USE OF SELF-MANAGEMENT TECHNIQUES FOR THE TREATMENT OF STUDENTS DIAGNOSED WITH ADHD: AN EMPIRICAL INVESTIGATION OF THE SELF-REGULATION OF BEHAVIOR

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Except where reference is made to the work of others, the work described in this dissertation is my own or was done in collaboration with my committee.

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DISSERTATION ABSTRACT

USE OF SELF-MANAGEMENT TECHNIQUES FOR THE TREATMENT OF STUDENTS DIAGNOSED WITH ADHD: AN EMPIRICAL INVESTIGATION OF THE SELF-REGULATION OF BEHAVIOR

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ADHD is the most commonly diagnosed behavior disorder of childhood, affecting 3 to 5 percent of the school-age population and often persisting into adulthood. Although psychostimulant medication and behavior management techniques have proven useful in reducing the symptoms of ADHD, they have not succeeded in producing long-term effects or altering the behavior of those with ADHD so it is similar to a control group. Therefore, a comprehensive treatment for children with ADHD has yet to be found. In addition, treatments are needed that give children with ADHD the tools necesary to

handle problems independently so that they can rely less on external agents of control as they progress developmentally. The present study evaluated the use of contingency-based self-management techniques in the treatment of students with ADHD by addressing several issues neglected by previous studies, including targeting the primary symptoms of ADHD for behavioral change, making available multiple reinforcements for self-reinforcement of appropriate behavior, and involving the child in multiple aspects of self-management, including goal setting. Outcome measures included daily classroom behavioral observations and biweekly teacher completed rating scales. Parent rating scales and student self-reports were also administered at pre-test and post-test.

Results indicated significant reduction in problematic classroom behaviors often associated with ADHD (Off task and Fidgeting) for all four students based on data from behavioral observations. For two of the participants, these reductions were maintained up to a month following the discontinuation of the behavioral intervention. Teacher completed rating scales also revealed significant reductions in ADHD related symptomatology during the period of class in which the behavioral observation took place. However, according to teacher ratings, overall behavior remained at baseline levels. Teacher rating of academic productivity were inconclusive. Only one parent noted significant changes in her son's ADHD related symptomatology from pre-test to post-test, and child self-report measures noted few changes from pre-test to post-test. Overall, results are promising and suggest that programs of self-management for students diagnosed with ADHD deserve further evaluation.

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INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is the most commonly diagnosed behavioral disorder in children, affecting 3 to 5 percent of children (American Psychiatric Association, 1994; Barkley, 1998; National Institute of Health, 1998). ADHD is not just a phenomenon of Western culture; it is also exhibited worldwide, with variations in prevalence (Barkley, 1998). Its widespread prevalence, associated impairment, and poor prognosis have made effective treatment for the disorder a major public agenda, as evidenced by a recent multi-modal treatment study of children with ADHD (MTA Cooperative, 1999).

Thus far empirically supported treatments for children with ADHD consist of psychostimulant medication, behavior therapy, or a combination of the two (Pelham, Wheeler & Chronis, et al., 1998). However, these forms of treatment have not been successful in producing long-term treatment gains once discontinued, and neither treatment has resulted in functioning that would be described as "typical." A specific criticism of behavior therapy has been that its effectiveness depends primarily upon the motivation and capability of the adults in the child's life to follow through with the intervention (Pelham & Waschbusch, 1999). While behavioral change is often initiated through a well-structured environment and implemented by significant others (e.g., parents and teachers), progression toward independence and self-control of behavioral change relies less on external control and more on a student's ability to monitor and control his or her own behavior.

Children with ADHD often have difficulties maintaining self-directed behavior, especially when the immediate environmental distractions are salient, as typically is the case in the classroom. Barkley (1997a) emphasizes that effective treatments will make use of "forms of stimuli comparable to the internal counterparts that are proving so ineffective." Techniques such as self-monitoring, self-evaluation, and self-reinforcement show promise in their ability to become the externalized representations of these internal counterparts.

Treatments are needed that give children with ADHD the tools they need to handle problems independently so that they can rely less on external agents of control as they progress developmentally. Self-management techniques may be able to promote the ability of children with ADHD to self-regulate and become managers of their own behavior. This independence also appears to be a goal of consumers -- their parents and teachers. Given the complexity of the symptomatology of the ADHD diagnosis and the associated problematic functioning in cognitive, academic, behavioral, physical, and social domains, a single treatment approach would not be encompassing enough to affect all the sequelae of the disorder. Self-management techniques are strategies that have conceptual promise in treating ADHD, and have not yet been thoroughly and effectively researched as treatment components. This study was designed to further evaluate the use of contingency based self-management techniques for the treatment of students with ADHD within the school setting.

Diagnostic Criteria

In regard to ADHD, the diagnostic criteria of the DSM-IV are described as "the most rigorous and most empirically derived criteria available in the history of clinical

diagnosis for this disorder" (Barkley, 1998). As Barkley (1998) indicates, the "holy trinity" of ADHD is the chronic difficulties of inattention and/or impulsivity and hyperactivity. The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1994) requires that six or more of the nine symptoms of inattention and/or hyperactivity-impulsivity be present for a diagnosis. These symptoms must be more severe and persistent in children with ADHD when compared with others at a comparable developmental level (American Psychiatric Association, 1994).

Symptoms of inattentive behavior associated with ADHD include difficulty sustaining attention, distraction, forgetfulness, organizational difficulties, and problems listening (American Psychiatric Association, 1994). Symptoms of hyperactive behavior include fidgeting, excess motor activity, loudness, or excessive talking, and symptoms of impulsivity include difficulty waiting for turn, blurting out, and interruptive behavior (American Psychiatric Association, 1994). For a diagnosis to be considered, these patterns of behavior need to be present before age seven and prevalent across two or more settings, such as school and home (American Psychiatric Association, 1994). Along with the primary symptoms, ADHD is often associated with cognitive, behavioral, emotional, physical and academic difficulties (Barkley, 1997c; Pelham, et al., 1998; Shelton & Barkley, 1995; van der Krol, Oosterbaan, Weller, & Koning, 1998).

Subtypes

The DSM-IV (American Psychiatric Association, 1994) divides the diagnosis of ADHD into subtypes of Predominantly Inattentive Type, Predominantly Hyperactive-Impulsive type, or Combined Type based on whether the criteria are met for the

inattentive symptoms list, the hyperactive-impulsive symptom list, or both. Current research appears to be indicating that it is unlikely that these subtypes have the same impairment in attention (Barkley, 1998). In fact, Barkley (1998) points out that the Predominantly Inattentive Type seems to be associated with more problems in "focused/selective attention and sluggish informational processing; whereas the Combined Type of ADHD is associated more with problems of persistence, and effort and distractibility." It is unclear whether these types are separate diagnoses, or different developmental stages of the same diagnosis (Barkley, 1998). It is known that symptoms of hyperactivity-impulsivity appear first, usually diagnosed in preschoolers, and decline with developmental level, as symptoms of inattention increase with development (Barkley, 1998) In addition, symptoms are usually more apparent in school-age children (Barkley, 1998).

Comorbidity

Coupled with its high prevalence and severity of symptoms, ADHD is often associated with other diagnoses such as conduct disorder, oppositional defiant disorder, depression, anxiety and learning disabilities (Anastopoulos & Barkley, 1988; Barkley, 1991; Shelton & Barkley, 1995). Moreover, up to 44% of children with ADHD have at least one other psychiatric disorder, 32% have two others and 11% have at least three others (Szatmari, Offord, & Boyle, 1989). Oppositional Defiant Disorder and Conduct Disorder appear to be the secondary diagnoses most common in children with ADHD, with up to half of these children being dually diagnosed (Biederman, Newcorn, & Sprich, 1991), and these dually diagnosed children have been found to be less responsive to

treatment and have a more negative prognosis than children with ADHD alone (Biederman et al., 1991).

Prevalence

Although it was once thought that children outgrew ADHD, researchers now suggest that approximately 50 to 80% of children who are diagnosed with the disorder continue to exhibit deficits as adolescents and adults (Barkley, Fischer, Smallish & Fletcher, 2002; Pelham & Murphy, 1992), and that ADHD affects about 4 percent of the adult population (as cited in Barkley, 1998). Prevalence is also known to vary according to gender of the children being studied, occurring more frequently in males than females, with reported ratios of 4:1 to 10:1, depending on the sample (American Psychiatric Association, 1994).

