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PSYCHOLOGICAL INTERVENTIONS FOR DRUG ABUSE: A CRITIQUE AND SUMMATION OF CONTROLLED STUDIES

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ABSTRACT. *Empirical evaluations of treatments for abuse of substances other than alcohol are reviewed and critiqued. Methodological strengths and deficits of treatment-outcome studies are delineated, and interpretation of reported results is considered in light of these factors. In large part, intervention strategies for which controlled outcome evaluations exist can be divided into those conceptualized along classical conditioning lines (e.g., extinction and stimulus avoidance) and those derived from operant learning principles (e.g., contingency contracting and community reinforcement). Whereas stimulus-avoidance techniques appear to be relatively more effective than pure extinction trials in reducing drug use, the efficacy of operant methods has been most strongly supported. Moreover, componential treatment packages in which contingent reinforcement is applied to both reductions in drug use and increases in stimulus-avoidance behaviors evince the most dramatic effects. Additional research that addresses the methodological shortcomings of contemporary studies is needed.*

The *DSM-III-R* (APA, 1987) somewhat vaguely defines *substance abuse* as the continued use of a substance, although such use repeatedly results in problems over a period of at least 1 month. Illicit use of controlled substances, particularly cocaine, heroin, and methamphetamines continues to be a significant problem in the United States. Indeed, it is estimated that almost 5.5 million Americans are in clear or probable need of treatment for drug abuse (Gerstein & Harwood, 1990). Moreover, since the introduction of cheap, easily acquired crack-cocaine, the number of repeat and adolescent users has also grown considerably (Gold, Dackis, Pottash, Extein, & Washton, 1986), with a concomitant increase in cocaine-related hospitalizations of 200% over the previous decade. Furthermore, government-monitored treatment facilities report a 500% increase in clients

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served, to over 1 million in 1989 (NIDA, 1989), and this did not include patients receiving treatment from many private or nonreporting facilities. In addition to cocaine and methamphetamine, use of both marijuana and heroin is increasing again after a brief decline.

Pharmacological treatments of drug abuse, such as methadone maintenance for heroin and desipramine for cocaine abuse, have proven to be largely ineffective in reducing illicit drug consumption when employed in isolation (O'Brien et al., 1988). However, several reported case studies involving successful application of psychological interventions (Boudin, 1972; Crowley, 1986; Wolpe, 1965) exist. The relatively greater success of psychological treatments for this disorder may be a function of its entirely overt nature. That is, unlike depression, substance abuse is wholly comprised of observable behaviors and, therefore, may be more amenable to modification by interventions that are specifically designed to alter maladaptive behavior.

The following is a detailed review and critique of psychological treatment–outcome studies for drug abuse that have achieved minimal levels of experimental control. Specifically, each of the considered studies employed either between-groups or multiple-baseline designs to support inferences of therapeutic causality. Excluded from critical review are those reports employing simple time baselines (i.e., AB studies), uncontrolled case studies, or evaluations of treatments for alcohol abuse. The existence of several well-controlled evaluations of drug abuse treatments justifies these rather restrictive criteria. Moreover, earlier comprehensive reviews on this topic (e.g., Childress, McLellan, & O'Brien, 1985; Rawson, Obert, McCann, Castro, Ling, 1991) have not addressed differences between controlled and uncontrolled reports, thereby limiting the extent to which conclusions regarding relative efficacy between treatments can appropriately be made. Our review, therefore, places an emphasis on methodological adequacy, as well as treatment–outcome results, in determining the overall effectiveness of a particular intervention.

While the majority of recently conducted outcome studies attend to some important clinical and experimental factors, such as clearly specified subject inclusionary criteria and randomized assignment to condition, other equally relevant areas of interest are frequently neglected. These include use of: (a) standardized subject populations (i.e., subjects meet a specified *DSM-III-R* diagnosis); (b) active treatment comparison groups rather than no-treatment controls; (c) standardized treatment protocols; (d) assessments of treatment integrity; (e) published treatment specifications; (f) objective dependent measures; (g) multiple conceptually-related dependent measures rather than unidimensional dependent measures; (h) repeated dependent measures, and (i) follow-up assessments.

The importance of standardized and operationally-defined subject populations is obvious when making comparisons of clinical efficacy across treatments. If subjects differ on diagnostic or severity measures, both within-study (between-groups) and between-study evaluations of interventions are necessarily confounded by subject differences, and statements regarding the relative efficacy of treatments are somewhat weakened. With regard to the second point, Eysenck (1992) has described shortcomings of controlled studies that employ no-treatment control groups rather than active comparison interventions. Whereas effects of time are controlled in these studies, effects of nonspecific factors such as therapist attention are not. Because any intervention contains these factors, the efficacy of specific treatments beyond nonspecific therapeutic components remains unknown. Moreover, Carroll, Rounsaville, and Gawin (1991) noted the failure to employ active treatment-comparison conditions with disorders for which several treatments exist is unrealistic, inappropriate, and potentially unethical.

Repeated assessment of treatment integrity, either through recording devices or independent raters, is essential in assuring adherence to treatment protocols. The frequently noted finding that most therapists, regardless of orientation, "do the same thing" underscores the importance of both standardizing treatment techniques and measuring treatment integrity in reports purporting to compare two or more interventions. Treatment standardization increases the confidence with which statements of therapeutic causality are made. Furthermore, standardization of interventions permits independent replication of obtained results, which is the mainstay of the empirical approach.

Incorporation of objective measures of change is essential in any empirical endeavor, but is particularly relevant to substance abuse treatment-outcome research, where objective measures exist and are readily available, and subject motivation to bias self-report is often evident. Indeed, exclusive reliance on self-report is wholly inappropriate because members of this population often risk vocational, personal/familial, and civil losses when they admit drug use. In addition, the direction of experimenter demand is clear and may further bias reports. Along slightly different lines, use of several related dependent measures to assess treatment response enhances the clinical relevance of results and contributes to increasingly complete and accurate descriptions of treatment effects. Clearly, a treatment that reduces drug use and increases work and family satisfaction is preferable to an intervention that only reduces drug use. Similarly, employment of repeated, rather than simple pre/post-test assessments, permits analysis of the temporal sequence of therapeutic change. The importance of this point is obvious, in that an intervention with immediate effects is preferable to one resulting in the same positive change over a longer period of time. Relatedly, an intervention with delayed, but massive effects may be preferable to one that produces rapid, minor improvements. Finally, inclusion of follow-up assessments in outcome studies reveals the extent to which treatment gains are maintained. Indeed, the general consensus on the minimum posttest duration for published results is 24 weeks (6 months) (e.g.,*Journal of Behavior Therapy and Experimental Psychiatry and Addictive Behaviors* Instructions to Authors) and follow-ups for durations of less than 24 weeks produce results that are only suggestive of improvement. Tables 1 and 2 provide summaries of the degree to which reviewed studies address these important experimental criteria.

Subjects in the following reports abused a wide variety of illicit substances, including marijuana, cocaine, benzodiazepines, and heroin. Treatment classes reviewed include stimulus avoidance training (i.e., relapse prevention), contingency contracting, interpersonal psychotherapy for substance abuse, and supportive psychotherapy. Notably, at least one treatment in each of the reviewed studies was behavioral in nature. Indeed, application of behavioral techniques, based on the laws of both operant and associative conditioning, has resulted in two classes of apparently effective treatments. Interventions derived from classical conditioning principles can be subdivided into those that emphasize increased nonreinforced exposure to drug-related stimuli (i.e, extinction/counterconditioning-treatments) and those that employ techniques to increase systematic avoidance of conditioned discriminitive stimuli for drug use (here called "stimulus-avoidance" treatments). In contrast, purely operant strategies have focused on restructuring the contingencies within which drug-taking behavior operates.

