

A Meta-Analytic Review of Psychosocial Interventions for Substance Use Disorders

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Objective: Despite significant advances in psychosocial treatments for substance use disorders, the relative success of these approaches has not been well documented. In this meta-analysis, the authors provide effect sizes for various types of psychosocial treatments, as well as abstinence and treatment-retention rates for cannabis, cocaine, opiate, and polysubstance abuse and dependence treatment trials.

Method: With a comprehensive series of literature searches, the authors identified a total of 34 well-controlled treatment conditions—five for cannabis, nine for cocaine, seven for opiate, and 13 for polysubstance users—representing the treatment of 2,340 patients. Psychosocial treatments evaluated included contingency management, relapse prevention, general cognitive behavior therapy, and treatments combining cognitive behavior therapy and contingency management.

Results: Overall, controlled trial data suggest that psychosocial treatments provide benefits reflecting a moderate effect size according to Cohen's standards. These interventions were most efficacious for cannabis use and least efficacious for polysubstance use. The strongest effect was found for contingency management interventions. Approximately one-third of participants across all psychosocial treatments dropped out before treatment completion compared to 44.6% for the control conditions.

Conclusions: Effect sizes for psychosocial treatments for illicit drugs ranged from the low-moderate to high-moderate range, depending on the substance disorder and treatment under study. Given the long-term social, emotional, and cognitive impairments associated with substance use disorders, these effect sizes are noteworthy and comparable to those for other efficacious treatments in psychiatry.

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In the last 30 years, there has been significant progress in the development and validation of psychosocial treatments for substance abuse and dependence, with a predominant focus on the validation of cognitive behavioral treatments (1). Prominent among these approaches have been contingency management interventions and interventions emphasizing functional analyses and strategies for changing higher-risk situations for drug use in either relapse prevention or other cognitive behavioral formats.

Based on principles of operant conditioning, contingency management interventions offer incentives or rewards to encourage specific behavioral goals. In the case of treatments for substance dependence, monetary and nonmonetary rewards typically have been made contingent on negative toxicology screens, indicating abstinence from drug use. The approaches have shown consistent success, with drug use disorders ranging from opiate and cocaine dependence to nicotine dependence (2–7). An alternative approach, relapse prevention, focuses on identifying and intervening with higher-risk situations or events for drug use by helping individuals either avoid or manage these situations by rehearsing alternative (nondrug) responses. Similar to contingency management, relapse prevention approaches have shown benefit in a wide

range of trials for illicit drug and alcohol use disorders (8, 9). A similar focus on completing a functional analysis of cues for use and rehearsing behavioral and cognitive non-drug responses characterizes a variety of other cognitive behavioral approaches (10).

Although a number of smaller meta-analyses have been conducted for pharmacologic interventions for substance use disorders (11–14), few intervention-specific (15) and, to our knowledge, no comprehensive meta-analyses have been conducted for psychosocial treatments for illicit substance use disorders. Indeed, little is known about how the broad range of psychosocial treatments compare to one another across different outcome variables (e.g., abstinence, dropout rate, etc.), and even less is known about the overall strength of psychosocial treatments across different drugs of abuse (1).

The current study uses a meta-analysis to systematically investigate the efficacy of psychosocial treatments for substance use disorders and provides indices of the strength of findings for specific interventions and specific drug use disorders. Because meta-analyses have been conducted for psychosocial treatments of alcohol and nicotine use disorders (16–20), we focused only on illicit substance use disorders. As existing meta-analyses have fo-

TABLE 1. Study Characteristics and Effect Sizes for Psychosocial Interventions for Substance Use Disorders

