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Interventions for Reducing Adolescent Alcohol Abuse: A Meta-analytic Review

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Reducing Alcohol Use : A Meta-Analytic Review of Interventions for Adolescent Alcohol
Abusers

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Abstract

Objective. To assess the effectiveness of substance abuse interventions for their ability to reduce adolescent alcohol use.

Data Sources. A literature search of MEDLINE, PsycINFO, ERIC, Social Science Abstracts, Criminal Justice Abstracts, Social Work Abstracts, Social Science Citation Index, Dissertations Abstracts International, National Criminal Justice Research Service, Social Psychology, Criminological, Educational Trials Register, and the PsiTri databases from 1960 through 2008 was conducted.

Study Selection. Of 64 titles and abstracts identified, 16 studies and 26 outcomes constituted the sample. The researchers calculated Hedges g effect sizes and used a random effects model to calculate adjusted pooled effect sizes. Heterogeneity was explored using stratified analyses.

Main Exposure. Completion of a substance-abuse intervention that aimed to reduce or eliminate alcohol consumption.

Main Outcome Measures. Abstinence, frequency of alcohol use, and quantity of alcohol use measured between one month and one year upon completion of treatment.

Results. Pooled effects of standardized mean differences indicate that interventions significantly reduce adolescent alcohol use (Hedges's $g = -0.61$, confidence interval = $-0.83 - -0.40$). Stratified analyses revealed larger effects for individual treatment (Hedges's $g = -.75$, confidence interval = $-1.05 - -0.40$) compared to family-based treatments (Hedges's $g = -.46$, confidence interval = $-0.66 - -0.26$).

Conclusions. Treatments for adolescent substance abuse appear to be effective in reducing alcohol use. Individual-only interventions had larger effect sizes than family-based interventions

and effect sizes decreased as length of follow-up increased. Furthermore, behaviorally-oriented treatments demonstrated promise in attaining long-term effects.

Alcohol use during adolescence remains a significant concern. Alcohol is the most frequently used substance among adolescents.^{1,2} Results from the Monitoring the Future national study indicate that 16% of 8th graders report having had a drink within the past 30 days, as did 33% of 10th and 44% of 12th graders.² Easily accessible and lacking the same legal consequences of more illicit substances, alcohol use begins at young ages with just under 50% of 8th graders having used alcohol,² initiating use at an average age of 14.³ Misuse of alcohol also occurs at high frequencies with over half of 12th graders reporting ever having been drunk, 30% reporting binge drinking, and 3% reporting daily drinking.^{2,4-5}

Adolescent alcohol use disorders are associated with serious psychosocial problems. Youth dependent on alcohol report increased rates of comorbid mental health disorders⁶ and neurocognitive deficits.⁷ They also demonstrate reduced motivation in regards to academic success.⁸ Furthermore, alcohol misuse in adolescence places youth at increased risk for subsequent adult alcohol abuse and its related problems.⁹

Considering the serious consequences associated with adolescent alcohol use, several treatments have been developed to reduce youths' alcohol consumption and related behavioral problems. Interventions to reduce alcohol use are provided in two primary formats with treatment provided either directly to the adolescent or to the adolescent in the context of his/her family. Common individual treatments utilize behavioral interventions to identify internal and external stimuli that trigger alcohol use and then implement skills trainings to teach refusal skills, relaxation techniques, and behavioral management techniques.^{5,10} Often, cognitively oriented therapies will additionally focus on distorted thoughts and maladaptive perceptions that lead to problematic behaviors.¹¹ Motivational interviewing, a third common treatment approach, helps clients recognize their problem behavior and build internal motivation towards behavioral

change.¹² According to Thatcher and Clark,⁵ motivational interviewing may be especially pertinent for adolescents because they are often coerced into treatment and are often unwilling to acknowledge their problematic behaviors. Several randomized clinical trials have demonstrated reductions in adolescent alcohol use across individual intervention approaches.^{8,13}

Most research on reducing adolescents' substance use has evaluated family-based interventions.⁵ Because family dynamics are an integral component in the lives of adolescents, many consider the family to be an essential consideration when treating substance abusing adolescents.¹⁴ The four most common family-based programs that aim to reduce substance use are Multisystemic Therapy, Integrated Family and Cognitive Behavioral Therapy, Multidimensional Family Therapy, and Brief Strategic Family Therapy. Each of these treatments utilizes a multisystem approach in which the intervention not only attempts to change youth behavior, but also to reduce risk factors for substance use present in the youth's family or other social systems (school, peers, community). Several trials of family-based interventions have demonstrated effectiveness in reducing alcohol use.¹⁵⁻¹⁹

