Journal of Child Psychology and Psychiatry 43:1 (2002), pp 3–29

Mechanisms of action in youth psychotherapy

V. Robin Weersing[1] and John R. Weisz[2]

[1]University of Pittsburgh School of Medicine, USA; [2]University of California, USA

Background: In this review, we address a basic, but unanswered, question about psychosocial interventions for youth: How does psychotherapy work? **Methods:** We propose a framework for using mediation analysis to answer this question, and we review the youth therapy outcome literature for evidence on mediating mechanisms. We focus our review on clinical trials of empirically supported treatments for youth anxiety, depression, and disruptive behavior ($N = 67$). **Results:** Contrary to previous reports indicating that potential mediators are rarely assessed, 63% of the studies included measures of potential mediating mechanisms in their designs. Across treatment domains, percentages ranged from 22% of the studies of learning-based interventions for anxiety (i.e., systematic desensitization, modeling, and reinforced practice) to 91% of parent training investigations. Despite the rather extensive assessment of potential mediators, only six studies included any attempt to use the measures in a formal mediation test. Thus, despite the positive effects of treatments and surprisingly ample assessment of mediators, we still know remarkably little about how youth psychotherapies work. **Conclusions:** We note common problems that hampered mediation testing (e.g., the design of many trials made it difficult to determine the temporal order of change in the mechanism and outcome), and we offer recommendations for improving study design to better assess mechanisms of therapeutic action. We also note the need to test mediation among referred youth treated in representative practice settings to complement the laboratory-based evidence on therapy mechanisms that prevails to date.
Keywords: Behavior therapy, cognitive therapy, mediation, methodology, psychotherapy. **Abbreviations:** CBT: Cognitive behavioral therapy; RCT: Randomized controlled trials; ADHD: Attention deficit hyperactivity disorder; EST: Empirically supported treatments; CWD: Coping with depression; PT: Parent training; MST: Multisystemic therapy; MTFC: Multi-dimensional treatment foster care; CMT: Cognitive mediation training.

Fifty years ago, Eysenck's (1952) famous review of the adult psychotherapy literature appeared in print, with its pronouncement that therapy was no more efficacious than the passage of time. Reviews of the child and adolescent treatment literature followed and drew equally grim conclusions about the efficacy of therapy for youth (Levitt, 1957, 1963). These provocative papers spurred a flurry of research on the effects of psychotherapy and led to numerous refinements in nosology, assessment, and clinical trial design and analysis (see Kazdin, 1978, for review).

A half-century later, after 1500 studies (Durlak, Wells, Cotton, & Johnson, 1995; Kazdin, 2000) and four major meta-analyses (Casey & Berman, 1985; Kazdin, Bass, Ayers, & Rodgers, 1990; Weisz, Weiss, Alicke, & Klotz, 1987; Weisz, Weiss, Han, Granger, & Morton, 1995), there is little argument that psychotherapy can have a beneficial impact on the lives of troubled children. In randomized controlled trials (RCTs), therapy for youth routinely outperforms waiting list and attention-placebo control conditions, and, for selected youth problems, evidence is accumulating that some forms of therapy work better than others (e.g., Weisz et al., 1987, 1995; Weiss & Weisz, 1995). As a field, clinical child psychology has moved from asking the general question 'Can therapy work?' to identifying empirically supported treatment protocols for specific youth disorders (see Lonigan & Elbert, 1998).

Despite this progress, several fundamental questions about the effects of youth therapy remain unanswered. While we have ample evidence to suggest that psychotherapy for youth can produce positive effects in RCTs (efficacy), we have very little information about whether psychotherapy works outside of laboratory settings (effectiveness; Weisz, Weiss, & Donenberg, 1992). It is also unclear whether the statistically significant effects of therapy in clinical trials translate into clinically significant changes in children's functioning and distress (e.g., Kendall & Grove, 1988). The real-world effectiveness of therapy and the clinical significance of therapeutic change are clearly matters of consequence, and we make reference to these issues throughout this review. However, the majority of our attention in this review is focused on yet another unanswered question in child and adolescent therapy research. When youth psychotherapy 'works,' what are the mechanisms of action that produce therapeutic change?

Surprisingly little research exists to answer this basic question. At last review, it was reported that less than 3% of published clinical trials of youth psychotherapy included measures of the processes thought to underlie intervention effects (Kazdin, Bass, Ayers, & Rodgers, 1990). For those unfamiliar with treatment outcome research, this may seem to be a rather odd state of affairs: Treatments have been developed, tested in clinical trials, refined, retested,

Published by Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF, UK and 350 Main Street, Malden, MA 02148, USA

and proposed for general adoption, all without a clear understanding of what makes therapy therapeutic.

As an example, consider the case of cognitive-behavioral therapy (CBT) for youth depression. CBT is the most widely tested psychosocial intervention for depressed youth, employed in 13 of the 15 published RCTs (Brent, Gaynor, & Weersing, in press). The theory of psychopathology underlying CBT posits that a major cause of depression is cognitive distortions – faulty information processing that leads youth to take unrealistically negative views of themselves, the world, their future, and the causes of significant events in their lives (Beck, Rush, Shaw, & Emery, 1979; cf. Abramson, Metalsky, & Alloy, 1989). CBT techniques, such as cognitive restructuring, are designed to interrupt and remediate these distorted ways of thinking and, through this mechanism, produce changes in the broader syndrome of depression. At first blush, results of RCTs would seem to support the CBT model. Meta-analyses of the effects of CBT with depressed adolescents have yielded impressively large effect sizes (1.27, Lewinsohn & Clarke, 1999; 1.06, Reinecke, Ryan, & Dubois, 1998). In addition, preliminary evidence suggests that CBT outperforms family and supportive therapies for depressed youth – treatments that do not specifically target depressive cognitions (Brent et al., 1997). Despite this indirect evidence in support of the CBT model, the only investigation that has directly tested mechanisms of action in a CBT trial found that change in cognitive distortions actually did not mediate the effects of treatment on depression symptoms (Kolko, Brent, Baugher, Bridge, & Birmaher, 2000). These findings present a substantial theoretical challenge to the CBT model. CBT may be an efficacious intervention and may be the psychosocial treatment of choice for depressed youth. However, given the limited evidence available, it is possible that these beneficial CBT effects may have little to do with the theoretical model of psychopathology upon which CBT interventions are based.

This brief example illustrates the limits of our knowledge about the mechanisms of action in interventions for youth. The example also demonstrates the useful role that studies of therapy mechanisms can play in testing theoretical models of psychopathology. Ethical and practical constraints limit the extent to which investigators can conduct experimental research on the origins and maintenance of psychological dysfunction. Even were it possible, no researcher would suggest randomly assigning children to abusive parents or subjecting youth to a string of uncontrollable losses and failures. Psychotherapy research offers a unique opportunity to manipulate the processes involved in psychopathology, in the service of alleviating symptoms in already impaired youth. This view of treatment research as an explanatory and theory-testing tool is not new (e.g., Judd & Kenny, 1981; Scott & Sechrest, 1989; Cicchetti & Toth, 1992; Kazdin, 1999), and yet commentators continue to decry the small number of clinical trials that adopt theory-testing as a goal (e.g., Kazdin, 2000).

We agree that it is the rare clinical trial that explicitly sets out to test theory while demonstrating efficacy (for a laudatory exception, see Eddy & Chamberlain, 2000). However, in our reading of the youth therapy outcome literature, we have been struck by the number of RCTs that *could* have investigated treatment mediation, but did not do so. We have noticed that many studies of CBT have measured cognitive distortions; investigations of exposure therapy have included measures of arousal and habituation; and studies of parent training have assessed changes in discipline practices. In each of these cases, there have been opportunities to investigate mediators of treatment effects. In the main, investigators have seemed to treat these possible mechanisms as simple outcome variables, on par with changes in symptoms, diagnoses, and functioning. In short, we have seen a good deal of unrealized potential in clinical trial research.

In this review, we sought to uncover and explore this untapped information and, in doing so, demonstrate how studies of therapy effects might better capitalize on opportunities for theory testing. We begin by describing procedures for testing mediation, and we illustrate how mediational analysis provides a useful framework for testing psychological theories. We next use this mediational framework as a template for reviewing the youth psychotherapy outcome literature. In line with previous reports (e.g., Kazdin et al., 1990), we expected that very few studies would explicitly investigate mechanisms of action in youth psychotherapy. However, we did suspect that many RCTs would include measures that could have been used to investigate mediational hypotheses and that many of these studies would report results bearing, at least indirectly, on mechanisms of change. To test this notion, we conducted a focused review of what are arguably the most thoroughly tested treatment programs available for youth, namely those identified by the Task Force on Empirically Supported Procedures for Youth.[1] The Task Force reviewed treatments for youth with attention-deficit hyperactivity disorder (ADHD), anxiety, autism, depression, and disruptive behavior disorders. As no empirically supported treatments (ESTs) were identified for autism, we excluded autism from our review. Empirically supported treatments were identified for ADHD; however, much

[1] Readers are referred to Lonigan, Elbert, and Johnson (1998) for a complete description of the EST criteria, study selection procedures, and history and mission of the EST review committees. Findings of each of the disorder-specific review committees were published in a special issue of the *Journal of Clinical Child Psychology* (Lonigan & Elbert, 1998).

of the treatment research on ADHD used single-subject designs, raising unique issues in testing and interpreting mediating relationships. We, thus, limited our review to ESTs for youth anxiety, depression, and disruptive behavior problems.

Testing mediation in clinical trials

Answering the question 'How does youth psychotherapy work?'[2] requires the identification and assessment of mechanisms by which interventions affect change in clinically relevant outcomes. This process is fundamentally a search for mediated effects. Thus, before embarking upon our review of the EST clinical trials, we (a) briefly review the process of testing mediated effects and (b) illustrate how each step in mediational analysis maps on to a test of a different theoretical proposition about the effects of therapy.

Mediation is established by demonstrating four logical relationships among treatment, mediator, and outcome (see Judd & Kenny, 1981; Baron & Kenny, 1986). In psychotherapy research, each of these analytic steps asks a different question about the effects of therapy (see Figure 1). First, is psychotherapy efficacious? Second, does intervention affect specific mechanisms? Third, do therapy mechanisms affect psychopathology? And fourth, can therapy effects be accounted for through this causal pathway? We review the logic of these steps in greater detail below.

Step one: Efficacy test

The first step in a mediational analysis is to test the link between participation in a treatment and improved symptoms or functioning. This step assesses the efficacy of an intervention relative to a comparison condition, most often a wait list or no treatment control group. If intervention is not more efficacious than control, then the search for mechanisms underlying treatment effects logically ceases. Should treatment prove efficacious, the next three steps in analysis unpack how therapy accomplishes this beneficial change.

