MDMA

Nonmedical Use and Intoxication

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In 1914, when opium and cocaine were banned in the United States, a patent was issued to the Merck chemical company in Germany for a process to produce 3,4-methylenedioxymethamphetamine or MDMA (Merck 1914). Except for a series of animal studies in 1953 and 1954 (Hardman, Haavik & Seevers 1973), the compound remained relatively ignored until 1968 when nonmedical use first appeared in the western part of the U.S. (Seymour 1986). Since that time, MDMA has appeared under a variety of street names including (in descending order of popular usage): Ecstasy, XTC, Adam, MDM, M&M, The Yuppie Drug, X, A, E, Essence, MDA, Clarity, Venus, Zen, Doctor, Cocaine, and Speed.

By 1972, street use was identified in Chicago (Gaston & Rasmussen 1972) and respondents had reported widespread use in Boston by 1976. Assays performed on street samples received by PharmChem Laboratories (Renfroe 1986) were consistent with a pattern of MDMA use spreading throughout the U.S. from 1976 to 1985. According to estimates by the Drug Enforcement Administration (DEA), MDMA was available in at least 21 states and Canada by 1985, although use was concentrated in California, Texas, Florida and New York as well as New England. By 1986, clandestine laboratories were reported throughout the U.S., while European distribution was reportedly in the planning stages.

The effects of MDMA (which is similar in chemical structure to the hallucinogenic amphetamines) have been described as stimulant, analgesic, psychedelic, psychotomimetic, empathogenic and hallucinogenic (Seymour 1986; Adamson 1985; Shulgin & Nichols 1978). While most studies of MDMA in humans have focused on use in psychological or psychiatric therapy sessions (Seymour 1986), relatively little has been reported about nonmedical patterns of use. The present study was undertaken to assess the nature and extent of nonmedical MDMA use, heretofore only mentioned in the popular press (Doblin 1985). As will be presently described, the psychological intoxication resulting from MDMA is a primary reason for both nonmedical and medical use. An important caveat is that the doses, patterns of use, set and setting for nonmedical users described here differ substantially from that of medical users discussed elsewhere in this issue.

SUBJECTS AND METHODS

A small number of MDMA users were recruited from drug treatment centers, through word-of-mouth advertisements and from a previously studied population of nonmedical hallucinogenic drug users (Siegel 1978b). Users were initially screened by a telephone interview and a subsequent drug history questionnaire. From a total survey population of 1,076 drug users, 415 identified themselves as having tried MDMA on a single occasion. A total of 44 users (32 male and 12 female) were eventually selected for representative case study by meeting the requirement of having used MDMA at least twice during the previous 12 months. Users ranged in age from 17 to 55 and the majority were students (63.3%), while others

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listed their occupations as housewives, business persons, mental health professionals, writers or unemployed.

Examinations and tests were performed on each of the 44 users. Procedures included a subjective drug effects questionnaire, a personal history questionnaire, a mental status examination, the Minnesota Multiphasic Personality Inventory (MMPI), the Experiential World Inventory (EWI), in-depth interviews, physical examinations (for most subjects), the Betts QMI Vividness of Imagery Scale, the Gordon Test of Visual Imagery Control, Sensation-seeking Scales, photostimulation-induced imagery (for most subjects) and family interviews. Other tests were administered on an ad hoc basis, including the Wechsler Adult Intelligence Scale, the Bender-Gestalt, the Rorschach Inkblot Test, the Thematic Apperception Test, and the Belief in Paranormal Scale. An important caveat is that these subjects were recruited for study prior to July 1985, when MDMA was placed in Schedule I of the Controlled Substances Act. However, several subjects (N = 18) withdrew from the study at that time and some of the psychological testing was not completed on these individuals. Nonetheless, histories, questionnaires, interviews and mental status examinations were completed for all subjects. In addition, analysis samples of MDMA were obtained from the subjects and drug histories were confirmed through radioimmunoassay-H analysis of hair samples (e.g., Baumgartner, Jones & Black 1981).

Multiple Drug Use

All subjects reported histories of multiple drug use. Concomitant with their history of MDMA use, 87 percent were using alcohol; 56 percent, cannabis preparations; 56 percent caffeine (coffee, tea, chocolate and cola beverages); 18 percent, hallucinogens other than cannabis or MDMA; 11 percent, cocaine; and five percent, amphetamines.