With multiple studies evaluating the effects of interventions to reduce adolescent alcohol use, synthesis across studies is necessary to gain a clear picture of overall effects. Several papers synthesize related topics. For example, there are currently published meta-analyses and systematic reviews assessing the effectiveness of various substance abuse interventions for adults,²⁰ preventive interventions for adolescent substance use,²¹ and brief interventions for reducing substance use.²² Moreover, Vaughn and Howard²³ conducted a synthesis for controlled evaluations of adolescent substance abuse treatment. To date, however, a meta-analysis of outcomes for interventions to reduce alcohol use among adolescents does not exist.

Consequently, a primary purpose of this article is to assess the effectiveness of individual and family-based interventions for their ability to reduce adolescent alcohol use.

Additionally, questions remain regarding whether individual counseling or family-based treatments are more effective at reducing alcohol use. In a meta-analysis on drug abuse outcomes, Stanton and Shadish²⁴ found that family treatment was superior over individual counseling; however this study was conducted over 12 years ago and included both adolescents and adults seeking treatment for substance abuse. Thus, along with determining the effects of treatments to reduce adolescent alcohol use, a secondary aim of the current study is to compare the effects of individual treatments to family-based treatment approaches.

Methods

Data Sources and Searches

We followed standardized protocols for the identification, acquisition, coding, and analysis of studies of treatment effects on alcohol use outcomes consistent with the Quality of Reporting of Meta-analyses (QUOROM).²⁵ The search objective was to identify all studies that involved a comparison to a focal treatment targeting alcohol use outcomes for adolescent clients, between the ages of 12 and 19, for a forty eight-year time span (between 1960 and 2008). This time frame was selected in order to capture all potential studies. Databases systematically searched included: MEDLINE, PsycINFO, ERIC, Social Science Abstracts, Criminal Justice Abstracts, Social Work Abstracts, Social Science Citation Index, Dissertation Abstracts International, National Criminal Justice Research Service, Social, Psychological, Criminological, Educational Trials Register (C2-SPECTR), and the PsiTri database of randomized and controlled trials in mental health. Supplemental searches of alcohol and drug treatment websites, such as NIDA, Alcohol and Drug Abuse Institute (ADAI), at the University of Washington, and Center

on Alcoholism, Substance Abuse and Addictions (CASAA) at the University of New Mexico were also searched to augment formal systematic searches. Manual searches of the reference sections of identified studies, reference sections of recent pertinent book titles, and government documents were also conducted. Keyword searches included the following descriptors entered singularly and in Boolean format with “and” or “or”: “Adolescent,” “Alcohol”, “Alcohol Abuse,” “Ethanol”, “Alcohol Dependence,” “Substance Abuse,” “Substance Use Disorders,” “Psychosocial Interventions,” “Psychosocial Treatments,” “Youth,” “Behavioral Interventions,” “Behavioral Treatments,” “Psychotherapy,” “Randomized Controlled Trials,” and “Controlled Clinical Trials.” If a study appeared promising we retrieved the full text version. Following search descriptor refinements, duplicate citation removal, and step-by-step screening and filtering of articles vis-a-vis inclusion criteria, full text articles were reexamined for relevance and final study selection.

Study Selection

Studies were selected according to eligibility criteria established a priori. To be included, studies must have: a) tested an intervention to reduce alcohol use (excluding prevention studies, observational studies, and literature review/conceptual articles); b) targeted adolescents (ages 12-19) unless studies of mixed groups of adolescents and adults could allow specific determinations as to the effectiveness of treatment outcomes for adolescent subjects; c) examined quantitative alcohol use treatment outcomes such as alcohol abstinence, frequency of drinking, and quantity of drinking (as opposed to compliance, safety, other problem behaviors, or prevention-only outcomes); d) utilized a contrast condition for comparison (i.e., comparison group that included a control group, wait-list control or contrasting treatment group as part of the design (excluding one group pre-post design or case studies); finally e) investigations utilizing pharmacological

therapies were included only if drugs were administered as part of an integrated treatment protocol combining medications with one or more psychosocial interventions. The Quorum flowchart²⁵ illustrates the study screening process (see Figure 1).