In most clinical trial designs, symptoms are assessed at pre-treatment, post-treatment, and, less frequently, long-term follow-up assessments (Weisz, Huey, & Weersing, 1998). This assessment strategy is sufficient for establishing efficacy but may cause problems in the analysis of mediated effects. Establishing that change in the mediator causes changes in outcome requires that the mediator change before outcome. As will be discussed later, this may require more frequent and more sensitive assessments than

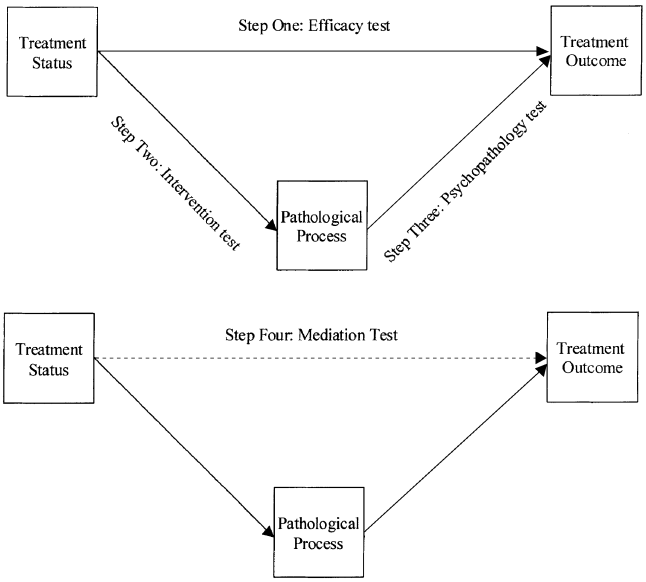

Figure 1 Mediational analysis as a framework for testing psychological theories

those necessary to simply establish the efficacy of an intervention.

Step two: Intervention/Specificity test

In the second step of analysis, the relationship between treatment and change in the candidate mediator is assessed. This step tests whether treatment affects the mechanism of action hypothesized to produce intervention effects (theory of intervention; Scott & Sechrest, 1989; Kazdin, 1999). In clinical trial designs where active treatments are being compared, this analysis is often referred to as a test of treatment specificity (e.g., Kolko et al., 2000). If treatment affects the specific, hypothesized mechanism of change, mediation analysis proceeds to the next step.

If no relationship is found between treatment and mediator, several factors may be at work. First, the model of intervention may be missing an important mediating pathway. This may be particularly likely for multi-component interventions that target multiple mediating processes (e.g., cognitive distortions, social skills, family conflict). Second, a null finding may be due to problems in the timing or method of measuring the mediating process. Logically, assessment of treatment mechanisms should occur early enough in intervention that the temporal sequence between changes in the mediator and later changes in symptoms can be established. However, if assessment is conducted too early, the measure of the mediator may not be sufficiently sensitive to detect treatment effects, producing an inaccurate finding of no relationship between treatment and mediator. As a third possibility, the relationship between participation in treatment and change in the mediator may be masked by the presence of significant moderators; for example, if treatment is delivered with low fidelity for some portion of the sample (Yeaton & Sechrest, 1981).

[2] Of course, answering this question also requires defining 'psychotherapy' and 'work.' By focusing our review on the EST clinical trials, we side-step some of these complexities.

Step three: Psychopathology test

The third step in mediation analysis evaluates the significance of the path between the mediator and treatment outcome. This analysis can be viewed as providing a partial test of the theory of psychopathology upon which the intervention is based. For example, Dodge and colleagues have proposed a model linking early child abuse, development of biased social information processing, and subsequent violent behavior in youth (Dodge, Bates, & Pettit, 1990). Interventions for violent youth based on the work of Dodge and colleagues target biased social information processing in an effort to decrease aggression (e.g., Lochman, Burch, Curry, & Lampron, 1984). Establishing a link between change in social information processing and change in aggression would not only help to establish the causal chain of treatment effects, but it also would provide some validation for the Dodge model. As discussed earlier, the change in the mediating process logically should precede changes in the terminal outcome.

A finding of no significant relationship between mediator and outcome may indicate that the mediator is not an important maintaining factor in psychopathology. Alternately, the link between mediator and outcome may suffer from the measurement problems discussed in step two (i.e., poor timing of assessment, poor sensitivity of measures). And, as in step two, the relationship between mediator and outcome may be moderated by other variables, and these moderators may mask significant relationships between mediators and outcome. Returning to our social information-processing example, it has been argued that there are several distinct subtypes of antisocial youth (see e.g., Moffitt, 1993; Loeber, 1990; Loeber et al., 1993). Some of these subtypes may exhibit consistently biased information processing (e.g., 'reactive' aggressors), while others may have more specific information processing deficits. Thus, subtype of disorder could moderate the pathway between mediator and outcome, and the significance of the relationship between mediator and outcome may vary depending on sample composition.[3]

Step four: Mediation test

In the fourth and final step of analysis, the original relationship between treatment and outcome, established in the efficacy test, is examined while controlling for the relationships between treatment and process and between process and outcome. If change in hypothesized mechanism mediates the relationship between treatment and outcome, the previously significant path between treatment and outcome should be substantially or wholly eliminated when controlling for the other paths in the model (see Baron & Kenny, 1986; Holmbeck, 1997; for analytic issues). Thus, by demonstrating mediation, it is possible, in principle, to show that psychotherapy 'works' and that it works through the mechanisms specified in the treatment's theories of intervention and psychopathology.

Of course, models may be more complicated than the simple single mediator model of Figure 1. Treatment may affect outcome through multiple independent mediators, through a chain of related, sequential processes, or in a non-linear fashion. Models may be analyzed with techniques as simple as regression or with elaborate structural equation models. As discussed earlier, the relationships linking treatment–mediator and mediator–outcome may be moderated by other variables. Similarly, there are likely optimal times to intervene in the course of youth disorder, and developmental and contextual variables may moderate the overall efficacy of intervention attempts (Cicchetti & Toth, 1992; Weisz & Hawley, in press). We find the basic four-step logic of mediation a useful starting place to begin thinking about these more complicated issues.

We also find mediational analysis a useful conceptual framework to organize what we know and do not know about how psychotherapy for youth works. We have a great deal of information about the first step in mediation analysis – the efficacy of therapies for youth. In the remainder of this article, we review the EST treatments for youth anxiety, depression, and disruptive behavior problems and seek to uncover information about the remaining steps in mediational analysis. In this review, it is not our intention to provide an exhaustive summary of the results and methodological details of the EST studies (see Lonigan & Elbert, 1998). Rather, we selectively review findings that bear on the theoretical models of intervention and psychopathology hypothesized to underlie EST effects.

Treatments for anxious and phobic youth

While many children experience transient fears and worries over the course of normal development, a substantial portion of youth suffer from enduring and impairing levels of anxiety. Indeed, anxiety disorders are the most common diagnoses in youth (Bernstein & Borchardt, 1991), with community prevalence estimates ranging as high as 20% (Bell-Dolan, Last, & Strauss, 1990). Untreated, youth anxiety disorders interfere with academic achievement and the development of age-appropriate social relationships (e.g., Strauss, Frame, & Forehand, 1987; Beidel, Turner, & Morris, 1999). In addition,

[3] The presence of a significant moderator of the mediator–outcome relationship may indicate that the mediation model is misspecified. Our example model may require the inclusion of additional mediating mechanisms, such as association with deviant peers, in order to fit the population of disruptive youth. Alternately, the model could be left as is but restricted to only apply to a subgroup of disruptive youth.

anxiety in youth may persist through childhood and adolescence into the adult years (Keller et al., 1992; Last, Hersen, Kazdin, Francis, & Grubb, 1987).

Modern theories of the etiology and maintenance of anxiety disorders focus on the interplay between (a) biological vulnerability to acute stress reactions (e.g., Biederman et al., 1993); (b) the experience of uncontrollable stressful life events (e.g., Chorpita & Barlow, 1998); (c) learned, maladaptive behavioral responses to threat (e.g., parental avoidance behavior; Dadds, Barrett, Rapee, & Ryan, 1996); and (d) inaccurate, overly-threatening, cognitive interpretations of events (e.g., anxious apprehension; Barlow, 1988). Specific intervention programs for anxious youth target different combinations of these pathological processes. We now review the EST clinical trials for youth anxiety and phobias and evaluate the extent to which they assessed these possible mechanisms of action. We broadly group the EST treatments into learning-based and cognitive-behavioral interventions.

Learning-based interventions

We classify three of the empirically supported treatments for phobic youth as learning-based interventions: (a) systematic desensitization, (b) modeling, and (c) reinforced practice. Learning theories of anxiety view pathological fears and phobic behaviors as acquired responses. Thus, in learning-based interventions, anxious youth engage in activities designed to promote the 'unlearning' of old fear responses and the learning of new associations and coping behaviors. This is generally accomplished through graded exposure to fear-inducing stimuli.

Readers are referred to Ollendick and King (1998) for a detailed review of studies and a thorough description of the EST interventions. In short, systematic desensitization involves exposure to a hierarchy of feared situations, while anxious youth engage in competing non-fear responses, such as relaxation. According to the original theory of desensitization, this exposure procedure should result in 'counter conditioning' – in which fearful responses are inhibited by the newly conditioned non-fear responses (Wolpe, 1954). In mediational terms, systematic desensitization should reduce arousal to feared stimuli, which in turn should cause changes in the broader subjective experience of anxiety.

Modeling treatments also rely on exposure to anxiogenic stimuli, but they are presumed to reduce anxiety through observational learning rather than Pavlovian conditioning. In a modeling intervention, youth repeatedly observe others interacting with feared stimuli and see that no ill-effects ensue (e.g., Bandura, Blanchard, & Ritter, 1969). Participant modeling, the most efficacious of the modeling treatments, follows up observation with youth participation in the same, feared activities. Modeling has been hypothesized to work by (a) disconfirming anxious youths' catastrophic expectations about engaging in feared behaviors; (b) enhancing youths' perceptions of control and environmental contingency; (c) teaching youth new, adaptive responses to threat; and (d) promoting physiological habituation over the course of exposure (cf. Foa & Kozak, 1986; Mineka & Thomas, 1999).

Reinforced practice and other operant procedures reward youth for engaging in feared behaviors (e.g., petting a scary dog; Obler & Terwilliger, 1970). As with the other two learning-based interventions, youth are gradually exposed to feared stimuli. However, in reinforced practice, the focus is teaching approach behavior rather than reducing anxious arousal per se. Through the experience of engaging in feared behaviors, youths may gain behavioral disconfirmation of feared catastrophic outcomes, learn adaptive coping behaviors, and have an opportunity for physiological habituation over the course of the treatment (Mineka & Thomas, 1999). These processes may well serve as mediators of treatment effects.

