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Given high rates of attention-deficit/hyperactivity disorder (ADHD) diagnosed in children, knowledge of effective treatment is crucial. To this end, a meta-analysis of parent-involved psychosocial treatment was undertaken to determine its effect on a number of outcomes salient to children with ADHD. Sixteen studies met the criteria for the meta-analysis. Findings indicated that the impact of treatment on ADHD was low compared to comparison and/or control conditions, whereas child-internalizing symptoms and academic problems were better affected by family involvement. Teachers reported the highest effect sizes followed by parents themselves. Although parent involvement might be important for affecting the internalizing symptoms and academic problems that plague children with ADHD, ADHD and externalizing symptoms might be better targeted by other interventions.

Keywords: *meta-analysis; attention-deficit/hyperactivity disorder; family treatment*

Rates of attention-deficit/hyperactivity disorder (ADHD) in school-age children have been estimated at 3% to 7% (American Psychiatric Association [APA], 2000). Given its prevalence, effective treatments are critical. Several reviews and meta-analyses have been conducted on the ADHD treatment literature. Medication has been the source of many meta-analyses and reviews throughout the years (e.g., Connor, Glatt, Lopez, Jackson, & Melloni, 2002; Faraone & Biederman, 2002; McClellan & Werry, 2003; Schachter, Pham, & King, 2001; and for a comprehensive review, see Jadad et al., 1999). DuPaul and Eckert (1997) and Robinson, Smith, Miller, and Brownell (1999) focused their meta-analyses on school-based interventions.

Baer and Nietzel (1991) conducted a meta-analysis of cognitive-behavioral treatments for their impact on child impulsivity, which was not restricted to those diagnosed with ADHD but also included those with conduct disorders, behavior disorders, and learning disabilities. Interventions were found to be successful in reducing impulsivity with an overall mean effect of .77. Klassen, Miller, and Raina (1999) published a systematic review of different management strategies for ADHD, although they did not conduct a meta-analysis. They found that psychosocial interventions were not effective according to parent and teacher reports on reducing ADHD symptoms when compared to control and/or comparison groups. Although they did not study the range of outcomes beyond ADHD symptoms, they concluded that behavioral therapies may be most helpful, not for ADHD symptoms, but for associated features, including peer problems and academic difficulties.

Pelham, Wheeler, and Chronis (1998) reviewed psychosocial treatments for ADHD according to the American Psychological Association Task Force criteria. They found that behavioral parent training met the criteria for a "probably efficacious treatment." Because the review focused on ADHD, it is assumed that ADHD symptoms were the outcome, although this was not made explicit in their review.

Purdie, Hattie, and Carroll (2002) conducted a meta-analysis of a range of interventions for ADHD that were published in the 1990s, including parent training (a total of four studies). They found the effect of parent training on hyperactivity, impulsivity, and attention to be low, although the impact on what they defined as "general cognition," comprising academic performance, memory, and IQ, was much more robust (.53 effect size).

As the current research study was drawing to a close, Bjornstad and Montgomery (2005) published in the

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Cochrane Collaboration a systematic review of cojoint family therapy for children with ADHD examining the outcomes of ADHD symptoms, disruptive behaviors, and school performance. Following *Cochrane Collaboration* standards, only randomized controlled trials were included and only two studies met the rigorous criteria established. The authors acknowledged that it was difficult to draw conclusions based on the limited number of studies.

This review of the literature indicates that a comprehensive meta-analysis of all interventions involving parents—not necessarily family therapy or parent training and not limited to a certain time frame—is still an area of knowledge that needs to be synthesized. Parent involvement in intervention for child ADHD has been recommended (Barkley, 1998). First, parents of children with ADHD often experience distress and frustration with their children's behavior. Interventions targeting the interactions between the child and caregivers may be essential to prevent coercive parent–child interactions, which are linked to the development of conduct problems (Patterson, 1982; Patterson, DeBaryshe, & Ramsey, 1989). Second, the problems children with ADHD have with self-regulation of behavior appear to rest more with performance rather than knowledge (Barkley, 1998). Therefore, self-regulation may have to be achieved through the efforts of people in the child's environment, such as parents. Given recommendations that parents be involved in treatment of ADHD in children, a meta-analysis was undertaken to determine the effect of parent involvement on child symptoms.