TREATMENT OF ADHD

Given its pervasiveness and associated impairments and chronicity, treatment of ADHD has risen to national interest for mental health professionals, as evidenced by a recent collaborative multi-site, multimodal treatment study of children with ADHD initiated by the National Institute of Mental Health (NIMH; Arnold et al., 1997; Richters et al., 1995). It is generally agreed upon in the literature that there are two validated short-term treatments, psychostimulants and behavior modification (Brown & La Rosa, 2002; Pelham, et al., 1998).

Psychostimulant Medication

As recent as 1995, stimulant medication use was estimated at 1.5 million children annually, or 2 to 6 percent of all elementary age children in North America (Goldman, Genel, Bezman & Slanetz, 1998; Richters et al., 1995; Robinson, Sclar & Skaer, 1999; Safer, Zito, & Fine, 1996). Reportedly, there has been a 2.5 fold increase in the prevalence of treatment with Ritalin from 1990 to 1995 (Goldman et al., 1998; Robinson et al., 1999; Safer et al., 1996). This sizable increase in the use of methylphenidate is likely the result of many reasons, including: more children are using medication into their teens, more students with Predominantly Inattentive Type are being placed on medication, the increase in the proportion of girls on medication, and the increase in the number of children being diagnosed with ADHD and treated with medication (Safer et al., 1996). Regardless, CNS stimulants are the most frequently used medications for the management of ADHD and the most well studied (Brown & La Rosa, 2002).

Consistent results from well-designed double blind, placebo controlled studies demonstrate the effectiveness of CNS stimulants in decreasing hyperactivity and impulsivity and increasing attention in individuals with ADHD (Brown & La Rosa, 2002). CNS Stimulants have also shown several positive short-term effects on many behaviors associated with the diagnosis of ADHD, such as increased behavioral compliance, decreased aggression, improved peer relations, increased effort on tasks (Brown & La Rosa, 2002; DuPaul, Barkley & Conner, 1998; Elia, Rappoport & Kirby, 1993; Goldman et al., 1998; Pelham & Murphy, 1992; Richters et al., 1995; Swanson, McBurnett, Christian & Wigal 1995), and improvement in cognitive functions (Rapport & Kelly, 1993). Use of stimulants has also been documented in the treatment of antisocial behaviors associated with Conduct Disorder and appears to be beneficial, but not well established (DuPaul et al., 1998). Additionally, mild mood changes have been reported by children using stimulant medications, usually by children being treated with high doses of methylphenidate (DuPaul et al., 1998). Extensive empirical research results indicate that stimulant medication enhances performance in laboratory measures of vigilance, impulse control, fine motor coordination, and reaction time in children with ADHD (DuPaul et al., 1998). DuPaul and colleagues (1998) point out that overall research findings indicate that effects of stimulant medication are most likely exhibited in situations that require children to restrict their behavior and concentrate on assigned tasks.

Although the precise mechanism of action is unknown, stimulant medications are thought to act by enhancing dopamine and norepinephrine neurotransmission (Brown & La Rosa, 2002). Categories of stimulant medication include methylphenidate (e.g., Ritalin), dextroamphetamine (e.g., Adderall), mixed salts amphetamine, and Pemoline

(e.g., Cylert) (Brown & La Rosa, 2002). Use of Pemoline has been associated with cardio-toxicity and hepatic failure; thus, it is no longer recommended for the management of ADHD (Brown & La Rosa, 2002). Use of Adderall has been shown to be at least as effective as Ritalin in managing the symptoms of ADHD for short-term durations (Pelham el al., 2000). In addition, extended release preparations of both of these commonly used medications have been developed (e.g., Concerta, Adderall-XR) and have increased in popularity due to ease in once-daily administration (Brown & La Rosa, 2002).

The use of stimulant medication for the treatment of ADHD has been so successful that it is often a standard to which other interventions are compared (Hinshaw & Erhardt, 1991). In fact, no other mode of treatment has the documented record of success that stimulant medication has (Whalen & Henker, 1997). An additional advantage of the use of stimulant medication is its affordability; it typically costs between one and two dollars a day (Whalen & Henker, 1997). However, the frequent long-term use of the medication can be a financial obstacle for many.

Most recently, The Multimodal Treatment Study of Children with Attention-Deficit/Hyperactivity Disorder (MTA Cooperative Group, 1999) demonstrated that combined behavioral intervention and stimulant medication offered no additional greater benefits than medication management for core ADHD symptoms. These controversial results have been heuristic in nature, spurring many debates about the role of medication management in the treatment of ADHD, the use of behavioral therapy in conjunction with medication, construction of empirical studies focused on assessment of therapeutic techniques, and the theoretical underpinnings of the diagnosis of ADHD.

Critique. Despite its widespread clinical use and evidence of positive short-term behavioral changes, treatment of children with stimulant medication has been criticized for several reasons. To begin with, it has been shown that stimulant medication is not a successful treatment for some children, with as many as 20 to 30% of children showing no positive responses to the drugs (Du Paul et al., 1998; Richters et al., 1995). These percentages may be higher with the Predominantly Inattentive Subtype (30 to 45%) (as cited in DuPaul et al., 1998). Proponents of its use estimate that up to 90% of children will respond if titration is done carefully (Goldman et al., 1998). The MTA study supports this estimate (Greenhill et al., 2001). During a controlled 28-day titration protocol, the response rate for Ritalin was at 77 percent, and 10 percent of the children who did not respond to Ritalin successfully responded to amphetamine.

Furthermore, it is widely known that there are large individual differences in response to stimulant drugs such as Ritalin across children, dosage and behaviors (DuPaul et al., 1998; Northrup et al., 1999; Rapport & Kelly, 1993; Whalen & Henker, 1997). Related to this, unexamined dose-response relationships may be obscuring important individual differences across children (Richters et al., 1995). Many of the studies do not consider previous pharmacological treatment or the possible link of drug response with a neurological or physical characteristic (Richters et al., 1995).

Although stimulant medication has been successful in short-term behavioral improvements, the use of this medication appears less satisfactory in having a long-term benefit for children diagnosed with ADHD (DuPaul et al., 1998; Richters et al., 1995). The effects of stimulant medication on academic achievement are a good example. The results of these studies show promising short term improvements in performance, but no

significant long term findings of scholastic success, as of yet (Brown & LaRosa, 2002; DuPaul et al., 1998; Whalen & Henker, 1997).

Even with short-term behavioral improvements through the use of Ritalin, additional therapies may be required. Northrup et al. (1999) provide empirical evidence that indicates behavioral effects of methylphenidate are influenced by the immediate environment. In this study, children who were not supervised by an adult in an academic setting, regardless of medication status, showed higher levels of disruptive and off-task behavior than children who were in time out, interacting with the teacher, or being observed by a staff member. According to the researchers, these results suggest that other behavioral consequences may be necessary to receive the most beneficial effects from the medication.

Another suggested complication in the use of stimulant medication is the possibility of state-dependent learning in which the performance gains during the medicated state are not seen in the non-medicated state (Richters et al., 1995). However, concerns regarding state dependent learning have not been substantiated by empirical literature (DuPaul et al., 1998).

Research studies of stimulant medication have also been criticized because of limited samples. Most of the empirical investigations have been on children between the ages of 6 and 12; therefore, caution must be taken in generalizing the benefits of medication to younger and older age groups (DuPaul et al., 1998). In addition, like many treatments for ADHD, pharmacotherapy is criticized for not placing children in the normal range of functioning, although there are improvements in certain behaviors (Richters et al., 1995). Lastly, Abikoff (1985) cites additional limitations: the weak

effects of medication on cognitive ability (e.g., reasoning, problem solving, and learning), interpersonal skills, and responses to social demands.

The Multimodal Treatment Study of Children with Attention Deficit/Hyperactivity Disorder attempted to address some of the concerns found in smaller studies (MTA Cooperative Group, 1999). MTA findings showed pharmacological interventions were more successful than behavioral interventions, behavioral interventions had no additive treatment effects when combined with stimulant medication, and behavioral treatments were not any different than non-standardized treatments from community providers (MTA Cooperative Group, 1999). However, Pelham (1999) is quick to point out that the results do not say, "Just say yes to drugs," and that methodological concerns plague NIMH's study as well. For example, the design of the study was significant in determining the outcome because post treatment measures were administered after the behavioral treatment was discontinued, but while the participants were still receiving medication (Pelham, 1999). In addition, Pelham (1999) discusses problems with sampling, including 70 percent of the community sample taking medication during the study. Pelham (1999) also points out that parents preferred the behavioral treatment, and that they were more likely to see their children as improved if they received a combination of medical treatment.