Prior to their MDMA use, subjects reported experiences with hallucinogens other than cannabis (27%) and of these, 18 percent had experimented with mescaline or related psychoactive phenylisopropylamines. During the previous 12 months, subjects reported MDMA use on at least two occasions and all used the oral route of administration.

Preparations and Purity

Subjects reported using MDMA in the form of powders, capsules and tablets. Individual doses, represented as 60 mg to 135 mg, were purchased at $5.00 to $30.00 each. Representative samples of tablets alleged to contain 120 mg of MDMA were analyzed and found to contain an average of 101 mg, while samples alleged to be 130-135 mg contained an average of 108 mg of MDMA. No active adulterants were found and the analyses did not identify inactive diluents. These results are generally consistent with previously analyzed samples (PharmChem Laboratories 1985) and estimates by the DEA that street preparations of MDMA may be over 90 percent pure.

Routes of Administration

All subjects employed the oral route of self-administration, while two experimented with intranasal administration. One subject reported an incident in which he self-administered MDMA via an intravenous injection.

Doses and Dosage Regimens

Subjects reported using initial doses averaging 100 mg (range: 50-390 mg). Supplemental doses, when used in a given session, averaged 40 mg each (range: 40-135 mg). The total dosage taken in a given session averaged 120 mg (range: 50-700 mg). In general, initial reactions to MDMA were described as "disappointing" in reference to the low intensity of anticipated psychedelic effects. Accordingly, a common motivation reported for supplemental doses was to enhance the intensity of the expected experience, thus titrating the subjective effect. The time interval between supplemental doses averaged 30 minutes (range: 20-120 minutes).

Procedures for doses and dosage regimens generally followed those outlined in two leaflets that were widely available to street users. The most popular leaflet, *General Information: MDMA* (Stafford 1984), which acquainted users with general effects and their time courses, cautioned against supplemental doses (p. 2): "Experiments have shown that a second supplement approximately one hour after the first, at the same dosage level of 40 mg or at a higher level of 50 mg, produces little if any further prolongation of the psychological effects, but will cause considerable increase in the physical side-effects of jaw-clench and nystagmus, with a resulting lessening of the desired de-stressing and relaxation effect." The second leaflet, *Flight Instructions for a Friend Using XTC*, which often appeared as a package insert with MDMA tablets sold in the Los Angeles area, advised against supplemental doses but recommended the concomitant use of beer to mask MDMA's bitter taste and enhance the onset of effects.

PATTERNS OF USE

The dosage regimens together with the set and setting define the pattern of drug use. Five patterns of drug use have been designated by the National Commission on Marihuana and Drug Abuse (1973) and will be used for discussion here.

Experimental Use

The initial recruitment survey revealed that most of the respondents were experimental users who engaged in short-term, nonpatterned trials of MDMA use with varying intensity and a maximum lifetime frequency of 10 times. These users were primarily motivated by curiosity about MDMA and a desire to experience the anticipated drug effects of ecstasy and peace coupled with psychological insight. Their use was generally social and among close friends. Of the 459 MDMA users, 415 (90.4%) expressed no desire to repeat their initial experience. Of these one-time users, most found the effects undesirable and 32 percent experienced little or no drug effect and felt no desire to continue use. Of the 44 MDMA users selected for study, 28 had used the drug 10 times or less and were classified as experimental users. Most experimental users (65%) received MDMA from others, whereas the remainder purchased their own supplies.

Social Use

Sixteen (16) users were classified as social users who engaged in more regular use than experimenters. Use generally occurred in social settings among friends or acquaintances who wished to share an experience perceived by them as acceptable and pleasurable. These users were primarily motivated by social factors and use did not tend to escalate to more individually oriented patterns. All social users began as experimental users and five of them engaged in episodes of more frequent use (see below), although their primary pattern was social. Most purchased their own supplies. Social use varied between one and four times per month, with an average use of six times in one year (maximum use of 20 times in one year).

Circumstantial-Situational Use

Three users engaged in episodes of this type of use, which is defined as a task-specific, self-limited use that is variably patterned, differing in frequency, intensity and duration. This use was motivated by a perceived need or desire to achieve a known and anticipated drug effect deemed desirable to cope with a specific condition or situation. The motivation cited by these users was to achieve a therapeutic insight into their feelings and behaviors. The average frequency of use for these individuals was once a week for a period of two years.

Intensified Use

Two users reported experimenting with episodes of intensified or daily use of MDMA. One of these users engaged in eight days of daily use, and the other engaged in three months of daily use. Such use was motivated chiefly by a perceived need to achieve relief from a persistent problem and/or stressful situation or a desire to maintain a certain self-prescribed level of performance. Both users reported tolerance to the physical and behavioral effects of the drug.