Data Extraction and Quality Assessment

Study characteristics such as citation information, methodological attributes, outcome variable information, measures, key findings, intervention description as well as other pertinent information such as sample size were recorded independently by study authors onto an intervention coding form. Following this initial coding procedure, information for all studies was double-coded by a second coder. Two dyads of authors independently coded studies and interrater agreement assessment showed minimal coding error for dyad one ($Kappa = .76$) and dyad two ($Kappa = .78$) Reitzel and Carbonell²⁶ suggest that the Kappa statistic is a superior calculation because it adjusts for the proportion of the rater's agreement that could occur between raters due to chance. Study authors met to evaluate any remaining discrepant codes and consensus was achieved via discussion.

Analysis of Methodological Quality

Each study was rated with regard to methodological characteristics using an adapted version of the Methodological Quality Rating Scale (MQRS). This scale was developed by Miller, Brown, Simpson, Handmaker, Bien, Luckie, et al.,²⁷ and the Mesa Grande project evaluating alcohol dependence treatment outcome studies²⁸⁻²⁹ and has been used in other systematic reviews^{23,30} and meta-analyses.³¹ Each study was evaluated across 13 methodological attributes. The maximum number of points a study could garner ranged from 1 (extremely poor quality) to 16 (exceptionally high quality).

Data Synthesis and Analysis

We combined data from multiple intervention studies targeting alcohol use outcomes. Alcohol use outcomes were measured as reductions in the frequency of alcohol use (i.e., drinking days, number of drinks consumed) assessed by structured interviews. We used the software Comprehensive Meta-Analysis 2.0.³² For intervention studies with sufficient statistical information this program calculates the standardized mean difference effect size. We used Hedges's adjusted g for effect sizes to correct for sample size bias.³³⁻³⁴ For treatment/comparison design studies, the effect size was calculated as the difference between the intervention group's mean posttest score and the comparison group's mean posttest score divided by the pooled standard deviation and adjusted for sample size. We examined and corrected extreme values using winsorizing techniques.³⁵ This process results in identifying effects greater than two standard deviations from the mean and assigning these effects a value equivalent to two standard deviations. Due to dispersion based on clinical inference and supported by statistically significant Q -values and relatively high tau-squared and I-squared values, we could not assume the true effect was identical across studies, and subsequently used a random-effects model over a fixed effects model to estimate pooled effects. The random effects model takes into account sources of variation within and between studies.³⁶ Fixed effects often inflate effect size precision due to narrower confidence intervals compared to random effects models.³⁷ As such, random effects models provide a more conservative estimate. We also tested pooled effects using a mixed effects model, which did not assume common variance among studies across subgroups, but combined subgroups using a fixed effect.³⁸ Heterogeneity was explored using stratified analyses. Funnel plots and associated statistics were examined to evaluate publication bias. A fail-safe N was computed in order to assess the file drawer problem inherent in meta-analyses (i.e., how many studies with null or differential effect is necessary to invalidate study results).

Results

Search Results

Figure 1 illustrates the results of the study screening process. Sixty-four potentially relevant studies were initially identified. After literature review articles, case studies, and other article formats not meeting search criteria were removed, 31 publications remained. Articles were reexamined for relevance and design qualifications for final study selection. Findings from 16 investigations published between 1994 and 2008 constituted the final study sample.

Study Characteristics

As shown in Table 1, all 16 of the studies contained in this analysis were journal article publications. Nearly 40 percent were published between 2006 and 2008. More than half (57%) were published between 2000 and 2004 while less than 10 percent pre-dated 1999. The entire sample of youth participants within this meta-analysis was under the age of 19 and all studies were carried out within the United States. A majority (62%) of the studies tested individual-based therapies and approximately one third tested family therapies. With regard to study design, 14 (87.5%) utilized experimental designs. Only two studies were quasi-experimental. Nearly all (94%) of the studies were conducted at single site locations, were considered replicable and reported baseline participant characteristics. The vast majority (94%) of the studies reported that their interventions were standardized by a manual or required the specific training of research staff. Most studies (69%) reported utilizing objective verification when collecting data and 69% reported utilizing collateral verification. The majority (56%) of studies had a follow-up length of between 6-11 months. Assessment of follow-up time periods revealed that only 38% of the studies were able to garner 85-100% of their original study participants. Even though only 44 percent of studies reported having less than 85 percent follow-up rates, a large majority (88%)

enumerated on their participants who had dropped out of the study. One study³⁹ did not report follow-up details. Table 2 describes design and treatment information for each included study.