RESEARCH OBJECTIVES

The primary objective of the current meta-analysis was to determine the magnitude and the direction of the difference of the effect size (ES) of the various outcomes associated with parent-involved treatment of ADHD. Outcomes were divided into 21 categories according to the particular informant involved—child, parent, or teacher reports of the following: (a) child internalizing problems, (b) externalizing problems, (c) ADHD, (d) social competence, (e) family functioning, (f) self-control, and (g) academic performance.

A secondary objective was to determine whether certain moderators influenced the ESs for these 21 categories of psychosocial outcomes. The current study examined five moderator categories, including the particular outcome involved, treatment characteristics, design type, key design characteristics, and sample demographics.

METHOD

Search Criteria and Procedures

To identify studies Medline/PubMed, PsychINFO, CINAHL, Social Work Research Abstracts, and Infotrac were searched from 1970 to 2003 with the following terms: *attention-deficit/hyperactivity disorder* (ADHD), *attention deficit disorder* (ADD), *hyperkinesis*, and *treatment*, *therapy*, *intervention*. Studies had to be written in English and published in refereed journals or books. Excluded were single-subject designs, case studies, and unpublished studies and interventions that were reported only at meetings or conferences. Reference sections of articles were also reviewed.

Inclusion criteria for studies involved the following:

- The study focused on a parent-involved psychosocial treatment for ADHD in a child (ranging in age from 0 to 18). As long as parents were a part of treatment, studies were included; it was not necessary, for instance, for parents and children to be seen cojointly. Another necessary criterion was that the treatment had to be clearly defined. For instance, studies in which participants received different types of psychosocial interventions, including family treatment, depending on their need (e.g., Satterfield, Cantwell, & Satterfield, 1979) were excluded. In addition, studies that only focused on treatment of the child were excluded.
- Children had to be screened for ADHD either by meeting diagnostic criteria or by scoring in the clinical range on established measures of ADHD symptoms.
- Although it was not necessary for designs to be randomized controlled, a comparison or control group design was a criterion.
- Of vital importance was that the current study contained sufficient statistical information to calculate a Cohen's *d* ES.

Hundreds of studies were screened for inclusion into the current study. Ultimately, the search yielded 16 published articles, which were published from 1980 to 2003.

Coding of Studies

All studies were coded independently by the first author and a trained doctoral student in social work, and disagreements were discussed to consensus. Table 1 presents the detailed coding system used to describe each study, which comprised treatment aspects, demographic characteristics of the sample, the research design, and the overall quality of the study. Quality was dependent on the following criteria: type of design with more points assigned for randomization and control conditions, the presence of follow-up, if the sample size was at least 30 participants per condition, and if there was the necessary information provided to code all the demographic information. Quality scores ranged from 2 to 6.

TABLE 1: ***Coding Scheme***

Category	*Values*
Outcome(s)	Child, parent or teacher reporting on the child's:
	Internalizing problems
	Externalizing problems
	Attention-deficit/hyperactivity disorder symptoms
	Social competence
	Family functioning
	Self-control
	Academic and/or learning disorders
Treatment Characteristics	Modality:
	Individual
	Group
	Family
	Day treatment
	Other medication vs. no medication
	Number of sessions
Design type	
	Random treatment and control
	Random treatment and comparison
	Nonrandom treatment and control
	Nonrandom treatment and comparison
	One group pre- and posttest
	One group posttest only
Key design characteristics	
	Overall quality
	Sample size
	Type of experiment, control, and comparison groups
	# of respondents in experiment, control, and comparison groups
	Follow-up
Sample demographics	
	Race
	Gender
	Socioeconomic status
	Household composition

Data Analysis

Separate ESs were calculated in each study for each outcome measure. The 21 outcomes categories were—according to the child, parent, or teacher report—(a) child-internalizing problems, (b) externalizing conduct problems, (c) ADHD, (d) social competence, (e) family functioning, (f) self-control, and (g) academic and/or learning disorders. Each type of outcome measure was also used as a potential moderator of ES.

