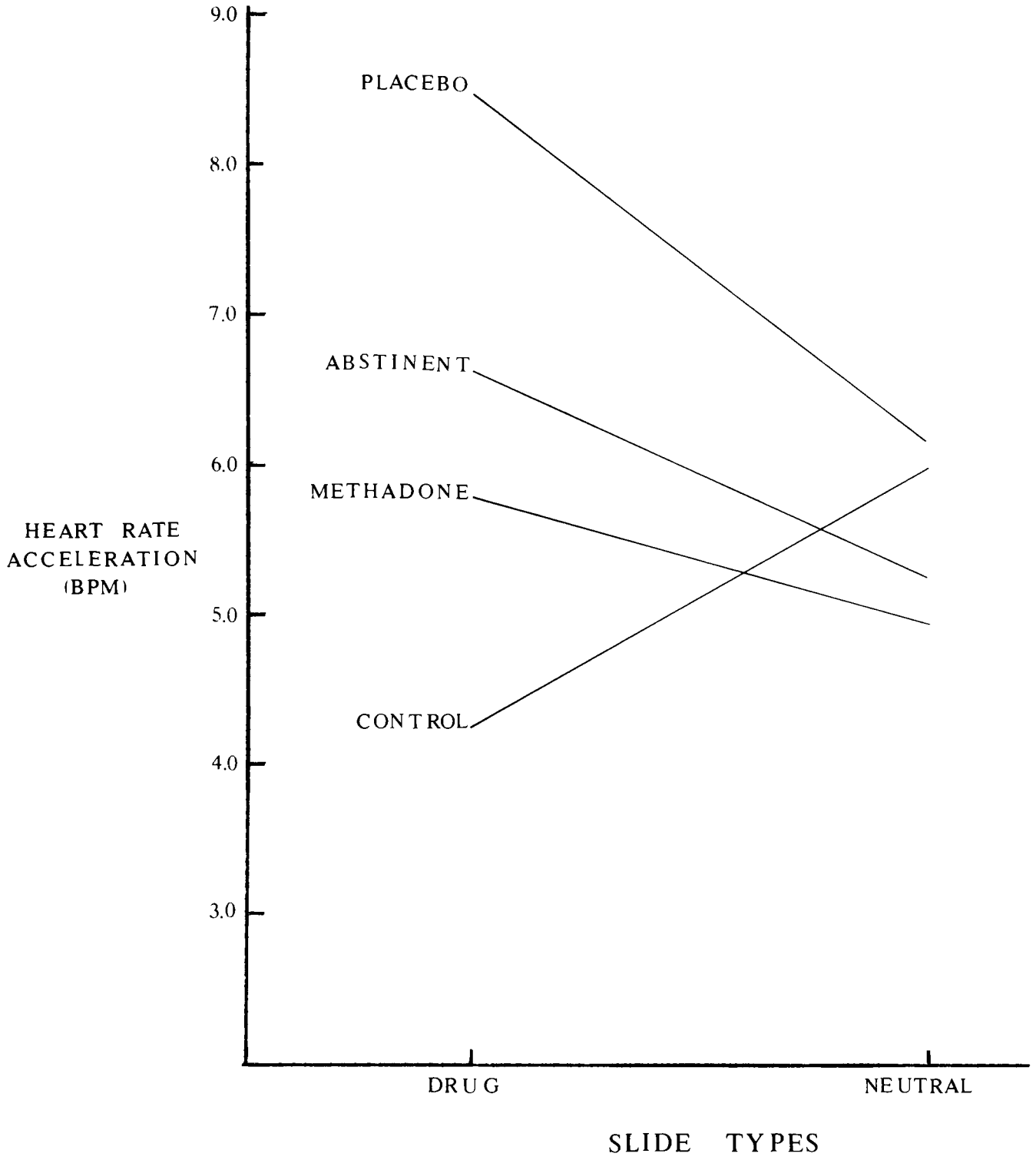
Source of Variation	SS	df	MS	F ratio
Between Subjects	470.99	47		
C (Groups)	67.41	3	22.47	2.63'
Rows (AB Between)	12.96	1	12.96	1.51
C x Row (ABC Between)	48.11	3	16.04	1.87
Subjects within Groups	342.50	40		
Within Subjects	176.07	48		
A (Orders)	0.40	1	0.40	0.16
B (Slide Types)	11.48	1	11.48	4.43*
AC (Order x Groups)	6.96	3	2.32	0.90
BC (Slides x Groups)	53.65	3	17.88	6.91**
(AB)'	0.00	0	0.00	0.00
(ABC)'	0.00	0	0.00	0.00
Error (within)	103.58	40	2.59	

'F (3,40) = 2.62 p .07

*F (1,40) = 4.08 p .05

**F (3,40) = 2.84 p .05

Figure 8. Graphic illustration of slide types x groups (BC) interaction based on cardiac acceleration data


9.0
8.0
7.0
6.0
5.0
4.0
3.0
PLACEBO
ABSTINENT
METHADONE
CONTROL
HEART RATE
ACCELERATION
(BPM)
DRUG
NEUTRAL
SLIDE TYPES

Cardiac Deceleration. Acceptance of the stimuli or attention during the task was operationally defined as cardiac deceleration. Heart rate deceleration was measured as the difference between the mean pre-slide heart rate for each experimental slide, either drug (heroin-related) or neutral, and the maximum point of deceleration during the first 20 second period after slide stimulus onset. As with the acceleration analysis, the base level for scoring was the base level for each slide (actually the last ten seconds of the preceding filler slide), and this base level was not necessarily the overall mean baseline of heart rate. The mean accelerative heart rate scores for the different subject populations under the different stimulus conditions and orders of presentation are presented in Appendix 5. Analysis of variance on this data (Table 27) indicated that the overall group effect (C factor) was significant, F (3,40 = 6.75, p .05, as was the overall effect of slide type (B factor), F (1,40) = 6.84, p .05. The slides x groups interaction (BC) was also significant, F (3,40) = 7.24, p .05.

The Newman-Keuls procedure applied to the Group factor data indicated that the overall mean for the Methadone group was significantly lower than for the three other groups. No other significant differences between the groups were observed. In other words, the Methadone group had significantly less cardiac deceleration to the slide stimuli than did the other three groups, ($\bar{x}$ = 3.98 for the Methadone group, $\bar{x}$ = 6.05, 7.15 and 6.67 for the Abstinent, Placebo and Control groups respectively). The Newman-Keuls summary table is presented in Appendix 6.

With regard to slide type it was observed that the mean decelerative score for the drug slides was 6.30 bpm, and for the neutral slides it was 5.63 bpm. Thus, there was significantly more deceleration to the drug slides than to the neutral slides.

Simple main effects for the slide types x groups (BC) interaction are

found in Appendix 6. This analysis revealed that there were significant differences between the drug and neutral slide stimuli for the Abstinent and Control groups in terms of there being greater cardiac deceleration to the drug slides. No differences were observed between the drug and neutral slides for the Placebo and Methadone groups.

When differences between the four groups were analyzed only at the level of the neutral slides it was observed that there were significant differences between the Methadone group and the three other groups in terms of their being significantly less cardiac deceleration for the Methadone group. As well, the Placebo group had a significantly greater amount of cardiac deceleration to the neutral slides than did any of the other three groups. No differences were observed between the Abstinent and Control groups for the neutral slides.

When differences between the four groups were analyzed at the level of the drug slides it was found that the Methadone group had significantly less cardiac deceleration than did the other three groups. No differences were observed between the three other experimental groups. The exact values for these analyses are to be found in Appendix 6. A summary of the BC interaction is to be found in Table 9.

In general, these results indicate that (1) overall the Methadone group had significantly less cardiac deceleration to the slide stimuli than did the other three groups, (2) within groups the Abstinent and Control groups had significantly more deceleration to the drug than to the neutral slides (3) between groups the Methadone group had significantly less cardiac deceleration to the drug slides than did the other three groups, (4) for the neutral slides the Methadone group had significantly less deceleration, and the Placebo group had significantly more.

Table 27

Analysis of Variance of the Cardiac Deceleration Responses for the Four Groups, Placebo, Methadone, Abstinent and Control, under the Two Stimulus Conditions and Orders of Presentation

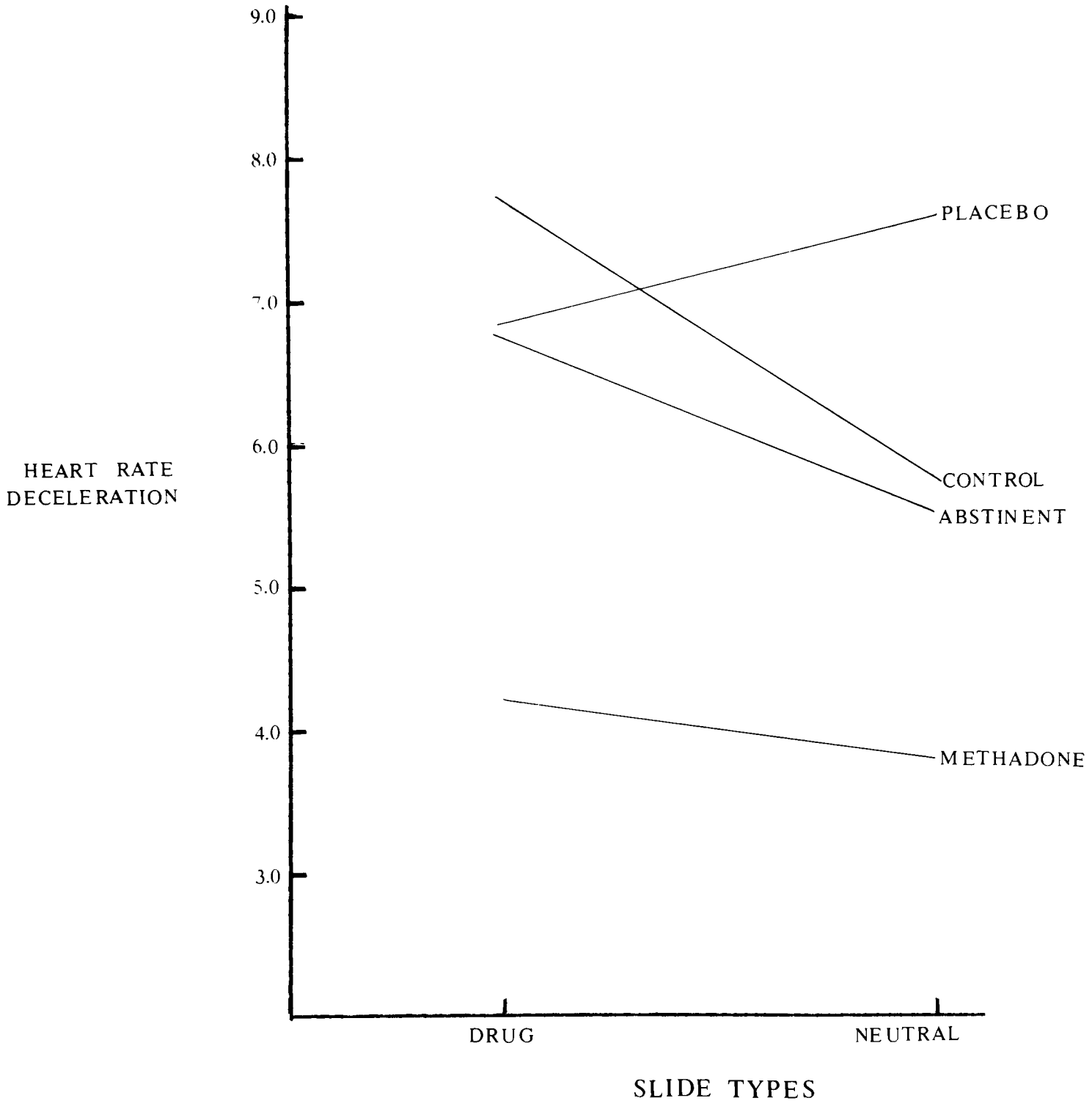
Source of Variation	SS	df	MS	F ratio
Between Subjects	500.65	47		
C (Groups)	140.42	3	46.81	6.75*
Rows (AB Between)	16.57	1	16.57	2.39
C x Row (ABC Between)	66.42	3	22.14	3.19'
Subjects within Groups	277.24	40	6.93	
Within Subjects	121.09	48		
A (Orders)	3.27	1	3.27	2.13
B (Slide Types)	10.51	1	10.51	6.84**
AC (Order x Groups)	12.48	3	4.16	2.71
BC (Slides x Groups)	33.38	3	11.13	7.24*
(AB)'	0.00	0	0.00	0.00
(ABC)'	0.00	0	0.00	0.00
Error (within)	61.46	40	1.54	

*F (3,40) = 2.84

**F (1,40) = 4.08

'significant at p .05 but not analyzed any further.

Figure 9. Graphic illustration of slide types x groups (BC) interaction based on cardiac deceleration data


9.0
8.0
7.0
6.0
5.0
4.0
3.0
HEART RATE
DECELERATION
PLACEBO
CONTROL
ABSTINENT
METHADONE
DRUG
NEUTRAL
SLIDE TYPES

Cardiac Data Analysis by Slide Type. A final set of heart rate analyses were undertaken to assess the effects of the different types of drug slide content in relation to the different groups. The 25 heroin-related slides were broken down into three groups of six according to the material that they represented. The N of 6 was chosen in order to maintain equal groups as there were only six slides which met the content criteria of the first category. For the other two categories the slides which best represented the concept were selected.

The first group represented what might best be called drug paraphernalia, that is, slides of syringes, a heroin 'kit' (eyedropper and needle), heroin being 'cooked', etc. The slide numbers for this catagory were 1,2,3,4,16, and 18. A description of each slide can be found in Table 5, p. 55-56). The second group of six represented the act of injection in all of its phases and consisted of addicts 'shooting up' in various parts of their bodies (arms, thighs, etc.). The slide numbers for this group were 7, 10, 13, 14, 15, and 17. The third group of six slides were chosen to represent the immediate consequences of the heroin experience, that is, the first 3 hours of being 'high'. The slide numbers for this catagory were 5, 8, 9, 23, 24, and 25. The emphasis in this group was the depiction of individuals behaving in a 'stoned' manner or 'nodding-out'.

The rationale for this analysis was that the heroin-related slide stimuli actually represented different classes of stimuli which might have different reinforcement value for the different groups. The other cardiac analyses treated all the drug slides as a single variable in terms of the statistical analyses. These analyses attempted to differentiate the heroin-related stimuli with a view to seeing which, if any, class of stimuli had the greatest capacity to elicit the cardiac responses, and also had the greatest capacity to statistically discrim-

inate both within and between the experimental groups.

(1) Difference Scores: The uncorrected difference score was the arithmetic difference between the pre and post stimulus mean values for each slide in the group. A two-way analysis of variance with repeated measures on the second factor (classes of stimuli) indicated that there were no significant differences between the experimental groups, F (3,44) = 0.47, p .05, or between the different classes of stimuli, F (2,88) = 0.62, p .05. A summary of this analysis is provided in Table 28.

(2) Cardiac Acceleration: The analysis of variance for the cardiac acceleration amplitude data indicated that there were no significant differences between the groups, F (3,44) = 2.41, p .05, or between the stimulus classes, F (2,88) = 0.97, p .05. A summary of this analysis is provided in Table 29.

(3) Cardiac Deceleration: The analysis of variance of the cardiac deceleration amplitude data indicated that there were no significant differences between the groups, F (3,44) = 1.98, p .05. A significant difference was observed between the stimulus classes however, F (2,88) = 5.24, p .05. The means for the three classes of stimuli were, tools (paraphernalia) = 5.40, acts of injection = 6.37, and consequences of injection = 6.09 bpm. The Newman-Keuls applied to this data indicated that the second two classes of stimuli (acts and consequences) produced significantly more cardiac deceleration than the paraphernalia class. No significant difference was observed between the acts and consequences classes of stimuli. The analysis of variance and the Newman-Keuls summary tables are presented in Table 30 and Appendix 6. A graphic illustration of the acceleration and deceleration data are presented in Figure 10.

