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Evidence-based psychosocial treatments for children and adolescents with attention-deficit/hyperactivity disorder

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Abstract

Despite the vast literature supporting the efficacy of stimulant medication in the treatment of attention-deficit/hyperactivity disorder (ADHD), several limitations of pharmacological treatments highlight the clear need for effective psychosocial treatments to be identified. A large evidence base exists for behavioral interventions, including parent training and school interventions, which has resulted in their classification as "empirically validated treatments." Additionally, social skills training with generalization components, intensive summer treatment programs, and educational interventions appear promising in the treatment of ADHD. Given the chronic impairment children with ADHD experience across multiple domains of functioning, multimodal treatments are typically necessary to normalize the behavior of these children. The state of the ADHD treatment literature is reviewed, important gaps are identified (e.g., treatment for adolescents), and directions for future research are outlined within a developmental psychopathology framework.

Keywords: ADHD; Behavior therapy; Parent training

Attention-deficit/hyperactivity disorder (ADHD) is the primary reason for referral to mental health services among school-aged children (Barkley, 1998). Children with ADHD display chronic and pervasive difficulties with inattention, hyperactivity, and impulsivity that result in profound impairments in academic and social functioning across multiple settings (typically, at home, in school, and with peers). Effective treatments for ADHD consist of stimulant medication and behavior modification. Although the efficacy of stimulant medication in the treatment of ADHD is well established, purely pharmacological approaches to treatment fall short of optimal outcomes for a number of reasons, highlighting the need for effective psychosocial treatments to be identified.

A large and convincing evidence base exists for behavioral parent training and behavioral school interventions, which has resulted in their classification as "empirically validated treatments" according to American Psychological Association (APA) Division 53 criteria (Lonigan, Elbert, & Johnson, 1998; Pelham, Wheeler, & Chronis, 1998). Behavioral interventions involve manipulating environmental factors that are antecedents to (e.g., setting, structure) or consequences of (e.g., adult attention) the maladaptive behavior. Given the chronic and pervasive nature of ADHD, behavioral treatments (like medication) must be implemented consistently over the long-term in each setting in which impairment is present (Chronis et al., 2001). Effective psychosocial treatments for ADHD will be reviewed herein, and will be presented within a developmental psychopathology framework (Holmbeck, Greenley, & Franks, 2003).

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1. Developmental psychopathology framework

The developmental psychopathology framework has as one of its initial considerations the *developmental appropriateness of behavior.* Developmental appropriateness is critical in arriving at a diagnosis of ADHD, setting appropriate goals for treatment, and appreciating environmental demands that are at play during any given developmental period. For example, many of the behaviors that characterize ADHD (e.g., difficulty sustaining attention, high activity level) are normative at certain stages of development, and may or may not be viewed as impairing depending on the environmental expectations at a particular developmental stage (Lahey et al., 1998). Thus, prior to diagnosis the child's behavior must be compared to developmental norms, impairment in functioning must be assessed across multiple domains, and appropriate treatment goals must be based on normative functioning for the child's age.

Treatments must also be *developmentally sensitive,* meaning that they must involve careful consideration of the child's level of cognitive development and his/her developmental needs and challenges (Holmbeck et al., 2003). In this regard, behavioral treatments for younger children must include consequences that are tangible, offered frequently, and presented immediately following the behavior so that children comprehend the connection between their behavior and the consequence. Likewise, treatments for adolescents must consider their desire for autonomy, for example, by involving them more fully in the treatment process. Across all age groups, consequences must be chosen that are meaningful and motivating for the individual at that particular stage of development. For example, time out may be a less appropriate punishment for adolescents. Rather, loss of privileges or activities (e.g., talking on the telephone, going to the mall with friends, obtaining access to the car) may be much more effective punishments for adolescents. Similarly, treatments must be *modified at developmental transitions* using developmentally sensitive behavioral strategies to reflect the behaviors that are most impairing at the time (e.g., disorganization at the transition to middle school; Chronis et al., 2001).

Finally, the developmental psychopathology perspective emphasizes that *children exist within multiple contexts*—most notably, home and school—that may include a multitude of risk and/or protective factors that must be modified or fostered in treatment in order to enhance developmental outcomes (Mash, 1998). By definition, ADHD symptoms and impairment must exist in at least two settings (APA, 1994). Treatments must therefore be implemented in each setting to bring about maximum benefit (Pelham et al., 1998). Furthermore, effective psychosocial treatments for ADHD rely on parents and teachers as agents by which treatment is delivered directly to the children. A vast literature suggests that the behaviors of children with ADHD are stressful to parents, and the same is likely true for teachers (Fischer, 1990; Johnston & Mash, 2001). Furthermore, many parents of children with ADHD experience psychopathology themselves (Chronis, Lahey et al., 2003), which is associated with suboptimal response to ADHD treatments (e.g., Sonuga-Barke, Daley, & Thompson, 2002). Therefore, comprehensive treatments rely upon a thorough assessment of the strengths and weaknesses of the child *and* his/her environment (e.g., the family, peer group, classroom setting) so that treatments can target child, parent, and other environmental contributors to the problem behavior across multiple settings.

We will now turn to a discussion of effective treatments for children with ADHD, beginning with a discussion of the efficacy and limitations of pharmacological interventions and the rationale behind the need for psychosocial treatments. We will then review the literature on effective and promising psychosocial treatments for ADHD.

2. Treatments for children with ADHD

2.1. Stimulant medication

The widespread use and evidence for the efficacy of stimulant medication are overwhelming. In fact, treatment effects of stimulants surpass evidence for pharmacological treatment of any other child psychiatric disorder. It is estimated that at least 85% of children diagnosed with ADHD are medicated with stimulants (Olfson, Gameroff, Marcus, & Jensen, 2003). Stimulant medication has been shown to have large, beneficial effects on a number of outcome measures, particularly measures of ADHD symptoms for the majority of children for whom they are prescribed (see Swanson, McBurnett, Christian, & Wigal, 1995 for a review). In the classroom, stimulants have been found to reduce classroom disruption and increase on-task behavior, compliance, and academic productivity. Additionally, stimulants have been shown to decrease negative social behaviors, including aggression, inappropriate peer interactions, and negative parent–child interactions.