The MTA study affirms research on the positive effects of stimulant medication on the core symptoms of ADHD, but it also speaks loudly to the need for advancement in the empirical literature of treatment outcome studies. Even with its limitations, psychostimulant medication is far more widely employed, less expensive, and has much more empirical support than psychosocial treatments (Pelham et al., 1998). However, it

should not be treated as a panacea, and criticisms in the literature such as these suggest that alternative treatments are needed to address areas where psychopharmacology falls short (Richters et al., 1995).

Behavior Therapy

Behavior therapy is considered the second most common treatment for ADHD, with the primary treatment often being medication (Pelham & Hoza, 1996). Clinical use of behavioral therapy has often involved training parents to implement contingency management techniques with their children as well as consulting with the child's teachers to form a plan of behavior management in the school system (Pelham & Waschbusch, 1999).

The majority of studies utilizing behavioral therapy are based on parent training and classroom intervention (Pelham et al., 1998). Results of research studies on behavioral treatment approaches in the classroom and at home consistently show improvement in observed behavior (Pelham et al., 1998), and behavioral treatments conducted by trained individuals in controlled settings typically have larger treatment effects than those obtained in parent training or classroom management studies (Pelham et al., 1998). Because of this discrepancy in results, clinicians and researchers have become aware of the need for intensive psychosocial treatment programs. Given the chronic nature of ADHD and need for therapies that offer more significant improvements, Pelham and Hoza (1996) have designed an intensive summer treatment program that has had promising results. However, a randomized trial has not yet been conducted to further support this treatment (Pelham et al., 1998).

School Setting. Behavior therapy used in the classroom to more effectively manage the behavior of children with ADHD can include a multitude of teacher mediated techniques and in-class consequences, such as strategic teacher attention, tangible rewards and token economies, response cost, time-out, and suspension (Carlson & Lahey, 1988; Pfiffner & Barkley, 1998). Peers have also been used effectively to reinforce appropriate behavior in the school (Carlson & Lahey, 1988; Pfiffner & Barkley, 1998).

Pfiffner and Barkley (1998) reviewed general principles of classroom behavior management techniques that apply to children with ADHD. First, rules and instructions should be easy to understand and relatively brief. Instructions should also be made visable in the child's external environment, so that the teacher can refer to them frequently and have the child repeat them out loud. The teacher must remember that children with ADHD will have difficulty adhering to classroom rules and that they have, "more trouble doing what they know, rather than knowing what to do (Barkley, 1998)." Thus, frequent repetition of the rules and consequences and decreases in the delays between the child's behavior and teacher implemented consequences will likely increase the child's ability to effectively manage his or her behavior in class.

When using consequences for the child with ADHD, they must be delivered immediately and swiftly. The efficacy of the consequences will be affected if they are delayed; this is even more important to consider when working with a child with ADHD than a child without ADHD. In addition, these consequences will need to be delivered more frequently for children with ADHD than for children without ADHD, and they often need to be more salient than those used for children without ADHD. Occasional praise or reprimands will not effectively manage the behavior of children with ADHD.

Punishment for the ADHD child should remain in balance with rewards, or a behavioral management program will not be as effective. Positives should equal or exceed the amount of negatives that the child with ADHD receives in the classroom. In addition, the positives or rewards that are used for children with ADHD will need to be changed frequently because children with ADHD become satiated more quickly to consequences than children without ADHD. The reinforcement value of a particular reward declines in value more quickly for a child with ADHD than for a child without ADHD (Pfiffner & Barkley, 1998). When positive or negative consequences for behavior are delivered immediately and at a high rate, the behavior of children with ADHD is often indistinguishable from children without ADHD (Barkley, 1998). Tasks with colorful or highly stimulating education materials also improve the ability of a child with ADHD to attend (Barkley, 1998).

Another key ingredient to effectively managing the behavior of a child with ADHD in the classroom is to plan ahead and anticipate any difficulties that might occur during transitions or changes in the set schedule. As Pfiffner and Barkley (1998) indicate, having the child "think aloud and think ahead" is an effective method of preparing the child to behave appropriately in upcoming situations.

Motivation continues to be a difficulty of the student with ADHD as well, especially in tasks that require frequent response with little or no reinforcement (Barkley, 1998). According to Barkley (1998), children with ADHD have "diminished capacity to bridge the delays in reinforcement and permit the persistence of goal-directed acts" because, unlike other children, they are not able to keep their focus on the goal with self-

directed internalized language. Again, children with ADHD will need assistance in the school setting to set goals and to externally remind themselves of their goals.

Parent Training. In the 1970's researchers began to focus on poor child rearing as a possible cause of hyperactivity (Barkley, 1998). Although some correlational research found positive relationships between negative parental-child relationships and symptoms of ADHD, the direction of this relationship was difficult to determine (Barkley, 1998). However, family context is still seen as an important variable in treatment and predicting outcome of children with ADHD, even though its specific relationship has not been determined (as cited in Barkley, 1998). Findings such as these have caused parent training to become widespread in the treatment literature for ADHD. In parent training (PT), parents are taught basic premises of contingency management during weekly group or individual sessions that include techniques such as time-out, point systems and positive reinforcement.

Studies that use these methods of intervention consistently reveal improvements in behavior (Anastopolous, Smith & Wein, 1998; Pelham et al., 1998). One of the advantages of PT is that it can target primary ADHD symptomatology as well as comorbid features, such as those associated with oppositional-defiant disorder (Anastopolous et al., 1998). In addition, the use of parent training has been extended and is showing promising results in other domains of functioning in ADHD children. A recent study shows that ADHD children who are socially rejected benefit substantially from social skills training, when their parents are trained to facilitate the transfer of treatment effects (Frankel, Myatt, Cantwell, & Feinberg, 1997). Parent training has shown promise in the facilitation of treatment effects of Cognitive Behavioral Therapy treatments for

children with ADHD as well; it is not simply used for teaching contingency management techniques (e.g., Frankel et al., 1997; Whalen, Henker & Hinshaw, 1985).

Parent training programs generally contain some form of positive reinforcement procedure, such as positive attention and contingent rewards, and some form of punishment procedure, such as time-out (e.g., Barkley, 1997d; Forehand & McMahon, 1981). Sessions for parent training programs can be done in an individual or group format and last for approximately 12 sessions. One criticism of current parenting techniques for ADHD children is that they focus on child misbehavior rather than the primary symptoms of ADHD (e.g., training skills of attention using behavioral therapy techniques) (Pisterman, Firestone, McGrath, Goodman, Webster, Mallory, & Goffin, 1992).

Critique. Pelham and Waschbusch (1999) critique the use of behavior therapy for children with ADHD, and mention several of its weaknesses. First, although improvements in behavior as measured by rating scales and behavioral observations are indicated after the use of behavior therapy, behavior therapy does not "normalize" the behavior of the child with ADHD. In addition, similar to medication use, the short-term effects of behavior therapy are only in place while the program is in effect, and some children fail to show improvements with behavior therapy. However, this failure is often attributed to the inconsistency of the parents or teachers in following the behavior therapy program. Overall, Pelham and Waschbusch (1999) conclude that the effectiveness of behavioral therapy for children with ADHD depends primarily upon the motivation and capability of the adults in the child's life to follow through with the intervention.

Self-Management Techniques

Increasing concern of parents and teachers regarding independence and responsibility of their children with ADHD has flared interest in self-management techniques (Teeter, 1998). From a broad perspective, self-management encourages independent functioning of the client and emphasizes the client's responsibility for change (Kanfer & Gaelik-Buys, 1991). According to Kanfer and Gaelik-Buys (1991), self-management is based on the rationale that many behaviors are not easily observed by anyone but the client, that the client needs to be actively involved in the goal making process, and that the client should learn a "set of generalizable coping strategies."

Kanfer and Gaelik-Buys (1991) conceptualize self-management processes using social learning theory. In this theoretical framework it is necessary that the individual considering behavioral change contemplate goal directed behavior (Kanfer & Gaelik-Buys, 1991). For example, it would be hypothesized from this model that having the child choose a goal to monitor would increase his or her investment in behavior change. It would also be important for the therapist to help the child recognize that the goal is achievable and that he or she is able to change the behavior in question. Thus, when a child accomplishes his or her goals he or she can make personal attributions for the behavioral change (Braswell, 1995; Kanfer & Gaelik-Buys, 1991). The belief that the accomplishment was related to internal effort of the child would then predictably increase the child's self-esteem (Dweck & Legget, 1988). Results such as these in behavior change programs would be especially successful for children with ADHD because previous research has shown that children with ADHD have a tendency to make external attributions or view their success or failure as a result of "luck" (Hoza, Pelham,

Washbusch, Kipp & Owens, 2001; Linn & Hodge, 1992), rather than take responsibility for their success.