EXTINCTION, COUNTERCONDITIONING, AND STIMULUS AVOIDANCE INTERVENTIONS FOR DRUG ABUSE

Initial justification for use of extinction and counterconditioning-based interventions for drug abuse was provided by several studies that demonstrated the potential of drug-associated stimuli to reliably elicit conditioned responses in drug users. For example,

TABLE 1. Basic Study Characteristics

Study	*n*	Experiment Design	Tx Integrity Assessed	Tx Standardized	Tx Specified in Rept.	Active Tx Comparison Group	Standard Dx Assigned	Objective Dependent Measures Used	Repeated Dependent Measures Used	Collateral Report Used	Related Dependent Measures Used
Roffman et al. (1988)	110	Randomized Between-Groups	Yes	Yes	No	Yes	No	No	No	No	No
Maculiffe (1990)	168	Randomized Between-Groups	Yes	Yes	Yes	No	No	No	No	No	Yes
Carroll et al. (1991)	42	Randomized Between-Groups	No	Yes	Yes	Yes	Yes	No	No	No	Yes
Stitzer et al. (1982)	10	ABA Within-Subject	Yes	Yes	Yes	NA	No	Yes	Yes	Yes	No
McCaul et al. (1984)	20	Randomized Between-Groups	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Budney et al. (1991)	2	Multiple Baseline Across Subjects and Behaviors	No	Yes	Yes	NA	Yes	Yes	Yes	Yes	Yes
Higgins et al. (1991)	25	Non-Randomized Between-Groups	No	Yes	Yes	Yes	Yes	Yes	No	No	No
Higgins et al. (1993)	38	Randomized Between-Groups	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Azrin et al. (1994)	82	Randomized Between-Groups	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

Ehrman, Robbins, Childress, & O'Brien (1992) found that cocaine users, but not normals, evinced decreased skin temperature and skin resistance, and increased heart rate, drug cravings, and feelings of withdrawal, when engaging in drug-preparation behaviors (e.g., placing a cocaine-like substance in a pipe and heating it) or when exposed to audio and videotapes depicting cocaine use. Moreover, cocaine users did not exhibit such patterns of responding when exposed to similar types of heroin cues, indicating that these responses were specific and under the control of cocaine-related stimuli. Similar conditioned responses to drugs have been shown to exist in heroin users (Childress, McLellan, & O'Brien, 1986; O'Brien, Ehrman, & Ternes, 1986). In addition to the drug itself, several second-order conditioned stimuli have also been shown to effectively elicit drug-taking behaviors. These discriminitive cues include mood states associated with past drug use (Childress, McLellan, Natale, & O'Brien, 1987), interceptive/somatic sensations (Bickel & Kelly, 1988), geographic locations (Wikler, 1948), other drug users and situations conducive to drug use (e.g., cash in pocket) (Caudille & Marlatt, 1975; Lichtenstein, 1977; O'Brien, Childress, McLellan, & Erhman, 1990), drug paraphernalia (McLellan, Childress, Erhman, & O'Brien, 1990), and other drugs (e.g., alcohol) (Bickel & Kelly, 1988).

Obviously, the magnitude and extent of conditioned stimuli that control drug-taking behavior is potentially enormous. Therefore, treatments endeavoring to extinguish or alter substance abuse that occurs in response to these discriminitive stimuli must include exposure trials that are comprehensive and multi-faceted. If all discriminitive stimuli are not addressed, spontaneous recovery (relapse) of the undesired response is likely. Such disappointing occurrence is typical among drug users following treatment completion, and may be the result of insufficient exposure during extinction trials. Furthermore, full recovery of previously extinguished drug-use behavior is made more likely after an initial relapse because the stimulus properties of the drug itself can effectively reinstate previously extinguished substance-abuse behavior (Bigelow, Griffiths, & Liebson, 1977; Griffiths, Bigelow, & Henningfield, 1980), and nonreinforced exposure to this stimulus class is difficult if not impossible to achieve. In addition, extinction trials are almost always performed imaginally or in analogue settings, thereby limiting the extent to which effects are generalized to *in vivo* situations. That is, salience of imaginal or analogue stimuli is necessarily less than that of stimuli experienced *in vivo*, producing a relatively weaker conditioned inhibition of drug-use behavior following exposure trials. Counterconditioning treatments of drug abuse suffer from similar inherent weaknesses. These interventions are employed to replace reinforcing qualities of drug ingestion and drug-related stimuli with aversiveness. As with extinction-based techniques, exposure to drug-related stimuli is essential. However, in counterconditioning treatments, these stimuli take on negative, rather than neutral (i.e., nonreinforcing) valences. As is the case with extinction strategies, the number of conditioned discriminitive stimuli triggering drug abuse often exceeds that which is feasibly addressed in session.

Although effectiveness of extinction techniques in reducing self-reported *craving* has been demonstrated, (O'Brien et al., 1988; O'Brien et al., 1990), to date, no acceptably controlled evaluations of pure extinction or counterconditioning treatments for drug abuse have been published. However, O'Brien, Childress, McLellan, and Ehrman (1990) presented preliminary case study results indicating that adjunctive extinction/exposure sessions were moderately effective in reducing drug abuse, but specific drug-use data were not reported. Similarly, Gotestam and Melin (1974) employed covert extinction (in which subjects imagined ingesting drugs and not getting high) to successfully reduce amphetamine abuse in three of four female heroin addicts. Using counterconditioning methods, Duehn and Shannon (1973) treated seven poly-drug users (e.g., LSD, mari-

TABLE 2. Specific Study Characteristics

Study	Subject Mean Age (years)	Drug Targeted	Treatment Types	Tx Length	Dependent Measures	Format of Dependent Measures	Follow Up	Results
Roffman et al. (1988)	32.5	THC	Stimulus-Avoidance vs. Supportive Counseling	12 weeks, mean 7.5 sess	Retrospective self- and sig. other report, taken pre-post-test	Use over 30 days pre-test vs. use over 30 days of follow-up	1 month	Stim avoidance; 36% abstinent at follow-up, THC use reduced from 27 to 8 days/month. Supportive: 25% abstinent at follow-up, THC use reduced from 26 to 13 days/month.
Maculiffe (1990)	31	Heroin	Stimulus-Avoidance vs. No-Tx Control	12 months, mean 4 months (# sess NA)	Retrospective self-report of drug use, employment, criminality, take 6- and 12-months post-test	Percent abstinent over 6-month preceding assessment period	No true follow-up, tx offered continuously	Stim avoidance: 34% abstinent at 6-mo., 30% abstinent at 12-mo., employment up. Control: 20% abstinent at 6-mo, 15% abstinent at 12 month
Carroll et al. (1991)	26	Cocaine	Stimulus-Avoidance vs. Interpersonal therapy	12 weeks, (# sess NA)	Self-report, taken weekly, but not reported in repeated format, ASI	Percent subjects achieving 3 consec. weeks abstinence. Percent subjects abstinent last 3 weeks of treatment	None	Stim avoidance: 57% attained 3 consec weeks abstinence, 43% abst. for last 3 weeks tx. Interpersonal tx: 36% attained 3 consec weeks abstinence, 19% abst. for last 3 weeks tx.
Stitzer et al. (1982)	28	Benzodiazepines	Contingent Contracting for Abstinence	12 weeks, (24 sess.)	Objective urinalysis taken 2x/wk	Weekly urinalysis data for each subject reported repeatedly over tx and 3mo. follow-up	Average 6 weeks	Overall, 88% urines positive during baseline, 47% positive during contingency, 91% positive during posttest. 60% subjects evince clear reductions in benzo use during contingency.

McCaul et al. (1984)	29	Heroin	Contingency Contracting and Methadone vs. Methadone Control	13 weeks	Objective urinalysis, PSQ	Percent abstinent each week, number of consecutive opiate-free urine specimens	None	Contin. Contract: 50% subj. with 11 or more consec opiate-free urines, % sub. opiate-free each week sig greater than controls over active Methadone tx. Methadone Cont.: 60% sub with 5 or less consec opiate-free urine. PSQ discomfort scores elevated.
Budney et al. (1991)	32	Cocaine, THC	Sequential application of contingency contracting	28 weeks	Objective urinalysis, taken 4x/wk	All urinalysis data for each subject reported repeatedly over each phase of tx	1 and 5 month	Systematically increasing contingent reinforcement: 100% coc.-free urines when cont. directed to coc., gains maintained during F.U.. 93% THC-free urines, only when cont. directed to THC. THC use resumed when contingencies removed
Higgins et al. (1991)	30	Cocaine	Contingency Contracting/ Comm. Rein. vs. 12-step Counseling	12 weeks, (# sess NA)	Objective urinalysis, taken 4x/wk	# of consecutive weeks abstinence, overall percentage of cocaine-free urines	None	Contin. Contract: 10 sub achieve 1-mo. abstinence from coc, 92% urines cocaine-free 12-step: 3 sub achieve 1-mo. abstinence, 78% urines cocaine-free
Higgins et al. (1993)	29	Cocaine	Contingency Contracting/ Comm. Rein. vs. 12-Step counseling	24 weeks (36 sess)	Objective urinalysis taken 3x/week	% of subs abstinent each week of treatment reported repeatedly, # of consecutive weeks abstinence	None	Contin.Contract: 70% subjects abstinent at week 12, 50% at week 24, 74% subjects achieve 1-month abstinence from coc 12-Step: 18% subjects abstinent at week 12, 5% at week 24, 16% subjects achieve 1-month abstinence.