However, there are several important limitations to an exclusively pharmacological approach in the treatment of ADHD. These include the limited effects of stimulant medication on problems such as academic achievement and peer relationships, the fact that up to 30% of children do not show a clear beneficial response to stimulants, the inability to

continuously medicate children due to side effects such as insomnia and appetite suppression, the potential adverse long-term side effects of taking stimulants, the failure of many adolescents to adhere to medication regimens, and the paucity of evidence supporting long-term beneficial effects of pharmacological therapy on domains of impairment (see Pelham & Lang, 1993; Smith, Waschbusch, Willoghby, & Evans, 2000; Swanson et al., 1995; Weiss & Hechtman, 1993, for reviews). Finally, given the literature presented herein suggesting that ADHD is associated with a host of family problems, it is unlikely that stimulant medication for children is sufficient to treat the multiple mental health needs and pervasive impairment common in these families (Chronis, Lahey et al., 2003; Chronis, Pelham, Gnagy, Roberts, & Aronoff, 2003). Indeed, we recently found that late-afternoon stimulant dosing for children with ADHD did *not* result in improvements in parent mood and functioning (Chronis, Pelham et al., 2003). Finally, results of the Multimodal Treatment Study of Children with ADHD (MTA; MTA Cooperative Group, 1999a), which will be discussed in depth later in this review, suggested that although medication in this study was effective in reducing ADHD *symptoms*, only combined behavioral–pharmacological treatment resulted in improved social skills and improved parent–child relationships, including a reduction in harsh and ineffective parenting (Hinshaw et al., 2000). Furthermore, children who received combined treatments were more likely to be normalized (Connors et al., 2001; Swanson et al., 2001), and parents overwhelmingly endorsed treatment conditions including a behavioral component (Pelham, Fabiano, Gnany, Greiner, & Hoza, 2004). Thus, there is overwhelming evidence that points to behavior therapy as a valuable component of treatment for ADHD.

2.2. Family-based interventions

The inattentive, hyperactive, and impulsive behaviors that characterize ADHD often contribute to impairment in the parent–child relationship and increased stress among parents of children with the disorder (Fischer, 1990; Johnston & Mash, 2001). Over time, parents may develop maladaptive and counterproductive parenting strategies to deal with these problems that may serve to maintain or exacerbate existing behavioral difficulties (Patterson, DeBaryshe, & Ramsey, 1989). It follows that one evidence-based component of comprehensive treatment for ADHD involves working directly with parents to modify their parenting behaviors in order to increase positive outcomes with their children (Pelham et al., 1998). Effectively modifying poor parenting practices is of utmost importance, as poor parenting is one of the more robust predictors of negative long-term outcomes in children with behavior problems (Chamberlain & Patterson, 1995). Behavioral parent training, then, is one of the most effective ways to change parenting and therefore treat ADHD (Pelham et al., 1998).

Behavioral parent training has a long, successful history as a treatment for children with ADHD (Pelham et al., 1998), oppositional defiant disorder (ODD) and conduct disorder (CD; Brestan & Eyberg, 1998), as well as many internalizing disorders (e.g., Silverman et al., 1999). Behavioral parent training explicitly provides parents with instruction in the implementation of behavior modification techniques that are based on social learning principles. Parents are taught to identify and manipulate the antecedents and consequences of child behavior, target and monitor problematic behaviors, reward prosocial behavior through praise, positive attention, and tangible rewards, and decrease unwanted behavior through planned ignoring, time out, and other non-physical discipline techniques (e.g., removal of privileges).

The efficacy of parent training in treating ADHD has been evaluated in at least 28 published studies (for a review, see Chronis, Chacko, Fabiano, Wymbs, & Pelham, 2004). These studies employed manualized parent training interventions, included children between the ages of 3 and 14, were heterogeneous in design (e.g., randomized, controlled clinical trials, single subject case studies), and combined parent training with various treatment components (e.g., school interventions, social skills training). Overall, these studies suggested that parent training results in improvements for children with ADHD in several important areas, most notably parent ratings of problem behavior and observed negative parent and child behaviors, with an average effect size of .87 (range=−.09–2.25; Fabiano, Pelham, Coles, Gnagy, & Chronis, in preparation). In some cases, parent training has also resulted in improvements in other domains, such as parental reports of stress (e.g., Anastopolous, Shelton, DuPaul, & Guevermont, 1993), and social behavior and acceptance (Pelham et al., 1988).

2.3. School-based interventions

Many of the difficulties that characterize ADHD, both in terms of inattention and hyperactivity/impulsivity, may interfere with a child's classroom behavior and their ability to learn, resulting in lower academic achievement and impaired functioning in the school setting. As such, researchers have long examined effective ways of helping children with ADHD to behave appropriately in school and to perform better academically.

2.3.1. Classroom behavior management

Behaviorally based classroom interventions constitute an empirically supported treatment for children with ADHD (Pelham et al., 1998). As with parent training, behavioral classroom interventions generally involve regular consultation with the child's teacher regarding the use of behavior modification strategies. Consultation usually begins with psychoeducation about ADHD and identification of specific target behaviors, based upon a functional assessment of behavior (i.e., examination of antecedents, behaviors, and consequences). Teachers are then instructed regarding the use of specific behavioral techniques, including praise, planned ignoring, effective commands, and time out, as well as the daily report card (DRC) and/or more extensive individualized or classroom-wide contingency management programs.