Overall Comparisons of Treatment Effects

As shown in Table 3, using the random effects model the adjusted pooled effect size (Hedges's g) was -0.62 (95% CI = $-0.83 - -0.40$). All tested interventions yielded reductions in alcohol use. The range of standardized effects for reducing alcohol use was substantial ranging from -0.09 (95% CI = $-0.45 - 0.27$) for Brief Motivational Interviewing⁸ to -1.991 (95% CI = $-2.37 - -1.61$) for Cognitive-Behavioral Therapy integrated with the 12-step approach.⁴⁰ In addition to Cognitive-Behavioral Therapy with the 12-step approach, Brief Motivational Interviewing,⁹ Active Aftercare,⁴¹ Multidimensional Family Therapy,¹⁷ and Brief Intervention with Adolescent and Parent¹⁹ yielded large (> 0.80) effects. Intervention effects tended to wane over time. Although the majority of studies did not include such long-term assessments of intervention results (12 months or greater), those studies that did revealed enduring effects for Behavioral Treatment compared to supportive counseling (Hedges's $g = -0.66$, 95% CI = $-0.97 - -0.34$), Multidimensional Family Treatment compared to Family Education (Hedges's $g = -0.81$, 95% CI = $-1.29 - -0.34$) and Multidimensional Family Therapy compared to group therapy (Hedges's $g = -.57$, 95% CI = $-1.06 - -.07$).

Stratified and Sensitivity Analyses

Stratified analyses by individual vs. family intervention classifications showed that pooled effects revealed somewhat larger effects for individual interventions (Hedges's $g = -0.75$, 95% CI = $-1.05 - -0.40$) compared to family-based interventions (Hedges's $g = -0.46$, 95% CI = $-0.66 - -0.26$). Moreover, pooled effects for stratified analyses by follow-up length revealed larger effect sizes for outcomes with follow-up data of six months or less (Hedges's $g = -0.66$,

95% CI = -0.95 – -0.38) compared to follow-up data of greater than six months (Hedges g = -0.50, 95% CI = -0.68 – -0.32). Results of stratified analyses are shown in Table 3. We used Duval and Tweedie's trim and fill method⁴² to examine and impute studies based on any asymmetric pattern, and results showed a negligible change in overall pooled effects based on imputation of three studies (increase of 0.04 in Hedges's g), suggesting that publication bias is minimal. A fail safe N was also computed to address the file drawer problem and results showed that 1053 null studies would be necessary to change the alpha to a non-significant value. Although relatively low in power, rank correlation and Egger's regression intercept were both non-significant, also suggesting lack of publication bias.

Discussion

This meta-analysis finds that numerous treatments for adolescents contribute to the reduction of alcohol use over time. When synthesizing all 16 studies and 26 outcomes, the overall pooled effect size is g = -.62 (p < .001), indicating treatment has a medium sized effect on the reduction of alcohol use for adolescents according to Cohen's⁴³ heuristics (<.20 = small, .50 = moderate, >.80 = large).

Intervention approaches varied in their effects on alcohol reduction. Interventions with large effect sizes (>.80) include Brief Motivational Interviewing, Cognitive-Behavioral Therapy with 12-steps, Cognitive-Behavioral Therapy with aftercare, Multidimensional Family Therapy, Brief Interventions with the adolescent, and Brief Interventions with the adolescent and a parent. Interventions with medium effect sizes include Integrated Family and Cognitive Behavioral Therapy, Behavioral Treatment, Triple Modality Social Learning, Multidimensional Family Therapy, and Brief Interventions only with the adolescent. The outcomes for Multisystemic

Therapy were statistically significant, yet this treatment demonstrated a relatively small effect on the reduction of alcohol use.

Interestingly, three of the five interventions that produced large effect sizes included brief interventions. This is in contrast to Tait and Hulse's²² previous systematic review of the effectiveness of brief interventions for substance using adolescents that found that, although statistically significant, the effect size for alcohol interventions was small with a Hedges's g effect size of .27. Considering the emergence of brief interventions primarily due to managed care, the larger effect sizes found in this review indicate that more recent tests of brief interventions are yielding stronger reductions in alcohol use. However, research on brief interventions is limited, and more research is needed to assess its effectiveness with alcohol reduction for adolescents and to understand the mechanisms that produce changes.