Compulsive Use

None of the subjects engaged in compulsive use. This type of drug use is characterized by high frequency and high intensity levels of use over a relatively long duration, producing some degree of psychological dependence.

INTOXICATION EFFECTS

The acute physiological and psychoactive effects reported by the 44 users did not differ substantially from those described in the literature on MDMA (see Seymour 1986), in unpublished work (see Greer 1983) or elsewhere in this issue. Briefly, all subjects reported a mixture of both positive and negative effects during intoxication. In general, most users recognized that they were using a psychedeliclike substance and they considered the psychoactive properties to be positive effects. Specific positive effects included the following (among others): changes in feelings and emotions (80%); enhanced communication, empathy or understanding (68%); changes in cognitive or mental associations (68%); euphoria or ecstasy (63%); changes in perception (44%); and transcendental or religious experiences (11%).

Several undesirable physical and psychological effects were reported by most users. These negative effects included the following (among others): muscle tension and/or jaw clenching (100%), increased sweating (91%), blurred vision (77%), ataxia (77%), nausea (38%) and anxiety (15%).

Taken together, MDMA users experienced more frequent negative effects as a result of acute intoxication. Nonetheless, as with nonmedical use of psychedelics such as ketamine (Siegel 1978b), MDMA users continued to rate the overall experience as positive and rewarding.

While the majority of reported effects disappeared within 24 hours, several users reported prolonged physical and psychological effects. The most common physical complaints were muscle tension in the jaw (N = 5), which continued for periods of two days to six weeks, and blurred vision (N = 3), which continued for periods of one to three days. The most frequent psychological complaints were fatigue (N = 22), depression (N = 12), anxiety (N = 11) and insomnia (N = 3), which were reported for periods of one day to eight days following MDMA use.

The majority of users mentioned "benefits" from their MDMA experiences, although such changes were

not specifically examined in the current study (see Greer 1983). In addition, acute adverse reactions were reported by three users. A female user became mute and semicatatonic for 72 hours following ingestion of her regular monthly dose of 130 mg. A male user reported severe anxiety coupled with paranoid delusions and threatening hallucinations. He continued to manifest paranoia and startle reactions to minimal stimuli for 24 hours. A third male user reported that a 700 mg MDMA session began with a pleasant near-death experience (Siegel 1980), but an unpleasant dissociative-hallucinatory reaction with features of paranoia continued for 48 hours. A fourth user, who reported an episode of confusional delirium for several hours, also manifested high blood pressure, horizontal and vertical nystagmus as well as muscle rigidity, but may have ingested a preparation contaminated with phencyclidine.

Perceptual Changes

Of the phenomena reported above, the perceptual changes are perhaps the least understood, yet are among the most important in understanding the precise nature and form of MDMA intoxication. The presence of perceptual changes, including hallucinations, are key diagnostic criteria in the determination of reactions to the psychedelic drugs. Therefore, these perceptual changes were the subject of concentrated examination and testing in users in the present study.

A total of 19 subjects (44%) experienced some perceptual phenomena consisting chiefly of increased sensitivity to light, blurred vision and difficulty in focusing on visual targets. Some of these subjects manifested mydriasis and horizontal nystagmus that may have contributed to these reported effects. Several users also experienced decreased lacrimation that may have further contributed to these effects.

All 19 of these subjects experienced some attentional dysfunction, but only six reported any difficulty in thinking associated with such changes. Such experiences included difficulty in maintaining attention during complicated tasks, difficulty in maintaining thoughts during conversation and general preoccupation with personal problems. These effects are similar to those observed in other psychedelic intoxications where there is increased attention to inner subjective experiences concomitant with decreased awareness of external objective sensations (Fisher 1975).

A total of nine subjects (20%) reported illusory or hallucinatory experiences in several modalities including vision, touch, hearing, smell and taste. Subjects generally described these events as pseudohallucinations, lacking the concomitant delusion that such events really existed. **Pseudohallucinations are characteristic of many psychedelic intoxications and differ from psychotic or true hallucinations, which are accompanied by delusions or beliefs that the perceptions are real (Siegel & Jarvik 1975).**

Visual Effects

Nine subjects reported visual hallucinations associated with the use of MDMA. Effects were reported with the eyes opened and closed. In the eyes opened condition, subjects reported vibratory movements in the visual field, persistent afterimages and the sensation of object movement in their peripheral visual fields. In dim illumination these sensations of movement were extremely weak and often appeared as flashes or spots of light. Subjects also reported seeing geometric patterns similar to the form constants found with hallucinogenic intoxication (Siegel & Jarvik 1975). During the initial stages of intoxication, MDMA users reported that these patterns were usually black and white and were composed of straight lines, points and curves. Patterns reported by subjects included stars, stripes, zigzags, herringbones, checkerboards, lattices and tunnels. When subjects ingested more than 300 mg they reported that these patterns became colored with faded blues, yellows and reds. Most patterns were located approximately two feet in front of the eyes and were seen to change slowly.