Table 28

Analysis of Variance of Heart Rate Difference Scores for the Four Groups, Abstinent, Placebo, Methadone, and Control under the Three Stimulus Classes of Drug Slides, Paraphenalia, Acts of Injection and Consequences of Injection

Source of Variation	SS	df	MS	F ratio
Between Subjects	155.83	47		
A (Groups)	4.88	3	1.63	0.47
Subjects within Groups	150.95	44	3.43	
Within Subjects	134.62	96		
B (Stimulus Classes)	1.79	2	0.89	0.62
AB	5.51	6	0.92	0.63
B x Subject Within Groups	127.32	88	1.45	

Table 29

Analysis of Variance of the Cardiac Acceleration Responses for the Four Groups, Abstinent, Placebo, Methadone, and Control under the Three Stimulus Classes of Drug Slides, Paraphenalia, Acts of Injection and Consequences of Injection

Source of Variation	SS	df	MS	F ratio
Between Subjects	905.42	47		
A (Groups)	127.96	3	42.65	2.41
Subjects within Groups	777.46	44	17.67	
Within Subjects	381.25	96		
B (Stimulus Classes)	7.87	2	3.93	0.97
AB	16.54	6	2.76	0.68
B x Subjects within Groups	356.84	88	4.06	

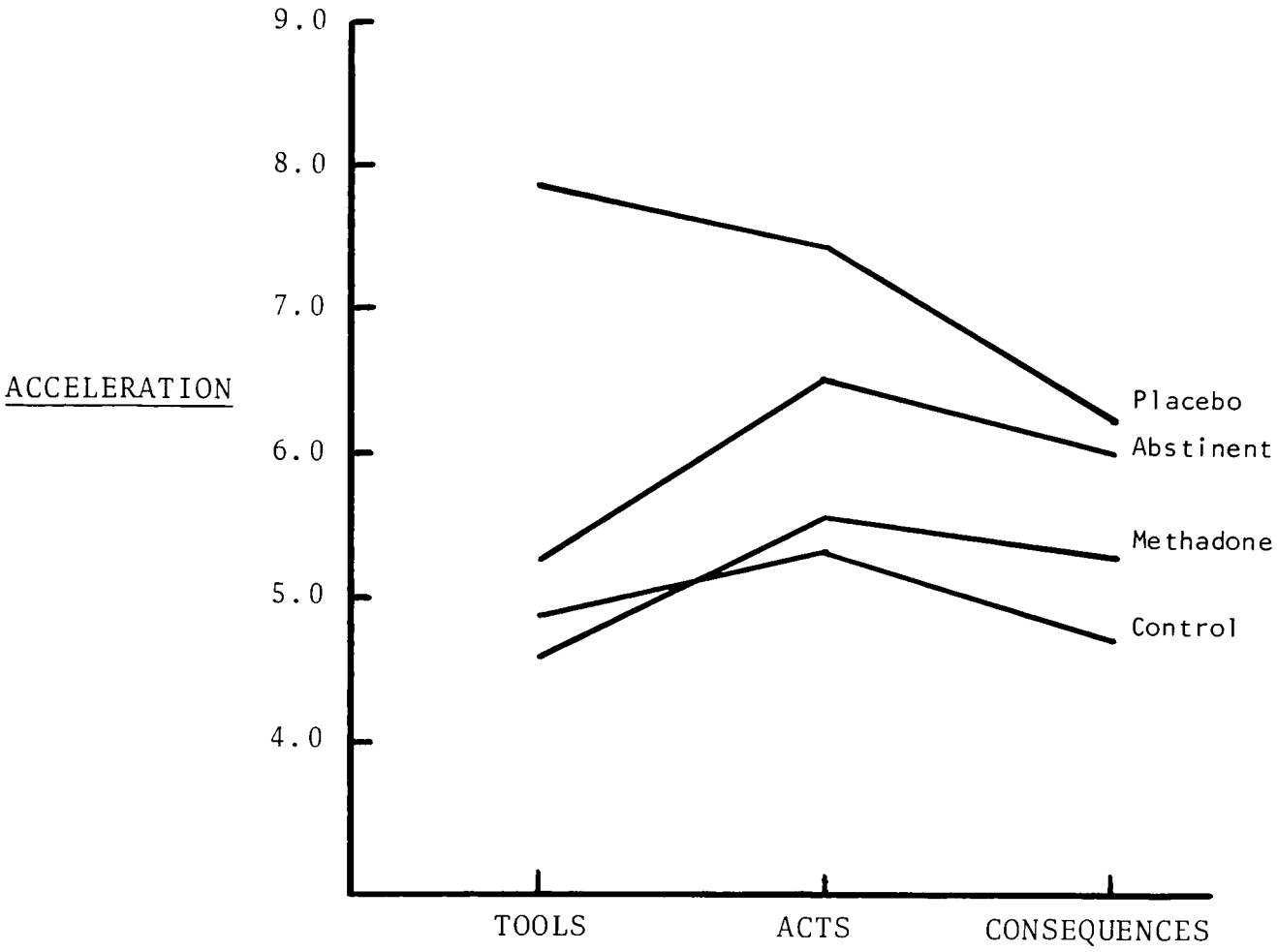
Table 30

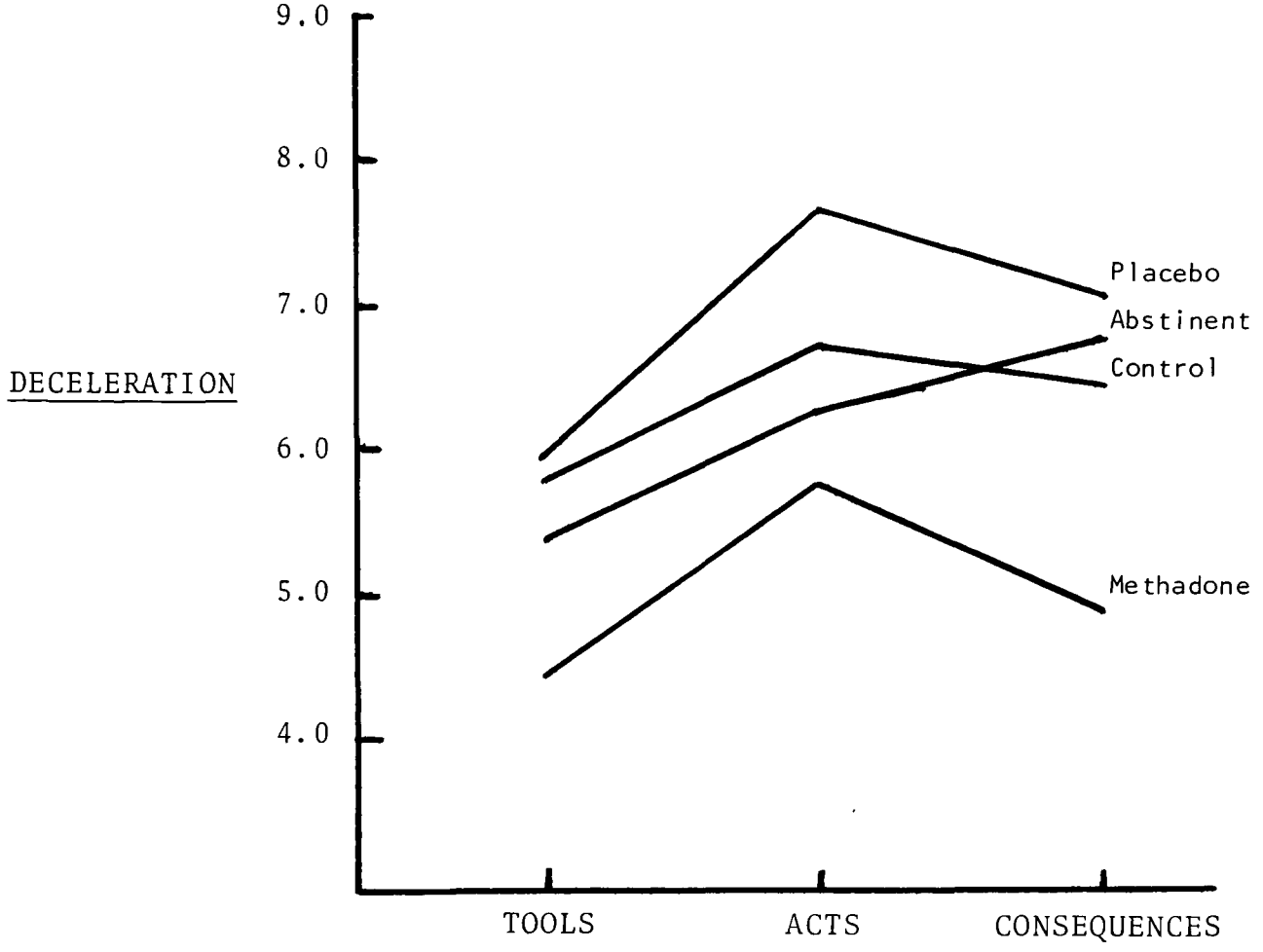
Analysis of Variance of the Cardiac Deceleration Responses for the Four Groups, Abstinent, Placebo, Methadone, and Control under the Three Stimulus Classes of Drug Slides, Paraphenalia, Acts of Injection, and Consequences of Injection

Source of Variation	SS	df	MS	F ratio
Between Subjects	557.69	47		
A (Groups)	66.30	3	22.10	1.98
Subjects within Groups	491.39	44	11.17	
Within Subjects	237.06	96		
B (Stimulus Classes)	24.28	2	12.14	5.24*
AB	8.70	6	1.45	0.63
B x Subjects within Groups	204.08	88	2.32	

*$F_{.95}(2,88) = 3.13$

Figure 10. Summary of the Cardiac Acceleration and Deceleration Data for the Stimulus Class Analyses


ACCELERATION
9.0
8.0
7.0
6.0
5.0
4.0
Placebo
Abstinent
Methadone
Control
TOOLS
ACTS
CONSEQUENCES


9.0
8.0
7.0
6.0
5.0
4.0
DECELERATION
Placebo
Abstinent
Control
Methadone
TOOLS
ACTS
CONSEQUENCES

CHAPTER IV

Discussion of Results

Introduction

The purpose of this study was to investigate the relationship between a number of hypothesed correlates of arousal experienced by addicts and non-addicts to heroin-related and neutral stimuli. The key theoretical constructs upon which the hypotheses were based were as follows: (1) it was argued that relapse to heroin taking behavior was a function of the degree of arousal produced in an individual when heroin associated stimuli were perceived by the individual. Evidence was presented to support the contention that this arousal was classically conditioned to heroin associated stimuli during the development of the addiction, and the greater the arousal produced by heroin associated stimuli, the more relapse was facilitated. (2) It was suggested that these stimuli act to arouse the addict who is trying to maintain abstinence thereby increasing the probability that heroin taking behavior will occur. (3) It was proposed that methadone acts to reduce the arousal state that could be produced by heroin associated stimuli in heroin addicts.

The hypotheses attempted to assess these issues by examining the relationship between arousal to heroin associated stimuli and the effects that methadone has on this arousal. It was felt that addicts in an 'abstinent' (ie. no drug) condition, would be experiencing the greatest amount of initial arousal, and would experience the greatest amount of arousal to the stimuli, both heroin-related and neutral. Addicts who received the Placebo, would be experiencing the next greatest amount of arousal, although it was thought that both the pre and post slide dependent variable scores would be attenuated by

the placebo. The non-addict control group, and the addict group who received methadone would be experiencing the least amount of initial arousal in the pre-slide condition. During the physiological recording and in the post-slide condition it was thought that the methadone group would be experiencing the least amount of arousal. The control group during the slide presentation and in the post-slide condition would be experiencing considerable arousal, but less than the 'abstinent' or placebo groups.

Summary of the Results and Evaluation of the Hypotheses.

Profile of Mood States. The overall results of the Profile of Mood States indicated that three of the five factors - tension, depression and anger, yielded significant results in terms of differentiating either between the groups or between the administration times (pre and post slides). A significant difference was found between the groups for the tension and anger factors, and it was in terms of the Control group reporting less tension and anger than the three addict groups. These results are consistent with those reported by Blake et. al. (1973) which is one of the few studies which has compared affect scores between groups of addicts and non-addict controls. In their study, using the Multiple Adjective Checklist (Zuckerman, 1965), they found that non-addicts reported significantly less anxiety, hostility and depression than addicts on methadone maintenance.

Within the addict groups, the Abstinent group reported significantly more tension/anxiety than either the Placebo or Methadone groups and significantly more anger/hostility than the Methadone group. No significant differences were observed between the Abstinent and Placebo groups on the anger/hostility factor, or between the Placebo and Methadone groups on either of the factors.

These results are entirely consistent with the comments made by Blake et. al. (1973) who argue that methadone exerts an anti-affective action which is related to the plasma level of the drug. One can assume that the Methadone group had the highest methadone plasma concentration, and, in this study, they had significantly less affective disturbance in comparison with the Abstinent group.

An overall time effect occurred for the depression and anger factors in the direction of their being a significantly greater amount of mood disturbance after viewing the slides. These results are consistent with those reported by Teasdale (1973), who, using a modified version of the POMS found an increase in fatigue, anger, depression and tension as a result of viewing drug as opposed to neutral slides in a small group (n=6) of heroin ex-addicts. In a partial replication of Teasdale's study, Mandelzys and Mandelzys (1974) found that viewing slides related to heroin injection had some effect in maintaining a mood which was similar to that of an abstinent condition.

Thus, the slide stimuli appeared to have the effect of increasing depression and anger/hostility for all groups. These results are even more interesting when one takes into account the data of Price et. al. (1975) who found a significant decrease in mood disturbance following methadone administration for all of the POMS factors (p .0001). Pre-methadone, his group of addicts described themselves as having a significant amount of mood disturbance as determined by all of the POMS factors. Within 45 minutes after receiving methadone, the physiological abstinence signs had disappeared and the mood states of the addicts had become significantly less disturbed. The difference between the results reported by Price et. al. and those of this study would appear to lie in the effect that the slides had in not only maintaining, but also elevating, the degree of mood disturbance.

In summary, the control group exhibited consistently less mood disturbance then the other three groups and the abstinent group exhibited consistently more mood disturbance then the other three groups. The fact that the Abstinent group exhibited the most mood disturbance is directly consistent with what was predicted, and fits well within the 'arousal framework' of this study.

Opiate Withdrawal Scale. The results of the Opiate Withdrawal Scale T score analysis indicated that all three groups were always experiencing a significant amount of withdrawal, regardless of drug administration or slide presentation when compared with the standardization sample of Haertzen and Meketon (1968). The significant interaction observed in this analysis indicated that the Abstinent group was significantly different then the other two groups in the direction of reporting significantly more subjective withdrawal, but only in the pre-slide condition. Post-slides there were no significant differences between the groups. These results are in harmony with those reported by Haertzen and Meketon (1968) who demonstrated that scores on the scale were highly correlated with having received or not having received methadone for withdrawal alleviation. They are also consonant with their data comparing subjects tested after placebo administration in comparison with when they were withdrawing from heroin. In this study, the Placebo group subjects were found to score significantly lower in the pre-slide condition after the

placebo administration.

As stated earlier, it was felt that the total score analysis would be a more sensitive indicator of withdrawal then the T score analysis because it provided for a wider range of responsiveness (ie. 5 catagories versus the nominal catagories of 'yes' or 'no'). While there were no overall significant differences between the groups, a significant difference was observed between the completion times in that the groups were experiencing significantly more withdrawal symptoms before the slides were presented then after the slides were presented. The significant interaction followed the same pattern as the T score analysis in that the Abstinent group was significantly different (greater subjective withdrawal) then the Methadone and Placebo groups but only in the pre-slide condition.

Two points should be emphasized in considering these results. Firstly is the fact that there was a relationship between drug intake and subjective withdrawal. Those subjects who had ingested methadone, or thought they had, were experiencing significantly less subjective withdrawal before viewing the slides then those who had not ingested any medication. As well, there were no significant differences between the Placebo and Methadone groups, and more importantly, the Placebo group was reporting less withdrawal then the Methadone group although this trend was not significant. These results are in accordance with those reported by Tennant et. al. (1975) who demonstrated in a double-blind study comparing propoxyphene napsylate (Darvon-N) with a placebo, that 38.9% (7/18) of the addicts who were administered the placebo did not develop measurable signs and symptoms of withdrawal over a relatively long time period.

The fact that the placebo had such a powerful effect in relation to

the Opiate Withdrawal Scale scores of subjective craving and withdrawal is a result in harmony with that reported by O'Brien (1976). He reported that in a double-blind study comparing hydromorphone (Dilaudid) with saline, patients typically reported some degree of 'high' or euphoria whether the injection was saline or hydromorphone. One patient not only had significant placebo responses up to 24 trials but also had a consistent pupillary constriction of 1.0 mm. whether the injection was saline or hydromorphone. When it was demonstrated to him on one trial tnat the injection was drawn from a saline bottle and that it was a placebo, he still felt a 'taste' (ie. that the drug had had some appreciable effect). Similar findings to these have also been reported by Levine (1974) and O'Donnell and Jones (1968).

Thus, O'Brien's results are similar to the results of this investigation in that they both demonstrate that the ritual itself is a key factor to be considered. In this study, all of the behaviors associated with methadone treatment, coming to the clinic, seeing clinic personnel, and taking the daily dose of methadone can all be considered as part of a conditioned effect.

The results comparing placebo and methadone ingestion indicate that over and above the issue of conditioned abstinence to heroin, drug taking behavior with regard to methadone can be maintained in part by the conditioned pleasurable effects of the drug taking ritual, that is, all of the stimuli associated with coming to and being at the clinic, as well as from the pleasurable pharmacological effects of the drug, i.e., relief of withdrawal distress. It is obvious then, that these conditioning variables must be considered along with the pharmacological and psycho-social variables in evaluating methadone programs.

The second point of interest was that the slides appeared to act as an

intervening variable to reduce the difference between the groups. The observed difference between the Abstinent and the other two groups which was apparent in the pre-slide condition completely dissipated after slide presentation. Being more specific, the Abstinent group's subjective withdrawal scores significantly decreased after viewing the slides while the Placebo and Methadone groups showed a slight non-significant increase. The net result was no difference between the groups in the post-slide condition. The most parsimonious explanation which can be given to these results is that contrary to what was hypothesized the slides failed to evoke subjective symptoms normally experienced in opiate withdrawal, at least for the Placebo and Methadone groups. Perhaps having injested methadone or placebo not only had the desired physiological effect, but a positive psychological effect as well. For the Abstinent group, however, the slides might not have evoked craving as hypothesized, but rather withdrawal relief in that the subjects experienced some kind of vicarious "positive reinforcement" as a function of viewing the slide stimuli. In support of this explanation with regard to the Abstinent group results is that one of the long term consequences of previous physical dependence might be positive affect to heroin-related stimuli, if the stimuli that are presented are only mildly aversive as was the case in this study. On the other hand, if the stimuli were to be extremely aversive (eg. actual injection (hydromorphone) as in the O'Brien, 1976, study), then perhaps considerably more subjective craving would have occurred for the Abstinent group.

Interestingly, the pattern of these results are in some ways consistent with those obtained by Siegal (1976) in an experiment designed to assess morphine analgesic tolerance in rats. In his study, rats were made tolerant to morphine in either of two environments and then assessed for morphine induced alteration of pain sensitivity in both environments. Siegal found that analgesic tolerance was

displayed when rats were tested in that environment in which they had previously received morphine, but not in the alternative environment. The analogy that could be drawn between the two studies is that it is the ideosynchratic association between particular environmental cues and particular drug effects which are the crucial variables which should be considered.

If this explanation for the apparent discrepancy between the results of the Placebo and Methadone groups and the Abstinent group is tentatively accepted, then it may be concluded that the two sets of data complement, rather than contradict each other, the former revealing the potency of methadone and the latter revealing the potency of previous physical dependence.

Semantic Differential. The analyses of the Semantic Differential data were undertaken to evaluate the cognitive effects of the slide stimuli in terms of two kinds of determinents: stimulus factors and personal factors. By stimulus factors were meant those cognitive factors which derived from the nature of the external stimulus object, that is, from the slides themselves. By personal factors were meant those factors which derived from the characteristics of the perceiving addict. Here the assumption was made that there was a relationship between the physiological state of the addict and the cognitive state, and that part of the hypothesized arousal effect of the slide stimuli could be assessed by evaluating the cognitive state by measuring the attitude and meaning of the concepts of heroin and methadone. This assumption is perhaps best summarized by Schacter (1967) who states that, "the individual will describe his feelings as emotions only to the extent that he experiences a state of physiological arousal" (Schacter, 1967, p. 119).

As stated earlier, Krech et. al. (1962) describe the evaluative factor as measuring the valence of the attitude components. By valence they mean the degree of concordance, or the extent to which the concept is looked upon as being favourable or unfavourable.

The results indicated that there was a significant pre-post difference for the concept of heroin in that heroin was looked upon as being significantly more negative after the slides were presented than before. For methadone, the slides had no significant effect in that methadone was viewed basically in the same way both pre and post slides. When an analysis was completed comparing heroin and methadone it was observed that in both the pre and post-slide condition that heroin was viewed as being significantly more negative than methadone. These data are in accordance with those reported by Robbins (1973) which indicated that when ex-addicts rated a series of drugs, heroin was ranked lowest (i.e. the most negative), for 10 of 14 word pairs in comparison with methadone, LSD, amphetamines and marijuana.