Surprisingly, individual-only interventions had larger effect sizes ($g = -.75$) than family-based interventions ($g = -.46$). These findings are in contrast to previous work that finds family-based interventions to be the ideal mode of treatment for adolescents with alcohol use disorders.^{5,14,44} Unequivocal claims that individual-based treatment is more effective than family-based treatment are not, however, warranted as potentially confounding factors were not controlled for in stratified analyses. Furthermore, both types of treatment were statistically significant ($p < .001$) and many of the specific interventions for both modalities contained large effect sizes. Two of the family-based interventions had large effect sizes^{17,19} as did three of the individual counseling interventions.^{9,19,41} In fact, Winters and Leitten¹⁹ assessed the effectiveness of brief interventions with solely the adolescent and a brief intervention with the adolescent and one parent, and found the inclusion of a parent had a much larger effect size ($g = -1.71$). Nevertheless, concerning the studies included in this meta-analysis, individual counseling had a

larger influence on the reduction of alcohol use for adolescents with alcohol use disorders than family-based interventions. The differences between individual- and family-based interventions found in the study, however, may lack reliability because of the small number of studies that satisfied inclusion criteria, increasing the chances that there are alternative explanations that explain the differences in effect sizes. Thus, this comparison should be further studied as more research is conducted and disseminated..

Effect sizes decreased with length of follow up. The time between the end of the intervention and follow-up data collection has an important influence on effect size when synthesizing the outcomes. While it is possible that treatment effects can consolidate over time, making relapse less likely, this study finds the contrary – an increased chance that treatment participants return to pre-intervention levels of drinking when there was a longer follow-up period. Reduced effects of interventions over time may occur as youth reduce how often they utilize skills developed in treatment, and other influences such as deviant peer groups may have greater influence over youth problem behavior post intervention. Nonetheless, the following interventions resulted in significant reductions in alcohol use at 12 months post treatment: Behavioral Treatment¹³ and Multidimensional Family Treatment.¹⁷ Considering that these interventions focus on altering maladaptive behaviors, it appears behavioral-based treatment, whether individually- or family-based, is beneficial in attaining long-term change.

Study conclusions should be interpreted within the context of several limitations. First, inclusion criteria were purposely narrow in an attempt to reduce heterogeneity among studies; however, specific alcohol use outcomes did differ slightly, increasing the chances of construct validity invariance⁴⁵. Outcomes examined included: alcohol use, alcohol use frequency, days of alcohol use, quantity of alcohol used, and past month alcohol use. While similar, results would

be considered more valid if the outcomes were identical. Follow-up lengths also differed, and, as previously discussed, greater follow-up periods are associated with smaller effect sizes because the treatment participant has more opportunities to increase frequency and quantity of alcohol use over time. While stratified analyses comparing follow-up periods of more than and less than six months revealed stronger effect sizes for follow-up periods of less than six months, our overall effect sizes represent a synthesis of different follow-up periods. Finally, we did not stratify results based on different types of control group, preventing us from comparing effect sizes for standard treatment versus waiting list control groups. Although all but two of the studies were a randomized controlled trial, we cannot be assured that type of control group did not influence the magnitude of the effects size results.

This is the first known meta-analysis to examine interventions aimed at reducing alcohol consumption for adolescents. As the number of rigorously designed alcohol intervention studies for adolescents increases, future meta-analyses should synthesize studies with greater precision by intervention. Such analyses would help identify with more certainty those interventions most effective in reducing adolescent alcohol use.

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* Study included in meta-analysis