Study	Treatment Type ^a	Control Condition ^b	Weeks of Treatment	Sessions Per Week	Unique Population
Polysubstance use disorders					
Stitzer et al., 1992 (28)	CM	NCM	24		
Iguchi et al., 1997 (29)	CM	TAU	12	3	
Downey et al., 2000 (30)	CM	NCM	12		
Chutuape et al., 2001 (31)	CM	NCM	28		
Katz et al., 2002 (32)	CM	NCM	12		
Kosten et al., 2003 (33)	CM	NCM	12		
Petry & Martin, 2004 (34)	CM	STN	12		
Linehan et al., 1999 (35)	CBT (DBT)	STN	52	2	Borderline women
Schmitz et al., 2002 (36)	CBT	TAU	12	2	Bipolar disorder
Pollack et al., 2002 (37) ^c	CBT	TAU	12	1	
Hien et al., 2004 (38)	CBT	STN	12	2	Posttraumatic stress disorder
Azrin et al., 1994 (39)	CBT	TAU	52	1	
Gotheil et al., 2002 (40)	CBT	TAU	12	1	
Cocaine use disorders					
Silverman et al., 1996 (41)	CM	NCM	52		
Jones et al., 2004 (42)	CM	NCM	12		
Signmon et al., 2004 (43)	CM	TAU	24		
Silverman et al., 2004 (44)	CM	TAU	52		
Higgins et al., 1993 (45)	CBT/CM	TSF	24	2	
Carroll et al., 1998 (46)	CBT	TSF	12	2	Alcoholism
Crits-Christoph et al., 1999 (47) ^d	CBT+GDC	GDC	24	1-2	
Carroll et al., 1994 (48)	RP	TAU	12	1	
Schmitz et al., 2002 (49)	RP	TAU	12	2	
Opiate use disorders					
Carroll et al., 2001 (50)	CM	TAU	12		
Carroll et al., 2002 (51)	CM	TAU	12		
Bickel et al., 1997 (52)	CBT/CM	TAU	26	3	
Rawson et al., 2001 (53)	CBT	STN	26	3	
Linehan et al., 2002 (54)	CBT (DBT)	TSF	52	2	Borderline women
Abbott et al., 1998 (55)	CBT	TAU	28	2	
McAuliffe, 1990 (56)	RP	STN	24	2	
Marijuana use disorder					
Sinha et al., 2003 (57)	CM	ME	4		
Copeland et al., 2001 (58)	CBT	WL		1	
Budney et al., 2000 (59)	CBT	ME	14	1	
Roffman et al., 1988 (60)	RP	TAU	12	1	
Stephens et al., 2000 (61)	RP	WL	18	1	

^a CM=contingency management, CBT=other cognitive behavior therapy interventions, RP=relapse prevention, DBT=dialectical behavior therapy, GDC=group drug counseling.

^b TAU=treatment as usual, ME=motivational enhancement interviewing, TSF=12-step facilitation, NCM=noncontingency management, STN=standard care, GDC=group drug counseling, WL=wait listing.

^c Reported significant differences in effect size between women ($d=0.4$, $N=13$) and men ($d=-0.55$, $N=10$).

^d Included multiple comparison conditions, but table entries are specific to the CBT+GDC versus GDC comparisons listed.

cused on motivational interviewing interventions (21–24), which tend to be employed in single-session formats, we chose to target more comprehensive interventions. Additionally, because 12-step interventions are distinct from traditional psychotherapies, these interventions were used as control conditions only. We provide a comprehensive account of the strength of cognitive behavioral treatments for cocaine, opiates, cannabis, and polysubstance abuse and dependence. In addition, we provide an analysis of various outcome variables (including abstinence, treatment retention, and treatment dropout). Finally, we provide evidence for potential moderating factors in treatment outcome across studies.