In accordance with Kanfer's theory, simple self-regulated tasks, such as allowing children to make their own choices, has been shown effective in improving the behavior of children with ADHD in the classroom. For example, Powell and Nelson (1997) examined the effects of allowing a student with ADHD to choose his own academic assignments within a single-subject design. The child's classroom behavior improved when he was allowed to choose from three assignments identical in difficulty. Similarly, Northrop, Jones, Broussard, and George (1995) compared the use of a commonly used reinforcement survey with the use of a verbal or pictorial choice assessment in which children diagnosed with ADHD were asked to choose between two categories of stimuli (e.g., "Would you rather get things to eat like cookies chips or popcorn or get things to do like art projects, play computer games or go to the library?"). Results showed that the pictorial and verbal forced choice comparisons more accurately differentiated between the high and low reinforcer preferences and were more likely to correspond with the subsequent reinforcer assessment than the survey.

According to the social learning theory model of self-regulation, an unsatisfactory situation causes an individual to contemplate change and motivates that person toward change and goal formation. For example, if a child is continuously getting in trouble for misbehavior and is unable to participate in recess, Kanfer would hypothesize that the child would become unsatisfied with missing playtime and would attempt to change the behavior that continuously places him or her in trouble. Kanfer and Gaelik-Buys (1991) term this process as "anticipatory self-regulation." However, this commitment to change

often does not necessitate actual change; self-management techniques are often called into action to support this decision of goal directed change (Kanfer & Gaelik-Buys, 1991).

Hoff and DuPaul (1998) listed several potential advantages of using self-management procedures. First, children "take control" of their behavior or become agents responsible for observation, reinforcement and change of behavior, therefore, increasing the likelihood of maintaining their performance without the use of an external agent. Second, when adults are in charge of the contingencies they often miss much of the child's behavior. For example, a teacher who is in charge of monitoring the behavior of several children in the classroom will not be able to monitor each child's behavior precisely. He or she will only be able to obtain a sample of the child's behavior and will only provide contingent responses to the sample of behavior that he or she has witnessed. Putting the child in charge of his or her own contingencies could result in more consistent responses to behaviors than that of the teacher or parent, assuming that the child is an accurate observer (Gross & Drabman, 1982).

Third, adults who are involved in the administration of these contingencies often become discriminative stimuli, and thus children only engage in the desired behavior when the adult is present (Gross & Drabman, 1982). An excellent example of this is a study by Northrup et al. (1999). In this experiment children who were not supervised by an adult in an academic setting, regardless of whether they were being treated with medication, showed higher levels of disruptive and off-task behavior than children who were in time out, interacting with the teacher or being observed by a staff member.

Self-management procedures still require an amount of adult regulation and time commitment (Kern et al., 1997). For example, adults usually initiate, train and assist the child in the use of these methods (Kern, Marder, Boyajian, Elliot & McElhattan, 1997). Regardless, self-management techniques do not require as much assistance from adults, once children learn the techniques (Gross & Drabman, 1982; Hoff & DuPaul, 1998). Another advantage of self-management is that the behavior changes resulting from these techniques are hypothesized to have stronger maintenance effects than contingency management procedures (Gross & Drabman, 1982; Hoff & DuPaul, 1998). Another positive viewpoint of self-regulatory skills is that they help children realize that they can exert control over what they do (Braswell, 1995).

Self-management strategies can generally be divided into two groups "procedures based on the principals of contingency management" and procedures based on "cognitive control" (as cited in Shapiro, DuPaul, & Bradley-King, 1998). Self-management interventions based on principals of contingency management usually include techniques such as self-monitoring, and self-reinforcement, and they emphasize response-consequence relationships (Shapiro et al., 1998). Whereas, those based on cognitive control strategies emphasize antecedent-response relationships, and include techniques such as self-instructional training and problem solving (Shapiro et al, 1998). Cognitive control strategies, especially self-instructional training, have been the primary focus of research on self-management techniques (Hinshaw & Melnick, 1992), and these studies have shown nonexistent to weak treatment effects (Abikoff & Gittleman, 1985; Braswell et al., 1997; Brown, Borden, Wynne, Schleser & Clingerman, 1986; Cohen, Sullivan, Minde, Novak & Helwig, 1981; Eastman & Rasbury, 1981; Friedling & O'Leary, 1979;

Goodwin & Mahoney, 1975; Horn, Ialongo, Greenberg, Packard & Smith-Winberry, 1990; Horn et al., 1991; Horn, Ialongo, Popovich & Peradotto, 1987; Ialongo et al., 1993). However, strategies based on contingency management, such as self-monitoring, self-evaluation, and self-reinforcement, have shown consistently positive treatment outcomes in the empirical literature (see Table 1).

It may be that criticisms of the ineffectiveness of self-management techniques are primarily criticisms of cognitive control techniques, rather than the use of self-management as a whole. For example in Abikoff's (1985) critical review of cognitive training interventions, only 5 of the 22 studies reviewed included components of self-management other than problem solving or self-instructional training. More current reviews have found the combination of stimulant medication and self-reinforcement, with minimal support from self-instructional training (Ervin, Bankert & DuPaul, 1996; Pfiffner & Barkley, 1998).

Further studies need to be done in the general education setting to address the inconsistent findings of studies on self-management (Hoff & DuPaul, 1998). Hoff and DuPaul (1998) indicate that an important area for research would be to examine the critical factors related to the effectiveness of self-management. For example, task difficulty, motivation for changing the behavior, reinforcement, goal setting, and performance feedback may all influence the use of self-monitoring techniques (Gross & Drabman, 1982). Overall, the components of self-management have proven useful to children with and without ADHD. Edwards, Salant, Howard, Brougher, and McLaughlin (1995) describe it as "a very powerful tool" that might allow otherwise segregated children to be included in the regular classroom.

Self-Recording Methods

Two closely related methods of self-recording behavior and self-management components are self-monitoring and self-evaluation. Training in self-monitoring and self-evaluation attempts to enhance skills necessary for task performance and to reverse maladaptive styles of responding, such as impulsivity and carelessness, which are intrinsic to children with ADHD (Ervin et al., 1996; Hinshaw & Ernhardt, 1991). It is thought that an increased awareness of problematic behaviors may increase self-regulatory behavior (Ervin et al., 1996). Both self-monitoring and self-evaluation increase the child's responsibility in monitoring his or her own behavior. As a result, less time is taken from the teacher to regulate the student's behavior in the classroom or the parent to regulate the child's behavior at home (Edwards et al., 1995; Ervin et al., 1996; Mathes & Bender, 1997; Shapiro & Cole, 1994).

Kanfer (1970) advocates for the use of self-recording techniques, saying that the knowledge they provide about controlling variables and their predicted effects on behavior make the techniques "clinically powerful tools of behavior modification." However, he also cautions against the use of self-recording techniques as the primary means of behavior modification, saying that behavior modification is a "precondition for execution of new adaptive behaviors." Overall, these procedures have shown positive results in producing, maintaining and generalizing behavior change in students with behavior disorders, including those diagnosed with ADHD. (See Table 1.)

Self-Monitoring

The focus of self-monitoring is to teach the child to become a trained observer of his own behavior and to make "objective" recordings of his behavior without prompting

from others (Braswell, 1995; Braswell & Bloomquist, 1991; Ervin et al., 1996; Shapiro & Cole, 1994). The goal of self-evaluation, however, is for the child to compare the quality of his or her behavior against some existing criterion (Braswell, 1995; Braswell & Bloomquist, 1991). Both self-monitoring and self-evaluation are often used in a more comprehensive self-management treatment package which usually includes self-reinforcement (Ervin et al., 1996), and they are often utilized in the academic setting (Shapiro & Cole, 1994). According to Shapiro and Cole (1999), self-monitoring plays a critical role within the self-regulation process and to separate it from the process would be. "conceptually inconsistent with the nature of the intervention."

One of the most important considerations in asking children to self-monitor is to make sure that the target behavior is clearly described and that they understand what they are monitoring and how to do it (Shapiro & Cole, 1999). The type of behavioral recordings that the individual is asked to collect often vary based upon the type of behavior the individual is recording. For discrete behaviors, self-monitoring the frequency of the behavior is more advantageous; whereas, if the target behavior varies in the length of time of occurrence, time sampling measures are more advantageous (Gross & Drabman, 1982). Kanfer and Gaelik-Buys (1991) suggest modeling the self-monitoring sequence and having the client rehearse the techniques of self-monitoring with the recording devices before data collection actually begins. Since self-monitoring is used frequently in the school system it is helpful to select procedures that are the least intrusive, most practical and socially acceptable (Shapiro & Cole, 1999).