The ES index reported is Cohen's *d*, defined as the difference between the means for experimental group and control and/or comparison group outcomes divided by the pooled within-group standard deviation (Cohen, 1988). Cohen's *d* is a widely accepted measure to use when reporting group differences on outcomes research because it is readily interpretable, referring to differences between the groups in standard deviation units. An ES of .20 indicates two-tenths of a standard deviation unit difference between experimental participants and control comparison participants. Usually, an ES of .20 is described as small, .50 as medium, and .80 as a high ES.

Effects were given a positive sign to indicate hypothesized change, and a negative sign to indicate change in the direction that is opposite to what was hypothesized. Therefore, positive values for *d* signify greater treatment success by experimental group participants than by control and/or comparison group participants.

Meta-analytic procedures assume independence of the individual hypothesis tests included in the meta-analysis. One source of nonindependence is the use of multiple hypothesis tests located within a single study (Strube & Hartman, 1983). Use of nonindependent results in a meta-analysis tends to inflate the Type I error rate for an analysis and should be avoided (Wolf, 1986). Various strategies have been used to avoid the problem of nonindependence of effects for the same study. Mullen (1989) suggested that it is preferable to collapse the different results into one global hypothesis test than to consider separate hypothesis tests derived from the same study as if they were independent. Therefore, an overall ES (Cohen's *d*) was calculated for studies with multiple outcome measures; that is, within each study, ESs were averaged so that each study yielded no more than one ES. No study or participant was counted more than once. The rationale for averaging measures into a single index was supported because a nonsignificant difference in ESs was obtained when individual measures were compared.

The resulting single ES for each study was inserted into Borenstein and Rothstein's (2001) Comprehensive Meta-Analysis (CMA) program. Following Hedges and Olkin (1985), ESs were adjusted to correct for bias to small sample size. Weighting procedures were used to combine ESs from different studies to give greater weight to studies whose effects were based on larger sample size. This weighting procedure is important because ESs that are based on a small sample (fewer than 30 respondents) in the original study yield overestimates of true effects and, consequently, must be reduced accordingly. CMA also computed Confidence Intervals (CIs) around the point estimate of an ES. Because all studies proposed directional hypotheses predicting that the intervention would have a positive effect, the 95% CIs (with one-tailed alphas of .05) are presented.

Fixed-effects models are appropriate when meta-analysts wish to make inferences only about the ES parameters in

the reviewed studies or about an identical set (Hedges & Vevea, 1998). In fixed-effects models, the study effects estimate the population effect with the only error being from the random sampling of participants within the studies. In contrast, random-effects models are appropriate when analysts wish to make inferences that generalize beyond the specific set of reviewed studies to a broader population. These models assume that variability between ESs emerges from participant-level sampling error and from random differences between studies that are associated with variations in experimental procedures and settings. It has been argued that random-effects models more adequately mirror the heterogeneity in behavioral studies and use noninflated alpha levels when the requirement of homogeneity has not been met (Hunter & Schmidt, 2000; Mullen, 1989; Rosenthal, 1984). The CMA program computed fixed- and random-effect model parameters, and fixed-effects and random-effects models are reported.

To account for the "file drawer problem," the tendency for studies supporting the null hypothesis to remain unpublished (Rosenthal, 1984), a fail-safe *N* was calculated. The fail-safe *N* is the number of undiscovered or unpublished studies with ESs of zero that would raise the overall ES above a critical value of $p = .05$ (Wolf, 1986).

Heterogeneity was analyzed by computing Corcoran's *Q*, which has an approximate chi-square distribution with $p - 1$ degrees of freedom, where *p* is the number of categories within each moderator variables (Hedges & Olkin, 1985). Because the *Q* statistic for all reviewed studies combined indicated heterogeneity, a moderator variable analysis of ESs was conducted to identify sources of heterogeneity.

There is support for using meta-regression analysis to explore sources of heterogeneity if, as it is in this analysis, an initial overall *Q* test for heterogeneity is significant (Berkley, Hoaglin, Mosteller, & Colditz, 1995; Hardy & Thompson, 1998, Harwell, 1997; Higgins & Thompson, 2002). The term *meta-regression* is used to indicate the use of study-level covariates, as distinct from regression analyses that are possible when individual data on outcomes and covariates are available. The *Q* tests for general "overdispersion" of trial results and does not address whether heterogeneity relates to particular covariates. Furthermore, *Q* only examines main effects and does not control for the explanatory effects of other possible moderators.