Evidence from the EST clinical trials indicates that these three learning-based interventions are efficacious treatments for phobic youth, with participant modeling and reinforced practice attaining well-established treatment status (see Ollendick & King, 1998).[4] Thus, all three interventions have established the first link in a mediational analysis – demonstrating that treatment affects outcome. As discussed previously, these interventions may 'work' by reducing arousal, teaching adaptive coping, providing evidence against catastrophic cognitions, and/or establishing a sense of control. We examined each of the RCTs to determine if any of these possible mechanisms were measured, and, if so, if mediation was tested. In Table 1, we summarize the results of this review. As can be seen in the table, 14 of the 18 studies did not measure any of the putative treatment mediators, and none of the investigations of reinforced practice assessed possible mechanisms of action. Of the four studies that did assess pathological processes, all measured arousal or habituation to anxious stimuli at the end of treatment.

[4] The Task Force on Empirically Supported Procedures for Youth identified empirically supported treatments as either 'well-established' or 'probably efficacious' (see Lonigan, Elbert, & Johnson, 1998). To be designated well-established, a treatment must have been tested by independent teams of investigators and shown to be (a) more efficacious than placebo or alternate treatment; or (b) as efficacious as an already established treatment. In contrast, probably efficacious treatments have either (a) met all the criteria for well-established status, except independent replication; or (b) been shown to be more efficacious than a no-treatment control group by independent research teams. Alternate criteria are applied for interventions supported by a series of single-case designs. The distinction between well-established and probably efficacious is not critical for the purposes of this review.

Table 1 Mechanisms of action in learning-based ESTs for phobic youth

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/Mediation tests
Bandura et al. (1967)	MOD live positive MOD live neutral Dog alone Positive alone	Not assessed	MOD live treatments superior to dog alone or positive context alone	Not assessed	Not assessed
Mann & Rosenthal (1969)	MOD live SYS in vitro No tx	Not assessed	Active treatments superior to no tx	Not assessed	Not assessed
Bandura & Menlove (1968)	MOD film multi MOD film one Attention	Not assessed	Active treatments superior to attention	Not assessed	Not assessed
Hill et al. (1968)	MOD film No tx	Not assessed	MOD film superior	Not assessed	Not assessed
Ritter (1968)	MODP MOD No tx	Not assessed	Active treatments superior to no tx. MODP superior to MOD alone	Not assessed	Not assessed
Bandura et al. (1969)	MODP MOD film SYS in vitro Wait list	Arousal (self rated)	Active treatments superior to wait list. MODP superior to alternate treatments	Active treatments had better effect than wait list. MODP had best effect in some analyses.	Not assessed
Blanchard (1970)	MODP MOD + info MOD No tx	Arousal (self rated)	Active treatments superior to no tx. MODP superior to alternate treatments on some measures	Active treatments had better effect than no tx. MODP had better effect than MOD + info.	Mediation not assessed. Arousal significantly related to avoidance and anxious attitudes
Murphy & Bootzin (1973)	MODP active MODP passive No tx	Not assessed	Active treatments superior	Not assessed	Not assessed
Lewis (1974)	MODP MOD Participation Attention	Not assessed	MODP superior to MOD, participation, and attention	Not assessed	Not assessed
Obler & Terwilliger (1970)	Operant No tx	Not assessed	Operant superior	Not assessed	Not assessed
Leitenberg & Callahan (1973)	Operant No tx	Not assessed	Operant superior	Not assessed	Not assessed
Sheslow et al. (1983)	Operant Coping self-talk Operant + coping Attention	Not assessed	Operant treatments superior to coping self-talk and attention	Not assessed	Not assessed

Table 1 Continued

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/Mediation tests
Menzies & Clark (1993)	Operant MOD live Operant + MOD No tx	Not assessed	Operant treatments superior to MOD live and no tx	Not assessed	Not assessed
Kondas (1967)	SYS in vitro Relaxation only Hierarchy only No tx	Arousal	SYS in vitro superior to alternate treatments and no tx	SYS had better effect than alternate treatments and no tx	Not assessed
Mann & Rosenthal (1969)	SYS in vitro MOD live No tx	Not assessed	Active treatments superior to no tx	Not assessed	Not assessed
Miller et al. (1972)	SYS in vitro Eclectic tx Wait list	Not assessed	Active treatments superior to wait list	Not assessed	Not assessed
Barabasz (1973)	SYS in vitro No tx	Arousal, but no other measure of outcome	SYS in vitro superior to no tx	SYS had better effect on arousal	Not applicable, arousal only measure of outcome
Kuroda (1969)	SYS in vivo No tx	Not assessed	SYS in vivo superior to no tx	Not assessed	Not assessed
Ultee et al. (1982)	SYS in vivo SYS in vitro No tx	Not assessed	SYS in vivo superior to SYS in vitro and no tx	Not assessed	Not assessed

NOTE: Studies are divided into blocks to reflect the classification system used by the Task Force on Empirically Supported Procedures. Shaded entries have been identified as 'well established' (Ollendick & King, 1998). SYS, systematic desensitization; MOD, modeling; MODP, participant modeling

Mediating role of arousal and habituation. In the four studies in which arousal was assessed, treatment significantly lowered arousal to previously fear-inducing stimuli. However, only one study (Blanchard, 1970) assessed whether changes in arousal were related to changes in the broader syndrome of anxiety. In this study, Blanchard (1970) found that participant modeling was significantly more efficacious than vicarious modeling and a no-treatment control condition in reducing fear of snakes. In addition, participant modeling produced significantly greater reductions in arousal than the other conditions, and arousal was significantly related to measures of anxious avoidance and attitudes. These analyses provide limited support for the theory that modeling works partly through arousal reduction and that inappropriate arousal is an important component of anxious symptomatology. However, the design of the investigation leaves substantial questions about whether arousal actually mediated treatment gains or whether changes in arousal simply represented reductions in overall anxiety (i.e., arousal was measured at treatment termination, simultaneously with the other outcome measures). In addition, statistical procedures for formally testing mediation did not receive wide exposure until 16 years after the publication of this investigation (Baron & Kenny, 1986), and, unsurprisingly, Blanchard did not conduct analyses to test for mediated effects.

Cognitive-behavioral interventions

Three CBT programs have been identified as probably efficacious treatments for youth anxiety and phobias: (a) verbal self-instructional training for phobic youth (Kanfer, Karoly, & Newman, 1975; Graziano & Mooney, 1980); (b) the Coping Cat program for youth with a range of anxiety diagnoses (Kendall, 1994; Kendall et al., 1997; Barrett, Dadds, & Rapee, 1996); and (c) an extension of the Coping Cat program, including a family therapy component (Barrett et al., 1996). These CBT interventions have as a primary focus modifying the inaccurate cognitions characteristic of anxious and phobic youth. Anxious individuals tend to erroneously interpret ambiguous situations as threatening, over-estimate the likelihood of dangerous events, view the world as unsafe and full of risk, and perceive themselves as unable to successfully cope with these threats (see e.g., Barlow, 1988). Changes in these anxious modes of thinking are hypothesized to mediate the effects of CBT on anxiety symptoms.

In verbal self-instructional training, phobic youth are taught to use positive, coping self-statements to counter their anxious automatic thoughts. The Coping Cat intervention utilizes this technique, as well as more formal cognitive restructuring methods (e.g., monitoring and identifying irrational thoughts, challenging these cognitions, and developing more realistic, coping thoughts). Coping Cat also includes elements of the learning-based ESTs for phobic youth, such as reinforcement for 'brave' behavior; graded exposure to fear-inducing stimuli; and training in adaptive coping skills (e.g., relaxation and social problem-solving skills). In the family extension to Coping Cat (CBT + FAM), parents are taught to effectively carry out the CBT protocol at home (e.g., by rewarding brave behavior) and to better manage their own anxiety, in order to avoid modeling anxious thoughts and behaviors to their children. These multicomponent CBT packages may achieve their effects by changing anxious thinking or through behavioral and physiological pathways (e.g., arousal reduction; see description of the learning-based interventions).

Although there are far fewer clinical trials of CBT than of learning-based interventions, a higher proportion of the CBT studies included tests of therapy mechanisms. While only 22% of learning-based ESTs measured possible mediators, over half of CBT interventions included measures of cognitive processes targeted by the treatments. As can be seen in Table 2, the Coping Cat studies measured changes in children's anxious self-talk, and CBT + FAM assessed children's interpretations of ambiguous situations, with and without parental input. We examine these studies in greater detail below.

Mediating role of self-talk. The Coping Cat intervention is the product of a program of research on youth anxiety by Kendall and colleagues. In two clinical trials by the Kendall team, the intervention has proven more efficacious than wait list control at post-treatment (Kendall, 1994; Kendall et al., 1997) and over three-year follow-up (Kendall & Southam-Gerow, 1996). The superiority of Coping Cat over wait list also has been documented by Barrett and colleagues (Barrett et al., 1996) – the research team investigating the utility of adding family treatment to the basic Coping Cat protocol.

Referencing our mediational framework, Coping Cat has established the efficacy link between treatment participation and positive symptomatic outcome. Coping Cat also has been shown to impact potentially important mediators of intervention effects. Using data from both clinical trial samples, Treadwell and Kendall (1996) tested whether changes in anxious and negative self-talk mediated treatment effects. Support was found for the mediation hypothesis. Youth who received a course of Coping Cat endorsed significantly fewer negative self-statements on a paper-and-pencil measure of self-talk. In turn, changes in number of negative self-statements and the balance of positive to negative self-talk mediated the impact of treatment on outcome. Results for the content specificity of changes in anxious versus depressed self-talk were mixed.