The DRC is a school-based intervention in which specific behavioral goals are set and the child is rewarded at home based on the attainment of these goals (O'Leary, Pelham, Rosenbaum, & Price, 1976). Behavioral goals are set at a level that is challenging, yet attainable, and are made increasingly more difficult until the child's behavior is within developmentally normative levels based on the principle of shaping. The DRC also provides parents with daily feedback regarding their child's behavior and performance at school, and allows them to provide back-up reinforcement for classroom behavior. The number of DRC goals and frequency of feedback and reinforcement are based on the child's developmental level (Pelham, 2002). For example, young or very impulsive children may require fewer goals and more frequent feedback and reinforcement than older children or adolescents. Many researchers have reported beneficial effects of the DRC on observational measures and teacher ratings of classroom behavior (Chronis et al., 2001; Fabiano & Pelham, 2003; McCain & Kelley, 1993; O'Leary et al., 1976).

Many of the studies examining school interventions utilized single-subject designs or group designs that included either a wait-list or a no-treatment control group, and most investigated the effects of contingency management on dependent measures including direct observations and teacher ratings (e.g., Barkley, 2002). The majority of these studies suggested that behavioral school-based interventions typically result in very large improvements on these measures, with effect sizes in the range of 1.44, and with larger effects typically found on measures of child behavior relative to measures of academic or clinic performance (DuPaul & Eckert, 1997). Thus, behaviorally based classroom interventions appear to be a very effective means of behavior change in children with ADHD in the school setting. However, as cooperation of school professionals is necessary for these interventions, some of the same challenges exist as with home behavioral programs. That is, beneficial treatment effects rely on the consistent use of behavior modification techniques by teachers, who are sometimes resistant or unable to implement such programs as intended.

2.3.2. Academic interventions

While behaviorally–based classroom interventions typically target task engagement and disruptive behavior, academic interventions for ADHD focus primarily on manipulating antecedent conditions such as academic instruction or materials in order to improve both behavioral and academic outcomes (DuPaul & Eckert, 1998). For example, a group behavioral intervention to target homework problems in children with ADHD through the structuring of homework time, use of goal setting, and parent–teacher collaboration has been developed, and preliminary results suggest positive effects on homework accuracy and completion (Habboushe et al., 2001). Direct targeting of academic impairment is an important component of comprehensive treatment of children with ADHD due to the strong association between ADHD and academic underachievement (Barkley, 1998; Hinshaw, 1992), the high rate of co-occurring learning problems in this group (Silver, 1992), and the high rates of grade retention, expulsion, and school dropout in adolescents with the disorder (Barkley, Fisher, Edelbrock, & Smallish, 1990).

Academic approaches that have been developed and show some preliminary support for children with ADHD include task and instructional modifications, peer tutoring, computer-assisted instruction, and strategy training (DuPaul & Eckert, 1998). Task and instructional modifications involve implementing procedures such as reducing task length, dividing tasks into subunits and setting goals for the child to achieve in shorter time intervals, using increased stimulation of the task (e.g., color, texture or rate of stimulus presentation), and modifying the delivery of instruction depending on the student's individual learning style (DuPaul & Eckert, 1998; Dubey & O'Leary, 1975; Dunlap, et al., 1994; Ervin, DuPaul, Kern, & Friman, 1998; Richardson, Kupietz, & Maitinsky, 1987; Zentall & Leib, 1985). Computer-assisted instruction entails the manipulation of the task format through presentation of specific instructional objectives, highlighting of essential material, use of multiple sensory modalities, dividing content material into smaller chunks of information, and providing immediate feedback about response accuracy (DuPaul & Eckert, 1998; Ford, Poe, & Cox, 1993; Kleiman, Humphrey, & Lindsay, 1981). The instructional approach of strategy training requires teaching students to use a set of procedures or strategies that specifically address the demands of an academic situation (e.g.,

notetaking, study skills, homework completion, or self-reinforcement procedures) (Chase & Clement, 1985; DuPaul & Eckert, 1998; Evans, Pelham, & Grudberg, 1995). Finally, during peer tutoring, one student provides assistance, instruction and feedback to another, thereby simultaneously working on academic and social skill goals (DuPaul & Eckert, 1998; DuPaul, Hook, Ervin, & Kyle, 1995; Greenwood, Maheady, & Carta, 1991; Locke & Fuchs, 1995).

Although surprisingly few treatment outcome studies have attempted to incorporate academic interventions (DuPaul & Eckert, 1998), the studies that are available suggest that these interventions have beneficial effects on academic performance (Ervin et al., 1998; Evans et al., 1995; Ford et al., 1993; Richardson et al., 1987). A recent meta-analysis of school-based interventions for children with ADHD found that both behavior management and academic interventions had similar positive effects on ADHD-related behaviors, although it was difficult to discern the effectiveness of these approaches on academic performance due to the relatively few studies employing academic outcome measures (DuPaul & Eckert, 1997). Academic interventions may be preferred over contingency management approaches by teachers given their time efficiency and more direct, comprehensive targeting of academic deficits (DuPaul & Eckert, 1998). However, the findings from this meta-analysis also highlight the pressing need for more research in this area due to the small number of studies that employed academic outcome measures, examined females and/or adolescents, evaluated treatment generalization over time and across settings, or assessed treatment integrity and the social validity of the results (DuPaul & Eckert, 1997). Additionally, the fact that many of these studies were conducted in the classroom setting with small samples, and most often without adequate measures of treatment integrity and fidelity, makes it difficult to discern whether treatment was implemented as designed, thereby limiting the conclusions that can be drawn from the results. In order to become established as an empirically supported treatment, these interventions must be tested in controlled, randomized trials. Future studies should also attempt to develop and test new educational strategies, compare the effects of various intervention approaches, and use functional assessment data for individualized intervention planning.

2.4. Peer interventions

2.4.1. Social skills training

Interpersonal difficulties are one of the hallmark characteristics of children with ADHD (Whalen & Henker, 1985). Children with high levels of hyperactivity, noncompliance, or aggression are rated more negatively by peers on sociometric measures (Erhardt & Hinshaw, 1994; Pelham & Bender, 1982) and are more likely to be rejected by peers (Hinshaw & Melnick, 1995). As Coie and Dodge (1998) have documented, poor peer relationships are predictive of negative long-term outcomes for disruptive children. Thus, peer relationships are an important target of comprehensive treatment for ADHD. Social skills interventions focus on developing and reinforcing the use of appropriate social skills (e.g., communication, cooperation, participation, validation) (Kavale, Forness, & Walker, 1999). Although it appears logical that such interventions would improve the social behavior of these children, convincing evidence supporting the efficacy of social skills interventions for children with ADHD has been lacking (Pelham et al., 1998).