The appropriate regression model is a random-effect model where the weight for each trial should be equal to the inverse of the sum of the within-study variance and the residual between-studies variance. This random-effects model is consistent with the aforementioned model used to calculate an overall ES, *d* (Hunter & Schmidt, 2000; Mullen, 1989; Rosenthal, 1984; Thompson & Higgins, 2002). Stata's METAREG module (Steichen & Harbord, 2005) was used to perform a random-effects regression analysis for the following reasons:

1. In addition to testing whether ESs are related to the values of a single moderator, multiple regression can be used to perform more complicated analyses.
2. The multiple regression model provides a control for the total number of tests, and consequently, reduces the likelihood of a Type I error.

The procedure for multiple regression was as follows:

1 Dummy variables were created for categorical moderators.
2. The set of moderator variables was tested for multicollinearity.
3. The regression was performed using the reciprocal of the variance as the case weight.
4. The parameter estimates were tested and interpreted. Recall that tests on the individual parameters examine the unique contributions of each predictor.
5. An overall test of the model was performed.

RESULTS

Sample

Table 2 presents study characteristics, and Table 3 describes ES findings. The sample consisted of 16 studies, of which nine were published in the 1990s, four were published in the 1980s, and three in the 2000s. In terms of designs, 13 utilized random treatment and control and/or comparison groups, and 3 employed nonrandom treatment and control and/or comparison groups. Eleven of the 16 studies reported more than one measure of treatment outcome. Sample sizes ranged from 16 to 443 with a mean of 91 and a median of 67. Most treatments focused on school-age children and relied on group services. The average length of treatment was 32 sessions, although most interventions were either categorized as between 1 and 8 or 9 to 16 sessions in length.

Effect Size (Objective #1)

Separate ESs were calculated in each study for each outcome measure, and then each type of outcome measure was used as a potential moderator of ES. Table 4 summarizes the aggregate mean ESs by type of outcome measure for the 16 studies. Overall, the child's academic performance had the largest expected overall ES (8.2041), followed by the child's family functioning (.6730), and internalizing (.6349). Teacher-reported outcomes had the largest ESs (.7473), and child-reported outcomes had the smallest ESs (.1094). The overall

TABLE 2: ***Description of Design and Treatment***

Study Name and Year	*Design of Study*	*Modality*	*Number of Sessions*
Anastopoulos, Shelton, DuPaul, & Guevremont (1993)	Randomization to treatment and control groups w/follow-up	Individual with parents	9
Barkley, Guevremont, Anastopoulos, & Fletcher (1992)	Randomization to treatment and comparison groups w/follow-up	Parent-only for behavioral, family for problem-solving/ communication & structural family therapy	8 to 10
Barkley, Shelton, Crosswait, & Moorehouse (1996)	Randomization to treatment, comparison, and control groups	Group	10
Barkley, Edwards, Laneri, Fletcher, & Metevia (2001)	Nonrandomization to treatment and comparison groups w/follow-up	Family for problem-solving and/or communication skills, parent-only for behavioral	18
Bloomquist, August, & Ostrander (1991)	Nonrandomization to treatment, comparison, and control groups w/follow-up	Group	7
Bor, Sanders, & Markie-Dadds (2000)	Randomization to treatment, comparison, and control groups	Individual with parents	10 to 12
Firestone, Crowe, Goodman, & McGrath (1986)	Randomization to treatment, comparison, and medication groups w/follow-up	Group	9
Gittelman et al. (1980)	Randomization to treatment and comparison groups	Individual with parents	8
Horn, Ialongo, Greenberg, Packard, & Smith-Winberry (1990)	Randomization to Treatment and Comparison Groups w/Follow-Up	Group	12
Horn, Ialongo, Popovich, & Peradotto (1987)	Randomization to treatment and comparison groups w/follow-up	Group	8
Klein & Abikoff (1997)	Randomization to treatment, comparison, and medication groups	Individual parents	8
McNeil, Eyberg, Eisenstadt, Newcomb, & Funderburk (1991)	Nonrandomization to treatment and control group	Parent-Child	14
Multi-Modal Treatment Study of Children With Attention-Deficit/ Hyperactivity Disorder Group (1999)	Randomization to treatment, comparison, and community control groups w/follow-up	Group	360
Pfiffner & McBurnett (1997)	Randomization to treatment, comparison, and control group w/follow-up	Group	8
Strayhorn &Weidman (1989)	Randomization to treatment and control group	Parent-Child	7
Tutty, Gephart, & Wurzbacher (2003)	Randomization to treatment and comparison groups w/follow-up	Group	8