While the Coping Cat research provides the most complete information available on therapy mechanism in the treatment of anxious youth, the work has

Table 2 Mechanisms of action in cognitive-behavioral ESTs for anxious and phobic youth

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/ Mediation tests
Kendall (1994)	Coping Cat Wait list	Content of self-talk	CBT superior to wait list on multiple measures	CBT had better effect than wait list on self-talk in combined sample from 1994 and 1997 clinical trials	Self-talk mediated treatment gains in combined sample from 1994 and 1997 clinical trials (Treadwell & Kendall, 1996)
Kendall et al. (1997)	Coping Cat Wait list	Content of self-talk	CBT superior to wait list on multiple measures	Intervention link demonstrated (see above)	Psychopathology and mediation links demonstrated (see above)
Barrett et al. (1996)	Coping Cat Coping Cat FAM Wait list	Threat interpretations Avoidant solutions Family impact on threat and avoidance	CBT + family superior to CBT. Active treatments superior to wait list	Active treatments had better effect on candidate mediators than wait list. Slight superiority of CBT + family.	Not assessed
Kanfer et al. (1975)	CBT competence CBT Placebo	Not assessed	CBT with competence focused self-instructions superior	Not assessed	Not assessed
Graziano & Mooney (1980)	CBT Wait list	Not assessed	CBT superior to wait list	Not assessed	Not assessed

NOTE: Studies are divided into blocks to reflect the classification system used by the Task Force on Empirically Supported Procedures. CBT, cognitive-behavioral therapy

several limitations. As with the Blanchard (1970) investigation of participant modeling, the putative mediator in the Coping Cat clinical trials was measured simultaneously with outcome, making it difficult to determine the temporal order of changes in self-talk and changes in anxious symptomatology. In addition, the relationship between self-talk and anxiety may have been due, in part, to shared measurement variance. Self-talk was assessed by youth self-report, and changes in self-talk only mediated treatment gains for youth-report, dimensional measures of anxiety. Self-talk did not mediate treatment effects for teacher report on symptom scales or for parent symptom measures and diagnostic interviews.

Mediating role of threat interpretations and avoidance. Additional evidence in support of the cognitive mediator model of CBT is provided by the work of Barrett and colleagues. Their CBT + FAM intervention has been shown to be more efficacious in reducing anxiety than Coping Cat alone and to be superior to wait list control conditions (Barrett et al., 1996). Additionally, the clinical trial included 'experimental measures' that appear to be potential mediators of treatment effects. Anxious youth were asked to interpret and respond to a series of ambiguously threatening situations. Youth responses then were rated on how threatening they viewed the scenarios and whether they chose to cope with the situations by avoidance. Following these individual responses, youth and their families jointly evaluated two additional scenarios – one involving unexplained physical sensations (feeling 'funny in the tummy') and the other focusing on unclear social feedback (peers laughing). From this procedure, Barrett et al. calculated mean threat scores, mean avoidance scores, and scores indexing the impact of anxiogenic family processes on threat interpretations and avoidant behaviors.

Overall, Barrett et al. (1996) found that both CBT + FAM and Coping Cat produced significant reductions in children's threat interpretations and use of avoidant coping responses, both before and after family discussion. CBT + FAM appeared to be somewhat more effective than Coping Cat in reducing avoidant responding (Coping Cat was not superior to wait list). However, the two active interventions did not differ in threat and avoidance scores taken after family discussion, a somewhat surprising result given the extra emphasis on family processes in CBT + FAM. In this investigation, the relationships between change in threat and avoidance and change in overall anxiety symptoms were not assessed, and formal mediational analyses were not conducted.

Summary

In sum, the EST clinical trials for anxious and phobic youth provide only limited information on possible mechanisms of therapeutic action. Evidence is especially thin for learning-based interventions. Despite the many possible mediators of these treatments' effects, the studies of systematic desensitization and modeling only assessed arousal, and only one of these studies verified that changes in arousal were related to changes in anxiety more generally (Blanchard, 1970). None of the clinical trials of reinforced practice assessed candidate mediators.

Evidence on therapy mechanism is somewhat stronger for cognitive-behavioral interventions. More than half of the EST studies of CBT included measures of the cognitive processes hypothesized to cause the interventions' effects. In all of these studies, CBT did change both the cognitive mediator and symptomatic outcome, and, for the Coping Cat intervention, change in self-talk from pre- to post-treatment mediated treatment gains.

Across clinical trials, refinements in study design and measurement technology may have allowed for stronger inferences about therapy mechanism. For example, all of the studies that assessed possible mediators did so at treatment termination, muddying the temporal relationship between change in the mechanism and change in outcome. In addition, a small range of measurement strategies was employed, with a general reliance on self-report rating scales for both mediator and outcome assessment. This substantial method overlap raises questions about the validity of observed mediational relationships. We also suspect that the small number of learning-based clinical trials measuring mechanism may be partially due to the difficulty in devising self-report scales for many of the mediators of interest (e.g., changes in conditioned associations between cognitive stimuli and affective responses). New work on performance-based methods of assessment may allow for more precise measurement of these constructs (for review, see Vasey & Lonigan, 2000).

Treatments for depressed youth

It is only in the past 30 years that depression has been recognized as a significant psychiatric problem in children and adolescents. Indeed, recent epidemiological work in youth depression has suggested that the disorder (a) has a high lifetime prevalence by the onset of puberty (28%; Lewinsohn & Clarke, 1999); (b) may produce lifelong impairments in social and occupational functioning (see, e.g., Rohde, Lewinsohn, & Seeley, 1994), and (c) substantially increases the risk of early mortality by suicide (Shaffer et al., 1996; Gould et al., 1998).

Two major psychological theories have been proposed to explain the etiology and maintenance of depression. Cognitive theory postulates that the syndrome is the result of inaccurate, overly negative views of the self, the world, and possibilities for the future (Beck et al., 1979). Under situations of stress, this negative cognitive triad is hypothesized to interfere with accurate information processing and lead individuals to become increasingly despondent. Learned helplessness theory places a heavier emphasis on the environmental and behavioral antecedents of depression (Abramson et al., 1989; Abramson, Seligman, & Teasdale, 1978). Depression is thought to arise from a history of environmental non-contingency that results in negative, global, and stable beliefs about the world and the individual's ability to control his or her fate. As with the Beck model, this pessimistic explanatory style is believed to interfere with adaptive coping and to lead to behavioral avoidance, withdrawal, and subsequent depression. Both cognitive and learned helplessness theories were developed to explain the phenomenon of adult depression; however, there is a growing body of evidence that depressed youth exhibit patterns of depressogenic information processing similar to depressed adults (for a review, see Gladstone & Kaslow, 1995).

Given the relative recency of research on depression in youth, it is perhaps not surprising that there are few child and adolescent depression clinical trials. At last review, a total of 15 RCTs had been published, 13 of which assessed the effects of cognitive-behavioral interventions (Brent et al., in press). The EST Task Force identified two of these CBT treatments as probably efficacious (see Kaslow & Thompson, 1998), and we review these interventions below. For youth depression, we also expanded our review to include all published CBT clinical trials. This decision was based on the marked similarity between the two specific CBT treatment programs featured in the Kaslow and Thompson review and the CBT programs used in other published youth depression trials.[5]

Cognitive-behavioral interventions

Two CBT programs for youth depression have been identified as probably efficacious treatments: (a) the CBT program for depressed children, developed by Stark and colleagues (Stark, Reynolds, & Kaslow, 1987; Stark, Rouse, & Livingston, 1991); and (b) the Coping with Depression course (CWD), originally developed for depressed adults by Lewinsohn and colleagues and later adapted for adolescents (Lew-

[5] Several of the Task Force review teams adopted a generic approach to identifying ESTs and rated the empirical support for broad categories of treatment; for example, identifying 'CBT' as a probably efficacious treatment for phobias (Ollendick & King, 1998). Kaslow and Thompson appear to have adopted more of a brand-name approach and, thus, evaluated the empirical support of specific manualized protocols.

insohn, Clarke, Hops, & Andrews, 1990; Lewinsohn, Clarke, Rohde, Hops, & Seeley, 1996). An additional ten published RCTs have tested the effects of CBT for depressed children and adolescents (see Table 3). Across studies, these CBT interventions share a focus on teaching youth: (a) cognitive techniques to identify and modify irrational and depressogenic thought patterns; (b) behavioral strategies to regulate mood (e.g., pleasant activity scheduling, relaxation techniques); and (c) problem-solving skills to proactively cope with environmental demands (e.g., social skills training). Implicit or explicit in these treatment models are the notions that reductions in depression may be mediated by changes in cognitive distortions, improved mood management skills, or improved skills in social problem solving.

Overall, CBT for youth depression appears to be an efficacious intervention, although treatment effects may be stronger for depressed adolescents (e.g., Brent et al., 1997) than depressed children (e.g., Butler, Miezitis, Friedman, & Cole, 1980). Turning to the question of mechanism, a majority of CBT depression studies did include measures of cognitive and behavioral processes targeted by treatment and theorized to be important causal factors in depression recovery. As can be seen in Table 3, seven studies assessed youths' positive self-concept or sense of perceived control. Five studies measured more generalized cognitive distortions and feelings of hopelessness. Four studies focused on behavioral processes, such as youth engagement in pleasant activities and adaptive social skills. We next examine the evidence in support of the mediating role of these cognitive and behavioral processes.

Mediating role of cognitive processes. In seven of the nine studies that assessed depressive cognitions, CBT produced greater change on cognitive measures than did comparison conditions. Following a course of CBT, depressed youth reported a more positive view of themselves, jumped to fewer negative conclusions, and had a less hopeless view of their futures. The mediating role of these cognitive changes was assessed by Kolko and colleagues (2000) in a follow-up to the Brent et al. (1997) clinical trial.

In the original Brent RCT, CBT for depressed adolescents was compared to family and nondirective interventions (Brent et al., 1997). On multiple measures of depression, CBT was found to be more efficacious than these alternate treatments. Notably, CBT produced significantly better effects on indices of clinically significant change in depression. Kolko and colleagues sought to uncover the mechanisms of action responsible for these positive effects and investigated the mediating role of several cognitive and family process variables. As hypothesized, CBT did produce significant, specific changes on a measure of cognitive distortions, but CBT was not superior to alternate interventions in changing feelings of hopelessness. In addition, contrary to hypotheses, CBT was as effective as family therapy in changing several indices of adaptive family functioning. Thus, while CBT affected one theoretically specific mechanism of cognitive change, it also produced nonspecific changes in 'mediators' belonging to another theoretical model of intervention. In their final analyses, Kolko and colleagues did not find that change in cognitive distortion mediated the impact of CBT on depression outcome. However, mediational analyses were cut short by the finding of no difference in efficacy between the three interventions. As discussed earlier, CBT was more efficacious than alternate treatments in terms of clinical remission of depression diagnoses and speed of symptomatic recovery. The three interventions did not differ on the dimensional outcome measures used in the mediational analysis (i.e., BDI; Beck Depression Inventory).

Some additional, indirect support for the cognitive mediator model of CBT is provided by follow-up reports to three of the CBT clinical trials (Clarke et al., 1992; Brent et al., 1998; Jayson, Wood, Kroll, Fraser, & Harrington, 1998). In these studies, poor self-concept, pervasive cognitive distortions, and high levels of hopelessness at intake related to poor treatment response (see Table 3). While these studies establish a link between maladaptive cognitions and depression symptoms, they do not answer the question of whether change in these pathological processes causes improvements in depression.