(*Continued*)

TABLE 2. Continued

Study	Subject Mean Age (years)	Drug Targeted	Treatment Types	Tx Length	Dependent Measures	Format of Dependent Measures	Follow Up	Results
Arzin et al. (1994)	28	Cocaine, THC, Benzo-, Heroin, LSD, amphet	Contingency Contracting/ Stimulus Control vs. Supportive Counseling	12 months	Objective urinalysis, taken 1x/wk, self-report daily use, sig- other report daily use (if any of above indicative of drug use, subjects considered to have used). Various standardized questionnaires	% of subjects abstinent each month, overall mean number of months abstinent, days per-month of use	No true follow-up, tx given continuously	Contin.Contract: 37% subjects abstinent all drugs at month 2, 65% abstinent all drugs at month 12, 6.2 months overall abstinence, ave 2.1 days use/ month of any drug 12-Step: 20% abstinent all drugs at month 2, 20% abstinent all drugs at month 12, 2.6 months overall abstinence, ave. 5.4 days use of any drug

juana, and amphetamines) with covert sensitization (in this case, imaginal nausea) and found that LSD use was diminished. Furthermore, an aversive counterconditioning strategy employing faradic shock during exposure trials, in conjunction with inpatient supportive counseling, was found by Frawley and Smith (1992) to be moderately effective in reducing cocaine, marijuana, and amphetamine use. In all of these studies, lack of control, presence of additional treatment components, and absence of objective dependent measures combine to seriously weaken conclusions regarding the efficacy of extinction and counterconditioning procedures, both *in vivo*, and imaginal.

CONTROLLED STUDIES: CLASSICAL CONDITIONING-BASED TREATMENTS

In contrast to extinction and counterconditioning-based interventions, stimulus-avoidance treatments have as their goal reduced exposure to drug-related stimuli. As with extinction techniques, the rationale of stimulus-avoidance treatments is derived from tenets of classical conditioning. [Although a convincing argument can be made that the procedure is also inherently operant, in that a conditioned stimulus is, in fact, a discriminitive stimulus for a response that leads to reinforcement. Here, however, the conditioned stimulus is considered to elicit the urge response (rather than the drug-use-leading-to-reinforcement response) and is therefore associative in nature.] However, the potential of multiple discriminitive stimuli to elicit drug-use behavior is considered to be beyond that which is extinguishable through analogue or imaginal exposure trials. Consequently, skills are taught to facilitate systematic avoidance of drug-associated stimuli (e.g., people, places, etc.). To date, several empirical evaluations of stimulus-avoidance interventions have been performed. Roffman, Stephens, Simpson, and Whitaker (1988) provided the earliest controlled evaluation of an avoidance-based relapse prevention treatment for marijuana abuse. Subjects were 84 males and 26 females with a mean age of 32.5 years and a mean marijuana use duration of 18 years. Admission to the study was contingent on subject report of 50 episodes of use in the past 90 days. Although no *DSM-III* diagnoses were assigned, 90% of subjects reported lifetime history of cocaine and hallucinogen use and 63% reported current alcohol use. Excluded from participation were individuals who: (a) were concurrently receiving other substance-abuse treatment; (b) "abused" (no operational definition provided) alcohol or drugs other than marijuana in the 90 days before treatment; and (c) evinced significant psychopathology. The latter two exclusionary criteria are problematic in that they limit generalizability of overall treatment results. That is, only a relative minority of individuals seeking treatment for drug abuse are "pure" marijuana abusers, and the incidence of mood and anxiety disorders is relatively higher among substance abusers than normals (Kandel, Davies, Karus, & Yamaguchi, 1986). Furthermore, fully 85% of this sample were employed, and the average level of education completed was 14 years. It appears, therefore, that individuals in this study sample may differ significantly from the typical drug user.

Subjects were matched on the basis of gender and randomly assigned to either relapse prevention (employing stimulus avoidance strategies) or supportive counseling treatments. Both interventions were comprised of ten 2-hour group sessions provided over 12 weeks by male and female therapist teams. Sessions were audiotaped to assure appropriate delivery of treatment. Skills training to facilitate avoidance of conditioned elicitors of drug-use behavior served as the primary component of the relapse prevention treatment. Specifically, subjects were encouraged to identify and avoid both the behaviors that typically preceded drug use, as well as external stimuli that triggered drug use. Role playing was employed to "demonstrate assertive responses to temptation by others" (p. 131), and to practice avoidance of interoceptive urges and cognitive reminders of use.

Planned systematic avoidance of high risk situations was discussed and encouraged. Additional procedures employed included relaxation training and "homework assignments" (no further clarification regarding the use of these techniques was provided).

In contrast to the avoidance-based relapse prevention treatment, subjects in the social support intervention were encouraged to use their existing interpersonal networks to limit drug use. The investigators reported that many "themes" of the relapse prevention condition were also discussed in the social support treatment, however, no active skills training was performed. Finally, the authors indicated that "suggestions" were given to both groups "that could be taken in preparation for quitting" (p. 131). Lack of treatment specificity and the implication that avoidance training in the form of suggestions was given in both groups limits, somewhat, conclusions regarding the differential effectiveness of either treatment.

Relevant dependent measures included subject and collateral verbal reports of daily drug use, obtained retrospectively, at pretreatment for the 90-day period preceding treatment, and at 1-month post-treatment, for the 30-day period following treatment termination. No repeated or objective assessments were performed during treatment. Furthermore, although analysis of pretreatment daily drug-use data revealed no between group differences, data regarding differential attrition in experimental conditions were not provided, thereby confounding treatment effects with both the extent of differential attrition between groups, and the subject characteristics of treatment noncompleters.

Subjects in both conditions received an average of about 7.5 treatment sessions. Overall, 36% of subjects receiving relapse prevention and 25% of subjects receiving social supportive counseling reported that they had not used marijuana in the month following treatment termination (difference not statistically significant). However, within-group analyses revealed that subjects in the relapse-prevention condition reported a significantly greater reduction in daily use frequency pre- to posttreatment (27.1 to 8.1 days/month use) than did subjects in the social support condition (26.4 to 13.0 days/month use). The investigators indicated that collateral reports of use correlated 0.81 with subject reports. Unfortunately, no specific collateral report data were provided for each condition. This is problematic in that it is not known: (a) which group, if either, evinced higher subject-collateral report correlations, and (b) whether collaterally reported rate of drug use was diminished to a significantly greater extent (or at all) in subjects receiving relapse prevention. Notably, neither treatment had any effect on subject or collateral use reports for substances other than marijuana.

Results of this evaluation, although moderately positive, must be interpreted with extreme caution for the aforementioned reasons. Moreover, use of reliable or objective dependent measures and longer assessment time samples would have significantly strengthened conclusions about the relative efficacy of each treatment. Indeed, although the investigators indicated that they had conducted follow-up interviews for 6 months, data were reported for only the first 30 days following treatment termination. Consequently, the present study's conclusion that an avoidance-based intervention is somewhat effective in reducing marijuana use is merely suggestive.

The second study reviewed (McAuliffe, 1990) also employed stimulus-avoidance strategies to facilitate abstinence in heroin addicts who were completing inpatient addiction treatment. Whereas interpretation of outcome data from this experiment is obviously confounded by pretreatment drug-use levels (i.e., subjects were abstinent or nearly abstinent at pretest), results are still relevant, given the high rate of relapse among heroin users and the extremely large sample size employed in the evaluation. One-hundred sixty-eight subjects were obtained from a large pool of inpatients in both the United States and Hong Kong (no dramatic differences between sites were reported on any variable, hence all following comments refer to the combined sample). Eighty-three percent of the sample were male, with a mean age of 31 years and mean heroin-use duration of 7 years. Subjects had received an average of 3.5 past "treatments" for drug addiction prior to participation in the present study.

Following three assessment sessions, patients were randomly assigned to either an avoidance-based relapse prevention condition or a no-treatment control condition. No attention-placebo control, or existing addiction treatment was employed to control for nonspecific treatment effects produced through simple participation in an active treatment program. Subjects in the control condition were offered referrals, but the proportion of subjects who pursued alternative treatments was not reported, thereby introducing a potential confound into outcome results. The relapse-prevention intervention was conducted twice per week in 1.5-hour group meetings. One session each week was led by a master's level psychologist who had received extensive training in treatment techniques, whereas the second session was led by a recovered addict. In therapist-directed sessions, subjects were taught how to identify and "erect walls" against discriminitive stimuli that triggered drug use, such as drug-taking friends, locations, moods, and importantly, behavioral chains that had led to use in the past. Specifically, patients were taught skills to enable them to sever relationships with users, initiate nondrug-related friendships, relocate to nonuse environments, and acquire nondrug-related employment. To reconstruct social networks with "safe" people, subjects were required to attend group-sponsored meetings and activities on weekends and holidays. Furthermore, intersession associations with other group members were encouraged. In the second meeting each week, a recovering addict provided positive peer motivation and modeling to both validate and increase participation in relapse prevention strategies. Notably, counselors followed structured, manualized treatment protocols and sessions were audiotaped and reviewed to assure treatment integrity.

Relevant dependent measures included subjects' retrospective report of heroin use, employment, and illegal behavior over posttreatment months 1 through 6, and 7 through 12. These data were collected at about 8 and 19 months posttreatment, respectively. Again, no repeated objective measures, or collateral reports, were obtained to corroborate subject self-report (a urinalysis was performed at the final interview but detected drug use for only the 3 days preceding urine sampling). Therefore, validity of the primary dependent measure appears questionable, particularly when considering the differential experimenter demands placed on subjects who received an active treatment for an average of about 4 months, relative to control subjects, who received no known treatment.