Q statistic was significant, and within-group homogeneity was not found for any group of ESs based on the type of outcome measure. Therefore, the mean ES for each study was used to calculate an aggregate fixed effect and random ES for the 16 studies.

Based on the value of Q, the requirement of homogeneity was not met ($Q = 331.49$, $df = 15$, $p < .01$), and consequently, the 16 individual ESs were combined within the context of random-effects model (d =.4208, $SE = .2727$, $p = .0617$, 95% CI = –.1145 to .9662). (For reference, the result of the fixed-effect model is d = .1876, $SE = .553$, $p < .001$, 95% CI = .0791 to .2961.) The fail-safe N for this analysis is 264. In other words, 264 studies averaging null results (mean z-Score of zero) must be "crammed into file drawers" before one could conclude that the overall d was due to sampling bias in

TABLE 3: ***Study Effect Sizes According to Outcome (Sorted by Largest d First)***

Study	*Quality Rating*	*Outcomes*	d	n	SE
Barkley, Guevremont, Anastopoulos, & Fletcher (1992)	4	Ext	1.7670	61	.1811
Bloomquist, August, & Ostrander (1991)	2	Int	1.7210	52	.2108
Pfiffner & McBurnett (1997)	4	Ext, ADHD	1.3650	27	.2136
Klein & Abikoff (1997)	2	ADHD	.9370	86	.2695
Firestone, Crowe, Goodman, & McGrath (1986)	3	Ext, ADHD	.8780	73	.3542
Barkley, Shelton, Crosswait, & Moorehouse (1996)	5	Ext, ADHD, Soc Comp	.8420	205	.2850
Horn, Ialongo, Greenberg, Packard, & Smith-Winberry (1990)	3	ADHD	.7670	42	.2033
Horn, Ialongo, Popovich, & Peradotto (1987)	2	Int, Ext, ADHD	.1980	24	.5000
Strayhorn & Weidman (1989)	4	Ext, ADHD	.1840	90	.3273
Anastopoulos, Shelton, DuPaul, & Guevremont (1993)	4	Int, Ext, Fam Func	–.1010	34	.2727
Multi-Modal Treatment Study of Children with (1999) Attention-Deficit/Hyperactivity Disorder Cooperative Group	5	Ext, Int, ADHD, Fam Func, and Self-Cont	.0030	579	.2500
McNeil, Eyberg, Eisenstadt, Newcomb, & Funderburk (1991)	1	Ext, ADHD	–.0070	30	.3200
Barkley, Edwards, Laneri, Fletcher, & Metevia (2001)	3	Int, Ext, Soc Comp	–.0110	92	.4082
Gittelman et al. (1980)	2	Int, Ext, ADHD, Soc Comp, Aca Probs	–.3930	61	.2281
Bor, Sanders, & Markie-Dadds (2002)	4	Ext, ADHD	–.5060	63	.2327
Tutty, Gephart, & Wurzbacher (2003)	5	Int, Ext, ADHD, Fam Func, Self-Cont	–.9650	100	.1013

NOTE: Ext = externalizing; Int = internalizing and/or conduct disorders; ADHD = Attention-deficit/hyperactivity disorder; Soc Comp = social competence; Fam Func = family functioning; Aca Probs = academic problems; Self-Cont = Self-control.