Mediating role of behavioral processes. Four studies assessed possible behavioral mediators of CBT effects. Lewinsohn and colleagues (1990) measured the frequency and enjoyment of pleasant activities before and after CBT. As targeted in the intervention, CBT beneficially impacted pleasant activities. The relationship between engagement in pleasant activities and symptom relief was not directly assessed, but low levels of pleasant activities at intake did predict later depression symptoms. Mediation was not tested.

Three clinical trials examined the role of social skills and social adaptation in depression recovery. Evidence on the effects of CBT are mixed, with one study reporting improved social skills and functioning after CBT (Vostanis, Feehan, Grattan, & Bickerton, 1996a), and three investigations indicating that CBT did not outperform comparison conditions (Rosselló & Bernal, 1999; Wood, Harrington, & Moore 1996; Liddle & Spence, 1990). None of these RCTs assessed mediation.

Summary

Over three-quarters of the CBT studies of depression included measures of the cognitive and behavioral processes theorized to underlie intervention effects.

Table 3 Mechanisms of action in cognitive-behavioral interventions for depressed youth

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/Mediation tests
Stark et al. (1987)	Self control Problem-solving Wait list	Self-concept	Active treatments superior to wait list	CBT had better effect on self-concept than problem-solving tx	Not assessed
Stark et al. (1991)	Self control + NST	Cognitive distortions	CBT superior to NST on some measures	CBT had better effect on cognitive distortions	Not assessed
Lewinsohn et al. (1990)	CWD CWD + parents Wait list	Pleasant activities Cognitive distortions	Active treatments superior to wait list	Active treatments had better effect on candidate mediators	Mediation not assessed. Candidate mediators predict recovery (Clarke et al., 1992)
Lewinsohn et al. (1996)	CWD CWD + boosters Wait list	Not assessed	Not assessed	Active treatment superior to wait list	Not assessed
Butler et al. (1980)	CBT Role-play Attention Wait list	Cognitive distortions Locus of control	Role play generally superior, but incomplete analyses	Role play appeared to have better effect, but incomplete analyses	Not assessed
Reynolds & Coats (1986)	CBT Relaxation Wait list	Self-concept	Active treatments superior to wait list	CBT had better effect on academic self-concept at follow-up	Not assessed
Kahn et al. (1990)	CBT Relaxation Self-modeling Wait list	Self-concept	Active treatments superior to wait list	Active treatments had better effect on self-concept than wait list	Not assessed
Liddle & Spence (1990)	CBT Attention No tx	Social skills	No treatment effect	No treatment effect on social skills	Not assessed
Vostanis et al. (1996a,b; 1998)	CBT Supportive	Self-concept Social adjustment	No treatment superior	CBT had better effect on social adjustment	Not assessed
Wood et al. (1996)	CBT Relaxation	Cognitive distortions Self-concept Social adjustment	CBT superior to relaxation	CBT had better effect on self-concept	Mediation not assessed. Cognitive distortions did not predict recovery (Jayson et al., 1998)
Weisz et al. (1997)	CBT No tx	Not assessed	Active treatments superior to no tx	Not assessed	Not assessed
Brent et al. (1997)	CBT Family Supportive	Cognitive distortions Hopelessness Family processes	CBT superior to alternate txs on multiple measures	CBT had specific effects on cognitive mediators	Mediation assessed but not found (Kolko et al., 2000)
Clarke et al. (1999)	CBT CBT + parents Wait list	Not assessed	Active treatments superior to wait list	Not assessed	Not assessed
Rosselló & Bernal (1999)	CBT IPT Wait list	Self-concept Expressed emotion Social adjustment	Active treatments superior to wait list	IPT had better effect on social adjustment and self-concept than wait list	Not assessed

NOTE: Studies are divided into blocks to reflect the classification system used by the Task Force on Empirically Supported Procedures. No treatments were identified as 'well-established' (Kaslow & Thompson, 1998); shaded treatments have been identified as 'probably efficacious.' CBT, cognitive-behavioral therapy; CWD, Coping with Depression for adolescents; IPT, interpersonal psychotherapy for depression

However, while a large number of studies measured these processes, only one investigation assessed mediation (Kolko et al., 2000). This investigation found that changes in cognitive distortions were specific to CBT, relative to alternate treatments, but that cognitions did not mediate the effects of CBT on treatment outcome.

As with CBT studies of anxiety, mediational work in youth depression suffers from significant overlap between the hypothesized cognitive mediators and treatment outcome. Youth self-report was employed to assess all of the candidate cognitive processes and many of the measures of depression symptoms (e.g., the BDI). In addition to this methodological overlap, there may be problems with conceptual overlap between measures of depression symptoms writ broadly and the constructs of hopelessness and depressive cognitions. It may be useful to unpack the construct of depressogenic thinking into more specific cognitive processes such as enhanced recall of negative memories (e.g., Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998), impaired ability to use positive memories to regulate mood (e.g., Rusting & DeHart, 2000), or tendency to ruminate in situations of stress (e.g., Nolen-Hoeksema & Morrow, 1993).

Treatments for disruptive youth

The umbrella of 'disruptive behavior' covers a variety of youth rule-violations and hostile acts, ranging in intensity from swearing to criminal assault. Disruptive and violent behaviors in youth cause a great deal of familial, school, and societal concern. As a result, while community prevalence rates for each of the two disruptive behavior diagnoses hover around 10% (see Costello, 1990), conduct problems are the most common cause for youth referral to mental health services (Achenbach & Howell, 1993; Weisz & Weiss, 1991).

A number of risk factors have been implicated in the development and maintenance of conduct problems in youth, including: (a) poor parent behavior management practices and coercive family interactions (e.g., Dishion & Patterson, 1999); (b) neurobiological impairments in youths' executive functioning, verbal reasoning, and reactivity to threat (e.g., Taylor, Iacono, & McGue, 2000); (c) errors in youths' processing of social information (e.g., Crick & Dodge, 1994); and (d) contextual, neighborhood, and peer group norms for antisocial behavior (e.g., Moffitt, 1993). Different combinations of these risk factors may characterize different subtypes of conduct problem youth (for review, Loeber, 1990; Loeber et al., 1993; Moffitt, 1993). For example, it has been proposed that early-onset of conduct problems (before age 10) may spring from heritable, neurological impairments that manifest as youth irritability and poor behavioral inhibition (e.g., Taylor et al., 2000). These children may be more challenging to manage, especially by parents with similar tendencies, and over time, parent–child interactions may become increasingly coercive and child behavior worse (Moffitt, 1993; cf. Dodge et al., 1990). In contrast, adolescent-onset of disruptive behavior may be more closely tied to association with deviant peers and poor parental monitoring of behavior (Taylor et al., 2000). These different patterns of etiology and course may be quite consequential; for example, the early-onset subtype is much more strongly associated with later adult criminality (Moffitt, 1993).

We next evaluate the EST clinical trials and assess the extent to which intervention was used as an opportunity to test these theories of disruptive behavior. The majority of child and adolescent psychotherapy research has evaluated treatment of conduct problems, and the EST Task Force was able to identify two well-established and ten probably efficacious treatments for disruptive behavior in youth (Brestan & Eyberg, 1998). The ESTs fall into two general categories: (a) parent- and system-focused interventions, including several varieties of parent training and multisystemic therapy; and (b) youth-focused interventions, such as anger management treatments and social problem-solving interventions. Given the maturity of the disruptive behavior treatment literature, we spend somewhat less time in this section describing the details of individual studies and treatment protocols and instead draw summary conclusions across programs of work.

Parent- and system-focused interventions

Parent- and system-focused interventions aim to reduce disruptive behavior in youth by changing the context in which such behavior occurs. Parent training (PT) programs may involve relatively little therapist–youth contact, as the treatment focus is primarily on teaching parents behavioral management strategies. Parents receive instruction in how to set clear behavioral goals, monitor and track youth behavior, provide positive reinforcement for desired behavior, use extinction techniques for disruptive behavior, apply mild punishment strategies, use clear commands, and develop a positive communication style. Changes in these parenting practices are the hypothesized mechanisms of action by which PT interventions affect youth behavior. PT programs may differ in the mix of skills taught and in the additional emphasis given to building positive parent–youth relationships (cf. Hamilton & MacQuiddy, 1984; Eyberg, Boggs, & Algina, 1995). Across these variations, PT has a long and well-established history of positive effects with behaviors from tantruming to repeat criminal violations. Both of the well-established ESTs for youth conduct problems are PT interventions (Brestan & Eyberg, 1998) – Patterson's *Living with Children* program (Patterson & Gullion, 1968) and the Webster-Stratton videotape modeling treatment.

While PT interventions have shown reliable, positive effects, a significant portion of youth continue to have conduct problems at post-treatment and over follow-up (Dishion & Patterson, 1992). To improve on the effects of traditional PT, some investigators have added CBT components designed to teach parents and/or youth social problem-solving and stress reduction skills (Spaccarelli, Cotler, & Penman, 1992; Webster-Stratton, 1994; Kazdin, Siegel, & Bass, 1992; Kazdin, Esveldt-Dawson, French, & Unis, 1987b; Vitaro & Tremblay, 1994; Tremblay, Pangani-Kurtz, Masse, Vitaro, & Phil, 1995). These interventions have not produced dramatically superior effects on youth behavior, although they have been shown to affect the targeted mediating constructs (e.g., parent problem-solving skills; Webster-Stratton, 1994).

Multisystemic therapy (MST) was developed, in part, to serve these more intractable cases of conduct problem youth. MST attempts to reduce disruptive behavior by changing the family, peer, school, and community contexts in which youth reside (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 1998). In general, MST interventions focus on improving parental monitoring of youth behavior, increasing family cohesion and reducing coercion, and disengaging youths from deviant peer groups (Huey, Henggeler, Brondino, & Pickrel, 2000); thus improvements in youth behavior might be expected to be mediated through increased parental monitoring of the youth, improved family relationships, and reductions in deviant peer contact. The MST model places a great deal of emphasis on crafting an individually tailored treatment plan for each disruptive youth. Indeed, MST protocols described in clinical trials refer readers to a list of treatment principles, rather than a treatment manual per se (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 1998). Although MST is a more recent arrival than traditional PT, MST has shown positive effects with samples of adjudicated and seriously disruptive youth (e.g., Henggeler, Melton, & Smith, 1992) and has been identified as a probably efficacious EST (Brestan & Eyberg, 1998).

In Table 4, we summarize the results of each of the 22 EST clinical trials of parent- and system-focused interventions. We identify pathological processes assessed in the studies and summarize the results of analyses bearing on therapy mechanism. As can be seen in the table, almost every clinical trial (91%) measured at least one possible mediator of treatment effects. As would be expected, given the theories underlying these interventions, candidate mediators were most often measures of parent behavior management skills, measures of general family functioning, or indices of youth association with deviant peers. In the next section, we briefly review each of these treatment mechanisms.