Method

Study Selection

We selected randomized, controlled clinical trials for inclusion in this meta-analysis by performing a comprehensive search

strategy. First, we conducted a computer-based PsycINFO search of available articles published between 1840 and March of 2005 using the following key terms to conduct title searches (asterisks denote that any characters/letters can follow the last character in the terms): cocaine, crack, opi*, heroin, amphetamine*, methamphetamine*, MDMA, ecstasy, methylenedioxymethamphetamine, cannabis, marijuana, psychedelic, mushroom, glue, inhalant, poly*, substance* abuse, substance* use, addict*, and dependen* singularly and in combination with the following secondary descriptors: treatment*, trial*, outcome*, therapy, random*, intervention*, medication*, psychopharm*, pharm*, buprenorphine, behavior*, counseling, cognitive, meta analys*, contingency, and voucher*. Second, we performed a computer-based MEDLINE search of articles available between 1966 and March 2005, combined with a Cochrane Central Register of Controlled Trials search for the first quarter of 2005 with the following search terms: substance abuse and randomized, or drug abuse and randomized, or drug dependence and randomized, or cocaine and randomized, or heroin and randomized, or opioid and randomized, or opiates and randomized, or methamphetamine and randomized, or amphetamine and randomized, or marijuana and randomized, or polydrug and randomized. These

Drug Context	Intent-to-Treat Sample (N)	Dropout (%)		Abstinence (%)		Effect Size (d)		
		Treatment	Control	Treatment	Control	Self-Report	Toxicology	Overall
Buprenorphine Methadone	Methadone	53	28	26	32	8	0.76	0.15 0.56
	Methadone	62	33.3	22.9			-0.37	-0.37
	Buprenorphine	41	35	62			0.40	0.40
	Methadone	35	37.5	5.3	56.6	10.5	0.37	0.37
		52			21	9	0.44	0.07 0.32
	Buprenorphine	80			25	29		0.00 0.00
	Methadone	42	10.5	13.0	17.0	16.0		0.38 0.38
		22	36.4	73.7			1.12	0.63 0.88
		46	40	67				0.12 0.12
	Methadone	23						0.00 0.00
Methadone		66	30	0			0.15	0.15
		82					0.47	0.47
		16					0.56	0.14 0.35
	Methadone	37	11	17	23.5	0	1.82	1.08 1.45
		92	74.6	78.9				0.45 0.45
	Methadone	30	0.0	6.3				0.31 0.31
	Methadone	51	28.0	46.2	42.0	0		1.56 1.56
		38	42	89	42	5	1.57	1.57
		41			28	30	-0.07	-0.07
		242	66.4	77.2	22.9	27.1		0.23 0.23
Naltrexone Buprenorphine Methadone	Naltrexone	56	64	61			-0.04	0.33 0.05
	Naltrexone	32	50	50			0.03	0.03 0.03
	Naltrexone	79					0.04	0.52 0.28
	Naltrexone	54						0.50 0.50
	Buprenorphine	39	47	80	11	0	0.42	0.64 0.47
	Naltrexone	81			53.7	22.5	0.64	0.63 0.63
	Methadone	24	27	0			-0.31	-0.09 -0.20
	Methadone	180					0.68	0.25 0.53
		88			44	26	0.49	0.49 0.49
Other		65	36	61			1.84	1.84
		151	12.3		20.8	3.6	0.87	0.87
		40	35	55	10	5	0.24	0.34 0.28
		110			36	25	0.31	0.31
		203			37	9	0.73	0.73

terms were searched as key, title, abstract, name of substance, and MeSH subject heading terms. This search was combined with a MeSH subject heading search in the same database with the following terms: amphetamine-related disorders, cocaine-related disorders, marijuana abuse, opioid-related disorders, phencyclidine abuse, substance abuse, and intravenous. We limited both the PsycINFO and the MEDLINE searches to studies conducted with human participants and published in the English language. All titles or abstracts for the citations produced were screened, and articles were collected for any citation that appeared to meet inclusion criteria.