TABLE 4: ***Outcome Category and Mean Effect Size (Sorted by Largest d First)***

Outcome Type	*Perspective Parent*	*Perspective Child*	*Teacher Perspective*	*Totals—Outcomes*	*Mean Effect Size—Outcome Type*
Child academic performance	(0)	43% (3)	(0)	6% (3)	8.2041
Child self-control	(0)	14% (1)	(0)	2% (1)	–1.6683
Child family functioning	6% (2)	(0)	(0)	4% (2)	.6730
Child internalizing	15% (5)	% (0)	27% (3)	16% (8)	.6349
Child attention-deficit/ hyperactivity disorder	30% (10)	14% (1)	45% (5)	31% (16)	.3970
Child externalizing	36% (12)	14% (1)	27% (3)	31% (16)	.3611
Child social competence	12% (4)	14% (1)	(0)	10% (5)	.0710
Totals-perspective	(33)	(7)	(11)	(51)	
Mean effect size—perspective	.4327	.1094	.7473		.4208[a]

a. Random effects model, *SE* = .2727, *p* = .0617, 95% Confidence Interval = –.1145 - .9662

the studies summarized in the current meta-analysis (Rosenthal, 1984).

Moderator Variable Analysis (Objective #2)

A test for heterogeneity examines the null hypothesis that all studies are evaluating the same effect. Cochran's Q, the usual test statistic, is computed by summing the squared deviations of each study's estimate from the overall meta-analytic estimate, weighting each study's contribution in the same manner as in the meta-analysis. *P* values are obtained by comparing the statistic with a chi-square distribution with $k - 1$ degrees of freedom, where k is the number of studies (Egger, Davey, Schneider, & Minder, 1997).

Because the *Q* statistic indicated heterogeneity for all reviewed studies combined, an analysis was conducted to identify characteristics that could have influenced study outcomes. A random-effects meta-regression analysis was conducted to explore sources of heterogeneity. The Stata module METAREG was used for random-effects meta-regression. The regression model consisted of the

following potential moderator variables: (a) treatment characteristics (modality, medication vs. no medication, number of treatment sessions), (b) design type (e.g., randomly assigned treatment and control groups), (c) key design characteristics (overall quality, sample size, type of experimental treatment, control and comparison groups, number of respondents in the aforementioned groups, whether there was a follow-up measure of the outcome), and (d) sample characteristics (race, gender, socioeconomic status, household composition).

A bivariate correlation analysis was performed to identifying potential sources of collinearity. Significant collinearity was suggested among the aforementioned moderator variables, and redundant variables were removed from the model. When variables appeared to be collinear, the final model includes variables that had relatively large part correlation (Pearson's *r*) with ES but had moderate-to-low zero-order correlations with other moderator variables ($r = .50$).

Figure 1 presents a funnel plot of ES by research design (for reference), mean age of children in the sample, and household composition. Table 5 summarizes the final meta-regression model. The I^2 for the model is .8120. The I^2 statistic indicates the percentage variability due to between-study (or interstudy) variability as opposed to intrastudy variability (Higgins, Thompson, Deeks, & Altman, 2003).Values of I^2 equal to 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. The tau-squared value is .2694. Tau squared is a measure of the residual variance after controlling for the effects of the moderator variables in the model. The estimated between-study variance has been reduced from .8120 to .2694.

The model consisted of three variables: household composition (unstandardized beta coefficient = 1.7373, $p = .044$), age (coefficient = .02057, $p = .049$), and socioeconomic status (coefficient = 1.3876, $p = .100$). Therefore, household composition is the strongest, statistically significant predictor of ES, followed by age; that is, larger ESs are predicted for two- versus single-parent households, and for older versus younger child clients. Although not statistically significant, the model also suggests that larger ESs are predicted for children from families with higher socioeconomic levels.

DISCUSSION AND APPLICATIONS TO RESEARCH AND PRACTICE

A number of limitations characterize the current study. Ultimately, only a small number of studies—16—were eligible for inclusion in the meta-analysis. In general, studies are "not meta-analysis ready" because ESs are not routinely reported. Furthermore, researchers are sometimes unable to compute ESs because the information necessary for these calculations is omitted. Important methodological data are the research design and the specific sample size for each statistical test, the type of sampling, data collection techniques, and psychometric information for all instruments and outcome measures. In reporting data analyses, it is crucial to identify not only each statistical test but also equally important the exact value of the test with its corresponding *p* value, whether it is one-tailed or two-tailed, as well as the degrees of freedom for each test. Incomplete reporting of research data and statistics may preclude the inclusion of a study in a meta-analysis. This could erroneously bias meta-analysis results, and its generalizability as studies with missing data may have insignificant findings or be of poor quality. Another problem with studies was missing data for the moderator variables. Examples of pertinent population characteristics include (a) gender, (b) age, (c) ethnicity and/or race, (d) household composition, and (e) socioeconomic status.