Recently, three studies of combined parent training and social skills training demonstrated stronger and more generalized treatment effects for the combined treatment versus social skills training alone (Frankel, Myatt, Cantwell, & Feinberg, 1997; Pfiffner & McBurnett, 1997; Sheridan, Dee, Morgan, McCormick, & Walker, 1996). Notably, one study of children with ODD, CD, and ADHD compared parent training alone, social skills training alone, the combination of parent training and social skills training, and a no treatment control group (Webster-Stratton & Hammond, 1997). This study found that all treatments resulted in significant behavioral improvements for parents and children. However, greatest and most generalized effects across home, school, and peer domains were found for the group that received combined parent training and social skills training. These results suggest that combining parent training with social skills training may result in more robust effects for parents and children than parent training alone. Yet, this finding awaits replication.

2.4.2. Summer treatment program

The Summer Treatment Program for children with ADHD (STP) is an intensive, 8-week outpatient program that combines evidence-based ADHD treatment components, including weekly, group-based parent training, a token or point system, positive reinforcement (i.e., praise), effective commands, time out, a DRC, social skills training, sports skills training, and problem solving skills training (Pelham & Hoza, 1996; Pelham, Greiner, & Gnagy, 1997; Pelham et al., in press). These treatments are implemented across recreational and academic settings in order to improve children's peer relationships, interactions with adults, academic performance, and self-efficacy (Pelham et al., 1998; Pelham et al., 2004).

Many studies have demonstrated the effectiveness of STP components (e.g., Pelham et al., 1993; for a review see Pelham et al., 2004); two studies have documented the improvement gained from the STP by comparing pre-treatment with post-treatment assessments (Pelham & Hoza, 1996; Pelham et al., 2000); others have demonstrated the effectiveness of the STP within the context of a comprehensive behavioral intervention that included long-term parent training and school intervention (e.g., MTA Cooperative Group, 1999a). Results of pre–post evaluations of the STP indicated statistically significant reductions in parent ratings of symptoms and impairment, as well as functional improvement ratings across multiple domains (e.g., rule-following, classroom productivity, sports skills, and self-esteem) completed by STP teachers and counselors at the end of each summer (see also Pelham et al., 2000). Overall, these results indicated large behavioral effects of the STP reported by multiple raters across important domains of functioning. Results were similar across a variety of demographic, diagnostic and socioeconomic factors (e.g., children exhibiting comorbid aggression, living in single vs. two-parent households, from diverse economic backgrounds).

Similar results were obtained across a variety of domains and measures in the STP conducted as part of the MTA study (MTA Cooperative Group, 1999a; Wells et al., 2000). In a subsample of the MTA sites, comparisons of pre- and post-treatment ratings, point system data, DRCs, improvement ratings, and parent satisfaction ratings demonstrated very large effects of behavioral treatment for both medicated and unmedicated children during the STP (Pelham et al., 2000). The effects of the behavioral program alone were so large that incremental medication effects were obtained on only five out of more than 80 measures collected during the STP.

To date, two well-controlled crossover studies have provided strong support for the STP treatment package, when compared to a camp setting void of behavior modification components (Chronis, Fabiano et al., 2004) and both no and low-intensity behavior modification (typical of most outpatient settings; Pelham et al., 2002). Thus, the existing literature suggests that the STP is an effective intervention that intensively addresses the social functioning of children with ADHD beyond that which can be accomplished via traditional clinic-based behavior therapy. Future studies are needed that employ controlled, between-groups designs and that carefully dismantle the effects of specific STP treatment components.

2.5. Combined behavioral–pharmacological interventions

Many studies have compared stimulant medication to behavior therapy and/or combined behavioral–pharmacological interventions for children with ADHD (e.g., Firestone, Kelly, Goodman, & Davey, 1981; Horn et al., 1991; Klein & Abikoff, 1997; MTA Cooperative Group, 1999a; Pollard, Ward, & Barkley, 1983). The largest of these was the fourteen-month MTA study, which included 579 children between the ages of 7 and 9 who were diagnosed with ADHD, Combined Type (Hinshaw et al.,1997). Children were randomized to one of four treatment groups: (1) Behavioral Treatment, including intensive treatment comprised of 35 sessions of parent training faded over time, classroom behavioral management training for teachers and bimonthly consultant sessions for 10 weeks, and the STP; (2) Medication Management, consisting of stimulant medication (or imipramine for stimulant non-responders) delivered 3 times daily for the duration of the study; (3) Combined Behavioral Treatment and Medication Management; and (4) a Community Comparison control, in which families were free to seek treatment from a provider in the community (approximately two-thirds received medication; Pelham, 1999). Results of this study suggested that careful Medication Management was as effective as Combined Treatment in reducing ADHD *symptoms*, with no clear incremental benefit of behavior therapy noted. However, combined treatment typically fared better than medication alone with regard to many of the socially valid targets of treatment (i.e., areas of functional impairment), such as improved social skills and parent–child relationships, including reduction of parent-reported harsh and ineffective parenting (Hinshaw et al., 2000). Secondary analyses support the superiority of the combined treatment in the normalization of behavior (Connors et al., 2001; Swanson et al., 2001). Also, combined treatment may allow for lower doses of medication to be used in conjunction with behavior management in the home and school settings, resulting in increased satisfaction with treatment (MTA Cooperative Group, 1999a; Pelham et al., submitted for publication).