Studies meeting all of the following inclusion criteria were included in the meta-analysis:

- Investigations of the efficacy of any individual psychosocial treatments for substance abuse/dependence, with the exception of alcohol abuse/dependence and nicotine abuse/dependence
- Randomized, controlled trials including a comparison group that could consist of inactive (e.g., waitlisted) or active (e.g., treatment as usual) treatments

- Studies including adult (18 years and older) participants only
- Studies including one or more of our posttreatment outcome measures (described below) to allow for comparable outcome data across studies
- Investigations of the efficacy of nonintensive outpatient treatments, which we defined as consisting of no more than three 2-hour treatment sessions per week

Studies with medication as a backdrop condition were included only if the medication dosage did not vary between the active treatment and control conditions. Controlled trials comparing the efficacy of various treatment intensities (e.g., once per week versus twice per week individual therapy of the same therapy type) were excluded if a clear control group (e.g., one receiving inactive treatment or treatment as usual) was unavailable (seven studies). When multiple control conditions were included in these trials, we employed the "most intensive" treatment condition as the active treatment to compare to the control condition, and any other conditions of varying treatment intensity were excluded. Studies containing follow-up data beyond 1 month posttreatment but not presenting data at posttreatment were ex-

cluded (four studies). Likewise, we excluded studies employing control conditions known to be efficacious for substance abuse treatment (e.g., cognitive behavior therapy, five studies) and studies using trials of wrap-around service treatment (one study), therapeutic workplaces/work therapies (one study), hypnotherapy (one study), telecommunication networking (one study), brief motivational enhancement (two studies), supportive/expressive therapy (one study), and acupuncture (seven studies). In total, 30 studies were excluded from consideration.

Procedure

When available, data on a number of descriptive variables were collected for each study, including the following: sex (data from 91.2% of the studies available), ethnicity (76.5% available), employment status (64.7% available), marital status (61.8% available), average length of substance use (55.9% available), comorbid alcohol abuse/dependence diagnoses (20.6% available), numbers of weeks treatment was administered (97.1% available), number of treatment sessions per week (58.8%), number of participants entered per condition (100% available), treatment retention rates (47.1% available), and numerous outcome variables, as described below.

Treatments were categorized into the following treatment condition "types": contingency management/vouchers (14 studies), general cognitive behavior therapy interventions (13 studies), relapse prevention (five studies), and cognitive behavior therapy plus contingency management combined (two studies). Descriptions of treatment conditions were used to categorize each condition into its best-fit treatment type.

Given the lack of "gold standard" outcome measures in the substance abuse treatment literature, we reviewed all controlled trials meeting our inclusion criteria, as well as all available substance abuse treatment reviews and meta-analyses, to develop a set of variables that would sufficiently allow for outcome comparison across studies. These variables included a combination of self-report data (data from 58.8% of the studies available) and measures employing toxicology screening procedures (76.5% available). Self-report outcome variables were the following:

1. Mean maximum number of days or weeks abstinent throughout treatment
2. Mean percent of days abstinent throughout treatment
3. Percent of sample abstinent for 3 or more weeks throughout treatment
4. Percent of sample demonstrating posttreatment and/or clinically significant abstinence
5. Posttreatment scores on the drug scale of the Addiction Severity Index (25)

Toxicology screen variables were 1) mean number of negative screens throughout treatment, 2) mean percent of negative screens throughout treatment, and 3) percent of sample demonstrating clinically significant abstinence.

With respect to the percent of the sample demonstrating post-treatment and/or clinically significant abstinence, for both self-report and toxicology screen data, studies varied widely in defining this variable. These definitions of posttreatment and/or clinically significant abstinence varied from 4 to 24 weeks of abstinence (or abstinence for the entire length of treatment), as measured by means of the participants' self-report or toxicology screen results. The 3-week abstinence cutoff appeared to be the most widely employed measure of clinically significant change, as these data were presented by 11 (30%) of the studies included in this meta-analysis. The Addiction Severity Index (used by 16 studies) (25) and the Time Line Follow-Back interview method (used by four studies) (26) were the most widely used interviews for collecting self-report data across studies.