Self-monitoring techniques often include a cueing device, usually an auditory sound, which prompts the child to observe his or her own behavior at regular intervals

(Shapiro & Cole, 1994). Studies have been done with non-cued self-reporting, but these studies typically show that children's recordings are not as consistent, even though the children do learn the process (as cited in Shapiro & Cole, 1999). Typically the cues are randomly presented during a specific time period to prevent the children from predicting the time at which the tone will occur and only engage in the appropriate behavior at that time (Shapiro & Cole, 1999). According to Shapiro and Cole (1999) external cueing is likely useful with young children or children with significant disabilities because it serves as a salient reminder of the time at which they are to record their behavior.

External cueing can also be detrimental if it takes the students attention from the task or disrupts their thinking. In addition, a study by Barkley, Copeland and Sivage (1980) indicates that schedule shifts can be detrimental for children with ADHD when large changes are made over short periods of time. In their study they had children ask themselves if they were on task at the sound of a tone that was emitted randomly an average on once per minute during the first week and once every three minutes during the second and third week. However, disruptive behavior appeared to increase as the tone was faded; therefore, Barkley et al. (1980) made a more gradual shift during the second phase of treatment, sounding the tone once every minute first portion of the phase and once every one and a half minutes during the second portion of the phase. A smaller shift in the time-sampling showed no increases in misbehavior, suggesting that small schedule shifts over short periods of time are more successful in maintenance of behavior change.

Lengthier periods of self-monitoring can be used, and studies have been done that have students self-monitor certain behaviors after each class period. Researchers in these studies suggest that this procedure is easy to use and requires no additional teacher time,

effort, and prompting (Shapiro & Cole, 1999). In a recent empirical investigation Shapiro et al., (1998) had a child and his teacher rate 5 classroom behaviors on a scale of 0 (poor) to 5 (excellent) after a 45-minute social studies class. Results showed that his on task behavior during social studies increased from 75% to 100% and consistently exceeded that of his peers.

A primary concern with the use of self-monitoring is "reactivity" or how simply measuring the behavior affects its manifestation (Kanfer, 1970; Shapiro & Cole, 1999). This becomes more of a concern when self-monitoring is used primarily as an assessment tool (Shapiro & Cole, 1999). Self-recordings of behavior can also be influenced by demand effects (Kanfer, 1970). In other words the recordings can be affected by how the client is influenced to record by the therapist. For example, if the goal is to reduce a problematic behavior the client may begin to record reductions in the behavior to show improvements toward the end goal rather than to reflect true change.

Another concern of self-monitoring is the timing at which it occurs. Since self-recording can occur before, during or after the targeted behavior its placement could influence results (Kanfer, 1970). For example, asking clients who have difficulty controlling their anger to tape record their conversations may have quite a different effect than asking those clients to rate their conversations after they are over. Another difficulty with incorporating self-monitoring into a classroom includes the distraction of the class by the cueing device (Shapiro & Cole, 1994). In addition, problems with accuracy may occur in the classroom because the students become so engaged in the academic task they forget to self-monitor (Shapiro & Cole, 1994). Similarly, difficulty discriminating the monitored behavior from other behaviors, and decreased interest in the treatment may

influence the effectiveness of self-monitoring (Shapiro & Cole, 1994). For these reasons, procedures to improve accuracy include comparing self-recordings with those made simultaneously by an external observer, and using reinforcement (Shapiro & Cole, 1999).

Despite these difficulties, self-monitoring is relatively easy to implement. Furthermore, accuracy of self-monitoring has been shown to be irrelevant in achieving desired change (Harris, 1986). Harris (1986) examined the effects of self-monitoring on attention and productivity in academic tasks. Self-monitoring increased both academic success and on task behavior. In this study accuracy checks by the teacher were not made and a significant improvement in behavior was noted. Possibly, effective change in behavior is strongly influenced by the ability to recognize that behavior.

More importantly, participants have indicated that they find the task of self-monitoring enjoyable and interesting, specifically stating that they like it because they complete more and produce a higher quality of work (Edwards et al., 1995). In addition, self-monitoring has been thought to motivate children to set future goals based on their previous experience (Harris, 1986), and more recent studies have focused on goal setting as a facet of self-monitoring (Ajibola & Clement, 1995). Graphic display of the data also appears to be particularly rewarding to the children (Harris, 1986).

Self-Evaluation

In self-evaluation, the child compares his or her behavior against a self-determined or externally determined standard (Gross & Drabman, 1982; Shapiro & Cole, 1994). It is theorized that self-evaluation provides a feedback system to an individual that guides further response (Gross & Drabman, 1982). A basic procedure often used for self-evaluation includes having the teacher rate the student on a numerical scale for academic

performance or behavior, then having the student match his or her ratings to the teacher ratings (Shapiro & Cole, 1994). The teacher's ratings of the student's behavior are then gradually faded so that the student is solely responsible for rating his or her behavior (Shapiro & Cole, 1994). If the targeted behavior does not increase or decrease, as desired, then the teacher may need to increase the frequency of matching evaluations with the student. Booster sessions are often necessary to make sure that the student is continuing to monitor his or her behavior in an appropriate fashion (Shapiro & Cole, 1994).

In studies comparing self-monitoring/self-evaluation to other forms of treatment for children with ADHD, both self-monitoring and self-evaluation have shown advantages. For example, Hinshaw, Henker & Whalen (1984a) examined the use of self-evaluation to see if it would produce greater enhancement of positive social behavior and greater reduction of negative social behavior than reinforcement alone. The two conditions did not differ significantly when children were taking medication; however, reinforced self-evaluation improved social behavior more than reinforcement alone when medication was not used. In studies comparing the use of psychostimulant medication with self-monitoring or self-evaluation, a combination of the treatments was found more effective than either individual treatment (Hinshaw et al., 1984a; Horn, Chatoor & Conners, 1983). Similarly, Shapiro et al. (1998) examined the use of self-evaluation techniques in a single-subject design with children with ADHD, and observed improvements in "on task" behavior.

Self-monitoring and self-evaluation are often paired with self-reinforcement in a treatment package, making it difficult to determine the therapeutic effects of each component (Barkley et al., 1980; Edwards et al., 1995; Horn et al., 1983; Rhode, Morgan

& Young, 1983; Varni & Henker, 1979). The majority of studies examining the use of self-monitoring and self-evaluation in children with ADHD have had the children monitor or evaluate the time they remained on task (e.g., Barkley et al., 1980; Edwards et al., 1995; Harris, 1986; Hertz & McLaughlin, 1990; Horn et al., 1983; Mathes & Bender, 1997; Rhode et al., 1983; Stewart & McLaughlin,1992). However, behaviors such as academic performance (Edwards et al., 1995; Harris, 1986; Rhode et al., 1983; Varni & Henker, 1979) hyperactivity (Horn et al., 1983; Varni & Henker, 1979) vocalizations (Horn et al., 1983) and pro social behavior (Hinshaw, Henker & Whalen, 1984b) have also shown positive changes with self-monitoring and self-reinforcement.

Self-Reinforcement

Self-reinforcement is another component often included in self-management programs. It is often described as the individual administration of reinforcement for meeting a predetermined standard of behavior (Braswell & Bloomquist, 1991). Gross and Wojnilower (1984) regard self-reinforcement as the most integral precursor in the development of self-control. Studies examining the application of self-reinforcement by children with ADHD have shown positive results for increasing attention to task (e.g., Ajibola & Clement, 1995; Barkley et al., 1980; Cameron & Robinson, 1980; Douglas, Parry, Marton & Garson, 1976; Edwards et al., 1995; Horn et al., 1983; Rhode et al., 1983; Varni & Henker, 1979) academic performance (Cameron & Robinson, 1980; Chase & Clement, 1985; Edwards et al., 1995), decreasing amount of misbehaviors (e.g., Barkley et al., 1980, Rhode et al., 1983) and hyperactivity (Ajibola & Clement, 1995; Horn et al., 1983; Rhode et al., 1993; Varni & Henker, 1979). As mentioned previously, it is often difficult to determine which behaviors may have been positively affected by the

application of self-reinforcement because it is often included in a self-management package which can include self-instructional training, self-monitoring, or self-evaluation, as well as other components.

Teaching self-reward generally begins during self-monitoring, and once children are able to accurately self-monitor, they are asked to begin to self-reinforce contingently (Gross & Drabman, 1982). Kanfer and Gaelik-Buys (1991) state that self-reinforcements should be compatible with the target behavior, when possible. For example, if the client is attempting to lose weight, an incompatible self-reinforcement would be a rich dessert because it is not congruent with the long-term goal.