Figure 1. Study Screening Process Diagram

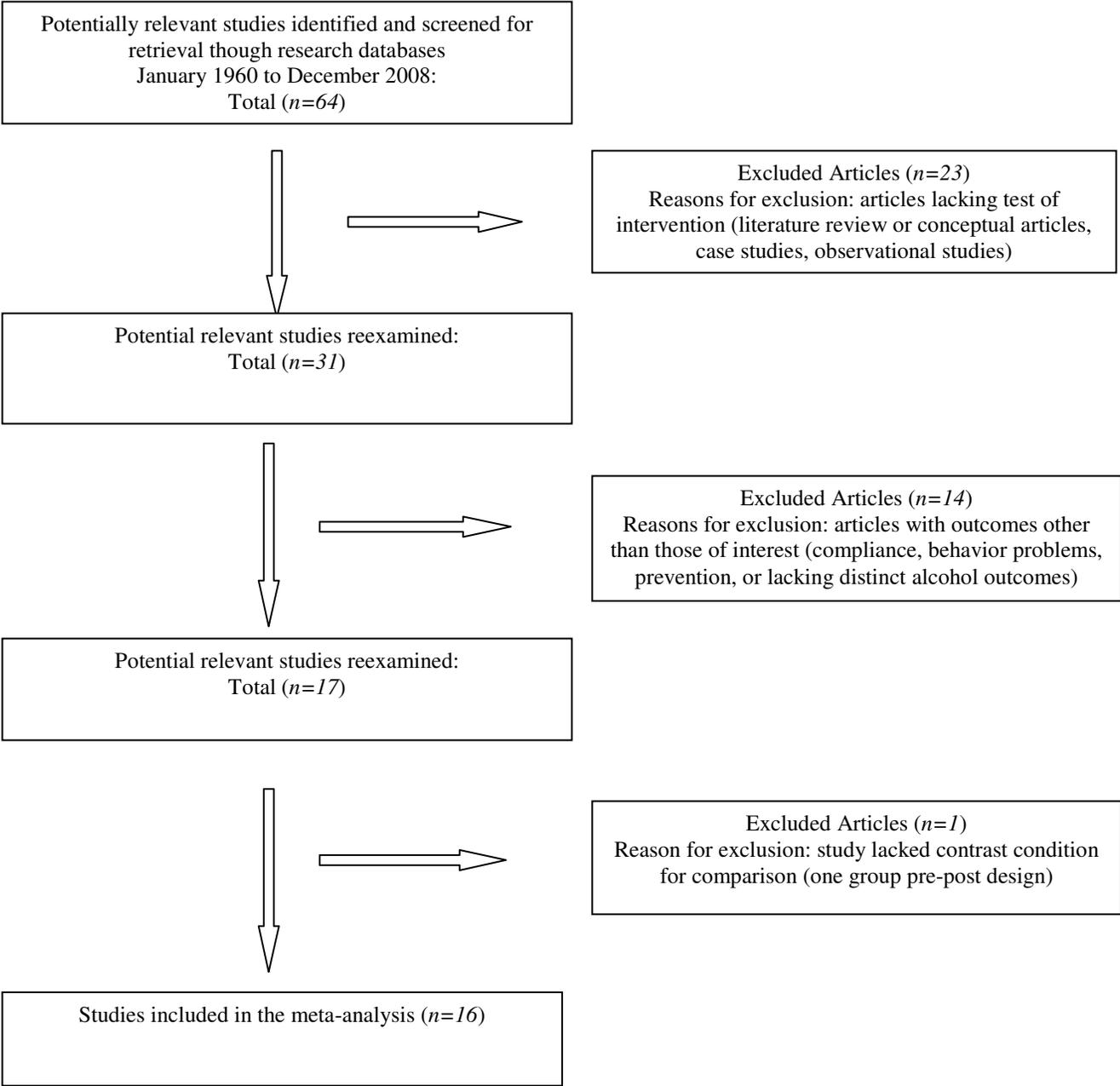


Table 1. Characteristics of Studies Included in Meta-Analysis (N = 16).

<i>Characteristic</i>	<i>Frequency (%)</i>
Publication type	
Journal article	16 (100)
Publication year	
2007-2008	5 (31)
2005-2006	1 (6)
2003-2004	3 (19)
2001-2002	4 (25)
1999-2000	2 (13)
Before 1999	1 (6)
U.S. samples	16 (100)
Intervention tested	
Family	5 (31)
Individual	10 (62)
Both	1 (7)
Age range	
12-19	16 (100)
Methodological Attributes	
Considered replicable	15 (94)
Reported baseline characteristics	16 (100)
Quality control	15 (94)
Outcome Follow-up length	
Less than 6 months	7 (44)
6 to 11 months	9 (56)
12 months or longer	3 (19)
Follow-up rate	
Less than 70% completion	2 (13)
70 to 84.9% completion	5 (31)
85-100% completion	6 (38)
Not reported	1 (6)
Collateral verification	11 (69)
Objective verification	11 (69)
Dropouts enumerated	14 (88)
Attrition delineated	14 (88)
Single site	15 (94)
Study Design	
Experimental	14 (94)
Quasi-experimental	2 (6)