Impressively, the investigators reported that data were available for 98% of subjects at the 6-month follow-up point, and for 78% of subjects at the 12-month follow-up point. For the first 6 months of treatment, total abstinence was reported by significantly greater numbers of subjects in the relapse-prevention treatment than in the control group (34% vs. 20%, respectively). An additional 13% of active-treatment subjects and 9% of controls reported using opiates less than once per month during this period (i.e., 5 days use or less). However, 53% of subjects in the relapse-prevention condition, and 71% of controls reported continued heroin use. Although the authors indicated that control subjects reported 22.7 more days of opiate use during this 6-month period than did subjects receiving relapse-prevention treatment, absolute mean number of days of use per month by subjects in each condition was not provided, thereby precluding a more fine-grained analysis of results. Data for the second 6 months of follow-up were moderately similar to the first: total abstinence was reported by significantly greater numbers of subjects in the relapse-prevention condition than in the control condition (30% vs. 15%, respectively). Additionally, 6% of subjects receiving relapse prevention and 4% of controls reported using opiates less than once per month during this 6-month period. Notably, the number of relapse-prevention subjects reporting continued heroin use increased to about 66% (vs. 81% of controls). Although statistically superior to the control condition, overall reductions in drug use resulting from the relapse-prevention treatment were not overwhelmingly impressive.

Considering subjective measures of employment, no differential effect of treatment was evident in subjects who had been employed at pretest. That is, subjects who were employed at pretreatment remained so. Regarding subjects who were unemployed at pretreatment, relatively greater proportions of subjects receiving relapse prevention treatment reported that they had acquired employment during both 6- and 12-month follow-up periods (56% and 45% employed, respectively) than did controls (44% and 30% employed, respectively). Finally, on self-report measures of criminality, no between-group differences in frequency of incarceration were evident. However, relapse prevention subjects reported significantly more "crime-free" days than did control subjects.

Commendably, the present investigators employed standardized, specified treatments with an exceptionally large number of subjects and conducted assessments for an extended duration. Additionally, treatment integrity was verified and supplementary, clinically relevant dependent measures were collected. However, selection of abstinent or nearly abstinent subjects for participation in this study precluded analysis of within-group treatment effects, and may have served to limit generalization of treatment results. Moreover, accurate analysis of between-group effects was made tenuous by the subjective, retrospective, and uncorroborated nature of the primary dependent measure. Indeed, it is highly unlikely that subjects were able to accurately recall patterns of daily drug use that occurred up to 8 months prior to assessment. Furthermore, level of experimenter demand was significantly greater for subjects who had invested considerable amounts of time and effort in the relapse-prevention treatment than for control subjects. As a result, achieved effects, although statistically significantly in favor of the avoidance-based intervention, do not appear to be clinically so. Again, efficacy of pure stimulus-avoidance treatments is only weakly supported.

Stimulus avoidance strategies have also been employed to reduce cocaine use. Carroll, Rounsaville, and Gawin (1991) employed a controlled group design to assess the relative efficacy of relapse prevention and interpersonal psychotherapy with 42 outpatients (mean age 26 years) who met *DSM-III* criteria for cocaine abuse disorder, and had ingested at least 14 g of cocaine in the 3 months prior to treatment initiation. Seventy-four percent of subjects were male, 68% were unmarried, 26% met *DSM-III* criteria for antisocial personality disorder, and 20% met *DSM-III* criteria for mood disorder. Excluded from the study were individuals: (a) for whom cocaine abuse was not the primary substance abuse diagnosis; (b) maintained on psychotropic medications; (c) evincing severe suicidal ideation; (d) with a life history of schizophrenia or mania; (e) who were court ordered to attend substance-abuse treatment. The therapists were three graduate students with an average background of 5.5 years in substance-abuse counseling. Participants were randomly assigned to either relapse prevention or interpersonal psychotherapy for drug abuse. As in earlier relapse-prevention interventions, skills training to achieve systematic stimulus avoidance was provided in which patients were taught to identify and avoid high risk situations for both craving and use and to develop effective strategies to control urges. In the interpersonal psychotherapy treatment, subjects were encouraged to identify interpersonal problems and conflicts related to drug abuse, and to develop increasingly adaptive ways of relating to and functioning with others. Both treatments were conducted in 12 hourly sessions over a 12-week period. Although treatment manuals were employed, no sessions were audiotaped, thereby precluding verification of treatment integrity between conditions. The relevance of this concern is increased by the fact that one therapist conducted treatment in both experimental groups.

The Cocaine Craving and Use scale, a self-report index of the quantity and frequency of cocaine use and craving, served as the study's primary dependent measure, and was administered to subjects each week during treatment. Although random urinalyses were also performed, these results were not reported or included in the data presented. The investigators maintained that because: (a) subjects were self-referred and not under court order, and (b) only one instance of urinalysis and self-report were in conflict, use of self-report rather than objective urinalysis as the primary measure of drug use was justified. However, this position seems unsupported because study participants, while not under court-ordered demand to report reduced drug use, were most definitely subject to experimenter demand effects (in both treatments, therapists' desire to reduce subject's drug use was clearly evident). Moreover, because the investigators do not state the frequency with which random urinalyses were preformed, the aforementioned self-report urinalysis concordance is potentially inflated. That is, because cocaine cannot be detected in the body after about 3 days of nonuse, even weekly urinalysis would produce *false negatives* about 50% of the time for an individual using the drug on 1 or 2 days each week. Furthermore, subject attrition was quite high, and the authors did not report the number of missed sessions for which random urinalysis was scheduled but not performed. The validity of the primary dependent variable is, therefore, suspect. In addition to drug use questionnaires, the Addiction Severity Index (ASI) was obtained monthly throughout the treatment to assess general impact of drug abuse on a variety of psychosocial dimensions. Although a large majority of subjects abused substances in addition to cocaine, rates of use of these drugs following treatment were not reported.

Interestingly, only 55% (24) of subjects completed 12 treatment sessions, and the authors removed one individual from the study because he evinced "no substantial reduction in cocaine use." Whereas not statistically significant, the number of drop-outs from interpersonal therapy was nearly twice that of the relapse-prevention condition. Unfortunately, although daily drug-use data were collected, these results were not reported, thus preventing analysis of the time course of therapeutic change. Instead, treatment outcome was measured in terms of percentage of subjects in each group achieving *short-term abstinence*, (defined as 0 days cocaine use for 3 consecutive weeks, occurring at any time during treatment) and *short-term recovery*, (defined as 0 days cocaine use for the 3 consecutive weeks prior to study termination). These measures are exceedingly poor indicators of clinical outcome for several reasons: first, with the measure of short-term abstinence, it is not known when the cessation of drug use occurred. That is, initially abstinent subjects who evince *increased* drug use in response to continued treatment are considered to have benefited from treatment to the same extent as subjects who remain abstinent for the entire 12 weeks of treatment; second, these measures are entirely too gross and impact of treatment is relatively unknown. Indeed, subjects using cocaine fully 75% of the duration of the study (63 days use during weeks 1-9) are considered to have achieved both short-term abstinence and recovery. In contrast, a subject using once every 3 weeks (i.e., 4 days use overall) and a subject using each day (i.e., 84 days use) are both classified, identically, as treatment failures; third, the duration chosen to be indicative of abstinence (i.e., 3 weeks) is entirely too brief to be of clinical relevance, in that nonuse for this duration may be produced by factors other than subjects' decision/training to remain drug-free. For example, inadvertent abstinence lasting 3 weeks can result from temporary reductions in local illicit drug supplies or temporary financial restrictions of the patient. Caveats regarding shortcomings of reported dependent measures aside, 57% of subjects in relapse prevention treatment versus 36% of subjects in interpersonal psychotherapy were classified as having achieved short-term abstinence at some point during the study. Additionally, 43% of relapse prevention subjects versus 19% of interpersonal psychotherapy subjects achieved short-term recovery during the final 3 weeks of treatment. When subjects were stratified according to severity of use, more dramatic between-group differences emerged. Among the relatively more severe users (defined as those individuals with scores above the study-sample's median value on the ASI), 54% of relapse prevention versus 9% of interpersonal therapy subjects achieved short-term abstinence, and 54% of relapse prevention versus 0% of interpersonal psychotherapy subjects achieved short-term recovery. On the measure of general addiction severity (e.g., the ASI), small improvements were noted for both groups on all self-report subscales (i.e, medical, employment, alcohol, drug, psychological, legal, family/social), but significant between-group differences (in favor of relapse-prevention treatment) were evident only on the psychological severity subscale.