3. Treatment for adolescents with ADHD

Although it is tempting and perhaps somewhat commonplace to apply the findings from the child treatment outcome literature to adolescents, this practice is not recommended. Numerous developmental and environmental changes characterize the transition from childhood to adolescence and therefore, it is unclear the degree to which treatments that

are effective for children with ADHD are appropriate or effective for adolescents. Smith et al. (2000) consider six important developmental changes adolescents experience that may have implications for treatment, which include: a greater cognitive capacity that includes the ability to think more abstractly and solve problems in a more systematic manner, increased self-awareness of behavior, a focus on identity formation and increased independence, greater reliance on peers for information and support, a different daily routine at school involving increased educational demands, and physiological changes such as growth and the development of secondary sex characteristics. Modifications to treatment may be warranted based on these developmental changes. Suggestions for developmental modifications have included increased involvement of the adolescent in the treatment planning process, altering behavioral contingencies to include fewer tangible reinforcers and more opportunities to interact with peers and exert independence, increased collaboration and coordination with teachers, more focus on organizational, time management and homework issues, and use of self-monitoring strategies.

The need for effective treatments specific to adolescents with ADHD is further highlighted by the fact that at least half of children diagnosed with ADHD will continue to meet diagnostic criteria into adolescence (Barkley et al., 1990; Weiss & Hechtman, 1986). The persistence of ADHD symptoms into adolescence is associated with increased academic and interpersonal difficulties and a higher incidence of criminal offending, substance abuse, automobile accidents, and school dropout (Smith et al., 2000). The pervasive nature of ADHD symptoms and associated impairment suggests that the disorder is chronic, and therefore, treatment must be long-term, extending past childhood into adolescence. However, despite the strong rationale for developing effective treatments for adolescents with ADHD, the large majority of psychosocial treatment studies have focused on children with ADHD, and only a handful of outcome studies of psychosocial treatments for adolescents with ADHD have been published. Of these studies, one study examined cognitive behavioral therapy in a clinic setting, three examined family-based interventions in a clinic setting, and the remaining studies involved school-based approaches (summary of these studies to follow).

Given that adolescents spend less time with their parents or a primary teacher and more time with their peers in unsupervised activities, efforts have been made to utilize treatments that rely more on the adolescent than parents and teachers. Consistent with the literature suggesting a lack of efficacy for cognitive-oriented approaches in the treatment of children with ADHD (Pelham et al., 1998), a study by Morris (1993) found no significant improvement in a sample of adolescents with ADHD after a 12-week cognitive–behavioral program in a clinic setting. In contrast, the CD group changed significantly on all dependent variables post-treatment. Perhaps the impulsivity associated with ADHD interferes with the adolescent's ability to self-monitor and control his or her own behavior. Therefore, employing a strict cognitive–behavioral focus appears to be ineffective in the treatment of both children and adolescents with ADHD.

3.1. Family-based interventions

As reviewed herein, family-based interventions typically involve training parents to implement contingency management programs with their ADHD children and have consistently revealed improvement in the home setting (Pelham et al., 1998). Therefore, it is likely that family-based approaches may have utility when modified for use with an adolescent population. Barkley, Guevremont, Anastopoulous, and Fletcher (1992) compared the relative effects of behavior management training, problem solving and communication training, and structural family therapy in a sample of adolescents with ADHD. All three treatments resulted in significant improvements in parent–adolescent communication and conflicts, parent-reported school adjustment, internalizing and externalizing symptoms, and maternal depressive symptoms at both post-treatment and a 3-month follow-up. However, there were no significant between-group differences, and the significant post-treatment gains failed to result in clinically significant reliable change or recovery (Jacobson & Truax, 1991). A later study comparing problem solving and communication training alone, behavior management training alone and their combination replicated these findings (Barkley, Edwards, Laneri, Fletcher, & Metevia, 2001). McCleary and Ridley (1999) have also found support for the effectiveness of a group-based parent training program for adolescents with ADHD, although these data are limited due to the lack of a control or alternate treatment group to adjust for the potentially confounding effects of time. Consistent with the combined treatment literature on children with ADHD, Robin (1998) suggests that use of multimodal, long-term, joint pharmacological and psychosocial interventions may be the better approach for treating the functional impairment faced by adolescents across multiple domains rather than a unimodal, short-term approach offered in only one setting. The treatments tested in these family-based intervention studies may be more useful in their ability to prepare parents to

understand, cope with, and raise their ADHD adolescents while decreasing parental and family distress in the process. Unfortunately, no studies to date have examined the effect of combined behavioral and pharmacological treatment for adolescents with ADHD.

3.2. School-based interventions

The remaining adolescent treatment studies examine interventions implemented within the school setting. Due to the increasing school demands adolescents face as they transition into secondary school, it is not surprising that nearly all parents of adolescents with ADHD report school functioning problems as one of their primary concerns (Robin, 1998). The prevalence of school-related difficulties, however, is only one reason why school-based care may be the preferred approach. Implementing interventions in the school context also increases the accessibility of care for most families, is consistent with the trend towards full-service schools, allows greater access to the peer group (which is increasingly influential during this stage of development), and creates numerous opportunities to achieve generalization of treatment gains (Evans, Langberg, & Williams, 2003).

Of these school-based studies, two employed single subject case designs examining the effects of specific behavioral techniques in reducing the off-task and disruptive behavior of adolescents with ADHD in the classroom. Adolescent self-monitoring of on- and off-task behavior (Stewart & McLaughlin, 1992) and the use of classroom-based functional assessments to determine which antecedents and consequences are associated with the behavior (Ervin et al., 1998) each have resulted in large reductions in off-task behavior. It appears that the use of these techniques in the classroom may have potential utility in addressing the problem behaviors of adolescents with ADHD. However, it is important to recognize that these results may not generalize to other classroom settings in which the child is currently involved and it is also difficult to determine from these studies if changes in academic productivity occurred since only on-task behavior was measured.