Osgood et. al. (1956) describe the potency factor as being concerned with power and the things associated with it such as size, weight, toughness, strength, etc. For this factor heroine was viewed as being significantly more potent after the slides were presented than before. Methadone was also viewed as being significantly more potent post-slides, but only for the group that had actually received the drug (i.e. Methadone group). Both pre and post-slides significant differences were observed when the concepts of heroin and methadone were compared on the potency factor. In both cases heroin was viewed as being significantly more potent than was methadone.

Between the three groups of addicts it was observed that the Methadone group evaluated the concept of heroin significantly more negatively than the Abstinent group, but not differently from the Placebo group. As well, the Placebo group evaluated methadone significantly more positively than either the Abstinent or Methadone groups.

In the pre-post analyses it was found that the Methadone group evaluated

both drugs significantly more negatively, both pre and post slides. For the potency factor there were no significant differences between the groups.

Several issues and points of interest arise in relation to these rather complex results. Firstly, methadone was always viewed as being significantly more favourable than heroin. Secondly, the Methadone group viewed heroin the most negatively of the three groups, both pre and post slides. This is an encouraging note for programs of methadone maintenance as it suggests that the drug is at least an acceptable substitute for heroin. However, although heroin was viewed more negatively, it was not in most cases viewed towards the bottom of the unfavourable scale even for the Methadone group. For many of the word pairs measuring evaluation, mean scores were above the median point on the scale. These results are similar to those reported by Robbins (1973) who comments that if drug addicts can go through all of the personal and social problems that follow addiction to heroin and still think that it relates more closely to 'wise' rather than 'foolish', then it does not bode well for the treatment of the addict.

Thirdly, the perceptions of heroin and methadone on the evaluative factor for all groups appeared to be independent. That is, heroin and methadone appear to have different meanings for these groups and cognitively may not be substitutes. It is possible that this result is due to the fact that methadone is frequently not used as a maintenance drug in treatment programs, but rather solely as a blocking agent for heroin (Dole and Nyswander, 1966).

Fourthly, both heroin and methadone were considered to be more potent after viewing the slide stimuli for all groups. This image or memory of narcotics as being potent relief for drug-related stimulus situations may help sustain the motivation for continued prolonged narcotic usage

whether it be heroin or methadone. This view is consistent with that proposed by Wikler (1971) and Ludwig and Wikler (1974) who maintain that the arousal due to external drug-related stimuli and their subsequent relief by narcotics is of great importance in establishing a habit pattern of relieving anxiety or arousal by the use of narcotics.

Bandura (1969) has commented that a common diffuse state of physiological arousal mediates many forms of emotional behavior and that different emotional states are identified and discriminated in terms of external cues rather than by somatic ones. That is, a person perceives a change in internal functioning by perceiving physiological cues, but these cues occur in all emotions and identification of a particular feeling state revolves around environmental cues. Moreover, Bandura goes further and states that these cognitive interpretations are based upon past experiences and are learned through the same processes involved in any other form of discriminative learning.

Thus, external stimuli, or in the case of this investigation, imaginal representations of exteroceptive heroin-related stimuli, were hypothesized to produce an arousal state. This arousal state had cognitive components, and for many of the subjects in this study it was felt that one of these cognitions would be 'heroin is bad and methadone is good'. This appeared to be the case as methadone was viewed as being significantly more positive than heroin both pre and post slides. But, what also seemed to occur was that in spite of this evaluation, it appeared as if for these addicts the alleviation of this arousal state involved the assumption on their part that somehow narcotics would eliminate it. Thus, both heroin and methadone were viewed as being significantly more potent post slides, but heroin was viewed as being significantly more potent than methadone both pre and post-slides.

What perhaps these results are pointing towards is what Ludwig and Wikler (1974) call 'cognitive mislabelling'. In one sense, "the use of opiates under such circumstances can be regarded as a consequence of negative rather than positive reinforcement since, from past experience, the addict associates such use with relief from discomfort" (Ludwig and Wikler, 1974, p. 15). In a more important sense, however, the anxiety due to withdrawal and its subsequent relief by heroin is of great importance in establishing a habit pattern of relieving more general anxiety and arousal states by the use of heroin and other drugs.

The issue of the relationship between response pattern and experimental setting is the final point to be considered in relation to the Semantic Differential results. After viewing scenes directly related to heroin injestion does an addict on methadone maintenance tend to think of methadone more positively in that the slides are evoking feelings of craving which he finds aversive? Or, is it possible that the slides are evoking positive cognitive associations, but owing to the experimental setting they are being interpreted as negative? That is, heroin was considered to be significantly more potent than methadone, but, it was also considered to be significantly more negative. One wonders when dealing with drug-oriented individuals such as the subject sample of this study whether there should not be a positive rather than a negative relationship between the potency of a drug and its valence.

It is possible that subjects experienced some dissonance in rating these drugs in a therapeutic environment under the conditions of exposure to previous drug-related behaviours, and tended to rate the treatment drug as being significantly more positive, although less effective, in order to retain a sense of meaning for their commitment to clinical treatment. In other words,

it is possible that the subjects may have employed altered cognitive labels to interpret their visceral states. That cognitive interpretation is modifiable by external situational factors or internal symbolization is clearly understandable, especially when one takes into account the research findings from other related areas. Schacter and Singer (1962) demonstrated that emotional states could be a function of the state of physiological arousal and of the cognitions appropriate to those states of arousal. Lazarus (1968) cites numerous studies where either physiological states or standard drug effects (eg. adrenalin) were manipulated through experimental factors, and Orne (1962) produced a large body of work on the power of situational demand characteristics to effect attitudes and cognitions. Finally, Wikler (1973) has provided evidence to show how cognitive variables can alter classically conditioned physiological and subjective responses.

Control Group - Semantic Differential and Attitude Towards Addicts.

The Semantic Differential data obtained from the Control group indicated that this group rated the drug slides as being significantly more negative and significantly more potent than the neutral slides. These results are entirely consistent and need not be elaborated upon further.

With regard to the Attitude Towards Addicts scale it was observed that the Control group had a very negative attitude towards addicts pre-slide presentation and this was not altered after viewing the slides. Interestingly, however, there was a significant change in attitude for one of the questions, that question being 'the only thing wrong with heroin addiction is that there is a law against it' (Question 2). Here there was an attitude shift from relative agreement to strong disagreement after viewing the slides.

One other point of interest was that both pre and post-slides the Control group perceived addicts as dangerous and damaging to society. Addicts were considered 'to all be pretty much alike', and to be non-treatable, societal misfits. The stereotypic view ascribed to addicts by this small group is probably quite representative of the misunderstanding of the general population. Indeed, the kind of attitude described here is similar to that reported by Brill (1966) in a study relating to prejudice and misinformation about addiction. In this report Brill comments that,

> We have been . . . quite irrational on the subject of narcotic use. The historic development of our national stereotypes and attitudes would in itself constitute a most worthwhile subject for study and undoubtedly shed light on the workings of our larger society. (Brill, 1966, p. 20).

Heart Rate Data. In the present study, a number of heart rate variables were used in order to assess the varied physiological responses emitted by the heterogenous subject samples during the experimental conditions. It was expected that there would be both demands and opportunities for varying kinds of sensory processing as a function of viewing the slide stimuli.

The data indicated that during the tonic (basal) heart rate periods there were no significant differences between the groups or between whether the basal measurements were taken before the drug slides or before the neutral slides. A significant order effect was observed for all of the basal measurements with heart rate being significantly greater after the second set of slides. The finding that there were no differences between the groups in basal heart rate corroborates the results reported by Okulitch (1973). It also supports the contention put forth by Dole and Nyswander (1969) that "methadone allows the patient to function without sedation or euphoria and with no impairment of vigilance, reaction time, affect, or intellectual function" (Dole and Nyswander, 1969, p. 97).

Both the pre and post-stimulus cardiac phasic analyses yielded similar results. In both cases heart rate for the Control group was significantly lower than for the three addict groups, and no differences were observed between the three addict groups. These results are similar to those reported by Prystav (1976) who demonstrated that various phasic cardiac components were significantly higher in drug addicts than in non-addict controls.

The degree of concordance between the pre-stimulus and post-stimulus heart rate data is consistent with the results reported by a host of authors (eg. Clifton and Graham, 1968; Graham et. al. 1968; Libby, Lacey and Lacey, 1973). Clifton and Graham (1968) comment that this relationship has an important physiological significance and is an excellent example of the Law of Initial

Values.

The difference score analysis (arithmetic difference between the pre and post stimulus mean values) was identical to what Libby, Lacey and Lacey (1973) refer to as 'uncorrected' difference scores. It was a conservative estimate in which the pre-post difference was determined for each subject individually. The data indicated that there were no significant differences either between the groups, slide types, orders, or for any of the interactions. The magnitude of the difference scores were quite large, however, the wide variability within groups masked any between group differences. As stated earlier, the Law of Initial Values was also operating, however, it was decided to not compute autonomic lability scores, since in spite of the fact that the uncorrected difference scores were extremely conservative they nevertheless had the distinct advantage over autonomic lability scores in that they more concretely and realistically communicated the actual data of the experiment (Libby, Lacey and Lacey, 1973). Prystav (1976) also obtained non-significant results in his difference score analysis even though the magnitude of his scores were far larger and his experimental condition (the cold pressor) was far more arousal producing then that employed in this study.

The acceleration and deceleration analyses were undertaken within the framework of the hypotheses of Lacey and Lacey (1959, 1963, 1967). In its simplest and most frequently cited form, the hypothesis states that acceptance of the environment or attention to external stimuli is associated with heart rate deceleration, whereas rejection of the environment, or attention to internal cues (associative processes) are associated with heart rate acceleration. The intake versus rejection dimension was also originally hypothesized

to be related to the pleasantness-unpleasantness dimension. In their view the role of affect is to mediate attention in that pleasantness tends to lead one to take in the environment, unpleasantness the opposite.

The relationship of Lacey's hypothesis to the issues raised in this study are quite complex and so the obtained data will be examined before any further discussion is undertaken.

The cardiac acceleration data indicated that there was no significant difference between the groups although the group main effect approached significance (p .07) with the Placebo group having a significantly greater amount of acceleration. Overall, there was significantly more acceleration to the drug in comparison with the neutral slides. The key interaction, that is, groups x slide types yielded the following results:

(1) Overall Effects: The Placebo and Abstinent groups had significantly more acceleration to the drug then to the neutral slides. For the Methadone group there was no significant difference between the drug and neutral slides, and the Control group had significantly more acceleration to the neutral in comparison with the drug slides.

(2) Drug Slides: When only the drug slides were considered it was found that the Placebo group had significantly more acceleration then either the Methadone or Control groups; the Abstinent group had significantly more acceleration then the Control group; there was no significant difference between the Placebo and Abstinent groups; and the Methadone group was not significantly different from either the Abstinent or Control groups.

(3) Neutral Slides: When only the neutral slides were considered then no significant differences between any of the groups was observed.

The cardiac deceleration data indicated that there was a significant group main effect with the Methadone group having significantly less deceleration then the other three groups. There was significantly more deceleration to the drug then to the neutral slides. The groups x slide types interaction yielded the following results:

(1) Overall Effects: The Abstinent and Control groups had significantly more deceleration to the drug then to the neutral slides. For the Placebo and Methadone groups there were no significant differences between the drug and neutral slides.

(2) Drug Slides: When differences were considered at the level of the drug slides it was found that the Methadone group had significantly less cardiac decleration then did the other three groups. No differences were observed between the other three groups.

(3) Neutral Slides: When only the neutral slides were considered it was observed that the Methadone group had significantly less deceleration and the Placebo group had significantly more deceleration. No differences were observed between the Abstinent and Placebo groups.

There are a number of important points which are related to this data. Firstly, when only the acceleration data is considered the results appear to contradict what was expected initially. That is, it was felt that since acceleration is associated with environmental rejection and stimulus unpleasantness, then logically the Control group would have the greatest amount of acceleration and the Abstinent group would have the least amount, with the Placebo and Methadone groups falling somewhere in the middle. However, a number of studies have reported results which are not contradictory to the original Lacey hypothesis, but rather have brought about modifications with

regard to the causal factors related to acceleration. For example, if a subject knows from some temporal display when a shock will occur, heart rate will accelerate (a stress response) until just before the shock occurs (Martin and Sroufe, 1970). Similarly, heart rate acceleration has been shown to occur when a subject becomes muscularly tense or during acute or on-going stress, for example, during the cold pressor or during confrontations with an aversive social situation (for a review see Hahn, 1973). In related work, Prigatano and Johnson (1974) found that slides of spiders elicited greater heart rate acceleration from female subjects afraid of spiders then from those unafraid of them, and Wiesenfeld, Klorman and Austin (1795) found that slides of mutilated accident and burn victims elicited heart rate acceleration from those who feared them. In an extension of these findings, Klorman et. al. (1977) found that mutilation materials evoked cardiac acceleration and high subjective tension in high fear subjects.

Looked upon in this light, the results are much more consistent if one assumes that the Placebo and Abstinent groups had the most to fear when viewing the heroin-related slide stimuli. If one defines fear in this particular situation as the perception of threat involving strong avoidance tendencies then it is logical to assume that the Placebo and Abstinent groups were under the greatest amount of threat, since they were the most likely to be experiencing withdrawal. Accordingly, the Methadone and Control groups were experiencing the least fear, and hence the least acceleration.

When only the deceleration data is considered the results are consistent with the more recent literature. Indeed, the data agrees with the findings of Hare and his colleagues (Hare et. al. 1970, 1971), Lacey et. al. (1963) and Libby, Lacey and Lacey (1973). These studies demonstrated that

unpleasant or aversive stimuli produced cardiac deceleration instead of the acceleration that should be expected on the basis of Lacey's early theorizing. All subjects found the stimuli unpleasant as could be seen from the Semantic Differential data. The three addict groups evaluated heroin as being significantly more negative then methadone, and heroin was evaluated as being significantly more negative after the slides were presented then before. Similarly, the Control group evaluated the heroin-related slides as being significantly more negative then the neutral slides.

Libby, Lacey and Lacey (1973) comment that at first glance, the fact that unpleasant stimuli should produce cardiac deceleration appears difficult to reconcile with the earlier hypothesis that deceleration accompanies the intention to note and detect external environmental events. One possible answer is that people do not neccessarily avoid and reject unpleasant stimuli. Instead, they may attend closely to them, as in the phenomenon of morbid fascination. Good examples of this phenomenon in contemporary life include the popularity of films such as 'The Exorcist', or 'Jaws', or the tendency of people to gather around car accidents or fires. Craig and Wood (1970) in summarizing the results of their study comment that "morbid preoccupation with the bizarre scenes seemed to dictate the observed heart rate . . . the homicidal scenes were reported verbally to yield a grim fascination" (Craig and Wood, 1971, p. 307).

Thus, the group that theoretically should have had the least interest in the drug slides, that is, the Methadone group, had signficantly less deceleration then the other three groups. One explanation might be that fortified with methadone the slides had less meaning for them. On the other hand, the Abstinent and Placebo groups, assuming that they were experiencing some con-

ditioned abstinence symptoms, reacted significantly more. The Control group, perhaps because of the phenomenon of morbid fascination described above, also produced significantly more cardiac deceleration then the Methadone group.

In terms of the total pattern of heart rate responding the Abstinent and the Placebo groups were quite similar. For both groups there was high acceleration and deceleration to the drug slides. For the Methadone group there was moderate acceleration and low deceleration, and for the Control group there was low acceleration and high deceleration. In light of what has been discussed one can speculate as follows: the Abstinent and Placebo groups reacted in such a way so as to indicate that they attended to the stimuli closely and also found them stressful and fear-producing. The Methadone group did not attend to the stimuli closely and found them moderately stressful. The Control group attended to the stimuli closely (morbid fascination) but did not find them to be extremely stressful.

It must be emphasized that this summary table is speculative and was created in an attempt to best fit the data to the theoretical constructs upon which the study is based. The heart rate literature with regard to the correlates of acceleration and deceleration is still in an early stage, and therefore any conclusions are hypothetical at the present time.

The final set of heart rate analyses were undertaken in order to assess whether the drug slides actually represented different classes of stimuli which might have different reinforcement value for the different groups. The other cardiac analyses treated all the drug slides as a single variable in terms of the statistical analyses. These analyses attempted to differentiate the heroin-related stimuli and to see, which, if any, class of stimuli had the greatest capacity to elecit the cardiac responses, and also

had the greatest capacity to statistically discriminate both within and between the experimental groups.

There were no significant differences either between the groups or between the stimulus classes for either the difference score or the cardiac acceleration analyses. For the deceleration analysis, no significant difference was observed between the four experimental groups, but a significant difference was observed between the stimulus classes with the classes of acts and consequences producing significantly more deceleration then the class of tools (paraphenalia).

The fact that there were no significant differences between the groups was probably due to the stimulus classes not being discrete units. That is, perhaps the similarities between the three classes were greater then their perceived differences, at least from the viewpoint of the subjects. That all four groups had significantly more deceleration to the slides depicting acts of injection or the consequences of heroin injestion in comparison with the paraphenalia (needles, etc.) is understandable when one considers what was previously discussed with regard to deceleration, i.e. morbid fascination, etc.

The Relationship Between the Dependent Variables

One conclusion that can be drawn with regard to this investigation is that although the relationship between the different measures of arousal was not high, the results were nevertheless consistent, logical, and lawful with regard to the theoretical perspectives of the study. For example, the Methadone group reported significantly less mood disturbance on the POMS then the other addict groups, had significantly less subjective withdrawal then the Abstinent group on the Opiate Withdrawal Scale, and produced cardiac data which was generally indicative of the lowest level of arousal of the four groups.

The relatively low correlations between different measures of arousal has been a much discussed topic in the literature for the last twenty five years. For example, Sarason (1960) in an extensive review of the literature up to that time found low correlations between physiological measures of arousal and psychological tests which attempted to measure various correlates of arousal, anxiety, activation, etc. In a review approximately ten years later, Lang (1971) found similar results.

From these and other reviews several conclusions have been drawn which can be applied directly to the relatively low relationships obtained in this study. One conclusion is that the failure to find significant relationships between physiological and behavioral measures of arousal may be due to the undependability of using single physiological and behavioral measures as indicators of arousal. Another conclusion is that there may very well be a relationship between physiological and test measured arousal, but only when measurements are taken simultaneously under threat or stress. Finally, Lacey (1967) has stated that arousal processes are not unidimensional but multidimensional, and therefore are not merely descriptive of behavior but rather, reflect the aim or goal of the behavior.

> The emphasis on the multidimensionality of the arousal process is tantamount to saying that different . . . processes have different roles to play in the execution of different kinds of behavior and different interactions with other concurrent responses, and hence appear in different amounts and temporal evolution, depending on the requirements of the intended interaction between the organism and its environment. (Lacey, 1967, p. 25).

Arguing along similar lines, Lang (1971) has pointed out that arousal responses are best considered as a complex of three partially independent systems: verbal-cognitive, overt-motor, and physiological-autonomic. These systems are partially independent, but also highly interactive, so that while correlations between any two measures of arousal may

be low, the systems nevertheless mutually augment and sustain each other if viewed as a totality.