Notable features of this study include use of standardized, specified treatments, an active-treatment comparison condition, and additional clinically relevant dependent measures in addition to simple use rates. Furthermore, the subject population was standardized through the use of *DSM-III-R* diagnostic assignment. As with earlier studies however, the moderate success of avoidance-based relapse-prevention treatments must be interpreted with skepticism for the following reasons: (a) rates of subject attrition were disappointingly high (43%) for a treatment lasting only 12 weeks; (b) no objective measures of drug use were reported. Instead, gross measures of self-reported use were employed to determine therapeutic response to treatment. [Even with these poor measures of change, the proportion of subjects achieving short-term abstinence or recovery (about half the relapse prevention subjects) was not exceedingly impressive]; (c) the investigators' failure to collect follow-up data severely limits conclusions about treatment efficacy, particularly with cocaine abusers, a population for which recidivism is exceptionally high. In sum, it appears that efficacy of relatively pure stimulus-avoidance interventions in the treatment of drug abuse has not been thoroughly supported thus far.

OPERANT INTERVENTIONS FOR DRUG ABUSE: CONTINGENCY CONTRACTING

In contrast to extinction and stimulus-avoidance interventions, operantly-based treatments endeavor to alter contingencies that exert influence over drug-taking behavior. Both reinforcement for abstinence and punishment for nonabstinence are typically included in *contingency contracts*. Boudin (1972) presented an early uncontrolled case study application of contingency contracting to reduce amphetamine abuse in a female, African-American, doctoral student. The subject had abused amphetamines over a 3-year period and was very motivated to reduce her use of drugs. A contingency contract was implemented in which self-report or therapist suspicion of drug use resulted in a $50 payment by the subject to the Ku Klux Klan (KKK) from a preestablished bank account. In addition to remaining abstinent, the subject was required to call her therapist three times per day and report current activities, and provide receipts documenting all monetary expenditures. The subject reported one instance of amphetamine use 1 month after the contract was initiated and a $50 check was mailed to the KKK. No future use was reported throughout the 12 months during which the therapist was in contact with the subject. Although several aspects of Boudin's treatment are inappropriate by today's standards of outpatient–therapist conduct, results appeared to be positive. In a second case study, Crowley (1986) employed contingency contracting to reduce drug abuse in 15 medical doctors. In addition to a wide variety of other treatments (e.g., detoxification, supportive counseling), the doctors entered into a contingency agreement in which drug use resulted in the mailing of a "surrender of license" letter to the state professional licensing board. Notably, drug use was measured through random urinalysis (the frequency of which was not provided). Results indicated that seven patients did not relapse at all during the 2 years of follow-up, and four others experienced only brief relapses. Four letters were mailed to the licensing board.

CONTROLLED STUDIES: OPERANT CONDITIONING-BASED TREATMENTS

Interestingly, the aforementioned case reports used punishment of negative response rather than reinforcement of positive response to reduce drug use. However, reinforcement for abstinence has been more widely reported. In a controlled case study, Stitzer, Bigelow, Liebson, and Hawthorne (1982) employed an ABA within-subjects withdrawal design to evaluate the effects of contingent reinforcement of benzodiazepine-free urine on "supplemental" benzodiazepine use in heroin addicts. Subjects were 10 males concurrently enrolled in an outpatient methadone maintenance program with an average age of 28 years and average addiction history of 10 years. To assure clinical significance, subjects were included in the study only if they tested positive for benzodiazpine use on at least 50% of twice weekly urinalyses given during a 3-month assessment trial (subjects actually tested positive for benzodiazepine use on 80% or more of these urinalyses). Following the initial baseline period, a 3-month contingency contract was implemented in which immediate reinforcers for each benzodiazepine-free urine were made available. Reinforcers included the choice of $15 cash, two methadone take-home doses, or a self-alteration of their methadone dose by 20 mg. No negative consequences were included in the contingency contract and all subjects received supportive therapy provided by clinic staff members for the entire study. Cessation of contingent reinforcement for drug-free urine (after 3 months) was followed by a monitored return to baseline (i.e., no contingency management). Postcontingency data were available for 12 weeks for six subjects, and for 1–10 weeks for the other four subjects. As mentioned, objective measures of drug use (urinalysis) were performed twice weekly throughout prebaseline, contingency, and postbaseline periods. Commendably, the investigators reported both individual, as well as group urinalyses results, thereby permitting evaluation of within-subject effects over the duration of treatment. Six of 10 subjects evinced clear reductions in benzodiazepine-positive urine over both pre- and postbaseline levels when contingencies were in effect. Three subjects showed no clear change in their benzodiazepine-use behaviors across the three time samples, and one individual evinced mild improvement over baseline levels. Considering group percentages, 88.4% of subjects' urine tested positive for benzodiazepines during the prebaseline assessment. This number was reduced to 47% when the reinforcement contingency was in effect, and was then increased again to 90.5% when the contingency was no longer present during the postbaseline assessment.

These results are seemingly impressive, in that for 60% of the sample, illicit use of benzodiazepines appeared to be under direct control of the contingency contract. Although only benzodiazepine use was targeted, rates of other drug use were as likely to decrease as increase during the contingency period. Hence, substitution of other drugs for reduced benzodiazepine ingestion was not evident. Furthermore, subjects' continued use of nontargeted drugs and the failure of several subjects to maintain treatment gains following termination of the contingency contract serve to demonstrate the control of the contingency system over benzodiazepine use. However, these positive results are mitigated by the small sample size and lack of between-group comparisons in this controlled case study. Moreover, the decidedly atypical contingency contract (i.e., payment not to use drugs) limits the extent to which this particular intervention may be applied in nonresearch based clinical settings.

In an extension of their original controlled case study, McCaul, Stitzer, Bigelow, and Liebson (1984) employed a controlled group design to evaluate the relative efficacy of a detoxification plus contingency management treatment and simple urinalysis monitoring with opiate abusers. Subjects were 20 male IV heroin users with an average age of 29 years and an average use duration of 7.5 years. Entrance into the study was contingent on subjects' provision of three consecutive opiate-positive urine over a 2-week "predetoxification period, followed by at least three opiate-free urine during the first 3 weeks of detoxification (urine samples were taken twice weekly). Note that the relatively more "severe" users were excluded from the study, in that only those individuals evincing improvement over the prebaseline period were selected for participation.

In accord with general outpatient detoxification procedures, participants were required to report to the clinic each day to receive their methadone. Following stabilization, dosages were gradually reduced under double-blind conditions during weeks 4-9, and were replaced by placebo during weeks 10–13. At the end of week 3, subjects were randomly assigned to either control or contingency contracting conditions. Both groups continued to participate in the clinic's weekly counseling sessions, however, control subjects received $5 each week for providing a urine specimen, regardless of urinalysis results. In contrast, subjects in the experimental condition received $10 and a take-home methadone dose for each opiate-free urine. Additionally, in the event that an experimental subject produced an opiate-positive specimen, reinforcers were withheld and the patient was required to attend daily counseling sessions and provide daily urine samples until an opiate-free urine was produced. Note that effects of the contingency contract are potentially confounded by effects of daily counseling sessions, provided only to subjects in the experimental condition who used opiates. These additional sessions were not "neutral" (i.e., nontreatment related) response costs, and may have reduced drug use in a manner independent of the contingency contracts. in addition to twice-weekly urinalyses, assessments also included the PSQ, a 60-item inventory which requires respondents to rate a variety of withdrawal symptoms on a 1–3 point scale. Although experimental subjects evincing opiate use provided daily urine samples, only the Monday and Friday urine of each group were included in the data analyses. Urinalysis data were reported in: (a) percentages of opiate-free urine for each condition, each week, permitting a moderately fine-grained analysis of the time course of therapeutic effects, and (b) number of consecutive opiate-free urine samples. (Note that active methadone detoxification occurred during weeks 4–9, followed by placebo maintenance and contingency/control conditions over weeks 4–13.)

Results showed that 90% of urine samples were opiate-free for both groups during baseline. Over weeks 4-7, contingency contracting subjects maintained these gains, whereas only 65% of the control subjects' urine contained no opiates. However, as methadone dosage reduction continued for both groups, the percentage of "clean" urine specimens was decreased each week until between-group differences were no longer significant (both groups producing about 30% opiate-free urine at week 12). Additionally, 80% of experimental versus 60% of control subjects' urine were opiate-free during detoxification (weeks 4–9), but these rates fell to 35% and 20% for the experimental and control conditions, respectively, during placebo maintenance (weeks 10–13). On the measure of number of consecutive opiate-free urines, 50% of experimental subjects produced 11 or more consecutive clean urines, whereas 60% of control subjects produced only five or fewer opiate-free samples. Interestingly, half of the experimental subjects relapsed only when their methadone dosage reached zero, whereas all of the control subjects relapsed by this time. On the PSQ, both group's scores were elevated during baseline and showed consistent decreases during detoxification. However, when methadone dosages had been significantly reduced (week 8), discomfort scores increased significantly for the control group. Rates of drug use other than heroin were relatively unaffected during detoxification, but increased slightly during placebo administration.