Mediating role of parent behavior management skills. Sixteen of the 22 clinical trials included measures of one or more behavior management skills taught by the intervention programs. Treatment effects on specific skills were not uniformly significant across studies (e.g., Bernal, Klinnert, & Schultz, 1980), nor across maternal and paternal behavior (e.g., Webster-Stratton, 1992). However, the overall pattern of results strongly suggests that interventions that teach parenting skills do, indeed, impact parenting practices. Participation in skills-focused treatment significantly increased parental monitoring of youths' behavior, parental use of clear commands, and parental praise and use of rewards. Treatment participation also decreased several undesirable parenting practices, such as criticism, spanking, and coercive discipline practices. Positive changes in parenting skills were evident in parents' reports of their own behavior (e.g., Spaccarelli et al., 1992); observations of lab-based parent–child interaction tasks (e.g., Alexander & Parsons, 1973); and in-home observations of unstructured family interactions (e.g., Webster-Stratton, 1984).

Given the reliability and consistency of these effects, we were surprised that none of the EST clinical trials directly tested whether changes in parenting practices mediated the effects of treatment on youth behavior.[6] We searched the treatment outcome literature for follow-up reports to these original clinical trials and found three additional studies bearing on the role of parenting skills in treatment effects. Two attempted to unpack the effects of the Patterson PT program (Patterson & Forgatch, 1995; Eddy & Chamberlain, 2000), and one examined the mechanisms of action in MST (Huey et al., 2000).

In a 1995 clinical trial, Patterson and Forgatch attempted to compare the effects of their well-established PT program for seriously disruptive youth to the outcomes of usual community therapy. Partway through the study, the community therapists independently sought out training in PT techniques, and, by the end of the investigation, there were no differences in treatment type between PT and usual care. Combining these treatment groups, the investigators tested whether changes in the parenting practices targeted by PT predicted long-term functional outcomes of the treated youth. Parenting skills at termination (discipline, monitoring, problem-solving) were significant predictors of youth arrests and of out-of-home placement, two years after therapy. As there was no treatment comparison condition after contamination of usual care, these results were not evidence of mediation, but they do

[6] As with Blanchard's (1970) investigation of participant modeling, this failure to test for mediated effects may be due, in part, to the age of the EST clinical trials. Nine of the clinical trials were published in or before 1986, the year in which Baron and Kenny's seminal work describing methods for testing mediation was published. Alexander and Parsons (1973) tested all of the relationships involved in mediation, except for the final step.

Table 4 Mechanisms of action in parent- and system-focused ESTs for disruptive youth

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/Mediation tests
Bernal et al. (1980)	Patterson PT NST Wait list	Parent attention Parent commands	PT superior to NST and wait list	No treatment effect	Not assessed (but see Patterson & Forgatch, 1995; Eddy & Chamberlain, 2000)
Firestone et al. (1980)	Patterson PT Wait list	Not assessed	PT superior to wait list	Not assessed	Not assessed (but see Patterson & Forgatch, 1995; Eddy & Chamberlain, 2000)
Wiltz & Patterson (1984)	Patterson PT Wait list	Parent commands	PT superior to wait list	Not assessed	Not assessed (but see Patterson & Forgatch, 1995; Eddy & Chamberlain, 2000)
Alexander & Parsons (1973)	Patterson PT PSY family tx NST family tx	Family processes indexing adaptive communication	PT superior to alternate treatments on multiple measures	PT had better effect on communication	Mediation not assessed. Communication predicted recidivism.
Webster-Stratton (1984)	VPT group VPT individual Wait list	Parent commands Praise/criticism Spanking	Active treatments superior to wait list	VPT treatments had better effect on candidate mediators	Not assessed
Webster-Stratton et al. (1988)	VPT individual VPT group PT group Wait list	Parent commands Praise/criticism Spanking	Active treatments superior to wait list. Trend toward VPT group superiority.	Active treatments had better effect on candidate mediators than wait list	Not assessed
Webster-Stratton (1990)	VPT no therapist VPT w/therapist Wait list	Parent commands Praise/criticism Parental warmth Spanking	Active treatments superior to wait list	VPT treatments had better effects on spanking, praise, and warmth than wait list	Not assessed
Spaccarelli et al. (1992)	VPT + CBT VPT + attn Wait list	Coercive punishment Parental stress Parent prob-solving	VPT treatments superior to wait list	Both VPT had better effect on punishment and problem solving than wait list. VPT + CBT improved stress.	Not assessed
Webster-Stratton (1992)	VPT individual Wait list	Parent commands Praise/criticism Parental warmth Spanking	Individual VPT superior to wait list	VPT had better effect on praise/criticism, paternal commands, maternal warmth, and spanking	Mediation not assessed. Moderators identified and included as tx targets in Webster-Stratton (1994)
Webster-Stratton (1994)	VPT VPT + CBT	Child prob-solving Parent commands Praise/criticism Parent prob-solving Parental stress Parental warmth Spanking Communication	No treatment superior	VPT + CBT had better effect on parent and child problem-solving skills and marital communication	Mediation not assessed. Criticism, maternal stress, paternal commands, and paternal problem-solving predicted deviant behavior
Vitaro & Tremblay (1994)	Delinquency PP No tx	Association with deviant peers	DPP superior at long-term follow-up	DPP had better effect on peer association	Not assessed

Table 4 Continued

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/Mediation tests
Tremblay et al. (1995)	Delinquency PP Attention	Parental monitoring Parental punishment	DPP superior to attention on some measures	No treatment effect	Not assessed
Henggeler et al. (1986)	MST Community tx	Family functioning Association with deviant peers	MST superior to community tx	MST had better effects on peer association and some family measures (warmth, equality)	Not assessed (but see Huey et al., 2000)
Henggeler et al. (1992)	MST Probation	Family functioning Peer relations	MST superior to probation	MST had better effects on candidate mediators	Mediation not assessed. Candidate mediators did not predict deviancy (also see Huey et al., 2000)
Borduin et al. (1995)	MST Community tx	Family functioning Peer relations	MST superior to community tx	MST had better effects on family functioning	Not assessed (but see Huey et al., 2000)
Zangwill (1983)	PCIT Wait list	Parent rewards Parental punishment	PCIT superior to wait list on many measures	PCIT had better effect on candidate mediators	Not assessed
McNeil et al. (1991)	PCIT No tx	Not assessed	PCIT superior to no tx on many measures	Not assessed	Not assessed
Eyberg et al. (1995)	PCIT Wait list	Praise/criticism	PCIT superior in incomplete sample	PCIT had better effect on candidate mediators	Not assessed
Peed et al. (1977)	PT Wait list	Parent commands Parent attention Parent rewards	PT superior to wait list on many measures	PT had better effect on candidate mediators	Not assessed
Wells & Egan (1988)	PT Family tx	Parent commands Parent attention Parent rewards	PT superior to systemic family tx	PT had better effect on candidate mediators	Not assessed
Hamilton & MacQuiddy (1984)	Time-out Time-out + seat Wait list	Parent praise Spanking	Time-out + signal seat superior to typical time-out and to wait list	Not assessed in wait list. Time-out + signal seat had better effect on spanking	Not assessed
Kazdin et al. (1987a)	PSST + PT Attention	Not assessed	PSST + PT superior to attention	Not assessed	Not assessed
Kazdin et al. (1992)	PSST PT PSST + PT	Family functioning Parental stress Also see Table 5.	PSST + PT superior in combination to either alone	PSST + PT had better effect on candidate mediators Also see Table 5.	Mediation not assessed. Change in child measures did not relate to change in parent measures. Also see Table 5.

NOTE: Studies are divided into blocks to reflect the classification system used by the Task Force on Empirically Supported Procedures. Shaded entries have been identified as 'well established' (Brestan & Eyberg, 1998). PT, parent training; PCIT, parent–child interaction therapy; PSST, problem-solving skills training; MST, multisystemic therapy; PSY, psychodynamic therapy; NST, non-directive supportive therapy; VPT, videotape parent training

suggest that parenting may have mediated the impact of treatment on long-term outcome had the design of the study remained intact.

Additional evidence for the mediational role of parent skills in the Patterson PT intervention is provided by clinical trials extending PT to foster care and prevention samples (for general review, see Dishion & Patterson, 1999). One of these investigations is sufficiently comparable to the parent training EST clinical trials to warranted extended discussion here. In a recent study, Eddy and Chamberlain (2000) compared the effects of multidimensional treatment foster care (MTFC) to usual group home placement on the subsequent criminal behavior of seriously disruptive teenage boys. Working with the juvenile justice system, youth were randomly assigned to group home or MTFC placements. MTFC youths received a broad package of services including individual therapy focusing on prosocial skill building, behavioral family therapy with their family of origin, and a behavioral management program at school. In addition, foster parents of MTFC youth had been extensively trained in a variant of Patterson's parent training program. In contrast, youths placed in group homes were supervised by adult caretakers, but the general milieu focused on promoting a positive peer environment, and youths generally were encouraged to participate in the governance of the residential facility.

Eddy and Chamberlain (2000) used structural equation modeling to test the effects of MTFC placement on later antisocial behavior and to assess if the effects of placement were mediated by caretakers' use of behavior management strategies and youths' association with deviant peers. Caretakers were either the MFTC foster parents or the youths' primary adult contact in the group home. The effects of these two mediators – behavior management practices and peer association – were combined into a single latent variable for analysis. Results of the investigation strongly supported the efficacy of MFTC, with MFTC youth having much lower levels of self-reported delinquent behavior and official criminal referrals 12 to 24 months after placement. These positive effects of MFTC on behavior were fully mediated by the latent variable capturing the combined effect of behavior management and peer association. In total, 32% of later antisocial behavior was explained by the causal path from treatment through mediator to outcome. Importantly, and unlike many other investigations, assessment of the mediating processes occurred three months into youths' placement, substantially before the measurement of delinquent behaviors at 12, 18, and 24 months. Mediators and outcomes were also assessed with different measurement technologies, increasing confidence in the observed effects.

Evidence on the mediating role of parent discipline practices also is provided by studies of MST. Huey et al. (2000) tested the role of parental monitoring in MST effects, using data from the 1997 clinical trial of MST with violent and chronic juvenile offenders (Henggeler et al., 1997). Results were then replicated in a separate sample of participants drawn from a study extending MST to the treatment of substance-abusing delinquents (Henggeler, Pickrel, & Brondino, 1999). Unlike previous reports, in the 1997 clinical trial, MST did not have significantly better effects than probation in reducing youths' future criminal activity or in the percent of youth incarcerated over follow-up. Additionally, parents in MST did not improve their monitoring of youth behavior; indeed, over time, parental monitoring decreased for both MST and probation youth. Henggeler et al. (1997) attributed these poor effects to problems with MST adherence. Expert ratings of adherence were not available for MST therapists, but the research team was able to obtain therapist-, parent-, and youth-report of therapists' use of MST strategies. Using these ratings as a criterion, MST therapists with good adherence did produce significant effects in the targeted mediators and terminal outcomes.