These eight outcome variables were used for the purposes of calculating treatment versus control condition effect size estimates. Effect size was calculated using Cohen's d (27). Owing to inconsistency in the outcome variables employed by each study, when studies presented data on two or more outcome variables, we aggregated (averaged) across these variables to yield an aggregate mean effect size for each study. In addition, to determine the differential effect of self-report versus toxicology screen outcome data, we aggregated outcome variables within each study to yield 1) an aggregate mean overall effect size, 2) an aggregate mean self-report effect size, and 3) an aggregate mean toxicology screen effect size. Finally, as a general measure of abstinence rates, we provide the percent of the sample demonstrating posttreatment and/or clinically significant abstinence variable (these data were reported by 16 of the 37 studies), or, if this variable was not reported for a particular study, we calculated this data from the information provided (data calculated for six studies).

Results

Study and Sample Characteristics

Effect sizes were calculated for a total of 34 studies. Across all studies, 2,340 entered the treatment and identified control conditions. The mean age of the participants across all studies was 34.9 years (range of means=20.6 to 43.0, SD=4.5). On average, samples were 62.2% male and 61.0% Caucasian. The majority of the participants were single/unmarried (67.7%), and less than half were employed part-time or full-time (42.5%). The participants reported an average of 10.1 years of substance use (SD=5.1). Of the seven studies reporting specific diagnostic criteria, approximately 50.7% of the participants met criteria for comorbid alcohol abuse or dependence, although alcohol was not the targeted substance in the treatment study.

Table 1 presents a detailed overview of these treatments, including 14 identified as contingency management, two as cognitive behavior therapy/contingency management combination conditions, 13 as general cognitive behavior therapy interventions, and five as relapse prevention. Of these, 13 of the treatments were for polysubstance use, nine for cocaine use, seven for opiate use, and five for cannabis use disorders. Treatment types were not significantly associated with (confounded with) the targeted drug use disorders according to chi-square analyses (contingency management versus all other treatments).

Overall, 43.6% of the studies included samples in which the participants received medication maintenance (e.g., methadone maintenance) in conjunction with both the experimental treatment and control conditions. The mean length of treatment across all conditions was 21 weeks (range=4–52 weeks, SD=14), and the average number of sessions per week averaged 1.8 sessions (range=1–3, SD=0.8). The mean intent-to-treat sample size per treatment condition was 38.23 (SD=32.00), ranging from five to 135 participants across all conditions.

Treatment Retention

Approximately one-third of the participants across all conditions dropped out before treatment completion

(35.4%). Mean dropout among control conditions was 44.6%. Across all substance use groups, cocaine and opiate patients tended to have higher mean dropout rates (42.0% and 37.0%, respectively) than patients treated for cannabis and polysubstance use (27.8% and 31.3%, respectively). Contingency management demonstrated the lowest dropout rates (29.4%), followed by general cognitive behavior therapy (35.3%) and cognitive behavior therapy plus contingency management (44.5%). Only two studies provided relapse prevention dropout rates (57.0%), and these studies were specific to cocaine treatment.

Aggregate Effect Sizes

Table 1 presents aggregate effect sizes across all studies. The aggregate effect size across all conditions and all substances was in the moderate range ($d=0.45$), with a 95% confidence interval (CI) of 0.27 to 0.63. Although there was an apparent difference in effect sizes depending on the outcome measure used, with self-report yielding a high-moderate effect size ($d=0.61$, 95% CI=0.35 to 1.20) and toxicology screen outcomes yielding a low-moderate effect size ($d=0.33$, 95% CI=0.17 to 0.49), this difference did not reach significance according to a within-sample t test, which included only the 12 studies that provided both measures ($t=1.16$, $df=11$, $p<0.28$). Urine analysis detection time differs across drugs of abuse. Whereas cocaine and opiates have an approximate window of detection of 1–3 days, the window of detection time for marijuana (cannabis) can extend to weeks to months for individuals who are chronic heavy users. In the current meta-analysis, only one study of marijuana used urine analysis as an outcome variable (Table 1).