Table 2. Design and Treatment Characteristics of Included Studies

Author(s)	Research Design	Intervention	Post-Randomization Group Comparison	Collaterals	Attrition	Site	Duration and # of Sessions	Outcome	Follow-up
Azrin et al. ¹³	Experimental	BT	Yes	Collaterals interviewed	Considered in outcome	Clinic	Average 19 sessions, 1 session/week	Days of alcohol use	12 months
Baer et al. ⁸	Experimental	BMI	Yes	No collateral verification	Considered in outcome	Homeless drop-in center	4 weeks, 1 session per week	Alcohol use	3 months
D'Amico et al. ⁹	Experimental	BMI	Yes	No collateral verification	Considered in outcome	Clinic	1 session with a 'booster' call one month later	Frequency of alcohol use	6 months
Friedman et al. ³⁹	Experimental	TMSL	Yes	Collaterals interviewed	Considered in outcome	Clinic	24 weeks, 1 session per week	Alcohol use	6 months
Godley et al. ⁴⁶	Experimental	ACC	Yes	Collaterals interviewed	Considered in outcome	Home	12 weeks, frequency not reported	Days to alcohol use	3 months
Godley et al. ⁴⁷	Experimental	ACC	Yes	Collaterals interviewed	Considered in outcome	Aftercare Services	90 days, 1 session/week	Time abstinent from alcohol	9 months
Henggeler et al. ¹⁵	Quasi-Experimental	MST	Yes (no randomization)	Collaterals interviewed	Considered in self-report	Home/School community center	40 hours direct contact with therapist in 4-5 months	Frequency of alcohol use	10 months
Kaminer et al. ⁴⁸	Experimental	CBT	Yes	Collaterals interviewed	Considered in outcome	Residential facility	12 weeks, one session per week	Severity of alcohol use	6 months
Kaminer et al. ⁴¹	Experimental	AA + CBT	Yes	No collateral verification	Considered in outcome	Home	12 weeks, 5 total sessions	Frequency of alcohol use and heavy alcohol use	3-6 months
Latimer et al. ¹⁶	Experimental	IF-CBT	Yes	Collaterals interviewed	Not considered in outcome	Clinic	16 weeks, 3 sessions/week	Frequency of alcohol use	6 months
Liddle et al. ¹⁷	Experimental	MDFT	Yes	Collaterals interviewed	Considered in outcome	Clinic	16 weeks, 1 session/ week	Alcohol use	12 months
Liddle et al. ¹⁸	Experimental	MDFT	Yes	No collateral verification	Considered in outcome	Clinic	1 session/ week	Alcohol use	12 months
McGillicuddy et al. ⁴⁹	Experimental	PCST	Yes	Collaterals interviewed	No dropouts	Clinic	8 weeks, 1 session/week	Frequency of alcohol use	50 days
Santisteban et al. ⁵⁰	Experimental	BSFT	Yes	Collaterals interviewed	Considered in outcome	Clinic	Average 11 session, 1 session/week	Frequency of alcohol use	5 months

Tomlinson et al. ⁴⁰	Quasi-Experimental	CBS/12-Step	Yes (no randomization)	Collaterals interviewed	Considered in outcome	Residential facility	N/A	Frequency of alcohol use	6 months
Winters et al. ¹⁹	Experimental	BI, BI-A, Bi-AP	Yes	No collateral verification	Considered in outcome	School	2 or 3 sessions	Alcohol use days Alcohol binge days	6 months

Table 3. Standardized Effects of Intervention Studies Targeting Adolescent Alcohol Use (N = 16).