Huey et al. (2000) extended these analyses and tested whether the relationship between MST adherence and youth delinquency was mediated by three processes – parental monitoring, family functioning, and association with deviant peers. Youth who did not receive MST were excluded from investigation, and the 'treatment' variable consisted of quality of MST implementation as rated by therapists, parents, and youths. A variant of path analysis was used to test the hypothesized relationships between treatment, mediators, and outcome; readers are referred to the original report for details of the analytic procedure and model fit statistics for the 1997 and 1999 samples of youth. Across samples, the influence of parental monitoring on youth delinquency was clear, both through a direct path and indirectly though the effect of monitoring on youth association with deviant peers. Relationships between MST treatment adherence and monitoring were significant, but weaker than the links between monitoring and outcome. Some support was found for mediation of MST effects on delinquency through changes in parental monitoring; however, mediation was only found when parent ratings of MST adherence were used (therapists and youths also assessed adherence).

Mediating role of family functioning. In addition to measures of parent behavior management, six of the EST clinical trials assessed family functioning. In this family functioning category, we included measures of families' affective tone, parental warmth, family cohesion, and hierarchy/dominance. Family functioning was assessed by parent- and youth-report (e.g., Henggeler et al., 1992); coded family interactions in the laboratory (Henggeler et al., 1986); and home observation (e.g., Webster-Stratton, 1992).

Results for family functioning paralleled findings for parent behavior management strategies. On the whole, the parent- and system-focused EST produced positive changes in family functioning, although results were not completely uniform across studies (e.g., Henggeler et al., 1986) or for changes in maternal versus paternal warmth (e.g., Webster-Stratton, 1992). The Huey et al. (2000) investigation, discussed earlier, also assessed whether these positive changes in family functioning mediated the effects of MST adherence on delinquency. Improved family functioning and greater cohesion were significantly associated with reductions in delinquency for all models tested. Improved functioning was also reliably related to less association with deviant peers. As with the models of parental monitoring, some support was found for the mediating role of family functioning on treatment outcome, but only for models based on parent-ratings of MST adherence.

Mediating role of association with deviant peers. Five of the EST clinical trials assessed youth association with deviant peers, including all four of the clinical trials of MST. In all of the studies, save Henggeler et al. (1997), the EST interventions succeeded in encouraging youth to associate with a less deviant peer group, primarily through improved parental monitoring of youth behavior (Huey et al., 2000). In the Henggeler et al. (1997) study, positive changes in peer affiliation were found in cases with high MST adherence ratings. As discussed previously, Huey et al. (2000) found deviant peer affiliation to be an important predictor of delinquency and a mediator between MST adherence and future conduct problems (for parent ratings of adherence). In addition, Eddy and Chamberlain (2000) found that a latent variable composed of both caregiver discipline practices and youth association with deviant peers mediated the impact of their multidimensional foster treatment program on later criminal behavior.

Youth-focused interventions

Five youth-focused treatment programs have been identified as probably efficacious interventions for conduct problem youth: Anger Control Training with Stress Inoculation; the Anger Coping Program; assertiveness training; Problem-Solving Skills Training; and Rational Emotive Therapy (see Brestan & Eyberg, 1998). These interventions target the disturbed cognitive processes and behavioral deficits thought to produce aggressive and disruptive behaviors. The interventions draw heavily from work by Dodge and colleagues on social information processing. A full discussion of the social information-processing model is beyond the scope of this review; in short, the model postulates that socially competent behavior is dependent on (a) accurate encoding of social cues and interpretation of others' intent; (b) generation and selection of appropriate responses; and (c) skillful enactment of the chosen course of behavior (see Crick & Dodge, 1994). Using techniques such as cognitive restructuring (e.g., Lochman, 1984) and social skills training (e.g., Huey & Rank, 1984), the youth-focused ESTs attempt to remediate deficits at each point in the processing model. Several of these programs also place a great deal of emphasis on teaching youths how to solve problems rationally and respond non-aggressively when youths are actually aroused and angry (e.g., 'hot' processing; Schlicter & Horan, 1981).

Just over half of the youth-focused ESTs included measures of the cognitive processes targeted by treatment. Below, we review this evidence on treatment mechanism, organizing our comments to map on to the stages of the social information-processing model. Table 5 provides a study-by-study summary of treatment effects and data on therapy mechanism.

Mediating role of social information processing. None of the EST studies assessed social information processing deficits in cue encoding or interpretation (e.g., hostile attributional bias). One clinical trial (Schlicter & Horan, 1981) did include a measure of general cognitive distortions. In this investigation, the anger control intervention had a significant impact on self-rated anger (the main outcome measure); however, cognitive distortions were unaffected.

Six of the EST clinical trials assessed disruptive youths' ability to generate solutions to interpersonal problems and select appropriate behaviors. Specific measures included: (a) the total number of solutions youth were able to generate to hypothetical interpersonal scenarios (Feindler, Marriott, & Iwata,1984; Lochman et al., 1984; Webster-Stratton, 1994); (b) the quality and type of these hypothetical solutions (Lochman et al., 1984; Kazdin et al., 1992; Webster-Stratton, 1994); and (c) the quality and type of response chosen by youth in role-plays of simulated provocations (Schlicter & Horan, 1981; Huey & Rank, 1984). Overall, participation in the social problem-solving treatments had positive effects on these measures of response generation and selection – increasing the total number of responses considered, reducing the aggressiveness of chosen responses, and increasing the number of skilled, assertive responses. None of the clinical trials assessed the relationship between these positive changes in lab-based tasks and reduction in aggressive and disruptive behavior at home or in school.

We searched for follow-up studies to these EST clinical trials to see if later reports re-analyzed clinical trial data to assess mediation. We did not find any studies that met this description. However, we did find one non-EST investigation with relevant results. Guerra and Slaby (1990) investigated the effects of cognitive mediation training

Table 5 Mechanisms of action in youth-focused ESTs for disruptive youth

Clinical trial	Treatment conditions	Candidate mediators	Efficacy test	Intervention test	Psychopathology/ Mediation tests
Schlicter & Horan (1981)	Anger control Relaxation No tx	Cognitive distortions Response to provocation (imaginal and live)	No treatment effect	Active treatments had better effect on response to provocation	Not assessed
Feindler et al. (1984)	Anger control No tx	Problem-solving	Anger control superior on some measures	Anger control had better effect on candidate mediator	Not assessed
Lochman et al. (1984)	Anger + goals Anger control Goal-setting No tx	Problem-solving	Anger treatments superior at reducing aggressiveness	Anger treatments had better effect on candidate mediator than goals or no tx	Not assessed
Lochman et al. (1989)	Anger + prob solv Anger control No tx	Not assessed	Anger treatments superior to no tx	Not assessed	Not assessed
Huey & Rank (1984)	Assertiveness NST No tx	Response to provocation (live)	Assertiveness superior to NST and to no tx	Assertiveness had better effect on candidate mediator	Not assessed
Kazdin et al. (1987a)	PSST + PT Attention	Not assessed	PSST + PT superior to attention	Not assessed	Not assessed
Kazdin et al. (1987b)	PSST NST Attention	Not assessed	PSST superior to NST and attention	Not assessed	Not assessed
Kazdin et al. (1992)	PSST PT PSST + PT	Response to provocation (imaginal) Also see Table 4.	PSST + PT superior in combination to either alone	PSST interventions had better effect on response to provocation. Also see Table 4.	Also see Table 4.
Block (1978)	RET PSY Wait list	Not assessed	RET superior to PSY and wait list	Not assessed	Not assessed
Webster-Stratton (1994)	VPT VPT + PCBT	Youth problem-solving Also see Table 4.	No treatment superior	VPT + CBT had better effect on problem-solving Also see Table 4.	Not assessed. Also see Table 4.

NOTE: Studies are divided into blocks to reflect the classification system used by the Task Force on Empirically Supported Procedures (Brestan & Eyberg, 1998). PSST, problem solving skills training; PSY, psychodynamic therapy; PT, parent training; VPT, videotape parent training; NST, non-directive supportive therapy; RET, rational-emotive therapy; PCBT, parent cognitive-behavioral therapy

(CMT), a social problem solving intervention for violent, incarcerated youth. In this study, they assessed a number of social information processing variables (e.g., cue interpretation, solutions generated to social problems) and youths' general beliefs about the legitimacy of aggressive behavior. These cognitive processes were directly targeted by the CMT program and hypothesized to mediate the effects of CMT on violent behavior. Compared to attention-placebo and no treatment control, CMT produced significant improvements on youths' aggressive, impulsive, and inflexible behavior, rated while youths were incarcerated. CMT did not have a significant effect on recidivism after release from the detention facility. CMT also improved the rationality of youths' social information processing and weakened youths' beliefs supporting the legitimacy of aggression. Formal mediational analyses were not conducted; however, the investigators did examine the relationship between the scores on the cognitive measures and behavior ratings at post-treatment assessment. The majority of social information processing and belief measures were not significantly related to aggressive behavior, although significant effects were found for cue interpretation (i.e., the hostile attributional bias)

and the overall belief that aggression is legitimate. While CMT did not produce significant effects on recidivism, Guerra and Slaby also examined the relationship between the hypothesized cognitive mediators and later criminal behavior. Recidivism was related to youths' endorsement of the hostile attributional bias, selection of hostile responses, belief that victims deserve aggression, and belief that aggression is a legitimate social response. These results provide some support for the mediating role of social information processing in youth-focused treatments for aggression. However, results tying cognitive to behavioral variables were mixed, formal mediational analyses were not conducted, and assessment of the hypothesized mediators and outcomes occurred simultaneously at post-treatment.

Summary

Seventy-seven percent of the EST clinical trials for disruptive youth included at least one measure of possible therapeutic mechanisms. Evidence on therapy mechanism is most complete for studies of parent- and system-focused interventions. Across clinical trials, teams of investigators, and methods of assessment, these interventions reliably improved the parent behavior management skills targeted by the treatment protocols. Parent- and system-focused interventions also produced good effects on youth association with deviant peers and on more general measures of family functioning and warmth.