Researchers have noted that for self-reinforcement to occur, it is necessary that the individual have free access to reinforcers, that the performance criteria have been established, and that the performance criteria are attained before the self-administration of the reinforcement occurs (Gross & Wojnilower, 1984; Shapiro & Cole, 1994). Shapiro and Cole (1994) point out that these requirements are often not met in research and that typical self-reinforcement in the laboratory setting consists simply of the self-delivery of a positive consequence. According to Shapiro and Cole (1994), this method is not consistent with the original conceptualization of self-reinforcement by Bandura. However, Gross and Drabman (1982) point out that allowing children to have total freedom in determining their reinforcements is unlikely in applied settings.

Unlike studies of self-monitoring that indicate accuracy is not an important part of the process, Gross and Wojnilower (1984) believe that a contingency on accuracy of self-reinforcement has to be part of this component. Otherwise, children may self-deliver reinforcers whether or not they perform the target behavior (Gross & Drabman, 1982).

Some programs also include the option of self-punishment or positive punishment, such as point loss in a contingency system (Braswell, 1995); token systems are also used frequently because they are convenient and easy to use and can be tied to multiple reinforcements (Gross & Drabman, 1982).

About half of the studies (Ajibola & Clement, 1995; Barkley et al., 1980; Edwards et al., 1995; Rhode et al., 1983) appeared to meet the requirements of self-reinforcement by training the children until they were competent in meeting a standard of performance, checking for accuracy of their performance throughout the study, offering the children a choice from several available reinforcers, and monitoring the delivery of the reinforcement by exchanging points for the reinforcement. Other studies also trained the children in the recognition of the defined behavior to self-reinforce, but did not monitor their accuracy (Cameron & Robinson, 1980; Chase & Clement, 1985; Horn et al., 1983; Varni & Henker, 1979).

Reinforcers administered in these studies varied from "M&M's" and nickels, to points that could be exchanged for toys or activity choices, such as time in the park and a trip to a fast food restaurant. Given the vast differences in the saliency of the rewards used for the studies, it is possible that the type of reward affected the outcome of individual studies. Most investogators offered rewards as choices for the child could, thus accommodating individual variation in reinforcement.

Bowers, Clement, Fantuzzo & Sorensen (1985) found support for the use of self-management for children with ADHD when they examined differences between self-administered reinforcement and teacher-administered reinforcement. They discovered that self-administered reinforcement was a more powerful reinforcer than the teacher-

administered reinforcement for all six children. The researchers point to relevant research in the area illustrating that providing children with choices increases the effectiveness of reinforcement.

Comparing self-reinforcement to other forms of treatment, it appears the overwhelming message is that a combination of psychostimulant medication and self-reinforcement is more effective than either treatment alone. For example, Ajibola and Clement (1995) compared the use of self-reinforcement with different doses of methylphenidate. The combined effects of methylphenidate and self-reinforcement were also greater than any one treatment alone, as predicted. Similarly, Chase and Clement (1985) examined the effects of Ritalin and self-reinforcement on academic performance, using them separately or in combination. The researchers concluded that using a combination of Ritalin and self-reinforcement is more effective in improving academic performance than is self-reinforcement alone; however, the use of self-reinforcement alone is substantially more effective for improving academic performance than Ritalin alone.

Critique

Looking at Table 1, studies of self-management techniques based on contingency management principles, such as self-monitoring, self-evaluation and self-reinforcement, showed positive results in the treatment of children with ADHD. However, several limitations exist in the literature and several avenues of research in this area are worth further consideration.

Measurement Issues. Heterogeneity of the population of children diagnosed with ADHD is a difficulty confronted by many investigators; the self-management treatment

literature is no exception (See Table 1). In these studies diagnoses of ADHD were found to be comorbid with aggression (Rhode et al., 1983) Oppositional Defiant Disorder (Varni & Henker, 1979); and learning disabilities (Chase & Clement, 1985). While the diagnosis of ADHD has also been comorbid with anxiety and mood disorders (Barkley, 1998), many of the studies did not investigate possible comorbid disorders (see Table 1). In addition, diagnostic procedural practices are influential and can be problematic in comparing the effectiveness of the various treatment outcome studies using self-management techniques. Samples of children within each study often met different diagnostic criteria for ADHD. For example, some researchers described the children to be impulsive and inattentive; whereas, other investigators simply used the Conner's Rating Scale to define the sample as hyperactive. Samples were also primarily male, not uncommon in the empirical literature on ADHD. In addition, samples in these studies were small (see Table 1), but the investigators continued to use between group designs, presenting a problem for the statistical power of the design to detect real change.

Another methodological concern is the use of the Conners' rating scales in the research to solidify the diagnosis of ADHD for research purposes. Looking at Table 1, 7 of the 17 studies used cutoff scores on the Conners' rating scale as the principal defining factor of the ADHD clinical sample. Although this scale has been used frequently in research, there has been little empirical research on the scale itself (Conners', 1999). In addition several "pirate" versions of the scales have been formed, often altering the scale, compromising the standardization of items and test format (Conners', 1999). Therefore, researchers in these studies may actually be using different versions of the Conners' scales, believing the tests are the same. Advanced psychometric approaches and refined

diagnostic criteria for childhood disorders have also warranted the revision and re-standardization of the original Conners' rating scales (Conners', 1999). Finally, use of the Conners' rating scale to define the sample may also affect the ability of the clinician to identify any of the comorbid conditions that commonly accompany the diagnosis of ADHD and that could affect the outcome of the treatment.

Use of rating scales in general becomes problematic in pre/post designs as seen in Table 1. Administering rating scales once before the treatment program and once after the treatment program to judge clinical change is problematic. A more effectively designed study would obtain a true measure of baseline and treatment effect by requiring multiple administrations of the rating scales (Hinshaw & Nigg, 1999). This prevents any misconception of behavioral symptoms related to the problem of the scaled score to regress toward the mean. Hinshaw and Nigg (1999) go further and state that if the purpose of the evaluation is to evaluate treatment gains in an unbiased fashion, methods of behavioral observation are preferable to rating scales, despite cost. A parent who fills out a rating scale in a treatment setting is not an unbiased rater; therefore, the rating scales used may be subject to biases (Hinshaw & Nigg, 1999). Rating scales are useful, however, due to their ease of use and their ability to tap into problematic behavior that may not be evidenced in the clinical setting (Hinshaw & Nigg, 1999). Many of the studies in the review that did not show positive treatment effects were studies in which rating scales were used for measurement. It is possible that the use of the rating scales in these studies may have been problematic. In assessment it is good to remember that multiple measures, at multiple times with multiple informants produce the most reliable information (Mash & Terdal, 1997).

Generalization. Investigators who found positive changes with the use of self-management techniques for children with ADHD have problems showing generalization (Teeter, 1998). Barkley et al., (1980) were able to show individual gains in on task behavior as a result of self-management technique, but these gains did not generalize to the classroom. It should be mentioned, however, that they did not train for generalization. Rhode, Morgan and Young (1983) examined self-management strategies in a single subject design of two children. In both cases improvements were noted with on task behaviors, attention to task, and improved academic performance. This study is especially important because it also showed generalization from a resource room to a general education classroom after specific procedures to promote generalization were implemented.

Issues surrounding generalization of treatment outcome easily become points of discussion as well after review of the literature on self-management. As Stokes and Baer (1977) point out, to be considered effective any therapeutic behavior change must occur "over time, persons, and settings", and these changes "should spread to a variety of related behaviors." Many of the CBT studies reviewed do not address generalization in the treatment design (e.g., Ajibola & Clement, 1995; Cameron & Robinson, 1980). Of the studies that do address generalization, there is a discrepancy between studies which examine generalization of laboratory treatment gains as changes in parent and teacher rating scales (Abikoff & Gittleman, 1985) and studies which explore generalization across context, such as from the laboratory setting to the school setting (Barkley et al., 1980; Harris, 1986; Rhode et al., 1983; Stewart & McLaughlin, 1992; Varni & Henker, 1979).

Although the necessity of generalization of therapeutic behavior change is accepted, the realization that it does not occur automatically is less accepted (Stokes & Baer, 1977). As stated by Stokes and Baer (1977), the "train and hope" approach is not an effective procedure for generalization, but it appears that many of the studies in the review used are using this approach. Only one of the studies in Table 1 trained for generalization (Rhode et al., 1983); most of the studies expected it to occur spontaneously. Not surprisingly, these studies accounted for the three out of four studies that showed generalization (See Table 1). Procedures for generalization should be built into the treatment program for optimal effectiveness (Stokes & Baer, 1977). Whalen et al. (1985) have suggested training children to generalize their skills to different contexts by giving them lessons on the similarities and differences across settings and teaching them to match strategies with appropriate contexts. They also suggest using peer coaches to facilitate transfer of training in the lab or modifying the environment to make the transfer of trained skills easier (Whalen et al., 1985).