Effect Sizes Across Substance Type

Figure 1 represents overall effect sizes for psychosocial treatments (collapsed across treatment type) in terms of the substance use being targeted. Independent-sample t tests revealed that psychosocial treatments had their lowest efficacy for polysubstance use, with a significant difference between outcomes for polysubstance use ($d=0.24$, 95% CI=0.03 to 0.44) and cannabis use ($d=0.81$, 95% CI=0.25 to 1.36) disorders ($t=2.42$, $df=17$, $p<0.03$). Treatments targeting cocaine use yielded medium to large effect sizes ($d=0.62$, 95% CI=0.16 to 1.08), and treatments targeting opiate use yielded small to medium effect sizes ($d=0.39$, 95% CI=0.18 to 0.60). There were no other significant differences between the substance use disorders treated.

Effect Sizes Across Treatment Type

Figure 2 presents effect sizes for treatment outcome in terms of treatment type across all substances. The results indicate that treatments incorporating both cognitive behavior therapy and contingency management had the highest effect sizes ($d=1.02$); however, this result must be interpreted cautiously as there were few studies in this category ($N=2$; 95% CI=−0.05 to 2.09). Treatments using con-

tingency management alone produced moderate-high effect sizes ($d=0.58$, 95% CI=0.25 to 0.90). Cognitive behavior therapy alone and relapse prevention evidenced low moderate effect sizes: $d=0.28$ (95% CI=0.06 to 0.51) and $d=0.32$ (95% CI=0.06 to 0.56), respectively.

Abstinence Rates

Across all active treatment conditions, almost one-third of the participants (31%) achieved posttreatment and/or clinically significant abstinence. Alternately, only 13% of all participants in control conditions achieved abstinence. Across drug use groups, rates were similar, with 36.2% of opiate users, 31.7% of cocaine users, and 26.0% of cannabis users achieving abstinence during the study period.

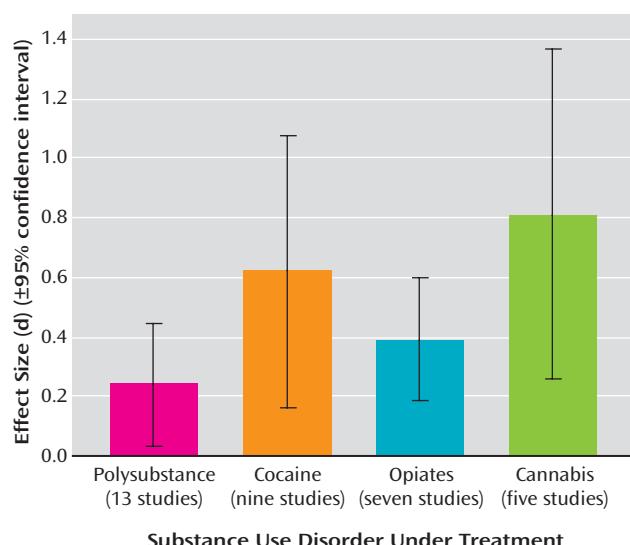
Although the combination of cognitive behavior therapy and contingency management evidenced the largest effect size, this advantage was not evident for the percent of abstinence posttreatment (26.5%). Treatment involving relapse prevention evidenced the largest posttreatment abstinence rates, with 39.0% abstinent. Posttreatment percent abstinent for general cognitive behavior therapy alone was 27.1%, and for contingency management alone, it was 31.0%.

Moderators

In an attempt to better understand our outcome findings, we examined variables that may potentially moderate the association between aggregate effect size estimates and treatment dropout rates. In terms of sample demographics, we used Pearson's partial correlations to assess the relationship between age, sex (percent male in each study), ethnicity (percent white), marital status (percent single/unmarried), employment status (percent employed), and average years of substance use in relation to outcome variables (e.g., treatment retention, overall effect size).

A significant negative correlation was found between age and effect size ($r=-0.37$, $p<0.05$), suggesting that younger samples were more likely to have larger effect sizes. A significant negative correlation was also found between average years of substance use and treatment dropout rate ($r=-0.68$, $p<0.05$), indicating that participants with longer histories of substance use were less likely to drop out of treatment than those with shorter histories of use. No other demographic variables were significantly associated with treatment outcome.