Another study based in the classroom examined the effectiveness of an academic intervention on adolescents with ADHD and employed both behavioral and academic outcome measures. Evans et al. (1995) utilized a Directed Notetaking Activity (DNA) procedure to teach the process of notetaking through modeling and practice during a lecture format classroom over an 8-week period. They found significant increases in on-task behavior, comprehension of material and improvement in scores on daily assignments. Future studies should examine the efficacy of other academic strategies, such as homework and study skills interventions, as well as these academic strategies combined with a larger set of educational interventions to address the behavior and academic achievement of adolescents with ADHD.

In keeping with the trend towards addressing the mental health needs of adolescents with ADHD in the school setting, as well as the recognition that comprehensive, long-term treatment is needed, the Challenging Horizons Program (CHP) for middle school students with ADHD was created (Evans, Axelrod, & Langberg, 2004). This after-school program incorporates the use of behavioral strategies administered by counselors and teachers within the program and a monthly parent training group. Behavioral interventions are individualized to address the specific needs of each adolescent and include use of a DRC, time out, contracting, point system, and shaping and generalization programs. Academic and interpersonal problems are also targeted, both individually and in groups, through instruction in notetaking, organizational and study skills, and through learning and applying problem solving steps and core social skills. Recent outcome data from the CHP found moderate to large effect sizes on academic functioning and classroom disturbance as rated by parents and teachers, whereas the community care group showed either no change or a decline on these measures (Evans, Langberg, Raggi, Allen and Buvinger, 2005). However, outcome results for social functioning were less promising and showed only small to moderate effect sizes. This study also has some considerable limitations including the use of a quasi-experimental design with limited measures and a small sample size. Nevertheless, results are promising and suggest that comprehensive targeting of impairment in the school setting for adolescents with ADHD may be warranted. Future research should further investigate this area. Once effective treatments for adolescents are established, research must investigate moderators and mediators of treatment outcomes, as no such evaluations have been conducted for adolescents with ADHD.

4. Predictors of treatment response

Although there is substantial evidence for the efficacy of behavior therapy in the management of ADHD, as with medication there remains great variability in the degree to which individual children improve as a result of

behavioral treatment. A number of published articles (several from the MTA Cooperative Group) have investigated potential mediators and moderators of ADHD treatment effects, including child comorbidity, parental psychopathology, parental cognitions, socioeconomic status (SES), and race or ethnicity. Most of the literature cited herein has been conducted with school-aged children as opposed to adolescents. Each of these areas will be reviewed in turn.

4.1. Comorbidity

ADHD commonly co-occurs with other childhood disorders, particularly ODD, CD, and learning disorders, and to a somewhat lesser extent with internalizing disorders, such as anxiety (Pliszka, 2000). In fact, in the MTA study, only 31.8% of the participants had a diagnosis of ADHD alone; 29.5% were diagnosed with ADHD and either ODD or CD, 14% were diagnosed with both ADHD and an anxiety disorder, and 24.7% were diagnosed with ADHD, ODD or CD, and an anxiety disorder (Jensen et al., 2001). Results of MTA intent-to-treat analyses suggested that children with pure ADHD or ADHD and ODD or CD often responded similarly to interventions, with the largest improvements found for interventions including medication (Jensen et al., 2001). In contrast, children with comorbid ADHD and anxiety responded best to interventions including behavior therapy. In fact, for children with comorbid anxiety disorders, behavioral treatment alone yielded comparable effects as medication alone and combined treatment on *both* ADHD and anxiety symptoms (MTA Cooperative Group, 1999b). Thus, there is some suggestion that comorbidity may point to the need for certain treatment components.

At the same time, behavior therapy was effective in treating children with ADHD regardless of comorbidity. This is likely because all of the MTA behavioral treatment conditions were *individualized* in that parents, teachers, and STP staff identified target behaviors based on each child's impaired areas of functioning (which, in these cases, included anxiety). It has been argued elsewhere that behavior modification is a component of effective treatment for virtually every childhood disorder (e.g., ODD, CD, anxiety, depression, autism), and when based on a functional analysis of problematic behaviors, can effectively address most co-occurring disorders, not simply those symptoms that are specific to a diagnosis of ADHD (Pelham & Fabiano, 2001). Additional treatment components (e.g., exposure, involvement in pleasurable activities) may be added as needed to address problems that are less amenable to behavioral techniques, but should always be based on an *individualized* behavioral assessment.

4.2. Parental psychopathology

Several studies have documented the greater prevalence of psychopathology in parents of children with ADHD (e.g., Cantwell, 1972; Chronis, Lahey et al., 2003; Fischer, 1990; Mash & Johnston, 1990; Nigg & Hinshaw, 1998). Parental psychopathology in general, and maternal depression specifically, is perhaps the most widely studied barrier to optimal treatment response following parent training for children with ODD and CD (e.g., Griest & Forehand, 1982; Webster-Stratton, 1985; Webster-Stratton, 1992). Furthermore, it has been shown that parental problems are associated with poorer treatment adherence to parent training programs for noncompliant or aggressive children (e.g., McMahon, Forehand, Griest, & Wells, 1981). Recent studies have extended these findings to behavioral treatment for ADHD specifically. Sonuga-Barke et al. (2002) found that the presence of more maternal ADHD symptoms was associated with poorer outcomes following parent training. Likewise, Owens et al. (2003) reported that maternal depressive symptomatology moderated treatment response in the MTA study—children in the medication and combined treatment groups showed significantly less improvement when mothers reported a high level of depressive symptomatology. These findings are not surprising given that distressed individuals often lack the motivation or organization to complete effortful tasks that require ongoing work, such as the consistent implementation of behavioral management techniques. Thus, comprehensive treatments for ADHD may benefit from adjunctive treatment components addressing parental psychopathology (Chronis, Chacko, et al., 2004; Chronis, Gamble, Roberts, & Pelham, in press).