Related to preprogramming of generalization, context of training likely affects treatment outcome. Similarity between the training setting and the natural setting also plays a role in the effectiveness of the treatment (Whalen et al., 1985). Most of the studies in Table 1 did not occur in the natural setting; they occurred in a laboratory-simulated classroom. Only three of the researchers actually implemented treatment in the classroom (Cameron & Robinson, 1980; Edwards et al., 1995; Rhode et al., 1983). Many of the investigators utilized a simulated classroom to conduct the experiment, and some (e.g., Varni & Henker, 1979) measured behavior in the laboratory, and then in the classroom, to determine if skills had generalized. Hinshaw and Melnick (1992) advocate for direct

focus on actual problems in achievement and peer relationships in CBT, rather than using analogue materials.

Brevity of Treatment. Like other psychosocial treatments, research on self-management techniques is often criticized for "attempting to answer long term problems with short term studies (Whalen & Henker, 1991, p. 129)." This can be appreciated more while examining the self-management studies in Table 1. The total number of sessions varies from 1 (Hertz & McLaughlin, 1990) to 25 (Hinshaw et al., 1984a), with only two researchers evaluating treatment progress at a later date or follow-up appointment (typically within three months).

Parent and Teacher Components. Abikoff (1985) criticized research on self-management techniques for limiting studies by focusing on one or two skills in individual treatment with the child, rather than including parents and teachers to a greater extent. More recent studies have addressed this deficit and have shown better success when delivered through an active parent component (Frankel et al., 1997; Whalen et al., 1985). Researchers appear to be recognizing the positive influence of including parents in the child's CBT training and are doing it more often. One of the studies in this review included a parent-training component (Douglas et al., 1976).

Targeting Symptoms of ADHD. Abikoff (1985) reviewed studies of self-management techniques and criticized the literature for its limitations in improving characteristic symptoms of ADHD, such as attention deficits. According to Abikoff (1985), weaknesses of previous studies included brevity of training, lack of generalization, and tendency to ignore individual differences. He proposed that future investigators address these methodological concerns. Since then those investigators who

have focused on changing characteristic symptoms of ADHD in school settings, such as attention to task and impulsivity, have demonstrated positive results. (See Table 1.) For example, Edwards et al. (1995), examined the use of self-monitoring and self-reinforcement for use with attention to task and reading comprehension. Sustained improvements were demonstrated for both of these variables.

Cognitive Development Level. Cognitive developmental level is an important consideration and needs to be further addressed by researchers. For example, Barkley et al. (1980) found that children of a lower verbal mental age spent less time on task and showed greater deterioration of performance when compared to children of higher verbal mental age on self-monitoring tasks. Similarly, Cohen et al. (1981) found that intellectually brighter students in their study were applying CBT strategies in contexts and with materials with which they had no exposure. Results such as these signify the importance of determining cognitive development before implementation of CBT components.

Looking at the use of self-management from a developmental perspective, Teeter (1998) points out promising results in its use with adolescents with ADHD between the ages of 12 and 20. These techniques have also been used successfully in middle childhood with students age 8 years old or older (Teeter, 1998). Similarly, Braswell (1995) advocates the use of self-regulation approaches only in the third grade or higher; however, simple monitoring tasks may be used with younger children. Self-monitoring was used primarily with children between the ages of 7 and 10, with few studies looking at older children ages 12, 13 and 15 (see Table 1). Inspection of studies in Table 1 revealed no significant differences based on age. However, further research should

examine possible effects of cognitive developmental level in the use of self-management techniques.

Confounds of Medication. Most of the studies attempted to decrease confounds of medication by keeping the children off their medication or maintaining the medication at a stable dose throughout the study as prescribed by a physician. Ajibola and Clement (1995) examined the use of high dose (. 7 mg/kg) and low dose (. 3 mg/kg) psychostimulants along with self-reinforcement and found that the low was more effective at decreasing impulsivity when combined with self-reinforcement than the high dose alone or the high dose with self-reinforcement. Taking this study into consideration, even if the dose is stabilized and maintained at the same level, its effects on treatment outcome will still need to be considered.

Treatment Integrity. Treatment Integrity was addressed by few of the outcome studies that were reviewed. Most researchers provided information regarding therapist characteristics, such as qualifications. Some investigators indicated that the clinicians were trained in the specific treatment before its administration, but did not indicate the extent of the training (Cameron & Robinson, 1980; Cohen et al., 1981; Douglas et al., 1976; Hinshaw & Melnick, 1992; Mathes & Bender, 1997). Hinshaw and Melnick (1992) were the only investigators that referenced the use of specific treatment manuals used to insure treatment integrity (Hinshaw & Melnick, 1992). Audiotape and videotape of the sessions, as well as regular supervision have also been used to ensure proper treatment delivery; however, none of the studies reviewed mentioned the use of these techniques. The small amount of studies that addressed basic components of treatment integrity limits

the generalizations that can be made regarding the effectiveness of self-management techniques.

Strengths of Self-Management Techniques

Despite methodological criticisms, self-management techniques have many advantages as a treatment for ADHD. First, self-management techniques are easily implemented in the classroom across a variety of subjects (Barkley et al., 1980). They also do not require extensive monitoring of the child's behavior by teachers in the classroom. Once the children learn the self-management techniques, it becomes their responsibility to monitor and earn reinforcements for appropriate behavior. Third, self-management techniques are often less time consuming for teachers to implement than other contingencies, and they promote internalization and self-regulation for the child. In addition, children who participate in these techniques often enjoy the increased responsibility and find it enjoyable to monitor their own behavior (Whalen et al., 1985). A fifth strength of self-management techniques is that the treatment allows children to become more independent and responsible for individual change (Kendall, 1993). Finally, to be effective a treatment should have conceptual underpinnings (Kazdin & Kendall, 1998), and the development and investigation of these techniques for children with ADHD has been explicitly guided by theory (Hinshaw & Erhardt, 1991).

Utility of Single-Subject Design in Treatment Outcome Studies

Although single-subject designs are infrequently used in treatment outcome research, many researchers point out that effects of treatment on the individual through the course of development is an important goal of future research (Jensen, Koretz, Locke, Schneider, Radke-Yarrow, Richters & Rumsey, 1993). According to Ervin, DuPaul,

Kern, and Friman (1998) problems with the heterogeneity of the sample and high rates of comorbidity, difficulties often associated in empirical investigations of children with ADHD, can be effectively handled with individualized treatment because each subject acts as his or her own control.

Single-subject design closely approximates the tailoring of treatment to specific individuals and their families as is done in therapeutic settings (Kutcher, 1986; Pelham, Schnedler, Bologna, & Contreras, 1980), and although this individually tailored multimodal approach to treatment has been considered sound clinical practice, it is rarely utilized in empirical literature (Richters et al., 1995). This is ironic, given that a frequent criticism of group designs in treatment outcome research is that they rarely offer helpful guidelines for routine clinical practice because individual physiologic, intrapsychic, social and interpersonal factors may all affect response to treatment (Kutcher, 1986).

Another important confound within treatment research methodology for children with ADHD is the use of stimulant medication. Most children with ADHD who participate in research studies are currently taking medication. Since dosage and even type of medication used are different for each child, use of a single subjects design potentially eliminates the idiosyncratic drug-behavior interactions which are potential confounds in interpretation and results of studies which compare one subject to another (Ayllon et al., 1975).

A common criticism of single-subject design is that it does not determine external validity. However, as Fuqua and Bachman (1986) point out single-subject designs can adequately determine generalizability because their design permits the systematic manipulation of the independent variable until its limits in effectiveness are reached. The

nature of the replication is considered more important than the multitude of replications (Bernard, 1957; Fuqua & Bachman, 1986; Sidman, 1960).

Use of the single-subject design for studying treatment outcome is also criticized because reversibility is usually not an option due to ethical and practical considerations. Therefore, replication providing proof and counter proof (Sidman, 1960) is often nonexistent in this area. The use of multiple baseline designs within single-subject research on treatment effects eliminates some of these concerns. If dependent variables in a multiple baseline design change only when treatment is initiated, these effects can be confidently attributed to the treatment. Moreover, unlike other designs, multiple baseline designs are more appropriate for evaluating irreversible treatment effects and do not require cessation of treatment (Poling & Grosset, 1986).