On initial inspection, it appears that the contingency management procedure was slightly effective in reducing opiate use for a very short period of time when administered in conjunction with methadone. However, inferences of causality regarding these gains are weakened by the fact that differential rates of individual counseling were received by experimental but not control subjects following relapse. Failure of subjects to maintain treatment gains during placebo administration, even though contingent reinforcement was still provided, highlights the need to continually assess the potency of reinforcers being offered, and address drive states (i.e., urges) caused by the absence of other reinforcers. That is, reinforcing qualities of opiates were significantly increased following methadone cessation. Whereas reinforcers offered through the contingency contract remained unaltered. Predictably, contingency management programs are effective only when contingencies are of sufficient strength to counter the reinforcing qualities of the drugs themselves. Therefore, systematically enhancing the level of contingent reinforcement for drug abstinence potentiates maintenance of treatment gains. However, stimulus salience greatly increases the relative impact of reinforcers. As a result, contingency contracting must be supplemented with stimulus avoidance methods so that the relative reinforcing potential of drugs is reduced.

Budney, Higgins, Delaney, Kent, & Bickel (1991) and Higgins, et al., (1991) performed preliminary tests of the hypothesis that systematically increased contingent reinforcement, combined with stimulus-avoidance techniques, will extend treatment gains for cocaine and marijuana users. In Budney et al., subjects were two males, aged 28 and 35 years, diagnosed, according to *DSM-III-R* criteria, with cocaine dependence and marijuana abuse. Additionally, each subject had used cocaine for at least 3 years and marijuana for at least 15 years. Both subjects had used cocaine during the week prior to admission to the study. A multiple baseline design across both behaviors and subjects was employed to assess the effects of contingency management, stimulus avoidance strategies, and community reinforcement techniques (Sisson & Azrin, 1989) on drug use. Notably, assessments were made repeatedly and included urinalyses four times per week (Monday, Wednesday, Friday, and Saturday) and significant other retrospective report of subjects' drug use and employment attendance (made at the end of each treatment phase for the immediately preceding period).

During the first 12 weeks of the study, all intervention strategies were initiated for each subject; however contingency management procedures were directed only to cocaine use. That is, contingent reinforcement in the form of voucher payment was delivered for cocaine-negative urine, irrespective of evidence of marijuana use. The therapist for both patients was a Master's level psychologist with 3 months training in substance-abuse treatment. As mentioned, to maintain and increase reinforcer potency, the payment for consecutive cocaine-free urine was systematically increased according to the following procedure: the first negative urine specimen was worth $1.50, each consecutive cocaine-negative specimen was worth $0.75 more than the previous one, and four consecutive cocaine-negative urine resulted in bonus payments of $10.00 (abstinence over the entire 12-week period would, therefore, be rewarded with cash voucher payments totaling $1,038.24). Vouchers were exchanged for various activities covered in the community reinforcement sessions (e.g., sporting goods, dinner certificates, etc.). Clinic staff made all purchases. In addition, patients attended twice weekly behavior therapy sessions in which community reinforcement (e.g., job training, relaxation training, increased participation in nondrug related activities, etc.) and stimulus avoidance techniques were rehearsed. Following the initial 12-week period, a "maintenance" intervention was initiated in which contingencies were altered and subjects were given one lottery ticket for each cocaine-free urine sample (collected only Tuesdays and Fridays). Additionally, behavior therapy sessions were reduced to 30 minutes per week. The maintenance period lasted 3.5 weeks for subject 1 and 7.5 weeks for subject 2. At week 15.5 for subject 1 and 19.5 for subject 2, the original reinforcement rates were again reinstated for 12 weeks, however, reinforcement was now made contingent on provision of both cocaine and marijuana-free urine specimens.

Results were impressive for both subjects. During the initial phase of the study in which cocaine abstinence was reinforced, subject 1 provided 90% and subject 2 provided 96% cocaine-free urine samples, and both subjects worked at least 22 of the final 30 days of this phase. In terms of marijuana use, though, subject 1 produced only 21% and subject 2 produced only 9% THC-free urine. During the 3.5-week (subject 1) and 7.5 week (subject 2) maintenance phases, both subjects remained 100% abstinent for cocaine, but continued to use marijuana at their original rates. Following sequential introduction (i.e., across subjects), of contingencies directed at marijuana use (i.e., across behaviors) both subjects maintained low cocaine-use rates and evinced significantly decreased rates of marijuana use. Specifically, subject 1 provided 96% cocaine-free samples and 92% THC-free samples, while subject 2 produced 100% cocaine-free specimens and 100% THC-free specimens. Both subjects reported working 24 days of the final 30 days of this treatment phase. Follow-ups were conducted 1 and 5 months after treatment termination. However, at the final follow-up session, retrospective reports were made for only the previous 30 days rather than 4 months. Both subjects produced cocaine-free/THC-positive urine at both follow-ups and reported an average of 4.5 (subject 1) and 15 (subject 2) days marijuana use, but 0 days cocaine use for the preceding 30-day period. Significant other reports and subject reports were in agreement during all phases of the study.

Dramatic reductions in drug use were evident for both subjects following sequential application of the contingency management procedure, thereby demonstrating the control of increasing contingencies across two classes of drug use. Unfortunately, it is impossible to infer causality solely to the systematically increased reinforcement, which, in light of the previously reviewed study by McCaul, Stitzer, Bigelow, and Liebson (1984), may be a necessary but not sufficient component of an effective treatment program for drug abuse. That is, although the effect of contingency management over and above the effect of community reinforcement strategies is known, the independent effects of contingency contracting characterized by systematically increased reinforcement are not.

In a second study with cocaine users, Higgins et al. (1991), employed a nonrandomized, between group design to evaluate the relative efficacy of an identical contingency contracting/community reinforcement intervention and standard 12-step substance abuse counseling. However, the study's 25 patients were: (a) not randomized to condition, and (b) were informed of the nature of the treatment they were to receive before they consented to participate in the study, thereby confounding noted results with self-selection biases. In response to these experimental weaknesses, the following review is somewhat brief. Subjects averaged 30 years of age, met *DSM-III-R* criteria for cocaine dependence and had used cocaine for a mean of 6 years. Participants in the behavioral condition reported using significantly more cocaine in the week prior to treatment than did subjects in the 12-step treatment condition and the behavioral condition contained significantly greater numbers of IV cocaine users. Assessments were performed as in the previously described study, and results were reported in terms of consecutive weeks of abstinence and overall percentage of clean urine for each group. Unfortunately, these measures do not permit examination of the time course of therapeutic change, and subjects considered "significantly improved" may have shown initial abstinence followed by increased use as the treatments progressed.

Importantly, significantly more behavioral (11 of 13) than 12-step (5 of 12) patients completed the 12 weeks of treatment. On the measure of continuous abstinence, patients receiving behavioral treatment produced significantly greater numbers of consecutive cocaine-free urines than did subjects in the 12-step program, even when missed urinalyses tests were considered to be cocaine-free (the latter form of this measure was used to eliminate the effects of differential dropout between groups on this measure). Indeed, in the behavioral condition, 10 subjects achieved 4 weeks consecutive cocaine abstinence and six subjects achieved 8-weeks abstinence, versus three patients and zero patients, respectively, in the 12-step program. Considering only collected specimens, 92% of behavioral versus 78% of 12-step urine specimens were cocaine-free.

Although highly impressive, results must be interpreted with extreme caution because subjects were not randomly assigned to condition. Furthermore, no follow-up assessment was performed, and noted effects may not have endured. However, improvements noted in the previously discussed controlled case study were also produced in this evaluation, with behavior therapy proving significantly more efficacious than the typically offered 12-step intervention.

Recently, Higgins et al., (1993) have addressed the aforementioned methodological shortcomings in a well controlled between-groups comparison of contingency management/community reinforcement counseling and standard 12-step substance abuse counseling for cocaine abuse. In this study, subject inclusionary criteria were: (a) a *DSM-III-R* diagnosis of cocaine dependence, and (b) a minimum age of 18 years. Exclusionary criteria were: (a) dependence on opiates or sedatives, (b) presence of psychosis, dementia, or a disabling medical condition, and (c) plans to leave the geographic area within 6 months. Thirty-four male and 4 female individuals with a mean age of 29 years, a mean use magnitude of 4 g per week, and a mean use duration of 6 years were selected for participation. Subjects were typically unmarried, unemployed, Caucasian males with a high school education. Study participants were matched, when possible, according to gender, route of cocaine administration, presence of a significant other, employment status, and scores on the ASI, and randomly assigned to either the contingency management treatment or standard 12-step substance abuse counseling.