The Relationship of Conditioned Reinforcement Theory to Methadone Maintenance

If it is at all possible to generalize the findings of this study from an experimental to a clinical setting, then it becomes clear that methadone maintenance treatment programs which rely more heavily on chemical intervention rather then on some form of therapeutic intervention should be relatively unsuccessful. That is, it is important that methadone treatment not merely be a pharmacological success, but a therapeutic success as well.

Brecher (1972) commented that methadone in itself is successful in 100 percent of all cases, or virtually 100 percent, if success is defined as it is for other drugs. Insulin, for example, lowers the blood sugar level in very nearly 100 percent of all diabetics. Methadone similarly relieves the craving for heroin in all or substantially all heroin addicts. Thus, while there is no denying that methadone is successful at the physiological level, the results of this study appear to indicate that at best, it is only mildly successful at what might be called the behavioral level, at the level of intervening in some way with the secondary reinforcers which sustained the initial addiction and which appear to precipitate relapse (or what Wikler refers to as the conditioned abstinence syndrome).

Evidence summarized from a wide variety of methadone treatment programs (eg. Senay, Shorty, Alksne, 1975) appear to suggest that there is a significant and dramatic decrease in drug-seeking behavior during methadone treatment, with resumption of heroin use after detoxification, even after long periods of abstinence. Dole (1969) has commented that the pharmacological results with methadone are consistent in all cases, but not the behavioral results.

> It is easy to reduce the methadone dose to about 50 milligrams per day. Drug hunger is still controlled . . . If you then continue to reduce the dose . . . the person will begin to experience a return of the old heroin hunger, not hunger for methadone but for heroin. (Dole, 1969, p. 38)

This return of the post-addiction syndrome (as Dole refers to it), is parallel to that of the addict who serves a period of time drug free in prison or in any other contained environment, yet heads for the nearest 'black market' soon after his release. Or if his resolve is strong then he may abstain for a period of time, but unless his environment is totally changed he will still come into contact with stimuli connected with drug-taking, drug-friends, and the areas where he 'hustles' for drugs (secondary reinforcers). These situations bring about a renewed craving for heroin which Dole (1969) states "is not uniform, some feel it more acutely than others, but they all feel it, including those who have been thoroughly rehabilitated" (Dole, 1969, p. 38).

These comments appear to exemplify the kinds of processes that were operating in this study. For although the results across all variables are somewhat inconsistent, nevertheless evidence for the operation of conditioned abstinence phenomena was obtained when the data was looked at in its totality An encouraging note was that overall the Methadone group appeared to be experiencing less arousal then the other two addicts groups. However, they were still significantly different then a 'normal' control group of non-addicts, as for example, on the Profile of Mood States, or, on the Opiate Withdrawal Scale where they reported a significant amount of subjective withdrawal.

It appears, therefore, that if more then pharmacological success is desired, then the host of conditioned reinforcers which are operating must be dealt with. Wikler (1973) summarizes these comments well, when he states,

> Suffice it here to point out that mere detoxification with or without conventional psychotherapy and prolonged retention in a drug-free environment does not result in extinction of the conditioned responses any more than satiating a rat with food (i.e. reducing its hunger drive) and keeping it away from the operant cage for a period of time will cure it of the lever-pressing habit acquired previously under conditions of food deprivation. (Wikler, 1973, 614)

The results of this study combined with what has just been discussed suggest that the following criteria should be considered in the development and improvement of methadone programs. Many of these suggestions are already being utilized in existing methadone programs, and all of them will be elaborated in terms of conditioning theory as this was the frame of reference for the study.

(1) The addict in treatment should be exposed to 'laboratory facsimilies' of his original drug-taking environment during the treatment program in an attempt to extinguish the conditioned environmental stimuli developed by prior association with either withdrawal distress or opiate reinforcement. That is, treatment effectiveness might depend on altering the addict's behavior and 'attitude'toward his old environment.

(2) Behavior modification techniques might be utilized effectively to hasten extinction in a paradigm involving cognitive relabelling of the conditioned responses. It was stated earlier that arousal due to withdrawal and its subsequent relief by narcotics is of great importance in establishing a habit pattern of relieving arousal in general by the use of drugs. Indeed, the Semantic Differential data clearly supports this conclusion. Thus, a program could be created so that the addict could learn to deal with affective disturbances more appropiately without recourse to drugs.

(3) The treatment should not only attempt to extinguish 'undesirable' conditioned behavior, but should also be directed towards the conditioning

of 'desirable' positive behavior. This is easy to say, but difficult to accomplish since many individuals who come to methadone clinics have pre-existing handicaps such as poor health, little education, prison records and years of addiction, so that their only skill is the ability to 'hustle' for drugs. However, a number of very successful programs have been developed using the 'life skills' concept in retraining many other types of deviant groups. For example, the California Department of Corrections has been using the 'life skills' approach with great success for almost fifteen years, and it is now operational at several institutions within the Canadian Penitentiary Service in dealing with both drug addicts and sex offenders.

(4) Another method of achieving extinction might be the use of long-lasting orally effective narcotic antagonists such as cyclazocine (Martin, 1967) or naltrexone (Martin et. al. 1973). The opiate antagonists block the biochemical, physiological and psychological effects of narcotics, and have been demonstrated to cause extinction of opiate seeking behavior in humans (eg. Altman et. al. 1976; Kleber et. al. 1974). At the present time, this treatment modality is not being employed in any organized fashion in Canada.

In a recent statement, the Minister of Health of the Province of British Columbia, stated that 'the heroin industry' was the fourth largest industry in B.C. with 'sales' forthe year estimated at about 255 million dollars (Vancouver Sun, 14/9/77). Moreover, in British Columbia, approximately 35% of the total Federal inmate population are heroin addicts (Stratton, 1976).

The only conclusion that can be drawn is that there is something wrong with the various forms of treatment being utilized at the present time. One of the major drawbacks of treatment programs in Canada is that they are not sufficiently comprehensive and they lack a systematic research and evaluative component (Le Dain, 1973). In addition, most treatment programs

are funded by a variety of government departments, both federal and provincial, and the frame of reference for funding purposes is almost exclusively the medical model. What appears to be required is a much more systematic and eclectic approach to treatment which, in addition to methadone maintenance would also include the use of narcotic antagonists when necessary. But even more important then chemical intervention should be the emphasis on treatment in therapeutic communities, detoxification in highly supportive settings, and a wide range of adjunctive services and therapies. As Le Dain (1973) comment,

> What is lacking in methadone maintenance programs is sufficient trained personnel for adequate follow-up and assistance with adjustment in the community. It is the same lack that we encounter in probation and parole. There are not enough people to give opiate dependents the close attention they require. (Le Dain, 1973, p. 990).

Limitations of the Study

(1) Choice of Sample: A limitation of this study was that the addict population was only dimensionalized into three catagories. These three catagories were selected because of their particular relevance to the hypotheses to be tested, but it is clear that the subject catagories used in the study were not exhaustive and many more catagories could have been developed. Theoretically, the conditioning effect should be present in any given catagory, however, the significance of other factors as sources of variance could not be assessed.

(2) Physiological Differences: There was quite likely blood and/or brain level differences of methadone within each of the three groups. That this was a contaminating factor in the study is acknowledged, however, it is assumed that any differences which may have existed were randomly distributed in such a way so that there were no significant differences between the groups. The fact that the groups did not differ on any other subject variables (see Table 4), makes this conclusion defensible.

(3) 'Cheating': The possibility that subjects in the study were using opiate narcotics prior to participation is something that should be considered. The random assignment argument can be used here again, although for this particular source of variability other factors have to be considered. At all three clinics urine samples were collected for urinalysis on a random basis, at the discretion of the programme staff. All subjects at all three clinics knew that once a sample was requested, no methadone would be given until a suitable sample was supplied. Also, the standard procedure was that if it was suspected that the urine sample was not genuine, or tampered with, then a blood sample could be requested before any medication would be given.

(4) Stimuli: The ability of visual stimuli presented in an artificial setting to reproduce the effects of stimulus events occurring in the natural environment is impossible, although research studies using such procedures have found them to be adequate and somewhat comparable to naturally occurring stimuli. Nevertheless, monitoring of subject responses 'in vivo' would have been the most precise way of measuring responses to stimuli and would have had the greatest degree of reliability and validity.

Conclusions

This study attempted to investigate the relationship between a number of behavioral, cognitive and physiological correlates of arousal, experienced by addicts and non-addicts, to heroin-related and neutral slide stimuli, within the framework of conditioned reinforcement theory. The major conclusion of this study would appear to be that although arousal to heroin-related exteroceptive stimuli is related to relapse, this study was not able to specify the precise nature of the relationship. The results support the conclusion that this relationship clearly exists, but the specifications of it are beyond this, or perhaps any single study.

The results lend some support to a conditioning effect as being one variance in the etiology of relapse, and also suggest that continued research investigating the relationship between stimulus attributes and relapse could contribute to an understanding of addiction in general. These data also suggest that increases in arousal may be correlated with heroin acquisitive behavior in ex-addicts in treatment. Finally, because of the variability of scores within groups, it appears as if other factors also enter into the relationship, but these factors could neither be tested nor could their relative importance be verified in this investigation.

One set of factors that could have been significant, however, could possibly have been a transient, frustration-induced irritability, especially on the part of subjects in the Abstinent group who were required to wait for their methadone. That is, they knew that they would receive their methadone eventually, but were required to wait over two hours in order to receive it. Unfortunately, this "irritability factor", a product of the experimental design, could not be assessed in terms of the way the experiment was constructed.

Another factor of significance was that it was impossible to assess the precise degree or severity of actual withdrawal in the Placebo and Abstinent groups since some subjects might have waited 20 hours between methadone doses and others 24 to 28 hours.

Overall, however, the Methadone group exhibited significantly less arousal than the other two groups to the heroin-related stimuli. This is a positive finding when one considers the amount of time, money and effort which is invested in methadone maintenance treatment.

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APPENDIX 1

CONSENT FORM

I hereby acknowledge that I have consented to participate in a study conducted by Nathan Mandelzys of the University of Ottawa.

I understand that I will be asked to view a series of slides related to heroin usage as well as a series of neutral slides. As well, I have agreed to complete a number of questionnaires which relate to my feelings concerning heroin and methadone.

I understand that I may or may not receive my regular daily dosage of methadone before participating in the experiment, but that I will receive it before I leave the clinic today.

I understand that all of the information gathered is completely confidential and will be used only for research purposes. I have been asked to not sign my name to any of the tests that I will complete.

I realize that I can withdraw at any time and that my participation is entirely voluntary. In addition, I know that this research is being sponsored by the Non-Medical Use of Drugs Directorate in Ottawa.

I am being paid $15.00 for my participation in this research project.

SIGNED:_____

WITNESS:_____

DATE:_____

INSTRUCTIONS

On the next page is a list of words that describe feelings people have. Please read each one carefully. Then put a check mark in the space that describes the closest to the way you feel RIGHT NOW.

EXAMPLE

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
Friendly.....	__	__	__	__	__

CODE:_____

PRE:_____

POST:_____

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
TENSE.....	—	—	—	—	—
ANGRY.....	—	—	—	—	—
WORN OUT.....	—	—	—	—	—
UNHAPPY.....	—	—	—	—	—
LIVELY.....	—	—	—	—	—
SORRY FOR THINGS DONE.....	—	—	—	—	—
SHAKY.....	—	—	—	—	—
LISTLESS.....	—	—	—	—	—
PEEVED.....	—	—	—	—	—
SAD.....	—	—	—	—	—
ACTIVE.....	—	—	—	—	—
ON EDGE.....	—	—	—	—	—
GROUCHY.....	—	—	—	—	—
BLUE.....	—	—	—	—	—
ENERGETIC.....	—	—	—	—	—
PANICKY.....	—	—	—	—	—
HOPELESS.....	—	—	—	—	—
RELAXED.....	—	—	—	—	—
UNWORTHY.....	—	—	—	—	—
SPITEFUL.....	—	—	—	—	—
UNEASY.....	—	—	—	—	—
RESTLESS.....	—	—	—	—	—
FATIGUED.....	—	—	—	—	—
ANNOYED.....	—	—	—	—	—
DISCOURAGED.....	—	—	—	—	—

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
RESENTFUL.....	—	—	—	—	—
NERVOUS.....	—	—	—	—	—
LONELY.....	—	—	—	—	—
MISERABLE.....	—	—	—	—	—
CHEERFUL.....	—	—	—	—	—
BITTER.....	—	—	—	—	—
EXHAUSTED.....	—	—	—	—	—
ANXIOUS.....	—	—	—	—	—
READY TO FIGHT.....	—	—	—	—	—
GLOOMY.....	—	—	—	—	—
DESPERATE.....	—	—	—	—	—
SLUGGISH.....	—	—	—	—	—
REBELLIOUS.....	—	—	—	—	—
HELPLESS.....	—	—	—	—	—
WEARY.....	—	—	—	—	—
ALERT.....	—	—	—	—	—
DECEIVED.....	—	—	—	—	—
FURIOUS.....	—	—	—	—	—
FULL OF PEP.....	—	—	—	—	—
BAD-TEMPERED.....	—	—	—	—	—
WORTHLESS.....	—	—	—	—	—
CAREFREE.....	—	—	—	—	—
TERRIFIED.....	—	—	—	—	—
GUILTY.....	—	—	—	—	—
VIGOROUS.....	—	—	—	—	—
BUSHED.....	—	—	—	—	—

INSTRUCTIONS

On the following page are some statements which describe how you may feel mentally and physically RIGHT NOW.

Put a check mark in the space which best describes your IMMEDIATE feelings to the statement.

EXAMPLE

	NONE	WEAK	AVERAGE	STRONG	VERY STRONG
I am more tired then usual....	___	___	___	___	___

CODE:_____

PRE:_____

POST:_____

	NONE	WEAK	AVERAGE	STRONG	VERY STRONG
I am very careful about the decisions I make.....	—	—	—	—	—
My voice sounds different than usual...	—	—	—	—	—
Answering these questions today is very easy.....	—	—	—	—	—
I am unusally aware of other people's feelings and emotions.....	—	—	—	—	—
I feel sluggish.....	—	—	—	—	—
I have a weird feeling.....	—	—	—	—	—
I can go to sleep easily even when I am not tired.....	—	—	—	—	—
I find it hard to keep my mind on a task or a job.....	—	—	—	—	—
I have unusual weakness of my muscles..	—	—	—	—	—
I am unusually sensitive to bright lights.....	—	—	—	—	—
My mouth seems very dry.....	—	—	—	—	—
I would like to repair a door latch....	—	—	—	—	—
My movements seem slower than usual....	—	—	—	—	—
I feel weak.....	—	—	—	—	—
My hands feel clumsy.....	—	—	—	—	—
Some parts of my body seem to be going to sleep.....	—	—	—	—	—
I feel so good that I know other people can tell it.....	—	—	—	—	—
My head feels as it does during a hangover.....	—	—	—	—	—
I have a feeling of just dragging along rather than coasting.....	—	—	—	—	—

GO ON TO THE NEXT PAGE.....

	NONE	WEAK	AVERAGE	STRONG	VERY STRONG
am not as active as usual.....	—	—	—	—	—
: is unusual for me to be so frank....	—	—	—	—	—
r movements are free, relaxed, and leasurable.....	—	—	—	—	—
don't feel like reading anything ight now.....	—	—	—	—	—
have one or more bad habits ıich are annoying to others.....	—	—	—	—	—
ıilure gives me a sense of remorse....	—	—	—	—	—
feel so miserable that other eople must be aware of it.....	—	—	—	—	—
have a disturbance in my stomach.....	—	—	—	—	—
: seems harder then ususal to ove around.....	—	—	—	—	—
: is interesting to analyze myself r answering these questions.....	—	—	—	—	—

INSTRUCTIONS

On the following pages you will see a list of words on both sides of the page with spaces in-between.

As you will notice, each of these words describes a feeling that a person may have about an idea or a concept. As well, when you look from left to right the words turn out to be opposite to each other in meaning.

Everyone sees things a bit differently, sometimes very differently, and although a person cannot always say in words what his definition of something is, it is sometimes easier to show what one feels or means by expressing it in terms of more or less.

The purpose of this questionnaire is to measure the meaning of heroin and methadone to you, at the present time, by having you judge heroin and methadone against a series of descriptive scales.

In completing the questionnaire, please make your judgements on the basis of what heroin and methadone mean to you at the present time, that is, RIGHT NOW.

On each page of the booklet you will find a different concept to be judged (that is, heroin or methadone) and beneath it a set of scales. You are to rate heroin or methadone on each of these scales in order.

CODE:_____

PRE:_____

POST:_____

HERE IS HOW YOU ARE TO USE THESE SCALES:

If I told you to think of the concept of school, and gave you a list of words, you could rate the concept of school somewhere along the space as being more or less your particular feeling:

SCHOOL

PLEASANT_____:_____:_____:_____:_____:_____:_____UNPLEASANT

Since there are seven spaces with the words pleasant and unpleasant on either side, you might check off the sixth space, because you feel that school is relatively unpleasant.

But if you think of words like fair and unfair about school, you might check off the space closest to fair.

FAIR_____:_____:_____:_____:_____:_____:_____UNFAIR

Finally, if you think of words like heavy and light about school, you might check off a space close to heavy because you feel that school is a heavy place to be for you.

HEAVY_____:_____:_____:_____:_____:_____:_____LIGHT

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging, that is, heroin or methadone.

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or, if the scale is competely irrelevant to you, unrelated to the concept, then you should place your check-mark in the middle space.

Try not to look back and forth through the items, that is, try to make each item a separate and independent judgement.

Do not worry or puzzle over individual items. It is your first impressions, the immediate feelings about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

H E R O I N

HAPPY_____:_____:_____:_____:_____:_____:_____SAD

HARD_____:_____:_____:_____:_____:_____:_____SOFT

EMPTY_____:_____:_____:_____:_____:_____:_____FULL

WEAK_____:_____:_____:_____:_____:_____:_____STRONG

DARK_____:_____:_____:_____:_____:_____:_____BRIGHT

LIGHT_____:_____:_____:_____:_____:_____:_____HEAVY

GOOD_____:_____:_____:_____:_____:_____:_____BAD

SHALLOW_____:_____:_____:_____:_____:_____:_____DEEP

UGLY_____:_____:_____:_____:_____:_____:_____BEAUTIFUL

SERIOUS_____:_____:_____:_____:_____:_____:_____HUMOROUS

PLEASANT_____:_____:_____:_____:_____:_____:_____UNPLEASANT

LARGE_____:_____:_____:_____:_____:_____:_____SMALL

Go on to the next page.....