4.3. Cognitions regarding children and treatments

Another issue that deserves consideration in the treatment of ADHD is that of parental cognitions, including both attributions regarding child behavior and expectations regarding treatment. The literature on parental cognitions suggests that, compared to parents of children without behavior problems, parents of children with ADHD tend to

attribute their children's inattentive, hyperactive, and impulsive behaviors to internal and stable child factors (Johnston & Freeman, 1997). Such attributions may be related to maladaptive parenting behavior. For instance, Slep and O'Leary (1998) found that maternal attributions about their child's misbehavior were related to harsh parenting; mothers who were told that their child deliberately misbehaved reported more anger toward their children and were more likely to display overreactive parenting (e.g., yelling, pulling) during subsequent mother–child interactions. Others studies have replicated the relationship between these attributions and negative parenting responses (e.g. Johnston & Patenaude, 1994; Johnston, Patenaude, & Inman, 1992). Finally, findings from the MTA study suggested that negative parental cognitions about themselves, their ADHD children, and their parenting were associated with poorer response to behavioral, pharmacological, and combined treatments for ADHD (Hoza et al., 2000). These studies highlight the need to address parental cognitions in treatment.

Parental satisfaction with treatment and perceptions about ADHD may also contribute to treatment attainment and compliance. Studies have shown that discrepancies between parental expectations and the actual demands of therapeutic approaches predict treatment attendance and dropout (Plunkett, 1984; Nock & Kazdin, 2001). In fact, parental expectations regarding treatment have been found to predict treatment attendance and dropout above putative factors (e.g., SES, parental stress/psychopathology, and severity of child's problem; Nock & Kazdin, 2001). No ADHD treatment studies, however, have included components addressing parental expectations of treatment.

Parental cognitions may be particularly relevant in the treatment of ADHD, as behavioral treatments rely on parents and teachers to consistently implement treatment over the long-term. Notably, when parents were asked to rate their satisfaction with treatments in the MTA study, they overwhelmingly endorsed treatment conditions that included a behavioral component (Pelham et al., submitted for publication). Likewise, consumer satisfaction ratings for parents and children who participate in the STP are uniformly high (Pelham & Hoza, 1996). As treatment palatability is essential for treating a chronic disorder, these are very important results which highlight behavior therapy as a well-received component of comprehensive ADHD treatment.

Teacher satisfaction with treatment has been examined far less frequently, however this may be an important consideration in promoting the consistent use of school-based interventions. That is, if teachers are not satisfied with treatments such as the DRC, they may be less likely to continue to implement them. One case study employed the use of a DRC to treat an 8 year old boy with ADHD and measured teacher satisfaction (Fabiano & Pelham, 2003). At the end of the treatment, the authors reported that teachers rated their satisfaction with the treatment at the highest level for every item on the scale. Given that treatment satisfaction may be related to increased retention and participation, future research is needed to identify treatment components related to satisfaction for both parents and teachers and to better understand the relationship between treatment satisfaction, retention, and outcomes.

4.4. Socioeconomic disadvantage (SES)

Weisz and Hawley (1998) discuss the fact that until recently, most efficacy studies have been conducted in university-based psychology or psychiatry clinics. As a result, existing studies often include intact, middle- to upper-middle class samples and fail to adequately represent lower-SES families who tend to have problems with service attainment, compliance, and response. For example, studies have shown that low-income and minority children with ADHD are less likely to have their special education services needs met (Bussing, Zima, & Belin, 1998) and are less likely to adhere to prescribed stimulant medication regimens (Borden, Brown, & Clingerman, 1985; Firestone, 1982). Similarly, low SES has been shown to contribute to poor compliance with and outcome following parent training for noncompliant children (McMahon et al., 1981).

Results of the MTA study also suggest differential treatment response based on SES (Rieppi et al., 2002). For example, behavior therapy in the MTA study resulted in incremental benefit over medication alone on ADHD symptoms for more educated families but not less educated families; however, blue-collar families showed incremental benefit of behavior therapy over medication alone for ODD symptoms, while white-collar families did not. Although somewhat contradictory, these findings suggest that less educated families can benefit from behavior therapy. Yet, given findings related to poorer treatment compliance with medication (Borden et al., 1985; Firestone, 1982) and parent training (e.g., McMahon et al., 1981) among low-income families, it is unclear to what extent the MTA findings generalize to real-world situations in which families are provided with fewer prompts and incentives for treatment compliance. Effectiveness studies of parent training for children with ADHD from low-income families, or families that are less likely to present at university-based clinics, are sorely needed.

4.5. Race/Ethnicity

Another important consideration in the delivery of psychosocial treatments to children with ADHD is race or ethnicity. Differences in cultural norms, expectations about children and parenting, or attitudes regarding mental health may influence treatment attainment, compliance, or outcomes (Kazdin & Weisz, 2003). Despite these differences and the potential variability in treatment response, research has indicated that ADHD children of different ethnic backgrounds may benefit from behavioral management programs in the home environment (e.g., Arnold et al., 2003; Capage, Bennet, & McNeil, 2001; Reid, Webster-Stratton, & Beauchaine, 2002). Reid et al. (2002) examined the use of parent training for parents of Head Start preschoolers. At the end of treatment, mothers in the intervention condition, regardless of ethnicity (Caucasian, African American, or Hispanic), evidenced more positive parent–child interactions, greater consistency in parenting, and the use of fewer harsh parenting techniques. High levels of satisfaction with the intervention were found for all ethnicity groups. Likewise, in the MTA study, Arnold et al. (2003) reported more improvement for African American children in the behavioral component than those in the community care arm of the study. Studies such as these illustrate that the efficacy of behavioral treatments seen with majority group parents can be replicated with ethnic minority families.