Evidence on therapy mechanism was less complete for studies of youth-focused interventions. Many of these clinical trials included measures of social information processing, and, overall, participation in treatment led to positive changes in youths' ability to generate solutions to interpersonal problems and reduced the aggressive content of youths' action plans. Despite these promising results, none of the EST studies formally assessed mediation or related changes in social information processing to other measures of disruptive behavior. We did find one non-EST clinical trial that related social information processing measures to behavior outcome. While the problem-solving intervention did produce positive change in both behavior and a broad range of social information processing measures, less than half of the cognitive measures actually were related to aggressive behavior (Guerra & Slaby, 1990). As with the CBT clinical trials of anxiety and depression, these studies also suffered from conceptual overlap between mediator and outcome. Indeed, some of the clinical trials classified social information processing tasks as measures of aggressiveness. To maintain consistency across studies, we reviewed all measures of social information processing as possible mediators, regardless of the investigator's particular operational definition.

Conclusions

We opened this review by posing a basic question: When youth psychotherapy works, *why* does it work? According to previous reviews and commentaries, there is very little evidence available to answer this query (e.g., Kazdin et al., 1990). Through our focused review of the EST clinical trials, we came to a somewhat different conclusion: Considerable evidence exists, but it has not been fully exploited. Consistent with previous reports, very few studies of treatment efficacy explicitly tested mechanisms of action underlying therapy effects. Although we reviewed 67 clinical trials, we found only six investigations that attempted to test mediation (Treadwell & Kendall, 1996; Kolko et al., 2000; Patterson & Forgatch, 1995; Eddy & Chamberlain, 2000; Huey et al., 2000; Guerra & Slaby, 1990). While complete tests of mediation were rare, we found that a large proportion of studies included measures that could have been used to investigate treatment mechanisms. Some 30% of anxiety trials, 79% of depression trials, and 77% of disruptive behavior trials included measures of processes hypothesized to mediate treatment effects. Within the disruptive behavior category, an impressive 91% of the investigations of parent training assessed possible mediators, most often parents' use of appropriate behavior management techniques. Across disorders and interventions, the EST treatments produced significant changes in many of these targeted mechanisms. Thus, at a general level, we found good evidence for the first two steps in establishing mediation. By definition, the EST interventions were efficacious, and a substantial proportion of treatments significantly impacted possible mediating mechanisms.

Despite this promising beginning, it would be difficult to conclude that the ESTs for youth work through the mechanisms specified in their theories of intervention. The vast majority of studies treated their 'mediator' as another outcome variable and, importantly, measured the mediator at treatment termination. This was true even for many of the investigations that explicitly sought to demonstrate mediated effects. As an example of the problems this engenders, it may seem quite logical to stipulate that training parents to monitor and supervise their teens' whereabouts decreases youth association with deviant peers, which in turn reduces delinquent and antisocial acts (Huey et al., 2000). However, this causal chain cannot be established purely on the basis of statistical relationships. It may be possible that different youth behaviors pull for different parenting practices, and the direction of effects may flow from youth behavior to apparent changes in parenting (e.g., youths who stop associating with gang members may be easier for parents to keep track of). Post-treatment assessment of mediators and outcomes may be a useful first step for investigators

seeking to understand mechanisms of therapeutic action.[7] However, multiple assessments of mediators and outcomes over the course of therapy and temporally based analytic strategies are required to conclusively demonstrate the direction of mediated effects.

The EST results bearing on mechanism also were limited by conceptual and methodological overlap between mediators and outcomes. This difficulty was most apparent in studies that assessed cognitive mediators. Youths' cognitive distortions were typically assessed with self-report rating scales, as were the symptomatic outcomes of interest (e.g., Kolko et al., 2000; Lochman et al., 1984). Additionally, the cognitive measures employed in the clinical trials focused on cognitive products, rather than cognitive processes. It may be splitting conceptual and methodological hairs to attempt to differentiate these products from symptoms, as in the overlap between the content of anxious self-talk and youths' self-rated anxiety symptoms (Treadwell & Kendall, 1996). One possible solution may be to refocus cognitive assessment from products to processes, such as selective attention, impaired recognition, and biases in recall. Specific processing deficits have been documented for anxious versus depressed youths (Gotlib & MacLeod, 1997), and there has been increasing interest in developing standardized, performance-based measures that do not rely on youths' ability to introspect and verbally report on these processes (for review, see Frick, 2000). Alternately, there also may be value in testing behavioral mediators of CBT effects, a relatively neglected endeavor. Only one of the investigations of CBT for depression assessed engagement in pleasant activities (Lewinsohn et al., 1990), a major skill taught to depressed youth to help them improve their mood.

Much of our discussion has highlighted limitations in the extant clinical trials research relative to the goal of mediation testing; however, we believe that these limitations are quite understandable in the context of an evolving field. Three points are particularly important in this regard. First, many of the studies reviewed here were conducted before the publication of articles detailing procedures for mediation analysis (e.g., Baron & Kenny, 1986). In these instances, authors deserve considerable credit for collecting data relevant to proposed therapy mechanisms, even though the data were not used in ways that we now regard as appropriate for full mediation testing. Second, for those studies conducted after the publication of mediation testing procedures, we need to realize that an efficient strategy for treatment development may not include extensive mediation testing at the front end. It may be reasonable to begin by determining whether a particular treatment produces desired outcomes before investing the resources needed to identify and assess measures (especially in the case of time-intensive mediators, such as in-home behavioral observation of family interactions). This strategic reasoning may account for the several instances in our tables in which the *first* published study of a particular treatment does the *least* to investigate mediation. As a third, and related, point, crafting a treatment mediation study is a complicated task, much more involved than designing a traditional efficacy clinical trial. Investigators must decide which mediators to focus on, how to measure these mechanisms, when and how frequently to assess mediators and outcome, and how to analyze these multiple measurements in a way that illuminates the processes under investigation. For many disorders and types of therapy, there currently may be little theory, and even less data, to guide these specific design decisions. Thus, the purpose of our critique has not been so much to criticize as to characterize the current state of knowledge and to identify ways to enrich our understanding of treatment mechanisms in future work.

Future directions: mechanisms of action in the real world

Overall, we see a great deal of promise in clinical trials research on youth psychotherapy. Although very few of the EST clinical trials formally assessed mediation, a majority of studies contained some information relevant to mechanism. Refinements in the design of studies and assessments of mediators may increase the theoretical yield of future investigations and help us to better understand the critical processes and ingredients responsible for therapy effects. Additionally, in a number of cases, already-completed studies may be revisited with new analytic methods to take fuller advantage of the assessments already completed.

Despite our emphasis on methodological rigor and precise assessment, we do not wish to leave the impression that research of this kind should exclusively, or even primarily, be conducted within the traditional settings and samples of clinical trials. Historically, the participants (recruited children and families, researcher-employed therapists) and contexts (e.g., grade schools, university research clinics) of clinical trials research have tended to differ rather markedly from the participants and contexts in which most everyday youth treatment occurs (Weisz et al., 1998). While there is certainly genuine value in traditional clinical trials, the effects of treatment models tested under carefully constructed, optimizing conditions may not generalize well to the wider universe of youth and families in need of mental health services and referred to most mental health

[7] Such analyses may lead to surprising outcomes. For example, in their meta-analysis of CBT effects, Durlak, Fuhrman, and Lampman (1991) found that CBT for youth produced change on cognitive and behavioral outcome measures, but changes in the two domains were not correlated.

service settings (Weisz, 2001; Weisz & Weersing, 1999).

In addition to the social policy imperative to develop and refine treatments for real-world children and families, we believe that testing mediational models in community samples may end up being better science. Working with community families, for example, may reveal significant limitations in our models of intervention effects. One can imagine model changes of two different forms, some leading toward increased complexity, some toward increased simplicity. Arguing for increased complexity is the fact that a major limitation in model building, both theoretically and statistically, is the exclusion of key constructs. This form of model misspecification may lead to illusory relationships between unrelated variables, obscure indirect effects, inflate error terms, and provide skewed estimates of regression coefficients. The pool of typical clinical trial participants may be 'low' on a number of theoretically important characteristics, and models of therapy effects tested in this sample may lead to model misspecification by underestimating the necessity of intervention components and mediational pathways. For example, the families of depressed youth in community settings have been reported to have serious parental psychopathology, chaotic life circumstances, and harsh parenting practices (Hammen, Rudolph, Weisz, Rao, & Burge, 1999). Theories of depression suggest that environmental stressors, particularly uncontrollable negative events, may be important factors in the development and maintenance of symptoms (e.g., Abramson et al., 1989). However, none of the ESTs for depression included intervention components designed to address the negative familial context of depressed youth. Importantly, even if the ESTs had targeted family context, change in the predictability and tone of family interactions may not have mediated treatment effects in the samples in which the ESTs were tested (e.g., mildly to moderately depressed schoolchildren; Butler et al., 1980).

Use of real-world samples of youth also may highlight opportunities to simplify our models of psychopathology and intervention. Consider the fact that youth recruited for clinical trials are often screened to limit comorbid psychiatric problems or diagnoses (e.g., Lewinsohn et al., 1990). In epidemiological studies, however, comorbidity among diagnostic categories and subsyndromal symptoms is high (see Angold, Costello, & Erkanli, 1999; Cerel & Fristad, 2001). This suggests that clinical trial research that focuses on 'pure' or constrained diagnostic samples may be creating and refining treatments for relatively rare groups of children and adolescents. Such research may also risk overlooking commonalities between different disorders and common mechanisms of therapeutic action. For instance, depressed, anxious, and aggressive children all may overestimate the hostile intent of others, although their behavioral responses to this attributional error may differ markedly (e.g., withdrawal versus aggression; Quiggle, Garber, Panak, & Dodge, 1992). An efficient intervention for multi-problem youths may target the shared aspect of disorders – that is, the misattribution of others' ill-intent – with the hypothesis that change in this mechanism should mediate treatment effects on multiple symptoms. This is a rather different approach to building and testing treatments than the disorder-specific model of traditional clinical trials.

In our view, theory-testing and research in the field are best viewed as overlapping rather than distinct or competing enterprises. It is quite possible that the fairest and fullest tests of our theories about why treatments work will be those that are focused on real-world clients treated in real-world clinical contexts. But whether researchers share this belief or not, and whether they structure their research in this way or not, one point now seems quite clear: With recent advances in our understanding of mediation testing, virtually any test of whether youth psychotherapy works can now be designed to tell us why it works as well.

Acknowledgements

Preparation of this manuscript was facilitated by National Institute of Mental Health (NIMH) Institutional Research Training Grant MH18269 supporting V. Robin Weersing and NIMH Research Scientist Award K05-MH01161 supporting John R. Weisz.

Correspondence to

V. Robin Weersing, Child Psychiatry, Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, 3811 O'Hara Street, Suite 112, Pittsburgh, Pennsylvania 15213; Tel: (412) 624-3673; Fax: (412) 624-4326; Email: weersingvr@msx.upmc.edu

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Manuscript accepted 14 August 2001