H E R O I N

FOOLISH_____:_____:_____:_____:_____:_____:_____WISE

THIN_____:_____:_____:_____:_____:_____:_____THICK

TENSE_____:_____:_____:_____:_____:_____:_____RELAXED

GENTLE_____:_____:_____:_____:_____:_____:_____VIOLENT

DANGEROUS_____:_____:_____:_____:_____:_____:_____SAFE

WIDE_____:_____:_____:_____:_____:_____:_____NARROW

SANE_____:_____:_____:_____:_____:_____:_____CRAZY

MASCULINE_____:_____:_____:_____:_____:_____:_____FEMININE

DIRTY_____:_____:_____:_____:_____:_____:_____CLEAN

PEACEFUL_____:_____:_____:_____:_____:_____:_____FEROCIOUS

HEALTHY_____:_____:_____:_____:_____:_____:_____SICK

POTENT_____:_____:_____:_____:_____:_____:_____IMPOTENT

Go on to the next page.....

METHADONE

SMALL_____:_____:_____:_____:_____:_____:_____LARGE

UNPLEASANT_____:_____:_____:_____:_____:_____:_____PLEASANT

HUMOROUS_____:_____:_____:_____:_____:_____:_____SERIOUS

BEAUTIFUL_____:_____:_____:_____:_____:_____:_____UGLY

DEEP_____:_____:_____:_____:_____:_____:_____SHALLOW

BAD_____:_____:_____:_____:_____:_____:_____GOOD

HEAVY_____:_____:_____:_____:_____:_____:_____LIGHT

BRIGHT_____:_____:_____:_____:_____:_____:_____DARK

STRONG_____:_____:_____:_____:_____:_____:_____WEAK

FULL_____:_____:_____:_____:_____:_____:_____EMPTY

SOFT_____:_____:_____:_____:_____:_____:_____HARD

SAD_____:_____:_____:_____:_____:_____:_____HAPPY

Go on to the next page.....

METHADONE

IMPOTENT_____:_____:_____:_____:_____:_____:_____POTENT

SICK_____:_____:_____:_____:_____:_____:_____HEALTHY

FEROCIOUS_____:_____:_____:_____:_____:_____:_____PEACEFUL

CLEAN_____:_____:_____:_____:_____:_____:_____DIRTY

FEMININE_____:_____:_____:_____:_____:_____:_____MASCULINE

CRAZY_____:_____:_____:_____:_____:_____:_____SANE

NARROW_____:_____:_____:_____:_____:_____:_____WIDE

SAFE_____:_____:_____:_____:_____:_____:_____DANGEROUS

VIOLENT_____:_____:_____:_____:_____:_____:_____GENTLE

RELAXED_____:_____:_____:_____:_____:_____:_____TENSE

THICK_____:_____:_____:_____:_____:_____:_____THIN

WISE_____:_____:_____:_____:_____:_____:_____FOOLISH

INSTRUCTIONS

On the following pages you will see a list of words on both sides of the page with spaces in-between.

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The purpose of this questionnaire is to measure the meaning of the heroin-related slides and the neutral slides to you, at the present time, by having you judge your feelings towards the two types of slides that you saw against a series of descriptive scales.

In completing the questionnaire, please make your judgements on the basis of what the heroin-related slides and the neutral slides mean to you at the present time, that is, RIGHT NOW.

On each page of the booklet you will find a different set of slides to be judged (that is, the heroin-related, or the neutral slides) and beneath it a set of scales. You are to rate the heroin-related slides or the neutral slides on each of the scales in order.

CODE:_____

HERE IS HOW YOU ARE TO USE THESE SCALES:

If I told you to think of the concept of school, and gave you a list of words, you could rate the concept of school somewhere along the space as being more or less your particular feeling:

SCHOOL

PLEASANT_____:_____:_____:_____:_____:_____:_____UNPLEASANT

Since there are seven spaces with the words pleasant and unpleasant on either side, you might check off the sixth space, because you feel that school is relatively unpleasant.

But if you think of words like fair and unfair about school, you might check off the space closest to fair.

FAIR_____:_____:_____:_____:_____:_____:_____UNFAIR

Finally, if you think of words like heavy and light about school, you might check off a space close to heavy because you feel that school is a heavy place to be for you.

HEAVY_____:_____:_____:_____:_____:_____:_____LIGHT

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging, that is the heroin-related or neutral slides.

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or, if the scale is completely irrelevant to you, unrelated to the concept, then you should place your check-mark in the middle of the space.

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Don't worry or puzzle over individual items. It is your first impressions, the immediate feelings about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

HEROIN RELATED SLIDES

HAPPY_____:_____:_____:_____:_____:_____:_____SAD

HARD_____:_____:_____:_____:_____:_____:_____SOFT

EMPTY_____:_____:_____:_____:_____:_____:_____FULL

WEAK_____:_____:_____:_____:_____:_____:_____STRONG

DARK_____:_____:_____:_____:_____:_____:_____BRIGHT

LIGHT_____:_____:_____:_____:_____:_____:_____HEAVY

GOOD_____:_____:_____:_____:_____:_____:_____BAD

SHALLOW_____:_____:_____:_____:_____:_____:_____DEEP

UGLY_____:_____:_____:_____:_____:_____:_____BEAUTIFUL

SERIOUS_____:_____:_____:_____:_____:_____:_____HUMOROUS

PLEASANT_____:_____:_____:_____:_____:_____:_____UNPLEASANT

LARGE_____:_____:_____:_____:_____:_____:_____SMALL

Go on to the next page....

HEROIN RELATED SLIDES

FOOLISH_____:_____:_____:_____:_____:_____:_____WISE

THIN_____:_____:_____:_____:_____:_____:_____THICK

TENSE_____:_____:_____:_____:_____:_____:_____RELAXED

GENTLE_____:_____:_____:_____:_____:_____:_____VIOLENT

DANGEROUS_____:_____:_____:_____:_____:_____:_____SAFE

WIDE_____:_____:_____:_____:_____:_____:_____NARROW

SANE_____:_____:_____:_____:_____:_____:_____CRAZY

MASCULINE_____:_____:_____:_____:_____:_____:_____FEMININE

DIRTY_____:_____:_____:_____:_____:_____:_____CLEAN

PEACEFUL_____:_____:_____:_____:_____:_____:_____FEROCIOUS

HEALTHY_____:_____:_____:_____:_____:_____:_____SICK

POTENT_____:_____:_____:_____:_____:_____:_____IMPOTENT

Go on to the next page....

NEUTRAL SLIDES

SMALL_____:_____:_____:_____:_____:_____:_____LARGE

UNPLEASANT_____:_____:_____:_____:_____:_____:_____PLEASANT

HUMOROUS_____:_____:_____:_____:_____:_____:_____SERIOUS

BEAUTIFUL_____:_____:_____:_____:_____:_____:_____UGLY

DEEP_____:_____:_____:_____:_____:_____:_____SHALLOW

BAD_____:_____:_____:_____:_____:_____:_____GOOD

HEAVY_____:_____:_____:_____:_____:_____:_____LIGHT

BRIGHT_____:_____:_____:_____:_____:_____:_____DARK

STRONG_____:_____:_____:_____:_____:_____:_____WEAK

FULL_____:_____:_____:_____:_____:_____:_____EMPTY

SOFT_____:_____:_____:_____:_____:_____:_____HARD

SAD_____:_____:_____:_____:_____:_____:_____HAPPY

Go on to the next page....

NEUTRAL SLIDES

IMPOTENT_____:_____:_____:_____:_____:_____:_____POTENT

SICK_____:_____:_____:_____:_____:_____:_____HEALTHY

FEROCIOUS_____:_____:_____:_____:_____:_____:_____PEACEFUL

CLEAN_____:_____:_____:_____:_____:_____:_____DIRTY

FEMININE_____:_____:_____:_____:_____:_____:_____MASCULINE

CRAZY_____:_____:_____:_____:_____:_____:_____SANE

NARROW_____:_____:_____:_____:_____:_____:_____WIDE

SAFE_____:_____:_____:_____:_____:_____:_____DANGEROUS

VIOLENT_____:_____:_____:_____:_____:_____:_____GENTLE

RELAXED_____:_____:_____:_____:_____:_____:_____TENSE

THICK_____:_____:_____:_____:_____:_____:_____THIN

WISE_____:_____:_____:_____:_____:_____:_____FOOLISH

INSTRUCTIONS

Below you will find some statements which deal with the issue of heroin addiction. Some people agree with these statements while others do not.

Please complete each statement in terms of what you really think.

1. Many well-adjusted people become addicted.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

2. The only thing wrong with heroin addiction is that there is a law against it.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

3. There is nothing that an addict could not do if he had heroin all of the time, that is, if he did not have to worry about his supply.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

4. All heroin addicts are pretty much alike.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

5. I am in favour of making heroin legal for addicts.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

6. Any heroin addict with will power should be able to give up heroin on his own.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

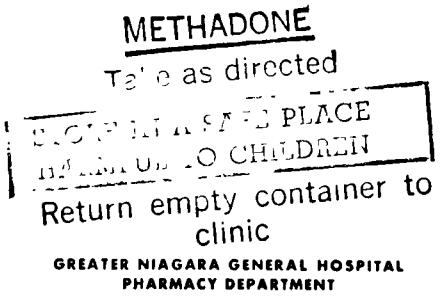
7. A heroin addict is more respectable than an alcoholic.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

8. It is very acceptable to smoke marijuana from time to time, but never to take heroin.

   Strongly agree__ Agree__ No Opinion__ Disagree__ Strongly disagree__

APPENDIX 2


METHADONE
Take as directed
KEEP IN A SAFE PLACE
AWAY FROM CHILDREN
Return empty container to clinic
GREATER NIAGARA GENERAL HOSPITAL
PHARMACY DEPARTMENT

APPENDIX 3

INFORMATION SHEET TO ALL PEOPLE IN THE METHADONE PROGRAM

My name is Nathan Mandelzys and I am a student in psychology at the University of Ottawa. For my Ph.D. thesis I am interested in doing research on (1) effects of methadone, and (2) some of the basic factors involved in heroin addiction.

I would therefore appreciate your help in a project which I would like to undertake to investigate these two topics. I think we are both interested in the nature of addiction, and perhaps we can work together in coming up with some answers.

The study will involve your cooperation in a testing procedure that I think you will find interesting, both from your own viewpoint and for the sake of much needed research in this particular area. It is basically a simple procedure and you will be told exactly what to do. There is a brief interview period to find out some basic information from you, and a testing period. I have set up three conditions, and you will be assigned to one of them in a random fashion. Each person who participates will be assigned to only one of three conditions. The conditions have been set up in terms of when you get your methadone.

There are no tricks in this study. Everybody will take their methadone as usual, the only difference between the groups is when you take it, due to the type of questions I am trying to answer in my study.

The procedure is very straightforward. It is not a 'test' of any kind at all, but for the purposes of the study, that's what I call it. You will be asked to watch a series of slides related to various aspects of heroin taking while I record your physiological responses on a polygraph. This is an absolutely painless, comfortable procedure. I will be attaching some electrodes to your fingers and wrists and you will sit comfortably in a chair watching the slides. As well, you will be asked to fill out some questionnaires about how you feel at the time, and what you think about heroin and methadone.

The whole thing should take about 2 hours of your time and you will be paid $15.00 or $20.00 for your participation. How much you will be paid depends on how many people participate in the study.

All of the information that I collect will be completely confidential. I am not interested in any particular person and his responses, but rather, the differences between the groups of people, therefore, there is no need to feel any anxiety about the testing procedure.

There is one thing that I must insist on: You must be 'clean' the day of the experiment. That includes not even taking the softest drug before the experiment, for example, grass, valium, etc. For my results to be representative of what I am looking at in this study it is absolutely essential that you do not take any drug the day that I see you. As usual, routine urine samples will be taken the day of the experiment.

If you decide to participate I think you will find the whole experience quite interesting and enjoyable.

REMEMBER: You will be tested only once, you will receive your daily dose of methadone before you leave the clinic, and you will be paid at least $15,00 for participating.

Please answer on the next page as to whether you want to participate or not and give your answer to your clinic director. This will give me some indication as to how many people are available in each clinic.

Thank You.

PROTOCOL FOR A METHADONE MAINTENANCE PROGRAM FOR THE MANAGEMENT OF OPIATE DEPENDENCY

1. COMMUNITY:

The Department of Psychiatry of the Greater Niagara General Hospital has 36 beds of a total of a 410 bed hospital, is responsible for the psychiatric services of the new Municipality of Niagara Falls, which covers the old Township of Niagara Falls, Chippawa, Willoughby, and part of Crowland. The Department also is responsible for psychiatric programming for the new Municipality of Fort Erie, which covers the old Township of Fort Erie, Stevensville, Ridgeway, and Crystal Beach. We serve a total population of approximately 90,000 people and a geographical area of approximately 255 square miles.

The municipality of Niagara Falls has a very mixed cultural and ethnic and social economic background. It is estimated that approximately 40% of the population is of Italian descent. Due to its location in Southern Ontario, we have approximately double the national average of people over the age of 65. The economic stability of the community is based both on heavy and light industry, it is estimated that 80% of the wage income comes from this source and the balance of 20% from the tourist industry. Within the short distance of the Niagara River there are four bridge crossings to the United States, and this creates a heavy transient vehicle movement, it is estimated that over the four bridges approximately ten and a half million vehicles pass annually. It is also estimated that between ten and twelve million people visit the City annually as a tourist attraction.

It is this area and its population that the programme is planned to serve and limit its operation.

2. NEEDS:

There is no clear statistical evidence as to the number of people that use heroin in the area serviced by the Department of Psychiatry. It has been subjectively stated that we are the third highest user-area in Canada, but it has also been subjectively stated that the drug abuse is no worse in this City than in any other across Canada. It is estimated that approximately 20 people could be described as "hard core criminally addicted", to the dependency on opiates. Similarly, it is estimated that there are approximately 200 people who use opiates to a lesser extent. Numbers here tend to fluctuate depending on the availability, quality, and price of heroin and the availability of other street drugs. In a recent study carried out by the Addiction Research Foundation there is evidence of a strong transient population amongst the user population in the area. There is some speculation that since amphetamines have become less available through recent legislation, there has been some slight increase in the use of opiates on the user level.

Some 18 months ago it became apparent that there was a need in the community for some form of methadone maintenance as a replacement for the illegal use of heroin, and since that date 68 people have been seen and treated by this unit. The majority of these users are not the hard core criminal addict. Of the 68 people, 4 have been accommodated at the request of other programmes while the individual has been temporarily visiting this area. Of the remaining 64 (46 male and 18 females) all have been within the age group of 16 to 25, of these 7 have been in the age bracket of 16 to 18, but none of this age have been seen in the past year. It is estimated that out of a population of 90,000, approximately 12% of this group falls in the age category of 18 to 25. The

unit tends to offer a secondary or tertiary preventative method in treating these people and is only vaguely involved in primary prevention by being involved and sharing in an on-going dialogue with interested groups who are dealing directly with this vulnerable age group.

3. OBJECTIVES:

3.1 To establish a treatment centre for opiate dependency as a service to the community.

3.2 To offer to the opiate user a legal alternative to their present illegal dependency.

3.3 By providing a valid alternative to illegal opiate to reduce the amount of petty crime in the community.

3.4 To provide easy access to other programmes that may be advisable to help the user change his present life style and dependency.

3.5 To reduce the need to use emergency facilities and hospital in-patient beds.

3.6 To improve the basic health of the individual.

3.7 To help the individual to be a more responsible citizen within the community in a productive labour force.

3.8 To help the individual to be a more responsible citizen within the community in his involvement with the general well being and running of the community.

3.9 To provide a focal point in the community where help is immediately available.

4. CRITERIA FOR ADMISSION:

4.1 The patient will be 19 years of age or older.

4.2 They will have a history of heroin usage for at least nine months and to such a degree that it is having a significant affect on the present life style of the individual.

4.3 Any person with less than 9 months usage of heroin will be given consideration for the program, if attempts under medical direction for withdrawal have proved unsuccessful.

4.4 An agreement to follow through with the expectation of the programme and a committment as outlined in the Appendix A.

4.5 Should a user be pregnant when screened for admission to the programme, she will be accepted in on the understanding that she will attempt to be off the programme some six weeks prior to expected date of delivery.

4.6 To show some degree of motivation in a willingness to attempt to change the person's present life-style in a dependency nature, but also some motivation to change his present mode of deviate behaviour.

5. SCREENING PROCEDURE:

5.1 The taking of a detailed history from the patient which will include details of the drugs used, employment, family involvement, etc., as per Appendix B.

5.2 The confirmation of the above history from spouse or family member.

5.3 Confirmation and contact with other social agencies in the community that have had contact or involvement with the user, i.e., family doctor, Addiction Research Foundation, Children and Family Services, lawyers, probation officers, etc.

5.4 A physical assessment of the patient either by his family physician, or if this is not obtainable, through the Young Adult Clinic run by the hospital.

5.5 Patients who have not had a regular family physician will be encouraged to make contact with a family doctor within the community.

5.6 A confirmation, if necessary, of pregnancy and clear direction to the user re the affect of opiate dependency of the child.

5.7 To encourage the user to obtain O.H.I.P coverage.

5.8 Identification of patient to be confirmed.

6. ADMISSION EVALUATION:

6.1 It is not proposed to admit the patient to hospital to confirm the diagnosis of heroin dependency. Niagara Falls is a small city. The amount of information gained from the patients and the numerous agencies that this programme is in close contact with makes it very unlikely that heroin addiction will be over diagnosed.

6.2 If admission for observation and treatment of symptoms is felt valuable at the point of evaluation, the Alcoholic and Drug Addiction unit of the hospital will be the first treatment facility considered.

7. TREATMENT PROCEDURE:

7.1 Details of staffing of the programme are attached in Appendix C.

7.2 A relatively low dose of methadone hydrochloride will be used. Over the past year the average daily prescribed amount is approximately 30 mg. daily.

7.3 It has been found this dose to be effective and in accordance with the findings of Goldstein, who found the differences between groups maintained on 30 - 50 and 100 mg. daily, when they exist at all, are very small. This statement applies to all criteria, including heroin use, supervisorship on the programme, clinical attendance, arrests, symptomatology, and so on. (Goldstein: Blind control dosage comparisons in 200 patients, in proceedings of the Third National Conference on Methadone Treatment, Public Health Serivce Publication 2172. Government Printing Office 1970, pages 31-37.

Goldstein, A.: Pharmalogic Basis of Methadone Treatment in the Fourth National Conference on Methadone Treatment. New York, The National Association for the Prevention of Addiction to Narcotics, to be published.)

7.4 All patients will receive methadone hydrochloride, this will be dissolved by the outpatient nurse in 4 oz. of Tang or similar orange juice. This amount will be dispensed and consumed in the presence of the programme nurse, unless otherwise directed.

7.5 For the first three weeks at least, daily attendance on the unit will be required or until a sufficiently good working relationship has been developed between the user and the programme staff, and it is felt that the patient is following within the rules and intentions of the programme.