Studies were restricted to cognitive-behavioral theoretical orientations, not because of inclusion criteria but by the type of treatment outcome studies that had been published. However, cognitive-behavioral treatment may not be routinely practiced in clinical practice outside university and laboratory research settings (Weisz, Weiss, & Donnenberg, 1992). Therefore, the published studies may not be representative of clinical practice and the way parents are involved in these settings.

With these caveats in mind, the overall results of the current meta-analysis should be considered suggestive of low-to-moderate intervention success moderated by household composition and age. Studies constituting the current meta-analysis focused on a wide range of outcomes, including academic performance, child self-control, family functioning, internalizing symptoms, externalizing symptoms, ADHD symptoms, and social competence. It is not surprising to note, ADHD and externalizing symptoms were represented in all the studies included in the current meta-analysis. The overall ESs were .3970 and .3611 for ADHD and externalizing, respectively, which are considered in the low range of ESs. However, this ES for ADHD symptoms was higher than the meta-analysis of parent training studies in the 1990s (Purdie et al., 2002).

At the same time, the ESs demonstrating the impact of medication on these symptom constellations have been higher. ESs for medication on ADHD symptoms have been reported for Ritalin as .82 (Swanson, McBurnett, Christian, & Wigal, 1995), for the tricyclics as .44 (Fletcher & Connor, as cited in Connor, Fletcher, & Swanson, 1999), and for Clonidine as .58 (Connor et al.,