Study Name	Comparison (Time Point)	Statistics for Each Study						
		Sample size		Hedges's g	Lower limit	Upper limit	Z-Value	p-Value
Study name		Treatment	Comp					
1. Azrin et al. ¹³	BT* vs. SC (12 mo)	81	81	-0.657	-0.972	-0.343	-4.093	<0.001
2. Baer et al. ⁸	BMI* vs. TAU (1 mo)	66	51	-0.120	-0.483	0.244	-0.645	0.519
	BMI* vs. TAU (3 mo)	85	51	-0.089	-0.452	0.275	-0.478	0.632
3. D'Amico et al. ⁹	BMI* vs. TAU (6 mo)	110	85	-1.540	-1.881	-1.199	-8.849	<0.001
4. Friedman et al. ³⁹	TMSL* vs. BRT (6 mo)	63	91	-0.514	-0.796	-0.233	-3.585	<0.001
5. Godley et al. ⁴⁶	ACC* vs. TAU (3 mo)	98	51	-0.477	-1.811	0.858	-0.700	0.484
6. Godley et al. ⁴⁷	ACC* vs. TAU (3 mo)	98	78	-0.129	-1.509	1.250	-0.184	0.854
	ACC* vs. TAU (9 mo)	54	78	-0.100	-1.479	1.280	-0.141	0.888
7. Henggeler et al. ¹⁵	MST** vs. TAU (post treatment)	58	56	-0.390	-0.758	-0.022	-2.074	0.038
	MST** vs. TAU (6 mo)	54	54	-0.337	-0.714	0.041	-1.749	0.08
8. Kaminer et al. ⁴⁸	CBT* vs. IT (15 mo)	5	7	-0.535	-1.616	0.546	-0.970	0.332
9. Kaminer et al. ⁴¹	AA* (CBT vs. No- AA) (3-6 mo)	70	41	-0.866	-1.255	-0.476	-4.354	<0.001
10. Latimer et al. ¹⁶	IF-CBT* vs. PC (6 mo)	38	21	-0.739	-1.353	-0.124	-2.357	0.018
11. Liddle et al. ¹⁷	MDFT** vs. FE (6 mo)	38	35	-0.814	-1.287	-0.341	-3.371	0.001
	MDFT** vs. FE (12 mo)	38	35	-0.442	-0.902	0.018	-1.885	0.059
	MDFT** vs. GT (6 mo)	38	28	-0.592	-1.085	-0.099	-2.353	0.019
	MDFT** vs. GT (12 mo)	39	28	-0.565	-1.057	-0.073	-2.250	0.024
12. Liddle et al. ¹⁸	MDFT** vs. CBT (3 mo)	47	49	-0.402	-0.791	-0.013	-2.024	0.043

	MDFT** vs. CBT (6 mo)	45	53	-0.194	-0.584	0.197	-0.971	0.331
	MDFT** vs. CBT (12 mo)	14	59	-0.166	-0.583	0.252	-0.777	0.437
13. McGillicuddy et al. ⁴⁹	PCST** vs. DTC (50 days)	126	8	-0.122	-0.959	0.714	-0.287	0.774
14. Santisteban et al. ⁵⁰	BSFT** vs. GT (5 mo)	70	85	-0.037	-0.311	0.237	-0.263	0.793
15. Tomlinson et al. ⁴⁰	CBT/12-step SUD and PC * vs. CBT/12-step SUD (6 mo)	70	88	-1.991	-2.373	-1.609	-10.22	<0.001
16. Winters et al. ¹⁹	BI-AP** vs. CON (6 mo)	26	26	-1.711	-2.340	-1.083	-5.338	<0.001
	BI-A* vs. CON (6 mo)	26	26	-1.372	-1.969	-0.775	-4.506	<0.001
	BI-A* vs. BI-AP (6 mo)	26	26	-0.557	-1.103	-0.011	-2.000	0.046
Random Effects: Overall				-0.616	-0.834	-0.397	-5.528	<0.001
Random Effects: Family only				-0.462	-0.662	-0.262	-4.527	<0.001
Random Effects: Individual only				-0.754	-1.105	-0.403	-4.208	<0.001
Random Effects: Outcomes for greater than 6 month follow-up				-0.499	-0.679	-0.320	-5.450	<0.001
Random Effects: Outcomes for 6 month or less follow-up				-0.661	-0.945	-0.377	-4.557	<0.001

Note: * denotes intervention focus on the individual; ** denote intervention focus is on the family, BT = Behavioral treatment, SC = Supportive counseling, BMI = Brief motivational interviewing, TAU = Treatment as usual, TMSL = Triple modality social learning, BRT = Basic residential treatment, ACC = Assertive continuing care, MST = Multisystemic therapy, IT = Interactional Treatment, CBT = Cognitive behavioral therapy, AA = Active aftercare, IGT = group treatment/therapy, IF-CBT = Integrated Family and Cognitive Behavioral Therapy, PC = Psychoeducation curriculum, MFT = Multidimensional family therapy, FE = Family education, PCST = Parent coping skills training, DTC = Delayed treatment condition, BSFT = Brief strategic family therapy, CBT/12-step = Cognitive-behavioral therapy integrated with 12-steps, SUD = Substance use disorders, PC = Psychiatric Comorbidity, BI-AP = Brief Intervention with adolescent and 1 parent only, CON = assessment-only Control Condition, BI-A = Brief intervention with adolescent only.