In addition, we also examined a number of treatment variables in relation to key outcome variables. Treatment variables included the number of weeks treatment was administered, the number of treatment sessions per week, and whether or not medication maintenance was employed. The results indicated a significant negative correlation between the number of treatment weeks and effect size ($r=-0.34$, $p<0.05$). Number of treatment sessions per week, however, was not significantly related to treatment outcome or treatment retention. Receipt of medication

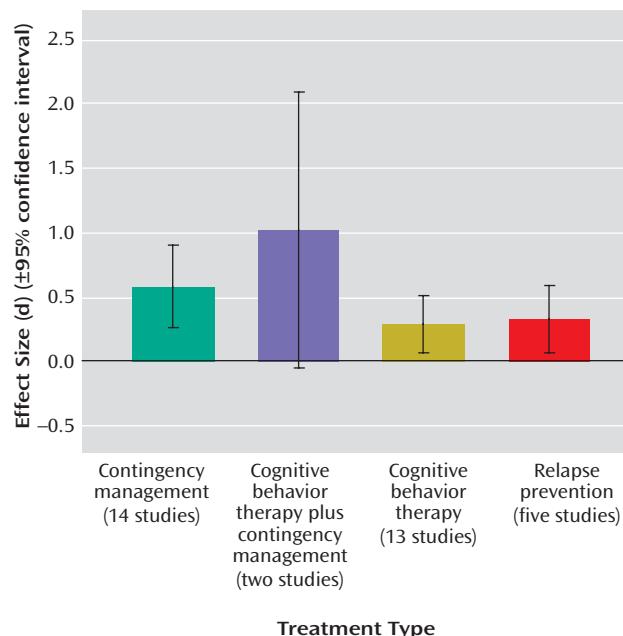
FIGURE 1. Mean Effect Sizes Across Substance Use Disorders Under Treatment

maintenance was negatively associated with dropout rates ($r=-0.51$, $p<0.05$); patients in studies in which medication maintenance provided a backdrop to the psychosocial conditions under study were less likely to drop out of treatment than patients in treatment that did not use medication.

Agonist Versus Other/No Drug Therapies

An additional issue that may influence the size of treatment effects is the background drug treatment condition. Agonist therapies, stimulating the relevant drug receptor, attenuate withdrawal and drug craving and may provide either a better or worse backdrop for other treatments. In a controlled effect size analysis, this drug condition affects changes in both the experimental and control treatment conditions, and hence, for there to be differential effects evident for comparisons between the psychosocial treatment conditions, the drug must lead to interaction effects. For example, if cravings are attenuated, a subsequent psychosocial treatment may have a differential "foothold" for changing drug use behaviors. Alternatively, the drug benefits applied to both the experimental treatment group and the control condition may make it more difficult to show additive effects by providing all patients in the trial with initial changes in drug use that may approach ceiling effects for short-term treatment.

To assess the potential influence of agonist therapies, we compared studies using this approach ($N=13$, including both methadone and buprenorphine treatment) to those that offered no drug treatment ($N=18$) or antagonist therapy ($N=3$, naltrexone treatment). Agonist treatment was used in seven of 13 polysubstance use studies, three of nine cocaine studies, and three of seven opiate studies. No agonist treatment was offered in studies of cannabis treatment; hence, these studies ($N=5$) were not considered in

FIGURE 2. Mean Effect Sizes Across Treatment Types

the following analysis. Overall, we found no significant difference or tendency in effect sizes for the combined drug groups, excluding marijuana (agonist overall: mean $d=0.38$, not agonists: $d=0.40$; $t=0.1$, $df=27$, $p<0.90$). Variability in effects was high, with agonist therapies showing both the highest and lowest effect sizes in the entire sample of studies included in this meta-analysis. No differences between agonist use and the remainder of the sample were significant when they were examined separately in the polysubstance, cocaine, and opiate use groups (all p values >0.14).