Despite the successes in parent training seen in families who complete treatment, many ethnic minorities are less likely to seek or obtain mental health services (e.g., Armbruster & Schwab-Stone, 1994; Bauermeister et al., 2003; Bussing, Zima, Gary, & Garvan, 2003; Chronis, Diaz, & Raggi, 2003; Diaz, Jones, & Chronis, 2003). Mental health professionals, therefore, should be aware of the cultural factors that influence treatment-seeking behavior and response to treatments (Forehand & Kotchick, 1996). For instance, Bussing, Schoenberg, and Perwein (1998) found that, compared to Caucasian parents, African American parents were less likely to have heard of ADHD. Moreover, in a large survey assessing knowledge and opinions regarding ADHD, 31% of African American parents incorrectly believed that children with ADHD will outgrow the disorder (Harris Interactive, 2002). Parents who believe that their child will grow out of inattentive or hyperactive/impulsive behaviors may be less likely to devote their time, energy, and money in treatment for these behaviors. Also, values such as those of *machismo and dignidad* may influence treatment compliance and attendance among Latinos (Chronis et al., 2003; Vasquez-Nuttall, Avila-Vivas, & Morales-Barreto, 1984). For example, Latino families may feel that they can handle their children's behavior problems on their own, rather than involving mental health professionals or those outside the family. Moreover, in some ethnic groups living in the United States, extended family members are involved in child-rearing (e.g., Garcia, 1993; Harrison, Wilson, Pine, Chan, & Buriel, 1990; Harry, 1994) and therefore should be included in the treatment process in order to improve consistency and generalization. Thus, to increase treatment-seeking behavior, those who deliver psychosocial treatments should be sensitive to cultural issues, such as *machismo* or the influence of extended family members, that may present obstacles or strengths during the course of treatment.

5. Conclusions

The existing literature clearly supports the efficacy of behavior modification, namely behavioral parent training and classroom behavioral interventions, in the treatment of childhood ADHD, both alone and in combination with stimulant medication. Due to the large evidence base consisting of rigorous experimental investigations, behavioral parent training and behavioral classroom interventions have been designated "empirically supported" psychosocial treatments for ADHD (Pelham et al., 1998). Social skills training, summer treatment programs, and academic modifications also have some support in the treatment of specific impairments and are therefore considered promising treatments at this time. Existing research, including the results of the MTA study, suggests that combined behavioral–pharmacological treatment is most effective in terms of addressing existing comorbid disorders and broad domains of impairment, as well as in normalizing child behavior (MTA Cooperative Group, 1999a). Given the chronic and pervasive nature of ADHD, it is not surprising that intensive, multi-component treatments are often necessary. These treatments must be implemented consistently over the long-term in all settings in which impairment is present in order to bring about maximum benefit. The developmental psychopathology perspective provides a critical framework by which these interventions are selected and implemented.

There may be no area within the ADHD treatment literature that is lacking more than the treatment of adolescents. It follows from developmental psychology that modifications need to be made to the treatments that have been shown to work for children with the disorder. Adolescence is a time in which parents and teachers

struggle to maintain adequate supervision, involvement, and control over the adolescent while adolescents strive for autonomy in decision-making and the peer group becomes increasingly influential (Holmbeck et al., 2003). At the same time, the adolescent is faced with increasing academic demands, peer pressure, and opportunities to engage in risky behavior. For all of these reasons, adolescents with ADHD are particularly vulnerable to negative outcomes during this stage, while being less equipped to make adaptive decisions on their own. Perhaps for any or all of these reasons, the evidence base for existing adolescent interventions is substantially weak. Treatments that have overwhelming evidence for younger children, such as interventions that rely largely on parents, have been found less effective during this stage of development. Moreover, efforts to enhance adolescent responsibility and prosocial behavior through the use of coping and problem solving skills appear to have only minimal benefit. School-based interventions, including self-monitoring, functional assessments, strategy training and behavioral management techniques, have shown some promise in improving academic performance and on-task behavior. Unfortunately, the relatively few studies conducted prevent any definitive conclusions regarding efficacy from being made. Future research must be directed at identifying developmentally appropriate interventions that integrate the involvement of adolescent, parents and teachers and effectively address a wide range of issues. Also, efforts need to be directed at developing ways to identify and intervene with children at earlier ages to maximize outcomes and circumvent many of the challenges present when treatment begins during adolescence.

Once effective interventions are identified, the next step is to obtain a better understanding of factors that predict treatment response. The large and diverse sample of 7–9 year old children in the MTA study permitted more extensive analyses regarding factors that may moderate treatment outcomes. Despite significant limitations to this study (see Pelham, 1999 for a discussion of these limitations), these MTA findings shed light upon factors that may allow practitioners to better match treatments to children based on comorbidity, parental education, or occupational attainment. Also highlighted in these analyses is the importance of parental cognitions and psychopathology as potential barriers to parent-delivered interventions, pointing to the need for future research examining the effects of treatment components specifically aimed at improving parenting efficacy and decreasing parental symptomatology. These findings and many others still to come from the MTA study will likely generate increasingly sophisticated research examining the practical use of empirically supported treatments for children with ADHD and comorbid disorders. Future investigations of moderators of treatment response for adolescents with ADHD must also be pursued, as no existing studies have examined this issue.

As discussed herein, effective psychosocial treatments for ADHD are rarely implemented directly with the children. Rather, all of the empirically supported treatments for the disorder rely on parents and teachers to implement on a consistent basis. We know from the child therapy literature that among children who begin treatment, 40% to 60% drop out prematurely against the therapist's advice (Kazdin, 1996). This same limitation exists for medication, which requires that parents regularly attend physician visits and refill their children's prescriptions. Although medication is often viewed as an "easier" solution, ongoing medication management is usually necessary over the long-term to bring about continued effects (Sherman & Hertzig, 1991); yet, the average number of prescriptions filled for stimulant medication is two (Sherman & Hertzig, 1991). Therefore, future research must be directed at understanding what can be done to improve the attainment of, adherence to, and outcomes following both behavioral and pharmacological treatments. This likely involves addressing contextual variables that may contribute to poor treatment compliance (e.g., parental stress and psychopathology), exporting evidence-based treatments beyond specialized academic clinic settings to community locations (e.g., schools, mental health centers, pediatrics offices), and presenting treatments in a manner that is both culturally sensitive and accessible regardless of education or income level. For ADHD, perhaps more so than any other childhood disorder, research has identified very effective therapies. That is, we now know what treatments work for ADHD under optimal conditions. The challenge now is to better understand how to maximize the effects of these treatments in real-world settings.

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