The behavioral contingency management procedure again combined stimulus-avoidance aspects of the community reinforcement approach with systematically increasing reinforcement for cocaine-free urine specimens. Specifically, during weeks 1–12, subjects were given purchase vouchers of $2.50 for the first cocaine-negative urine sample they provided. Each consecutive cocaine-free urine specimen was worth $1.25 more than the previous one, and every three consecutive clean urines were rewarded with a bonus $10.00. In the event of a cocaine-positive urinalysis, reinforcement vouchers were reset to the original $2.50 level. However, production of five consecutive cocaine-free urine samples restored contingency voucher levels to their "pre-reset" values. By remaining abstinent for the entire 12-week period, subjects earned the equivalent of $997.50. As in earlier studies by Higgins' group, therapists supervised all purchases. To expand the contingency management procedures, subjects' significant others were immediately informed of urinalysis results and provided predetermined, individualized contingent reinforcers. In addition, job training, competing-response training (i.e., community reinforcement), and stimulus-avoidance techniques were also included in the behavioral treatment package. During weeks 13–24, reinforcement contingencies were altered so that cocaine-negative urine samples were reinforced with $1.00 lottery tickets. Note that reinforcement was again contingent on the presence or absence of cocaine use only, and that use of other drugs was not considered. For the first 12 weeks of treatment, subjects attended 1-hour behavior therapy sessions on Mondays and Fridays. Session frequency was then reduced to once-per-week for weeks 13–24. Forty-two percent of behavioral patients also received disulfiram therapy as part of the community reinforcement program.

The 12-step substance abuse treatment initially consisted of one 2.5-hour therapeutic group meeting and one 1-hour individual session each week. As in the behavioral intervention, session frequency was reduced to once-per-week for weeks 13–24. According to the 12-step model, patients were counseled that cocaine addiction is an incurable but treatable disease. Supportive therapy was supplemented by educational lectures and videotapes about cocaine dependence, AIDS, and the disease model of addiction. During the 9th week of treatment, family members were invited to attend sessions to discuss the impact of patients' drug use on family relations. Participants were expected to attend additional self-help meetings and identify a personal sponsor by week 12. Therapists were informed that disulfiram therapy was available to all patients, but only one subject was referred and maintained on that drug.

Therapists in the behavioral condition were a male doctoral-level psychologist with 5 years experience in substance abuse counseling, and a female master's level counselor with 1 year of substance-abuse counseling experience. In the 12-step condition, therapists were a master's level social worker and counselor with 3 and 8 years experience in substance abuse counseling, respectively.

Dependent measures included urinalysis screening, performed Mondays, Wednesdays, and Fridays. Subjects who failed to provide urine specimens were considered to be cocaine-positive. Results were reported both in terms of percentage of subjects abstinent at each week of treatment, and total weeks of continuous abstinence. Unfortunately, subject or significant other reports of daily drug use were not collected, thereby precluding more fine-grained analysis of treatment effects. That is, use of cocaine once-per-week (for a total of 24 days) and once-per-day (for a total of 168 days) were scored equivalently as constant use.

As in previous studies, treatment retention was significantly higher for the behavior-therapy condition, with 84% of subjects completing 12 weeks of treatment (vs. 26% for the 12-step program) and 58% completing 24 weeks of treatment (vs. 11% for the 12-step program). Moreover, significantly greater percentages of subjects in the behavioral-treatment condition were abstinent from cocaine after the second week of therapy, and these gains were maintained, in large part, for the duration of the study. Indeed, altering reinforcement contingencies from vouchers to lottery tickets resulted in no immediate increase in cocaine use, as was the case in the previously reviewed report. Approximately 70% of subjects receiving contingency management/community reinforcement treatment were abstinent at the 12th week of treatment, versus roughly 18% of subjects receiving 12-step substance-abuse counseling. At the 24th week, 50% versus 5% of subjects were abstinent in the behavioral and the 12-step conditions, respectively. On the variable of continuous weeks abstinence, 74% of behavioral versus 16% of 12-step subjects remained cocaine-free for at least 4 consecutive weeks; and 42% of behavioral versus 5% of 12-step subjects remained cocaine-free for 16 consecutive weeks. When considering use of drugs other than cocaine, no significant between-group differences existed, with 28% and 18% of the urine specimens from contingency management and the 12-step program participants, respectively, positive for marijuana.

The short-term relative efficacy of the multi-component behavioral treatment over traditional 12-step substance-abuse counseling was clearly evident. However, because missed urine tests were considered cocaine-positive, it is possible that measures based on urinalyses were confounded by treatment attendance. Subjects receiving traditional 12-step substance-abuse counseling attended significantly fewer sessions than did subjects receiving behavior therapy. The extremely high propensity of cocaine-dependent individuals to relapse, though, largely validates investigators' assumptions that nonattending patients were using cocaine. More disturbing is the fact that only half of subjects in the behavior-therapy condition continued to maintain abstinence at the 6-month point of the study, even though treatment was ongoing. Although control over cocaine-use behavior was largely demonstrated by the contingency management procedure, feasibility of paying addicts to remain abstinent (i.e., paying addicts to do that which is expected of ordinary citizens) is questionable. Cognizant of this fact, the experimenters discussed the potential incorporation of more socially and politically acceptable means of contingent reinforcement (provided by significant others, etc.) into the behavioral treatment. Such a program has been implemented and evaluated by Azrin et al., (in press) and is discussed next.

The final critique is a review of our recent completed efforts. Although similar in many ways to interventions employed by Higgins and his group, Azrin et al., (in press) incorporated several significant procedural modifications that produced encouraging results in a large-scale, long-term, controlled clinical outcome study. Specifically, stimulus avoidance and community reinforcement procedures were complemented by an urge-control strategy and expanded application of contingency management techniques. This componential behavioral therapy was compared to typically offered supportive/nondirective group counseling for substance abuse.

Criteria for inclusion into the study were use of illegal drugs at least one time during: (a) the 30-day period prior to the first clinic contact, and (b) the initial 1-month assessment period. Unfortunately, the investigators did not indicate whether subjects met *DSM-III-R* criteria for substance abuse or dependence, hence, the clinical relevance of the study sample is unknown. Participating subjects were 56 males and 26 females with an average age of 27.5 years. Fifty-three percent of the sample used cocaine, 57% used marijuana, and 32% used other illicit substances (note that percentages exceed 100 because many individuals were poly-drug users). Overall, subjects were predominantly adults, male, unemployed, and unmarried, who used cocaine and marijuana. Although 93 subjects were considered eligible for treatment, results were reported for only the 82 individuals for whom 12 months of data were available.

Following an initial 1-month baseline/assessment period in which all dependent measures were collected, eligible participants were randomly assigned to either the Behavior Therapy or the Supportive counseling treatment. When several participants were concurrently available for assignment after baseline assessment, they were divided into pairs matched for problem severity and a coin flip determined assignment within the pair. The final study sample consisted of 46 subjects in the behavioral condition and 36 subjects in the nonbehavioral condition.

As mentioned, the componential behavioral intervention included modified stimulus avoidance, urge-control, and contingency management strategies conducted in weekly 1.5 hour sessions. Stimulus-avoidance techniques were standardized and proactive. That is, rather than providing subjects with general relapse prevention/stimulus-avoidance guidelines through discussion and persuasive problem solving, subjects were trained to construct "risk" lists of conditioned stimuli that had been associated with drug use in the past (e.g., people, places, situations, etc.) as well as "safe" lists of stimuli with which drug use had never been associated. Each evening, subjects were required to record the amount of time spent with each risk and safe stimulus so that overall daily amount of time in risk situations was quantifiable and known, In addition, subjects completed a "daily planner" for the next day comprised only of planned safe activities in order to actively reduce exposure to conditioned stimuli known to elicit drug use.

The urge-control procedure incorporated elements of both covert sensitization and response competition to effectively reduce drug craving and replace drug-seeking behavior with functional alternatives. Specifically, subjects were taught to recognize early signs of drug-use urges and to immediately engage in covert rehearsal of several individualized negative consequences of drug use. Once urge strength had been reduced or arrested, subjects were taught to quickly engage in a competing behavior that was either "fun" or "functional" (e.g., if at home watching television when they perceived an urge, subjects were taught, through modelling and rehearsal, to immediately refer to the stimulus avoidance list, find an acceptable safe activity and engage in it, etc.).

Finally, and in contrast to previously reviewed treatments in which contingency contracting was directed specifically to drug-taking behavior, the current investigators expanded contingency management procedures to include systematic reinforcement of competing nondrug-related behaviors. These included daily completion of the stimulus-avoidance recording and planning forms, as well as rehearsal of the urge control technique with a significant other, spending time with significant others, notifying significant others of their whereabouts at all times, and attending school or employment each day. Additionally, subjects were reinforced for successive reductions in the amount of time spent in risk situations, as measured by stimulus-avoidance recording forms. Note that Azrin et al., (in press) employed the contingency contract to increase subjects' motivation to engage in stimulus-avoidance behaviors that competed directly with drug-use behaviors, as well as to simply maintain abstinence. Rather than employing standard rewards for all subjects, contingent reinforcers were highly individualized, provided largely by significant others, and modified, according to subject and significant-other agreement, each week.