7.6 At a later date, when the above working relationship has been developed satisfactorily, methadone hydrochloride dispensed in 4 oz. of orange juice may be given to the patient so that it may be consumed at home and reduce his attendance on the unit over a week-end period initially.

7.7 At a later date in the treatment programme it is hoped that the individual will be visiting the unit only on Mondays, Wednesdays, and Fridays, and taking home with him the appropriate dose for Tuesday, Thursday, Saturday and Sunday.

7.8 In exceptional cases it is proposed that three days' supply may be given on one occasion.

7.9 The 4 oz. bottles have been labelled to the approval of the hospital pharmaceutical director, to be sufficiently safe for prevention of unauthorized use. A copy of labelling is attached in Appendix E.

7.10 Attendance at the clinic will be encouraged during morning and afternoon hours to maintain patient and outpatient staff contact to the maximum.

7.11 If through employment or other domestic situations it is impossible to attend during stated hours, then alternative hours may be negotiated between user and staff.

7.12 During the first 7 days, urine samples will be collected daily and then for the next 3 weeks random samples, at least 3 times weekly, will be taken. From then onwards it is random sampling at the discretion of the programme nurse.

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7.11 If through employment or other domestic situations it is impossible to attend during stated hours, then alternative hours may be negotiated between user and staff.

7.12 During the first 7 days, urine samples will be collected daily and then for the next 3 weeks random samples, at least 3 times weekly, will be taken. From then onwards it is random sampling at the discretion of the programme nurse.

7.13 Once a urine sample has been requested, no methadone hydrochloride will be dispensed until a satisfactory sample is given. This sample may be tested either by the duty nurse or by the laboratory staff to ascertain that it is urine.

7.14 Normally the patient will not be observed voiding; although the clinic reserves the right if there is any suspicion that a substitute is given, then close observation will be maintained.

7.15 The method of screening urine samples for drugs is attached in Appendix D.

7.16 If a urine sample is not obtainable and it is felt advisable at this point, the duty nurse may request a blood sample to be taken by the laboratory for appropriate testing for ascertaining drugs as in item 14 above.

7.17 It is proposed to issue all users on the programme with an identification card that he may carry with him at all times in case there should be any untold emergency, as per Appendix F. A signature on the identification card will be his acceptance for photographing. Identification cards are issued for a maximum period of three months, then renewed.

7.18 All patients who are involved in the methadone programme are expected to attend a weekly group session, unless it has been decided that he or she may be excluded. It is expected that they will attend at least 3 out of 4 sessions.

7.19 If a patient is excluded, it is expected he will be involved in some other form of counselling, either individual, conjoint, or family.

7.20 All of the treatment programmes in the hospital, and in particular in the Department of Psychiatry, will be open to the patient if it is felt it will be beneficial in helping them change their present life style.

7.21 The source of methadone hydrochloride will be the hospital pharmacy.

7.22 Methadone hydrochloride will be received by the programme nurse in tablet form. The nurse will be responsible for the dispensing of appropriate amounts of methadone hydrochloride to each individual patient's bottle. Individual bottles will be given to the patient when possible by programme nurse. At other times by the designated unit medication nurse.

7.23 The methadone hydrochloride tablets and the individual prepared bottles will be kept in a double locked cupboard, in a locked room on the Department of Psychiatry.

7.24 The hospital is opening a new Ambulatory Care Unit and it is our expectation that the programme will be operated from this unit. Storage of methadone hydrochloride will be similar to 7.23.

8. FOLLOW-UP PROGRAMME:

8.1 A critical review of the present methods of treatment is a continual factor within the programme. Regular consultation is carried out between the local representatives of the addiction research foundation and consistent communication and meetings are maintained between ourselves and other methadone maintenance programmes in the area, i.e., St. Catharines,

8.2 It is proposed in consultation with the research worker at the local Addiction Research Foundation to build up some form of on-going evaluation of our programme by looking at the changes in life styles of the patients who have been through and are currently involved with our treatment.

8.3 Other processes of treatment and evaluation of life style change are being reviewed currently by the group therapy leaders (programme nurse and two social workers), attending at Group Leader Therapy group at Brock University.

APPENDIX A

GREATER NIAGARA GENERAL HOSPITAL

METHADONE MAINTENANCE RULES

This programme is intended to provide you with a maintenance dose of methadone while you, with our help, work towards your own cure from your stated habit of using heroin. The following rules have been laid down to give you some guidelines as to your commitment to the programme.

1. Methadone medication will only be given out daily within the following hours: ~~2.00 to 2.30~~ 10 30 & 11 30 a.m. p.m., 7.00 to 7.30 p.m.

2. Methadone may be given outside these hours by prior arrangement with either the programme nurse or social worker or at the discretion of the duty nurse.

3. When a person comes on the programme he will be expected to come daily for medication and until a sufficiently good working relationship has been developed between the user and the staff, then one or more doses of medication may be given out. This is with prior arrangement and discussion with the appropriate staff member.

4. Group therapy sessions will be held weekly for the benefit of all persons on the programme whereby they may work out any problems relating to the fulfillment of both the individual and group goals as determined by the programme. The effectiveness of group process is in direct proportion to the group's discretion. It is therefore expected that all persons will make every effort to participate to the fullest extent in

group therapy. Failure to attend, unless prior arrangements or agreement with the programme staff, may lead to loss of privileges or possible withdrawal from the programme unless alternative type of therapy is replaced.

5. If any person on the programme misses attendance or is denied methadone for two or more successive days without prior arrangement, he or she is automatically withdrawn from the programme until reviewed.

6. Urine samples will be collected for urinalysis on a random basis, at the discretion of the programme staff, it is therefore advisable for all persons to come prepared. Once a sample is requested, no methadone will be given until a specimen is supplied, and it is at the discretion of the nurse on duty whether this sample be accepted as urine or she may take appropriate methods to test it out.

7. If it is suspected that urine samples are not genuine, or tampered with, it is at the discretion of the duty nurse to request a blood sample and the above ruling will equally apply.

8. Since we are a methadone control programme authorized under the Department of National Health and Welfare some minimal details are required to be returned monthly to Ottawa.

9. Any person we know to be still hitting while on the programme, may be cut off therapy until reviewed by the programme staff.

group therapy. Failure to attend, unless prior arrangements or agreement with the programme staff, may lead to loss of privileges or possible withdrawal from the programme unless alternative type of therapy is replaced.

5. If any person on the programme misses attendance or is denied methadone for two or more successive days without prior arrangement, he or she is automatically withdrawn from the programme until reviewed.

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7. If it is suspected that urine samples are not genuine, or tampered with, it is at the discretion of the duty nurse to request a blood sample and the above ruling will equally apply.

8. Since we are a methadone control programme authorized under the Department of National Health and Welfare some minimal details are required to be returned monthly to Ottawa.

9. Any person we know to be still hitting while on the programme, may be cut off therapy until reviewed by the programme staff.

APPENDIX 4

RAW SCORES

PROFILE OF MOOD STATES

GROUP	Ss No.	Tension		Depression		Anger		Vigor		Fatigue	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Abstinent	1	59	66	67	67	48	64	44	35	49	66
	2	56	48	46	46	51	47	46	41	54	55
	3	56	65	51	51	70	64	55	49	49	49
	4	55	76	72	64	58	80	37	35	75	75
	5	58	52	56	46	48	47	37	49	49	45
	6	74	66	46	56	51	61	46	40	60	58
	7	56	76	64	56	70	61	55	54	54	55
	8	54	61	51	62	48	47	54	60	43	43
	9	56	69	62	46	48	49	46	41	66	66
	10	55	76	59	51	49	72	54	49	46	58
	11	63	68	59	46	69	51	59	38	43	55
	12	74	51	46	64	61	66	41	43	63	51
Placebo	1	79	76	51	51	68	65	46	43	54	40
	2	48	48	46	46	48	42	55	49	41	40
	3	48	59	64	51	47	48	54	49	54	54
	4	52	51	59	45	64	51	44	41	55	52
	5	72	65	56	59	51	69	46	44	72	73
	6	48	42	56	47	51	49	49	49	55	52
	7	67	51	62	62	70	49	40	46	58	52
	8	55	54	46	44	41	42	44	40	63	46
	9	40	40	51	45	57	47	51	44	41	60
	10	54	67	56	59	66	76	46	41	46	69
	11	51	42	56	51	56	58	44	49	60	57
	12	56	55	51	47	56	41	46	44	54	54
Methadone	1	45	43	53	46	47	44	46	44	37	48
	2	47	55	56	51	53	42	51	52	57	52
	3	56	60	46	46	52	41	44	44	59	58
	4	59	58	59	46	72	53	55	46	49	54
	5	43	42	56	52	51	40	44	51	52	54
	6	54	45	56	56	49	41	43	41	49	51
	7	63	56	56	57	53	58	30	46	55	51
	8	60	54	64	45	48	45	41	49	55	52
	9	47	43	51	44	60	53	46	38	51	52
	10	56	41	46	44	51	49	30	46	46	37
	11	59	67	46	44	45	40	32	38	57	52
	12	60	55	64	53	49	42	41	44	48	57
Control	1	47	51	59	46	58	48	55	51	55	60
	2	47	47	46	45	45	44	44	44	52	52
	3	43	42	51	44	47	44	59	46	51	61
	4	51	42	46	44	51	42	73	44	45	55
	5	49	41	56	46	57	44	43	46	55	51
	6	49	42	59	47	49	45	44	46	49	49
	7	42	43	46	54	62	48	57	52	43	49
	8	42	56	59	56	54	48	35	35	61	55
	9	43	45	56	43	45	53	49	55	54	51
	10	35	56	46	46	47	45	59	54	57	46
	11	47	35	46	46	45	44	57	62	45	46
					56	48	45	54	40	54	48

MEANS & STANDARD DEVIATIONS

PROFILE OF MOOD STATES

		TENSION		DEPRESSION		ANGER		VIGOR		FATIGUE	
		PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
ABSTINENT	$\bar{x}$	59.66	64.50	56.58	8.74	55.92	9.27	48.25	7.94	54.67	10.01
	SD	7.10	9.80	54.58	8.04	59.08	10.93	44.50	7.75	56.33	9.22
PLACEBO	$\bar{x}$	55.83	54.16	54.50	5.70	56.25	9.19	47.08	4.40	54.42	8.84
	SD	11.28	11.03	50.58	6.21	53.08	11.43	44.92	3.42	54.08	9.99
METHADONE	$\bar{x}$	54.08	51.58	54.42	6.33	52.50	7.22	41.92	7.87	51.25	6.07
	SD	6.81	8.49	48.67	4.85	45.67	6.09	44.92	4.48	51.50	5.30
CONTROL	$\bar{x}$	45.25	45.92	51.75	5.72	50.67	5.77	52.42	10.03	51.75	5.40
	SD	4.41	6.43	47.75	4.73	45.83	2.95	47.92	7.28	51.92	4.96

T SCORES

OPIATE WITHDRAWAL SCALE

GROUP	Ss No.	PRE SLIDES	POST SLIDES
Abstinent	1	80	62
	2	82	85
	3	75	77
	4	72	64
	5	85	59
	6	75	72
	7	77	66
	8	85	82
	9	82	62
	10	77	51
	11	77	68
	12	73	73
Placebo	1	68	70
	2	43	55
	3	66	75
	4	75	75
	5	64	72
	6	66	43
	7	70	70
	8	68	70
	9	66	73
	10	73	84
	11	66	51
	12	47	55
Methadone	1	68	73
	2	66	55
	3	47	59
	4	77	87
	5	80	68
	6	75	79
	7	70	77
	8	55	62
	9	75	75
	10	62	68
	11	43	59
	12	82	66

TOTAL SCORES

OPIATE WITHDRAWAL SCALE

GROUP	Ss No.	PRE SLIDES	POST SLIDES
Abstinent	1	25	13
	2	26	28
	3	18	21
	4	16	11
	5	21	13
	6	22	16
	7	21	12
	8	26	22
	9	26	12
	10	18	9
	11	26	18
	12	18	16
Placebo	1	18	21
	2	5	8
	3	16	20
	4	17	17
	5	14	15
	6	12	5
	7	16	14
	8	17	19
	9	16	17
	10	21	23
	11	16	8
	12	6	8
Methadone	1	17	21
	2	15	8
	3	6	10
	4	26	34
	5	25	15
	6	23	22
	7	16	24
	8	8	15
	9	23	21
	10	14	15
	11	5	9
	12	26	14

MEANS AND STANDARD DEVIATIONS

OPIATE WITHDRAWAL SCALE

GROUP	STATISTIC	VARIABLE	PRE SLIDES	POST SLIDES
Abstinent	$\bar{x}$	T score	78.33	68.42
	SD		7.59	9.85
Placebo	$\bar{x}$	T score	64.33	66.08
	SD		9.60	12.11
Methadone	$\bar{x}$	T score	66.67	69.00
	SD		12.72	7.73
Abstinent	$\bar{x}$	Total score	21.92	15.92
	SD		5.08	4.05
Placebo	$\bar{x}$	Total score	14.50	14.58
	SD		4.72	5.99
Methadone	$\bar{x}$	Total score	17.00	17.33
	SD		9.52	7.44

SEMANTIC DIFFERENTIAL

EVALUATIVE FACTOR

GROUP	Ss No.	HEROIN		METHADONE	
		Pre Slides	Post Slides	Pre Slides	Post Slides
Abstinent	1	3.42	3.17	2.83	2.92
	2	3.17	5.34	2.84	3.83
	3	4.59	4.42	4.00	4.08
	4	2.91	5.33	3.33	3.58
	5	2.59	5.17	3.33	3.58
	6	2.33	3.66	2.58	3.08
	7	5.50	5.50	3.33	2.58
	8	1.50	2.33	3.08	2.33
	9	5.59	5.58	3.92	3.92
	10	3.08	4.42	2.83	3.08
	11	5.09	4.50	2.75	3.75
	12	4.66	4.58	2.83	2.92
	$\bar{x}$	3.70	4.50	3.14	3.30
Placebo	1	5.00	5.58	2.25	3.58
	2	5.25	4.84	3.58	3.58
	3	5.25	6.00	2.84	3.58
	4	5.75	5.17	2.67	2.42
	5	5.00	5.25	3.33	2.92
	6	3.08	3.92	1.66	2.67
	7	6.33	6.08	2.50	2.50
	8	2.67	3.67	1.91	3.50
	9	5.75	5.75	2.67	3.83
	10	2.08	5.08	2.08	2.17
	11	1.92	5.08	1.92	2.08
	12	5.42	5.08	2.83	2.08
	$\bar{x}$	4.46	5.12	2.52	2.91
Methadone	1	5.08	5.42	3.25	2.67
	2	6.58	6.17	4.42	3.83
	3	5.83	6.33	3.58	4.33
	4	5.75	6.42	3.00	3.33
	5	5.50	5.75	3.50	3.92
	6	3.25	6.08	3.25	3.08
	7	6.08	6.25	4.00	3.33
	8	2.67	4.75	3.00	2.50
	9	6.42	6.00	2.92	3.08
	10	3.17	6.00	3.17	3.08
	11	5.95	6.17	3.25	3.50
	12	6.08	5.50	4.00	3.42
	$\bar{x}$	5.19	5.90	3.44	3.33

SEMANTIC DIFFERENTIAL

POTENCY FACTOR

GROUP	Ss No.	HEROIN		METHADONE	
		Pre Slides	Post Slides	Pre Slides	Post Slides
Abstinent	1	3.00	5.50	3.75	4.42
	2	4.58	4.33	4.67	4.25
	3	5.17	5.08	4.58	3.75
	4	3.83	4.17	4.33	4.67
	5	5.00	5.42	4.67	5.50
	6	5.00	4.58	5.00	5.08
	7	5.00	4.42	4.83	4.50
	8	3.33	3.67	4.08	3.42
	9	4.00	4.83	4.25	4.25
	10	4.17	4.17	4.33	3.42
	11	2.33	3.83	2.83	2.58
	12	5.17	4.75	5.17	5.25
	$\bar{x}$	4.22	4.56	4.37	4.26
Placebo	1	5.08	6.17	4.25	4.58
	2	4.00	5.42	4.08	4.67
	3	5.58	6.00	4.75	4.17
	4	5.00	5.17	3.75	4.00
	5	6.33	5.92	5.58	5.33
	6	5.00	5.92	5.00	4.75
	7	4.75	6.00	4.92	4.83
	8	4.25	4.17	2.08	2.92
	9	4.00	4.17	4.42	4.83
	10	4.67	4.75	5.08	5.58
	11	3.00	2.92	1.75	1.75
	12	5.50	6.08	6.00	5.08
	$\bar{x}$	4.76	5.22	4.30	4.37
Methadone	1	6.50	5.83	3.92	4.92
	2	3.58	4.08	3.67	4.67
	3	6.42	6.25	3.50	4.83
	4	3.58	4.58	1.92	4.33
	5	6.08	6.17	5.58	6.67
	6	5.00	4.17	4.25	4.42
	7	4.00	3.92	3.17	4.58
	8	3.25	4.33	2.17	2.75
	9	3.58	3.92	3.42	4.75
	10	5.00	5.17	4.33	4.50
	11	3.42	3.08	2.17	2.42
	12	5.08	5.83	5.17	6.00
	$\bar{x}$	4.62	4.78	3.60	4.57

SEMANTIC DIFFERENTIAL

CONTROL GROUP

SS No.	EVALUATIVE FACTOR	
	Heroin-Related Slides	Neutral Slides
1	6.00	2.42
2	6.00	2.75
3	5.17	2.17
4	5.75	2.25
5	6.08	2.33
6	6.50	2.00
7	5.33	3.58
8	5.58	2.00
9	6.17	2.00
10	5.83	2.42
11	6.08	1.92
12	6.25	2.00
$\bar{x}$	5.90	2.32
SD	0.38	0.47

SS No.	POTENCY FACTOR	
	Heroin-Related Slides	Neutral Slides
1	5.92	2.42
2	3.33	4.58
3	6.08	2.08
4	4.75	3.66
5	6.58	3.92
6	3.33	4.42
7	2.83	3.83
8	5.00	2.08
9	2.25	4.67
10	4.92	4.00
11	5.58	1.75
12	4.83	3.92
$\bar{x}$	4.62	3.44
SD	1.38	1.06

ATTITUDES TOWARDS ADDICTS-CONTROL

SS No.	Pre-Slides	Post-Slides
1	24	31
2	31	30
3	34	33
4	29	28
5	26	25
6	25	24
7	28	27
8	34	34
9	36	35
10	31	33
11	31	30
12	32	34
$\bar{x}$	30.08	30.33
SD	3.78	3.68