Five subjects reported complex visual images in the dark or with closed eyes. These images included recognizable scenes, people or objects. The images were often multiplicative and formed around a bright center field of vision with details on the periphery. Some images had a symmetrical configuration, but most lacked the intense brightness, saturated colors and frequent changes that characterize other hallucinogenic imagery, such as that produced by mescaline. Two subjects reported episodes of polyopia (duplication of a visual target) and dysmegalopsia (distortion in size of visual target), phenomena that appear in incipient toxic psychoses from a variety of drugs, including mescaline (Klüver 1942) and cocaine (Siegel 1978a).

Tactile Effects

Seven subjects reported mild analgesic or anesthetic effects from MDMA in doses up to 300 mg. Doses of 500-700 mg produced strong dissociative reactions in three subjects who reported sensations of lightness and floating. Two subjects, while experiencing visual images of tunnels, had the concomitant sensation of floating or falling through these tunnel images.

Auditory Effects

Three subjects reported auditory sensations of "white noise," "the sound of rushing water," roaring sensations or muting of sounds. Such effects were reported as brief transitory events during the initial part of the intoxication.

DISCUSSION

The most apparent aspect of these findings is that the perceptual effects of MDMA intoxication are typical of intoxications from the classic hallucinogens, such as mescaline (Hoffer & Osmond 1967). Visually, users reported an orderly progression of imagery from simple geometric forms to complex scenes, a defining characteristic of drug-induced hallucinations (Siegel & Jarvik 1975), as well as those induced by isolation and stress (Siegel 1984).

Low doses of MDMA appear to produce experiences characterized by psychedeliclike effects unaccompanied by intense hallucinatory imagery. Consequently, users have often argued that MDMA is a unique drug that is distinctly different from mescaline or LSD. However, most users also adopt patterns of use whereby attention is focused on external events (e.g., interpersonal relationships and communication with others) rather than on internal events (e.g., exploration of subjective imagery). When attention is focused on these internal dimensions, as when guides or therapists help users direct their attention to imagery (Adamson 1985), hallucinogenic visual, auditory and body imagery changes are frequently reported. Even without guided imagery, higher doses of MDMA can produce hallucinogenic phenomena in several modalities and may catapult users into experiences wherein they surrender in awe and wonder to the imagery experiences (Adamson 1985: 136, 163).

Nevertheless, none of the subjects who reported these phenomena manifested any abnormal profiles on the psychological tests. Indeed, the EWI indicated low scores on sensory perception scales concomitant with high scores on time perception and ideation scales. This configuration is characteristic of individuals who abuse hallucinogens, many of whom develop a psychosis subsequent to hallucinogen abuse (El-Meligi & Osmond 1970). However, testing on the MMPI failed to identify any psychosis or incipient psychopathology that could be directly attributable to MDMA. One of the intensified users and one of the circumstantial-situational users displayed slightly elevated paranoid scales, but this must be viewed with caution inasmuch as both users were also involved in the distribution and sales of controlled substances.

The pattern of MDMA use, primarily experimental and social, is also typical of hallucinogenic drug use patterns. Adverse effects, including prolonged physical and psychological reactions, appeared more frequently among circumstantial-situational and intensified users or among users experimenting with higher doses. When use was shifted from these more frequent high-dose patterns back to more moderate social regimens, adverse reactions were minimized. In this sense, most users adopted patterns and dosages that failed to produce dependence and significant psychopathology. Nonetheless, the intoxications resulting from even low-dose experimental use were accompanied by negative as well as positive effects. And even single, high-dose experimental use can result, albeit rarely, in prolonged physical and psychological reactions. As similar reactions have been reported in medical settings (Greer 1983), some adverse reactions appear to be more acute psychopharmacologic effects than the results of the pattern of use. Thus, MDMA intoxication is neither uniformly controllable nor uniformly predictable. The number of variables affecting such intoxications is presently unknown.

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