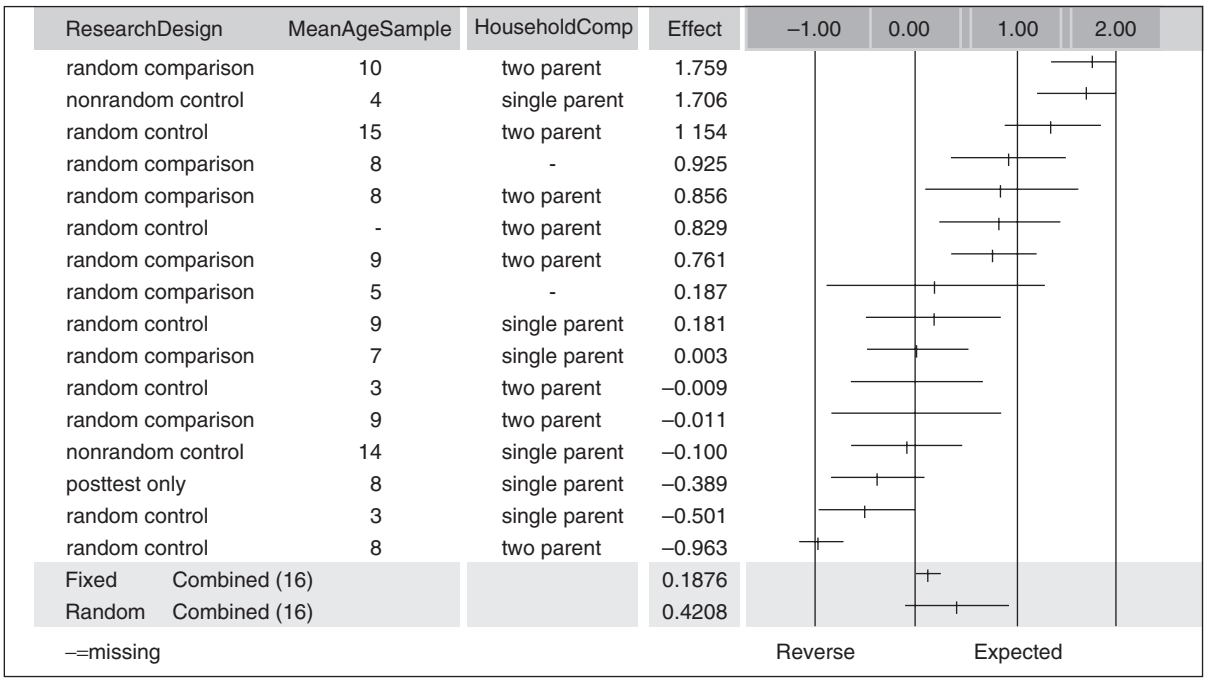

FIGURE 1: Funnel Chart Effect Sizes by Moderator Variables

TABLE 5: ***Moderator Variable Analysis (Dependent = Mean Effect Size)***

Model	*β*	SE	t
Household composition: 1 = two-parent, 0 = single-parent	1.7373	.5978	2.91*
Socioeconomic level: 1 = low, 2 = middle, 0 = upper	–1.3876	.6504	–2.13
Age	.2057	.0834	2.47*
Constant	–1.2861	1.3661	–.94

*$p < .05$.

2002). Similarly, Connor et al. (2002) found that the stimulants have a positive effect on aggression, with ESs of .84 for overt and .69 for covert aggression.

Child internalizing was the next largest outcome category with one-half the studies reporting on internalizing symptoms. It has been established that mood disorders are comorbid with ADHD in about 15%—75% of cases (Pliszka, 2000). The current meta-analysis indicates that parent-involved treatment may have a moderate effect on internalizing symptoms. The other outcomes had only a few studies represented within each category; thus, findings in these areas must be considered tentative. In general, the findings reflect Klassen et al.'s (1999) suggestion that the behavioral therapies may be effective, not so much for ADHD symptoms, but for associated features, such as academic problems. Indeed, the current meta-analysis indicated that academic problems were strongly affected by parent-involved treatment, an interesting finding because generalizability of treatments across settings has been a problem. However, it must be noted that this finding is based on a total of only three studies. Purdie et al. (2002) also demonstrated the moderately strong effect of parent training on "general cognition," although this result stemmed from only two studies.

Of interest is that child social competence, a purported thrust of many of the parent-involved treatments in the current meta-analysis, were barely affected by intervention. Child social functioning, a problem often noted for children with ADHD, does not appear to respond well to parent treatment.

In examining ESs by informant, the largest ESs were found for teacher reports. This finding was similar to Purdie et al.'s (2002) meta-analysis involving various interventions for ADHD. The validity of teacher reports in the diagnosis of ADHD have further been demonstrated through long-term follow-up (Mannuzza, Klein, & Moulton, 2002). The low ES for child report might call into question the advisability of spending time having children fill out measures. It has been found that children tend to underreport externalizing symptoms (Loeber, Green, Lahey, Frick, & McBurnett, 2002). In general, studies tended to rely on a multitude of outcome measures completed by various informants and would do well to streamline their measurement process with

outcomes that are theoretically linked to the intervention and that are well established in the field.

The regression of the moderator variables indicated that household composition and age were low-to-moderate predictors of overall ES. None of the other moderator variables tested, including medication versus no medication, modality, number of treatment sessions, study quality, design type, race, and gender, were significant predictors. In the current study, the older the child the more benefits conferred by parent-involved psychosocial intervention. This result is contradictory to findings in the conduct disorder literature that younger children tend to do better than do older children when their parents receive parent training (Fonagy & Kurtz, 2002). Estimates indicate that oppositional defiant disorder and/or conduct disorder are present in 40% to 70% of children with ADHD (Newcorn & Halperin, 2000).

A consistent finding in the literature has been that living in a single-parent home is a risk factor for treatment outcome (Fonagy & Kurtz, 2002). The current meta-analysis, too, indicated that children in single-parent homes did not do as well in parent-involved treatment as those who were from two-parent homes.

CONCLUSION

Overall, ADHD and externalizing symptoms are not affected by family involvement beyond a low-to-moderate effect, although child-internalizing symptoms are moderately affected. Other outcomes must be viewed as tentative because of the few studies in each category; however, academic performance and family functioning may be domains that family involvement positively benefits.

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