Publication Bias and Associations With Sample Size and Publication Year

Investigators have recognized the potential discrepancy between the number of trials completed and the number of trials published. If studies are not published because the findings are not significant, a meta-analysis of published studies may overestimate effect sizes. This problem has been labeled "the file drawer problem" (62).

Using a conservative method of addressing this problem, one must assume that the effect sizes of all current or future unpublished studies are equal to 0 and compute the number of studies it would require to reduce the overall effect size to a minimally informative level, in this case, a small effect size ($d=0.2$). With the guidelines of Orwin (63), more than 42 "file drawer studies" with null results would be required to reduce the overall effect size to a small level, according to Cohen's standards (27), a result indicating that the findings to date (based on 34 studies) are fairly robust. Moreover, we found no significant relationship between sample size and effect size ($r=0.02$, $p>0.90$), and

there was no significant association between publication year and effect size ($r=-0.09$, $p>0.50$).

Discussion

Overall, our meta-analytic review of cognitive behavioral treatment trials published through March of 2005 provided consistent evidence for benefit from a variety of psychosocial interventions. Effect sizes were in the low-moderate to high-moderate range, depending on the substance disorder and treatment type. Given the long-term social, emotional, and cognitive difficulties associated with substance abuse and dependence, these effect sizes and abstinence rates are noteworthy and comparable to those of interventions for other psychiatric disorders. Specifically, they are in the same range as those obtained in meta-analytic reviews using similar methods to examine the benefits of pharmacotherapy for anxiety disorders (64, 65).

Among the disorders under treatment, interventions for cannabis and cocaine yielded the largest effect sizes. However, cocaine treatments also yielded the largest dropout rates, and this dichotomous finding may suggest that rather than pursuing stepwise gains, many patients make an early decision between targeting abstinence or dropping out of treatment. Not surprisingly, treatment targeting polysubstance use yielded the lowest effect size and the lowest percent posttreatment abstinence. Polysubstance users, as a group, tend to have the highest rates of comorbid psychiatric and medical conditions, which may enhance dysfunctional coping motives while also interfering with treatment participation (1).

Overall, the highest effect size estimates were obtained for contingency management approaches, followed by relapse prevention and other cognitive behavioral therapy approaches. The combination of cognitive behavioral therapy and contingency management had particularly high effect sizes, but confidence in these estimates was limited by having only two studies for evaluation. Contingency management therapies often involve monetary incentives and frequent drug testing, which may challenge some treatment networks, although there has been some promise with the development of more cost-effective incentives (66).

Our meta-analysis was limited by the small number of studies for the combination of contingency management and cognitive behavioral therapy as well as for studies of relapse prevention. Also, fewer studies were completed for cannabis and opiate use disorders; hence, confidence in our effect size estimates is most limited for these disorders. Also, it is noteworthy that none of the relapse prevention studies analyzed included polysubstance users, the group with the lowest effect size estimates.

Although the backdrop condition of medication use (e.g., the use of agonist therapies) may have an effect on the overall responsiveness of the treatment samples, this

treatment effect should be applied equally to the experimental treatment and the comparison treatment conditions unless there is an interaction effect. For example, agonist therapy may make it easier for patients to respond to other treatment resources if craving is reduced; however, it is not clear whether this will differentially advantage the experimental versus the comparison treatment. In our meta-analysis, we found no reliable evidence of differential benefit in terms of the controlled effect sizes showing the effects of cognitive behavioral treatment over the control condition.

Overall, meta-analytic review of the psychosocial treatment literature for illicit drug use revealed promising findings. Given the aggregate effect size for active treatment, the current evidence suggests that the average patient undergoing psychosocial interventions achieves acute outcomes better than approximately 67% of the patients in control conditions. Directions for future research include studies aimed at improving retention rates for all substance use groups, as well as at improving treatment efficacy for polysubstance users.

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