APPENDIX 5

BASAL (TONIC) HEART RATE

GROUP	CONDITION	ORDER	MEAN	S.D.	VMIN[1]	VMAX[2]
Abstinent	Pre-Drug Slides	First	78.50	7.26	66	85
Placebo	Pre-Drug Slides	First	80.17	8.73	67	92
Methadone	Pre-Drug Slides	First	77.83	2.86	74	82
Control	Pre-Drug Slides	First	81.17	2.99	78	85
Abstinent	Pre-Neutral Slides	First	76.50	6.92	64	84
Placebo	Pre-Neutral Slides	First	79.67	2.34	76	82
Methadone	Pre-Neutral Slides	First	76.17	8.86	68	92
Control	Pre-Neutral Slides	First	75.83	8.95	62	90
Abstinent	Pre-Drug Slides	Second	85.33	6.89	80	90
Placebo	Pre-Drug Slides	Second	86.83	8.13	75	85
Methadone	Pre-Drug Slides	Second	85.17	2.99	80	88
Control	Pre-Drug Slides	Second	80.33	4.63	74	88
Abstinent	Pre-Neutral Slides	Second	82.83	5.38	78	92
Placebo	Pre-Neutral Slides	Second	89.00	12.05	78	92
Methadone	Pre-Neutral Slides	Second	85.00	9.53	68	96
Control	Pre-Neutral Slides	Second	81.33	7.12	73	89

[1]Refers to lowest single score. [2]Refers to highest single score

MEANS AND STANDARD DEVIATIONS FOR THE FILLER SLIDE HEART RATE DATA, PRE-SLIDE, POST-SLIDE AND FOR THE DIFFERENCE SCORES

GROUP	CONDITION	ORDER	MEAN	S.D.	VMIN	VMAX
PRE-SLIDE						
Abstinent	Pre-Drug	First	75.43	10.91	68	88
Placebo	Pre-Drug	First	84.33	8.62	74	94
Methadone	Pre-Drug	First	81.07	3.00	76	85
Control	Pre-Drug	First	82.58	3.67	77	86
Abstinent	Pre-Neutral	First	74.95	6.63	61	79
Placebo	Pre-Neutral	First	77.90	8.75	67	84
Methadone	Pre-Neutral	First	76.63	7.71	63	88
Control	Pre-Neutral	First	77.28	10.42	71	95
Abstinent	Pre-Drug	Second	87.87	12.93	77	94
Placebo	Pre-Drug	Second	87.37	8.67	73	91
Methadone	Pre-Drug	Second	85.30	5.52	76	95
Control	Pre-Drug	Second	82.33	5.28	72	91
Abstinent	Pre-Neutral	Second	84.10	6.08	71	96
Placebo	Pre-Neutral	Second	91.44	12.62	71	95
Methadone	Pre-Neutral	Second	90.08	5.35	70	95
Control	Pre-Neutral	Second	83.57	8.71	61	89
POST-SLIDE						
Abstinent	Pre-Drug	First	76.70	9.94	69	87
Placebo	Pre-Drug	First	83.42	8.23	73	89
Methadone	Pre-Drug	First	82.52	3.12	78	85
Control	Pre-Drug	First	85.22	6.25	75	91
Abstinent	Pre-Neutral	First	75.45	6.78	62	79
Placebo	Pre-Neutral	First	78.05	7.67	63	83
Methadone	Pre-Neutral	First	73.13	10.02	62	87
Control	Pre-Neutral	First	77.06	9.61	66	85
Abstinent	Pre-Drug	Second	85.70	7.72	78	92
Placebo	Pre-Drug	Second	89.07	6.67	81	95
Methadone	Pre-Drug	Second	85.15	5.63	78	90
Control	Pre-Drug	Second	83.78	6.83	75	88
Abstinent	Pre-Neutral	Second	83.13	6.17	73	88
Placebo	Pre-Neutral	Second	89.35	4.20	80	93
Methadone	Pre-Neutral	Second	81.08	4.60	73	85
Control	Pre-Neutral	Second	83.18	8.86	73	91
DIFFERENCE SCORES						
Abstinent	Pre-Drug	First	1.60	1.21	0.50	3.20
Placebo	Pre-Drug	First	1.44	1.28	0.00	3.50
Methadone	Pre-Drug	First	1.68	0.94	0.50	3.00
Control	Pre-Drug	First	3.19	2.40	1.00	7.00
Abstinent	Pre-Neutral	First	1.17	1.32	0.00	3.40
Placebo	Pre-Neutral	First	1.35	0.66	0.60	2.00
Methadone	Pre-Neutral	First	1.83	0.82	1.00	3.00
Control	Pre-Neutral	First	2.28	1.60	0.00	5.00
Abstinent	Pre-Drug	Second	2.92	2.16	1.03	7.00
Placebo	Pre-Drug	Second	2.84	0.98	2.00	4.40
Methadone	Pre-Drug	Second	1.01	0.77	0.00	2.00
Control	Pre-Drug	Second	2.44	1.79	0.00	4.00
Abstinent	Pre-Neutral	Second	1.30	0.82	0.00	2.30
Placebo	Pre-Neutral	Second	2.48	2.30	0.33	5.00
Methadone	Pre-Neutral	Second	1.33	1.08	0.50	3.50
Control	Pre-Neutral	Second	1.09	0.55	0.67	2.00

RAW SCORES FOR THE PRE-STIMULUS HEART RATE FOR THE FOUR GROUPS

#	ABSTINENT Order 1	ABSTINENT Order 2	#	PLACEBO Order 1	PLACEBO Order 2	#	METHADONE Order 1	METHADONE Order 2	#	CONTROL Order 1	CONTROL Order 2
	DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL
1	81.88	87.52	13	75.00	82.86	25	92.45	96.79	37	84.84	89.79
2	78.24	86.56	14	80.09	89.70	26	84.35	86.27	38	81.83	87.43
3	88.63	83.88	15	87.28	88.20	27	88.61	91.52	39	84.73	82.12
4	89.72	94.80	16	83.88	88.61	28	88.91	75.14	40	72.30	78.44
5	93.42	78.61	17	103.14	93.10	29	85.48	92.50	41	87.25	87.87
6	93.67	89.43	18	84.13	91.11	30	83.77	88.96	42	71.74	82.24
	NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG
7	79.33	78.65	19	77.54	73.40	31	84.20	74.00	43	76.14	76.02
8	88.75	89.76	20	91.00	84.61	32	89.00	77.77	44	69.02	69.56
9	81.04	78.39	21	86.77	96.50	33	76.40	70.82	45	77.72	77.30
10	83.22	82.47	22	78.56	78.00	34	80.95	84.11	46	74.71	73.96
11	97.00	96.55	23	84.38	87.79	35	97.71	92.64	47	77.50	68.68
12	75.71	80.40	24	86.08	88.00	36	86.39	86.42	48	91.00	81.28

RAW SCORES FOR THE POST-STIMULUS HEART RATE FOR THE FOUR GROUPS

	ABSTINENT			PLACEBO			METHADONE			CONTROL	
#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2
	DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL
1	80.64	87.94	13	77.48	83.14	25	92.98	97.69	37	83.20	90.00
2	78.56	86.96	14	80.18	89.20	26	86.70	87.00	38	81.92	87.61
3	91.90	85.11	15	85.96	88.73	27	89.57	91.24	39	83.50	81.56
4	89.76	95.00	16	81.48	87.48	28	88.50	75.43	40	69.80	80.69
5	92.29	78.70	17	102.81	92.95	29	85.48	92.68	41	87.25	87.17
6	72.94	86.14	18	85.79	91.00	30	81.59	84.78	42	70.53	82.95
	NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG
7	78.83	78.45	19	77.58	74.72	31	82.73	75.07	43	76.86	74.11
8	89.50	91.44	20	87.69	84.06	32	88.22	75.92	44	71.75	68.38
9	81.61	79.72	21	86.86	98.81	33	76.75	72.50	45	78.06	76.39
10	83.22	81.47	22	75.78	77.93	34	82.70	82.74	46	76.06	72.52
11	95.81	96.36	23	84.44	87.38	35	97.75	93.04	47	79.30	66.64
12	75.67	80.12	24	89.58	88.95	36	85.91	84.67	48	90.23	80.50

RAW DATA FOR THE DIFFERENCE SCORES
FOR THE FOUR GROUPS

	ABSTINENT			PLACEBO			METHADONE			CONTROL	
#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2
	DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL
1	3.24	3.41	13	4.24	2.64	25	2.80	3.38	37	2.52	3.04
2	2.32	3.40	14	1.91	1.50	26	3.10	2.55	38	2.08	1.83
3	5.27	1.20	15	3.42	2.40	27	2.83	2.38	39	3.09	3.04
4	1.32	1.40	16	2.72	3.65	28	3.20	1.71	40	3.90	3.81
5	1.88	1.22	17	2.24	2.62	29	4.05	1.55	41	3.92	2.87
6	5.00	5.71	18	3.00	3.22	30	3.27	2.91	42	3.05	4.29
	NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG
7	2.83	2.70	19	3.79	2.20	31	2.53	2.50	43	2.52	2.20
8	3.42	3.68	20	4.08	2.89	32	1.78	2.00	44	2.92	2.31
9	2.48	2.11	21	2.45	4.31	33	2.55	2.50	45	1.67	2.17
10	2.33	2.53	22	4.78	2.93	34	3.25	4.00	46	3.47	3.52
11	4.19	3.00	23	2.94	3.08	35	1.96	2.96	47	3.80	4.32
12	2.29	3.08	24	4.17	5.58	36	3.87	3.00	48	2.62	2.00

RAW SCORES FOR THE HEART RATE ACCELERATION
FOR THE FOUR GROUPS

	ABSTINENT			PLACEBO			METHADONE			CONTROL	
#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2
	DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL
1	7.64	8.82	13	2.28	12.40	25	2.70	2.20	37	3.36	5.96
2	8.48	8.96	14	5.36	5.94	26	8.75	4.36	38	2.54	2.74
3	9.30	3.10	15	3.58	12.75	27	5.96	4.52	39	8.00	7.24
4	2.08	2.52	16	2.88	8.64	28	5.40	4.50	40	2.95	6.75
5	3.08	2.26	17	5.57	7.04	29	7.90	4.82	41	6.29	4.30
6	8.50	6.67	18	9.21	5.00	30	2.95	5.78	42	5.21	7.38
	NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG
7	2.25	3.50	19	9.46	12.40	31	2.47	5.64	43	5.62	2.28
8	6.04	7.52	20	2.85	5.94	32	3.00	1.23	44	6.94	3.69
9	6.39	8.39	21	6.50	12.75	33	6.60	7.68	45	5.00	4.35
10	5.89	5.11	22	7.56	8.64	34	6.60	6.16	46	7.12	3.48
11	5.69	7.73	23	7.81	7.04	35	7.92	8.60	47	5.95	4.50
12	3.88	5.32	24	9.42	5.00	36	5.43	5.38	48	6.62	4.17

RAW SCORES FOR THE HEART RATE DECELERATION
FOR THE FOUR GROUPS

ABSTINENT			PLACEBO			METHADONE			CONTROL		
#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2	#	Order 1	Order 2
	DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL		DRUG	NEUTRAL
1	9.32	7.24	13	7.48	5.91	25	3.04	2.67	37	5.64	4.71
2	7.40	6.20	14	2.55	3.30	26	1.20	2.82	38	3.29	2.52
3	8.95	2.87	15	6.46	3.00	27	3.61	4.00	39	12.18	8.58
4	2.12	2.84	16	6.28	7.52	28	6.10	3.57	40	7.95	6.31
5	4.92	1.87	17	6.67	5.81	29	3.86	2.45	41	6.25	5.48
6	9.83	10.81	18	4.25	5.06	30	6.27	5.26	42	8.89	10.00
	NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG		NEUTRAL	DRUG
7	3.83	3.75	19	10.04	7.52	31	3.80	3.86	43	3.52	8.17
8	7.75	7.16	20	7.85	6.33	32	4.06	4.62	44	4.04	6.00
9	4.78	6.33	21	7.91	7.13	33	5.79	3.68	45	4.89	5.83
10	5.00	6.63	22	10.67	7.43	34	6.00	7.95	46	5.29	6.57
11	8.63	6.64	23	9.94	8.29	35	7.04	6.52	47	5.45	7.55
12	5.67	4.72	24	4.83	9.42	36	6.74	7.63	48	6.08	4.89

MEANS AND STANDARD DEVIATIONS FOR THE
PRE-STIMULUS HEART RATE FOR THE FOUR GROUPS

GROUP	SLIDE TYPE	ORDER	MEAN	S.D.	VMIN	VMAX
Abstinent	Drug	First	84.26	7.57	73.67	93.42
Placebo	Drug	First	85.59	9.57	75.00	93.14
Methadone	Drug	First	87.26	3.32	83.77	92.45
Control	Drug	First	80.45	6.75	71.74	87.25
Abstinent	Neutral	First	84.18	7.63	75.71	97.00
Placebo	Neutral	First	84.05	5.15	77.54	91.00
Methadone	Neutral	First	85.77	7.31	76.40	97.71
Control	Neutral	First	77.68	7.26	69.02	91.00
Abstinent	Drug	Second	84.37	7.28	78.39	96.55
Placebo	Drug	Second	84.72	8.15	73.40	96.50
Methadone	Drug	Second	80.96	8.22	70.82	92.64
Control	Drug	Second	74.47	4.79	68.68	81.28
Abstinent	Neutral	Second	86.80	5.42	78.61	94.80
Placebo	Neutral	Second	88.93	3.47	82.86	93.10
Methadone	Neutral	Second	88.53	7.45	75.14	96.79
Control	Neutral	Second	84.65	4.37	78.44	89.79

MEANS AND STANDARD DEVIATIONS FOR THE
POST-STIMULUS HEART RATE FOR THE FOUR GROUPS

GROUP	SLIDE TYPE	ORDER	MEAN	S.D.	VMIN	VMAX
Abstinent	Drug	First	84.34	8.08	72.94	92.29
Placebo	Drug	First	85.62	9.04	77.48	102.81
Methadone	Drug	First	87.47	3.87	81.59	92.98
Control	Drug	First	79.37	7.35	69.80	87.25
Abstinent	Neutral	First	84.11	7.38	75.67	95.81
Placebo	Neutral	First	83.65	5.68	75.78	89.58
Methadone	Neutral	First	85.68	7.06	76.75	97.75
Control	Neutral	First	78.71	6.20	71.75	90.23
Abstinent	Drug	Second	84.59	7.44	78.45	96.36
Placebo	Drug	Second	85.31	8.58	74.72	98.81
Methadone	Drug	Second	80.65	7.67	72.50	93.04
Control	Drug	Second	73.09	5.12	66.64	80.50
Abstinent	Neutral	Second	86.64	5.24	78.70	95.00
Placebo	Neutral	Second	88.75	3.35	83.14	92.95
Methadone	Neutral	Second	88.14	7.69	75.43	97.69
Control	Neutral	Second	85.00	3.77	80.69	90.00

MEANS AND STANDARD DEVIATIONS FOR THE
HEART RATE DIFFERENCE SCORES FOR THE FOUR GROUPS

GROUP	SLIDE TYPE	ORDER	MEAN	S.D.	VMIN	VMAX
Abstinent	Drug	First	3.17	1.65	1.32	5.27
Placebo	Drug	First	2.92	0.84	1.91	4.24
Methadone	Drug	First	3.20	0.45	2.80	4.05
Control	Drug	First	3.09	0.73	2.08	3.92
Abstinent	Neutral	First	2.92	0.75	2.29	4.18
Placebo	Neutral	First	3.70	0.85	2.45	4.78
Methadone	Neutral	First	2.66	0.79	1.78	3.87
Control	Neutral	First	2.82	0.75	1.67	3.80
Abstinent	Drug	Second	2.85	0.54	2.11	3.68
Placebo	Drug	Second	3.50	1.23	2.20	5.59
Methadone	Drug	Second	2.83	0.68	2.00	4.00
Control	Drug	Second	2.75	0.94	2.00	4.32
Abstinent	Neutral	Second	2.72	1.80	1.20	5.71
Placebo	Neutral	Second	2.67	0.73	1.50	3.65
Methadone	Neutral	Second	2.41	0.70	1.55	3.38
Control	Neutral	Second	3.15	0.85	1.83	4.30

MEANS AND STANDARD DEVIATIONS FOR THE
HEART RATE ACCELERATION SCORES FOR THE FOUR GROUPS

GROUP	SLIDE TYPE	ORDER	MEAN	S.D.	VMIN	VMAX
Abstinent	Drug	First	6.87	3.45	2.08	10.48
Placebo	Drug	First	6.48	3.59	2.88	12.28
Methadone	Drug	First	5.61	2.48	2.70	8.75
Control	Drug	First	4.72	2.15	2.54	8.00
Abstinent	Neutral	First	5.02	1.62	2.25	6.39
Placebo	Neutral	First	7.27	2.45	2.85	9.48
Methadone	Neutral	First	5.34	2.17	2.47	7.92
Control	Neutral	First	6.21	0.83	5.00	7.12
Abstinent	Drug	Second	6.26	1.90	3.50	8.39
Placebo	Drug	Second	10.29	3.60	5.94	15.00
Methadone	Drug	Second	5.78	2.55	1.23	8.60
Control	Drug	Second	3.74	0.82	2.28	4.50
Abstinent	Drug	Second	5.39	3.14	2.26	8.96
Placebo	Neutral	Second	4.90	1.06	3.10	5.88
Methadone	Neutral	Second	4.36	1.18	2.20	5.78
Control	Neutral	Second	5.73	1.85	2.74	7.38

MEANS AND STANDARD DEVIATIONS FOR THE
HEART RATE DECELERATION SCORES FOR THE FOUR GROUPS

GROUP	SLIDE TYPE	ORDER	MEAN	S.D.	VMIN	VMAX
Abstinent	Drug	First	7.43	3.16	2.12	9.83
Placebo	Drug	First	5.62	1.84	2.55	7.48
Methadone	Drug	First	3.35	1.75	1.20	6.27
Control	Drug	First	7.87	3.33	3.29	12.18
Abstinent	Neutral	First	5.61	2.08	3.67	8.63
Placebo	Neutral	First	9.87	1.05	7.91	10.85
Methadone	Neutral	First	4.57	1.86	2.79	7.05
Control	Neutral	First	4.88	0.95	3.52	6.08
Abstinent	Drug	Second	5.87	1.33	2.75	7.16
Placebo	Drug	Second	7.69	1.06	6.33	9.42
Methadone	Drug	Second	4.87	1.96	2.68	7.63
Control	Drug	Second	7.67	0.92	6.57	9.17
Abstinent	Neutral	Second	5.30	3.42	1.87	10.81
Placebo	Neutral	Second	5.43	1.47	3.00	7.52
Methadone	Neutral	Second	3.13	1.29	1.67	5.26
Control	Neutral	Second	6.27	2.70	2.52	10.00

MEANS AND STANDARD DEVIATIONS FOR THE
STIMULUS CLASS ANALYSES FOR THE FOUR GROUPS

GROUP	VARIABLE	TOOLS (PARAPHENALIA)		ACTS OF INJECTION		CONSEQUENCES OF INJECTION	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Abstinent	Difference Scores	2.90	1.65	2.71	1.36	2.98	1.85
Placebo	Difference Scores	3.29	1.11	3.35	2.15	3.41	1.60
Methadone	Difference Scores	2.54	1.18	3.10	1.15	3.29	1.18
Control	Difference Scores	3.26	1.16	2.58	0.93	3.11	1.58
Abstinent	Acceleration	5.23	3.48	6.62	2.76	5.83	2.73
Placebo	Acceleration	7.91	4.28	7.32	3.83	6.75	2.64
Methadone	Acceleration	4.68	2.02	5.48	2.76	5.12	2.75
Control	Acceleration	4.88	1.74	5.17	2.77	4.81	2.46
Abstinent	Deceleration	5.34	2.23	6.12	2.35	6.51	3.22
Placebo	Deceleration	5.96	1.26	7.47	2.11	6.95	2.77
Methadone	Deceleration	4.41	2.05	5.59	2.11	4.71	1.88
Control	Deceleration	5.88	2.39	6.32	2.39	6.19	2.27

APPENDIX 6

Summary of the Newman-Keuls Procedure to Test For Significant Differences Between Means for the Profile of Mood States Group Main Effect, for the Tension and Anger Factors

TENSION FACTOR		Ordered Means (Groups)		
		Methadone	Placebo	Abstinent
Differences between Means:				
	Control	7.24*	9.41*	16.49*
	Methadone	--	2.17ns	9.25*
	Placebo	--	--	7.08*
	Abstinent	--	--	--

ANGER FACTOR		Ordered Means (Groups)		
		Methadone	Placebo	Abstinent
Differences between Means:				
	Control	0.83ns	6.42ns	9.25*
	Methadone	--	5.58ns	8.42*
	Placebo	--	--	2.83ns
	Abstinent	--	--	--

*significant at $p < .05$ ns not significant

[1]For both analyses, df = 44, steps = 4,3,2
For tension factor $s_{\bar{a}} = 1.98$, for anger factor $s_{\bar{a}} = 1.98$

[2]For a description of the computational procedures see Winer (1971), p. 528-529.