The supportive treatment for drug abuse was conducted in a group format during weekly 1.5-hour sessions. This intervention was designed to incorporate features commonly used in nonbehavioral group counseling for drug abuse. Counselors encouraged expression of feelings and discussion of drug-related experiences, initiated discussion of weekly drug-theme topics, facilitated reactions to comments of other group members, and provided praise for abstinence desires. Significant others were invited to attend one group session per month. Subjects in this treatment condition were also offered individual supportive therapy on request. Notably, treatment integrity in both conditions was monitored by: (a) audiotape recording of sessions and subsequent random review of the tapes, (b) presence of a nonparticipating observer during group sessions, and (c) use of treatment manuals and a session checklist of specific treatment procedures.

Therapists for both conditions were college graduates or graduate students who had both training and experience in their respective treatment modality. The behavioral program counselors were given additional training in the new procedures specific to that type of program. Unfortunately, the investigators did not indicate whether therapists in each treatment condition were equally experienced or educated, thereby potentially confounding outcome results with individual differences between therapists.

Several dependent measures were employed to assess effects of treatment on rates of drug use and related areas. Specifically: (a) weekly urinalysis (during active treatment periods), (b) subject, and (c) significant-other report were employed to detect drug use.

For purposes of data analyses, an individual was considered to have used drugs if any one of these three indices reflected drug use of any kind (i.e., positive urinalysis, or self-report of use, or significant-other report of use of any drug). Family relationships were assessed for married/cohabitating adults by the Marital-Couple Happiness Scale (Azrin, Naster, & Jones, 1973) and for youth by the Parent-Youth Happiness Scale (Besalel & Azrin, 1981), both of which included a report of overall satisfaction (0–100%) regarding the relationship by the subject and the spouse/parent. Depression was assessed by the Beck Depression Inventory (BDI). Also measured were number days worked, school attendance, number of institutionalizations, and number of police contacts. Drug-use data were reported in terms of percentage of subjects in each condition using drugs each month, overall mean number of months abstinent for subjects in each condition (measured as 30 consecutive days of nonuse of any type of drug), and mean number of days-per-month drug use.

During baseline and active treatment periods, drug-use data were collected weekly, and standardized dependent measures were collected monthly. During the treatment "maintenance phase" (not a true follow-up, because subjects still received treatment on request), all dependent measures, including urinalyses, were collected monthly. As a result, relatively more emphasis was placed on report data of subjects and their significant others during this period. Although treatment was offered to all subjects for 12 months, extended abstinence resulted in reduction in session frequency, and subjects in both groups received a mean of 15 treatment sessions over 12 months. Whereas failing to achieve treatment-length standardization, provision of treatment in this "as needed" manner more closely approximates that which is available to outpatients in general.

Results indicated that, in the supportive counseling condition, the proportion of subjects using (any type of) drugs decreased during the first month to 80%, and remained at that general level (±6%) for the subsequent 11 months. In contrast, the proportion of drug-using subjects receiving the behavioral treatment decreased progressively over the duration of the study period. Specifically, 63% used drugs at 2-month point, 46% at 6-month point, and 35% at the 12-month point. The differences between treatment conditions were statistically significant for each month after the second month. Moreover, subjects receiving supportive counseling evinced an average of 2.6 months abstinence from all illicit drugs over the 12-month period, whereas behavior-therapy subjects showed an average of 6.2 months abstinence. On the fine-grained measure of daily drug use, supportive-counseling subjects used hard drugs (any drug other than marijuana) an average of 5.4 days-per month, compared to 2.1 days-per-month for behavioral subjects. Average number of days of marijuana use was also statistically significantly greater for supportive counseling subjects (3.8 vs. 2.2 days use-per-month). Additionally, differential improvements on several measures of general functioning were also evident, and in favor of the behavioral treatment. Specifically, subjects receiving behavioral therapy evinced increased school and work attendance, reported reduced alcohol use, and displayed improved Parental and Marital Satisfaction with subjects.

Positive effects resulting from the componential behavioral treatment are very impressive and consistent with reports of previous authors who employed contingency contracts to reduce drug use. Indeed, a very conservative rating of abstinence requiring: (a) nonuse of all drugs, and (b) absence of positive urinalyses, or self- or significant-other report of drug use was employed. Moreover, application of contingency management strategies to facilitate use of stimulus-avoidance techniques (i.e., direct, contingent reinforcement of competing, nondrug-use behaviors) appeared to result in increased long-term efficacy for the latter intervention. However, several shortcomings of the present study are evident and serve to temper these extremely positive results. First, objective drug use assessments were not consistently utilized during the maintenance phase of the study (i.e., monthly, rather than weekly urine tests were performed during this period). Second, behavior therapy was conducted in individual sessions while supportive counseling was provided in a group format. As a result, treatment type (behavioral vs. supportive) was potentially confounded by treatment modality (individual vs. group). Third, no true follow-up was performed, and the enduring nature of the treatment's effects are unknown.

CONCLUSIONS

After a brief decline, prevalence of drug abuse and dependence is again increasing in the United States. Although no consistently effective and validated pharmacological treatments for these disorders exist, several behaviorally-based interventions (both associative and operant) have been subject to controlled evaluations with various types of drugs, including marijuana, heroin, cocaine, and benzodiazepines. Notably, several of these empirical evaluations have attended (in part) to many frequently neglected, but nonetheless methodologically relevant experimental criteria, including subject and treatment specification, use of active treatment comparison groups, use of objective and/or clinically relevant dependent measures, and incorporation of follow-up assessments (see Tables 1 and 2).

Techniques based on associative learning theory have relied on either prolonged nonreinforced exposure to stimuli that control drug abuse (i.e., extinction), or conversely, acquisition of strategies to reduce or eliminate any occasion for exposure to stimuli that elicit drug-use behaviors (stimulus avoidance/control). In controlled studies, only mildly positive results have been produced by pure avoidance-based interventions, with 36% to 43% of subjects reporting abstinence at treatment termination. However, objective dependent measures of change were not employed in these evaluations, hence, the validity of these results is compromised.

In contrast to stimulus-avoidance interventions, operant treatments for substance abuse have been employed to restructure contingencies within which drug-use behavior occurs, so that nonuse behaviors are specifically and systematically reinforced. Evaluations of operant treatments have been relatively more sophisticated than studies of stimulus avoidance interventions. Notably, treatment outcome studies utilizing operant techniques have included objective measures of treatment outcome. Although the short-term control of simple contingent reinforcement over stimulus-abuse behaviors has been demonstrated for benzodiazepine, heroin, cocaine, and marijuana users, these programs are effective only when contingent reinforcers are of sufficient potency to counter the reinforcing qualities of drug urges. As a result, use of systematically increasing or repeatedly renegotiated contingent reinforcement appears to be more effective than standard, or nonindividualized forms of reinforcement. Furthermore, because salience can greatly increase a stimulus' reinforcing quality, contingency contracting appears to be significantly more effective when complemented by stimulus-avoidance strategies. However, expanding the focus of contingency contracting to include reinforcement of behaviors that compete with drug use (e.g., specific reinforcement of stimulus avoidance behaviors), in addition to reinforcement of abstinence (i.e., reinforcing what one should do, as well as reinforcing the absence of what one should not do) appears to be most efficacious in reducing or eliminating substance abuse. Such componential behavioral treatments were effective in reducing drug usage to fully one-third the level of use obtained with alternative treatments.

From this review, it is clear that the psychological treatment of substance abuse has progressed beyond its nascent stage. Indeed, large, well-controlled outcome evaluations of a variety of treatment strategies have been performed. However, future investigations, if they are to build on existing research, must address several methodologic requirements discussed here and satisfied to only a limited extent by existing studies. Specifically, new evaluations should employ highly standardized treatments and measures of treatment integrity. Moreover, subject populations must be identified and defined along particular diagnostic categories and diagnoses should be obtained in a standardized manner (e.g., through the use of structured clinical interviews). In addition, measures related to substance-abuse treatment outcome, including indices of anxiety, depression, and family and vocational functioning should be incorporated into each study's assessment battery. Importantly, use of *repeated objective dependent measures*, the sine qua non of contemporary drug-abuse treatment research, must serve as the central and common indicator of treatment response in all future studies. Relatedly, posttreatment follow-up assessments of at least 12–24 months duration are essential in determining the true efficacy of any substance-abuse treatment, and are thus needed to verify the significance of clinical effects produced by existing interventions. Specific future recommendations include subjecting the seemingly effective componential treatments employed by Higgins' and Azrin's groups to replication under even greater experimental rigor. If past results are again obtained, exceptionally efficient, potent, and rewarding treatments for this devastating societal problem will have been validated.

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