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 12

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Pre Slides)	1350.00	2	675.00	6.67*
A at b2 (Post Slides)	57.17	2	28.59	0.28
B at A				
B at a1 (Abstinent)	590.04	1	590.04	10.90*
B at a2 (Placebo)	18.38	1	18.38	0.34
B at a3 (Methadone)	32.66	1	32.66	0.60

*$p < .05$

See Appendix 7 for method of calculation of $MS_{w.cell}$ error term, and also for df of the F ratio.

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 13

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Pre Slides)	341.72	2	170.86	1.99
A at b2 (Post Slides)	45.39	2	22.70	0.28
B at A				
B at a1 (Abstinent)	216.00	1	216.00	14.56*
B at a2 (Placebo)	0.04	1	0.04	0.01
B at a3 (Methadone)	0.66	1	0.66	0.04

*p .05

See Appendix 7 for explanation of derivation of error term and F significance.

Summary of the Newman-Keuls Procedure to Test for Significance of Differences Between Means for the Semantic Differential Evaluative Factor for the Concept of Heroin and Methadone for the Group Main Effect

CONCEPT OF HEROIN	Ordered Means (Groups)	
	Placebo	Methadone
Differences between Means:		
Abstinent	0.69^{ns}	1.45^{*}
Placebo	--	0.76^{ns}
Methadone	--	--

CONCEPT OF METHADONE	Ordered Means (Groups)	
	Abstinent	Methadone
Differences between Means:		
Placebo	0.54^{*}	0.67^{*}
Abstinent	--	0.13^{ns}
Methadone	--	--

*significant at p .05 ^{ns}not signficant

[1]For both analyses df = 33, steps = 3,2,

For concept of heroin $s_{\bar{a}}$ = 0.28, For concept of methadone $s_{\bar{a}}$ = 0.13

[2]For a description of the computional procedures see Winer (1971), p. 528-529.

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 17

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Pre Slides)	4.08	2	2.04	1.85
A at b2 (Post Slides)	0.73	2	0.37	0.34
B at A				
B at a1 (Abstinent)	0.04	1	0.04	0.25
B at a2 (Placebo)	0.04	1	0.04	0.25
B at a3 (Methadone)	6.00	1	6.00	37.50*

*p .05

See Appendix 7 for explanation of derivation of error term and F significance

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 18

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Evaluation of Heroin)	13.36	2	6.68	5.81*
A at b2 (Evaluation of Methadone)	5.21	2	2.61	2.27
B at A				
B at a1 (Abstinent)	1.92	1	1.92	2.56
B at a2 (Placebo)	22.55	1	22.55	30.07*
B at a3 (Methadone)	18.36	1	18.36	24.48*

*p .05

See Appendix 7 for explanation of derivation of error term and F significance

Summary of the Newman-Keuls Procedure to Test for Significance of Differences Between Means for the Semantic Differential Evaluative Factor Pre and Post Slide Presentation for the Group Main Effect

PRE SLIDES	Ordered Means (Groups)	
	Placebo	Methadone
Differences between Means:		
Abstinent	0.07^{ns}	0.90^{*}
Placebo	--	0.83^{*}
Methadone	--	--

POST SLIDES	Ordered Means (Groups)	
	Placebo	Methadone
Differences between Means:		
Abstinent	0.11^{ns}	0.72^{*}
Placebo	--	0.60^{*}
Methadone	--	--

*significant at $p < .05$ ^{ns}not significant

[1]For both analyses df = 33, steps = 3,2

For pre-slides $s_{\bar{a}} = 0.25$, for post-slides $s_{\bar{a}} = 0.16$

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 19

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Evaluation of Heroin)	11.86	2	5.93	12.62*
A at b2 (Evaluation of Methadone)	1.37	2	0.69	1.46
B at A				
B at a1 (Abstinent)	8.58	1	8.58	28.60*
B at a2 (Placebo)	29.46	1	29.46	98.20*
B at a3 (Methadone)	39.45	1	39.45	131.50*

*p .05

See Appendix 7 for explanation of derivation of error term and F significance

Analysis of Variance of Simple Main Effects for
A x B Interaction in Table 20

Source of Variation	SS	df	MS	F ratio
A at B				
A at b1 (Potency of Heroin)	2.16	2	1.08	0.91
A at b2 (Potency of Methadone)	4.34	2	2.17	2.01
B at A				
B at a1 (Abstinent)	0.16	1	0.16	0.53
B at a2 (Placebo)	1.26	1	1.26	4.20*
B at a3 (Methadone)	6.22	1	6.22	20.73*

*p .05

See Appendix 7 for explanation of derivation of error term and F significance

Analysis of Variance of Pre-Filler Slide Heart Rate Scores for the Four Groups, Placebo, Methadone, Abstinent and Control

Source of Variation	SS	df	MS	F ratio
Between Subjects	3773.25	47		
C (Groups)	309.81	3	103.27	1.34
Rows (AB Between)	197.88	1	197.88	2.56
C x Row (ABC Between)	175.25	3	58.42	0.76
Subjects within Groups	3090.31	40	77.26	
Within Subjects	4135.31	48		
A (Orders)[a]	1435.56	1	1435.56	23.55*
B (Slide Types)[b]	39.94	1	39.94	0.65
AC (Order x Groups)	198.81	3	66.27	1.09
BC (Slides x Groups)	20.44	3	6.81	0.11
(AB)'	0.06	0	0.00	0.00
(ABC)'	0.06	0	0.00	0.00
Error (within)	2440.44	40	61.01	

*F (1,40) = 4.08

[a]For this analysis A refers to whether the filler slides were presented first or second

[b]B refers to whether the filler slides were presented before the drug slides or before the neutral slides

Analysis of Variance of Post-Filler Slide Heart Rate Scores for the Four Groups, Placebo, Methadone,Abstinent and Control

Source of Variation	SS	df	MS	F ratio
Between Subjects				
C (Groups)	3935.06	47		
Rows (AB Between)	273.13	3	91.04	1.15
C x Row (ABC Between)	277.44	1	277.44	3.50
Subjects within Groups	210.44	3	70.15	0.88
Within Subjects	3988.69	48		
A (Orders)[a]	1300.94	1	1300.94	22.84*
B (Slide Types)[b]	166.84	1	166.84	2.93
AC (Order x Groups)	215.94	3	71.98	1.26
BC (Slides x Groups)	26.50	3	8.83	0.16
(AB)'	0.06	0	0.00	0.00
(ABC)'	-0.12[c]	0	0.00	0.00
Error (within)	2278.50	40	59.66	

*F (1,40) = 4.08

[a]For this analysis A refers to whether the filler slides were presented first or second

[b]B refers to whether the filler slides were presented before the drug slides or before the neutral slides

[c]The minus SS for the (ABC)' source of variation is due to rounding-off errors in the computer calculations. The value stated is a spurious one.

Analysis of Variance of Filler Slides Heart Rate Difference Scores for the Four Groups, Placebo, Methadone, Abstinent, and Control

Source of Variation	SS	df	MS	F ratio
Between Subjects	104.25	47		
C (Groups)	8.44	3	2.81	1.21
Rows (AB Between)	1.14	1	1.14	0.49
C x Row (ABC Between)	1.43	3	0.48	0.20
Subjects within Groups	93.24	40	2.33	
Within Subjects	131.12	48		
A (Orders)[a]	0.29	1	0.29	0.12
B (Slide Types)[b]	6.93	1	6.93	2.89
AC (Order x Groups)	20.22	3	6.74	2.81
BC (Slides x Groups)	7.76	3	2.59	1.08
(AB)'	0.00	0	0.00	0.00
(ABC)'	0.00	0	0.00	0.00
Error (within)	95.92	40	2.40	

[a]For this analysis A refers to whether the filler slides were presented first or second

[b]B refers to whether the filler slides were presented before the drug slides or before the neutral slides

Summary of the Newman-Keuls Procedure to Test for Significance of Differences Between Means of the Pre-Stimulus and Post-Stimulus Heart Rate Scores for the Group Main Effect

PRE-STIMULUS

	Ordered Means (Groups)		
	Abstinent	Methadone	Placebo
Differences between Means:			
Control	5.59*	6.32*	6.51*
Abstinent	--	0.73ns	0.92ns
Methadone	--	--	0.19ns

POST-STIMULUS

	Ordered Means (Groups)		
	Abstinent	Methadone	Placebo
Differences between Means:			
Control	5.75*	6.32*	6.46*
Abstinent	--	0.57ns	0.71ns
Methadone	--	--	0.14ns

*significant at $p < .05$ ns not significant

[1]For both analyses df = 22, steps = 4,3,2
For pre-stimulus analysis $s_{\bar{c}} = 1.20$, for post-stimulus analysis $s_{\bar{c}} = 1.21$

Analysis of Variance of Simple Main Effects for
B x C Interaction in Table 26

Source of Variation	SS	df	MS	F ratio
B at C				
B at c1 (Abstinent)	10.93	1	10.93	4.22*
B at c2 (Placebo)	31.74	1	31.74	12.25*
B at c3 (Methadone)	4.33	1	4.33	1.67
B at c4 (Control)	18.17	1	18.17	7.02
C at B				
C at b1 (Drug Slides)	108.66	3	36.22	13.98*
C at b2 (Neutral Slides)	12.87	3	4.29	1.66

*p .05

See Appendix 7 for explanation of derivation of error term and F significance

Test on the Difference Between the Four Groups, Abstinent, Placebo, Methadone, and Control, (c1,c2,c3,c4) at the Level of the Drug Slides (b1)

Level (c at b1, Drug Slides)	Numerator	Denominator	F ratio
c1 - c2 (Abstinent-Placebo)	482.24	124.32	3.88
c1 - c3 (Abstinent-Methadone)	106.50	124.32	0.86
c1 - c4 (Abstinent-Control)	781.76	124.32	6.29*
c2 - c3 (Placebo-Methadone)	1042.00	124.32	8.38*
c2 - c4 (Placebo-Control)	2492.01	124.32	20.05*
c3 - c4 (Methadone-Control)	311.17	124.32	2.50

*p .05

See Appendix 7 for explanation of derivation of numerator, denominator and F significance

Summary of the Newman-Keuls Procedure to Test for Significance of Differences Between Means of the Cardiac Deceleration Scores for the Group Main Effect

CARDIAC DECELERATION

	Ordered Means (Groups)		
	Abstinent	Control	Placebo
Differences between Means:			
Methadone	2.07^{*}	2.69^{*}	3.17^{*}
Abstinent	--	0.62^{ns}	1.10^{ns}
Control	--	--	0.48^{ns}

*significant at $p < .05$ ^{ns}not significant

[1]For this analysis df = 22, steps = 4,3,2, $s_{\bar{c}} = 0.38$

Analysis of Variance of Simple Main Effects for
B x C Interaction in Table 27

Source of Variation	SS	df	MS	F ratio
B at C				
B at c1 (Abstinent)	8.50	1	8.50	5.52*
B at c2 (Placebo)	5.88	1	5.88	3.82
B at c3 (Methadone)	0.43	1	0.43	0.28
B at c4 (Control)	28.77	1	28.77	18.68*
C at B				
C at b1 (Drug Slides)	85.98	3	28.66	18.61**
C at b2 (Neutral Slides)	87.37	3	29.12	18.91**

*p .05, **p .05

See Appendix 7 for explanation of derivation of error term and F significance

Test on the Difference Between the Four Groups, Abstinent, Placebo, Methadone and Control (c1,c2,c3,c4) at the Level of the Drug Slides (b1) and the Neutral Slides (b2)

Level	Numerator	Denominator	F ratio
Drug (Heroin-Related) Slides (b1)			
c1 - c2 (Abstinent-Placebo)	0.01	73.92	0.01
c1 - c3 (Abstinent-Methadone)	921.73	73.92	12.47*
c1 - c4 (Abstinent-Control)	180.63	73.92	2.44
c2 - c3 (Placebo-Methadone)	920.03	73.92	12.57*
c2 - c4 (Placebo-Control)	177.42	73.92	2.40
c3 - c4 (Methadone-Control)	1918.44	73.92	25.95*
Neutral Slides (b2)			
c1 - c2 (Abstinent-Placebo)	690.64	73.92	9.34*
c1 - c3 (Abstinent-Methadone)	373.26	73.92	5.05*
c1 - c4 (Abstinent-Control)	2.07	73.92	0.03
c2 - c3 (Placebo-Methadone)	2079.36	73.92	28.13*
c2 - c4 (Placebo-Control)	617.03	73.92	8.35*
c3 - c4 (Methadone-Control)	430.98	73.92	5.83*

*p .05

See Appendix 6 for explanation of derivation of numerator, denominator and F significance

Summary of the Newman-Keuls Procedure to Test for Significance of Differences Between Means for the Cardiac Deceleration Stimulus Class Effect

STIMULUS CLASSES	Ordered Means (Groups)		
	Tools	Consequences	Acts
Differences between Means:			
Tools	--	0.69*	0.98*
Consequences		--	0.29ns

*significant at $p < .05$ nsnot significant

[1]For this analysis df = 88, steps = 3,2, $s_{\bar{b}} = 0.22$

For a description of the computational procedures see Winer (1971), p. 528-529

APPENDIX 7

PROCEDURE FOR CALCULATION OF NEWMAN-KEULS ERROR TERMS

For the A Factor:

$$s_{\bar{a}} = \frac{\text{MS subjects within groups}}{nq}$$

Example:

POMS Tension Factor

$$s_{\bar{a}} = \frac{95.20}{12 \times 2} = \frac{95.20}{24} = 3.97 = 1.99$$

df = p(n-1) 4(11) = 44

For the B Factor:

$$s_{\bar{b}} = \frac{MS_b \times \text{subjects within groups}}{np}$$

Example:

Heart Rate Deceleration Concept Analysis

$$s_{\bar{b}} = \frac{2.32}{12 \times 4} = \frac{2.32}{48} = .05 = .22$$

df = df for MS_b x subj. within gps. = 88

CALCULATION OF DEGREES OF FREEDOM FOR THE SIMPLE MAIN EFFECTS ANALYSES UTILIZING THE FORMULA DERIVED BY (SATTERTHWAITE, 1946), AS DESCRIBED IN WINER (1971)

For the simple main effects analyses, the distribution of the F ratio under the null hypotheses may be approximated by an F distribution having degrees of freedom equal to p-1 and f, where f is given by (Satterthwaite, 1946). These calculations will give the appropriate degrees of freedom for factor A at the various levels of b.

$$f = \frac{(u + v)^2}{(u^2/f_1) + (v^2/f_2)}$$

where:

$u = p(n-1)\ MS_{\text{subj. w. gps.}}$

$v = p(n-1)(q-1)\ MS_b \times \text{subj. w. gps.}$

$f1 = p(n-1)$

$f2 = p(n-1)(q-1)$

The critical value for the simple main effects analysis of factor B at the various levels of a is given by the following formula:

at the $\underline{p}$ .05 level,

$$F_{.95} = (q-1)\ p(n-1)(q-1)$$

METHODS OF CALCULATION OF SIMPLE MAIN EFFECTS FOR THE A x B INTERACTION IN THE TWO-WAY ANALYSIS OF VARIANCE WITH REPEATED MEASURES (WINER, 1971, p. 530-532)

A test on the simple main effect of Factor A at level b1 involves the following procedures:

Example:
Opiate Withdrawal Scale T score analysis

AB Summary Table

	b_1	b_2	Total
A_1	940	821	1761
A_2	772	793	1565
A_3	800	828	1628
Total	2512	2442	

A at b1

$$SS_a \text{ at } b_1 = \frac{940^2 + 772^2 + 800^2}{12} - \frac{2512^2}{36} = 1350$$

$$MS_a \text{ at } b_1 = \frac{SS_a \text{ at } b_1}{p-1} = 675$$

Denominator for appropriate F ratio is

$$MS_{w.cell} \text{ which equals } \frac{MS_{subj.w.gps.} + (q-1)\, MS_{B \times subj.w.gps.}}{q}$$

$$= \frac{148.42 + (1)(54.12)}{2} = 101.27$$

$$F = \frac{675.00}{101.27} = 6.67$$

A test on the simple main effects of factor B at level a1 uses the statistic:

$$F = \frac{MS_{b \text{ at } a1}}{MS_{B \times subj.w.gps.}}$$

The variation due to the simple main effects for factor B at level a1 is

$$SS_{b \text{ at } a1} = \frac{940^2 + 821^2}{12} - \frac{1761^2}{24} = 590.04$$

$$MS_{b \text{ at } a1} = \frac{590.04}{q-1} = \frac{590.04}{1} = 590.04$$

$$F = \frac{590.04}{54.12} = 10.90$$