Another advantage of the use of single subject design is that established functional relationships are the key to good external validity. Single-subject designs afford more opportunity for observations of relationships in data through experimental reasoning (Bernard, 1957). Mace (1994) argues the benefits of single-subject design in studies of functional relationship, stating, "...the behaviorist has the option of conducting an extended experimental analysis combining descriptive and experimental methods to design an individualized assessment condition..."

Another benefit of the use of the single-subject design is that it affords the researcher the ability to look at specific changes in behavior at specific points in time. This flexibility is not usually afforded in traditional group designs to investigate unusual behavioral variance while it occurs, and it would likely be a valuable asset in studying the multifaceted components of treatment with CBT and stimulant medication. Whether

utilizing a group design or a single-subject design, it is important to have a close relationship with the data and subject material.

Practically speaking, single-subject designs are considered easy to incorporate into routines in mental health treatment centers. They are also cost effective and provide immediate verification of clinical response relatively free from negative or overly optimistic attitudes of adolescents and parents while filling out questionnaires. Also, utilization of single-subject design in this setting may promote the regular clinical use of assessment strategies and may lead to more appropriate interventions (Allyon et al., 1975; Kutcher, 1986).

Another criticism of the use of the single subject design in treatment outcome research would be the difficulty in obtaining a steady state of behavior to measure. Three requirements for good baseline according to Sidman (1960), are stability, sensitivity, and control of extraneous variables. When baseline variability is high and a steady state is not easily established sensitivity to treatment will be low and small effects might be unrecognizable (Huitema, 1986; Sidman, 1960). However, Michael (1974) points out that group designs have the capability to statistically control variability, which may reduce the pressure on the researcher to develop appropriate control. In any design, controlling the variability and potential confounds should be a priority.

Richters et al. (1995) point out that enthusiasm for single-subject design has also been tempered by bias in subject recruitment, absence of a control group not receiving treatment, failure to use blinded assessment procedures, and uncontrolled assignment of subjects to treatment conditions. Limitations of sample size are also said to preclude meaningful comparisons of treatment combinations, and design limitations prevent tests

for interactions between treatment combinations, comorbidity patterns, and child/family characteristics (Richters et al., 1995).

Although there are limitations to the sample size in single-subject design, it is often difficult to obtain a sample large enough to be able to utilize a group design in treatment outcome research with clinical populations. Most statistical procedures require large sample sizes, and using small sample sizes in these procedures will either limit the ability to discover an effect if it is there or result in a significant p-value which is determined by variability in the data rather than effect size. With appropriate sample sizes, group designs do have the advantage of quick and efficient data collection, and the design is considered less subjective when interpreting results.

Huitema (1986) makes several important points regarding research methodology. He states that we should not confuse the design with the analysis, explaining that single-subject designs and group designs are not mutually exclusive. Rather, they often occur concurrently. He also emphasizes that the design chosen depends on the research question, and that there are several characteristics that are important to being an effective researcher, no matter what design one chooses to use. These include the ability to exert control over the experimentation process, close contact with the subject material, and concern in studying the functional relationships between the variables.

PROPOSED STUDY

Methodological concerns of self-management outcome studies prevent us from making blanket statements regarding their applicability as a treatment for students with ADHD. However, self-management techniques have shown successful results in changing characteristic symptoms of ADHD, especially in the classroom setting. Although critics may claim that these changes are not long standing and do not place the child with ADHD in a position of being "typically functioning," no treatment has yet proven "clinically significant and durable" for the associated problems attached to the diagnosis of ADHD, necessitating the search for adequate treatment components (Hinshaw & Erhardt, 1991). Problems of generalization and maintenance are also seen among widely accepted behavioral therapy treatments (Hinshaw & Melnick, 1992). There exists a need to find treatments that result in the reduction of the core symptoms of ADHD and result in improvement in functioning (Barkley, 1997a). In addition, treatments are needed that give students with ADHD the tools they need to handle problems independently so that they can rely less on external agents of control as they progress developmentally. Self-management techniques may be able to promote the ability of children with ADHD to self-regulate and become managers of their own behavior. This independence also appears to be a goal of consumers, their parents and teachers.

Thus, the present investigator proposes to further the research on the use of contingency-based self-management techniques to improve classroom behavior of students with ADHD. Several aspects of this study are unlike other studies attempted with

students with ADHD. Given Kanfer and Gaelick-Buy's (1991) theoretical assumption that the individual needs to be invested in the behavioral goal for behavioral change to occur, the focus of this study will be the influence of a self-management package that promotes active involvement of the student at all stages of behavior change, including participation in changing a targeted behavior problem in the classroom, goal setting, and self-reinforcement. Additionally, behaviors related specifically to the diagnosis of ADHD will be targeted. Typically, parent or teacher behaviors have been the focus of intervention, resulting in vicarious positive change in the student; however, the student will function as a mechanism/agent for behavior change in this study.

Core symptoms of ADHD (e.g. off task, fidgeting, vocalization) have not traditionally been the focus of studies exploring the use of self-management techniques. More recent investigators have shown positive changes in off-task behavior in the classroom through use of self-management techniques. Results, such as these, are promising. Attempts will be made to further research in this area by addressing the core symptomatology. We also plan to examine behavior change through the use of classroom observations, as well as typically used parent and teacher completed rating scales.

The heterogeneity of the diagnosis of ADHD and the variations in medication use for each student combined with the general difficulties in obtaining a large sample preclude the use of a group design. In addition, the treatment focused nature of this project and the primary hypothesis of individual change with treatment lends itself to the use of a multiple baseline across subjects design.

Based upon previous empirical findings, five broad hypotheses were made. First, it was hypothesized that the use of self-management techniques in treating students with

ADHD would be effective in improving the targeted behavior problems in the classroom, while other problematic behaviors (core ADHD symptoms) would remain unchanged. In a multiple baseline design a significant difference in the target behavior would result in a definite difference between observed occurrence of the behavior at baseline and behavioral intervention conditions. Second, it was hypothesized that decreases on teacher rating scales for ADHD core symptoms would be noted concurrent with the changes noted during the behavioral observations. Third, teacher ratings of academic productivity were hypothesized to show significant improvements during the periods of behavioral observation when the intervention was implemented. Fourth, it was hypothesized that there would be a significant difference on pre and post measures of core ADHD symptomatology as rated by parents. Finally, it was hypothesized that self-report measures would indicate fewer clinical elevations at post measurement on scales theoretically related to this experiment, such as attitude toward school, locus of control, self-esteem, and self-reliance.

METHOD

Participants

For this study school counselors were asked to refer students who were between the ages of 8 year, 0 months and 10 years, 11 months with Composite IQ scores of 85 or above on a formal standardized intelligence test (e.g., WISC-III). Two additional criteria were necessary for participation: (1) a diagnosis of ADHD, Combined Type, based on parent and teacher rating scales, and (2) evidence of problematic behavior during independent seatwork in the classroom based on initial behavioral observations.

As noted above, students with cognitive deficits were not considered for participation due to research findings that cognitive impairment can influence children's performance on self-management tasks (Barkley et al., 1980; Cohen et al., 1981). However, students were not excluded if they were learning disabled (LD), as studies have shown self-management to be effective for these students (e.g., Harris, 1986; Hertz & McLaughlin, 1990; Shapiro et al., 1998).

In addition, medication use was not an exclusionary criterion for this study. Given the experimental nature of this treatment component and ethical considerations, those who participated in this study were not asked to change their daily routine of medication management. However, considering possible dose-effect relationships between psychostimulant use and behavior therapy programs (Ajibola & Clement, 1995), information was obtained from the student's parent regarding current and previous medication management of ADHD symptoms, including dosage levels.

Twenty-four parents were referred by local school systems and indicated interest in having their children participate. Two parents did not complete the parent phone interview, and one student's family relocated before the study began. In addition, one student refused to participate. Of the remaining twenty students four students did not meet criteria for ADHD, Combined subtype (see below). Sixteen students remained eligible for participation. Eight of these students attended a rural elementary school in East Central Alabama, and the eight remaining students attended various schools dispersed across a wide geographic region in East Central Alabama. For logistical ease and financial reasons, data collection efforts were concentrated at the more proximal school.

A final sample of four children met research diagnostic criteria and showed evidence of difficulties with independent seatwork. Specific selection procedures are discussed in "Experimental Procedures." Please see Table 2 for characteristics of the four participants of the study. It is also important to note that all four children evidenced clinically significant (T-score $\geq$ 65) elevations on the ADHD Index of both the Conners' Parent Rating Scale-Revised (CPRS-R) and the Conners' ADHD/DSM-IV Scales-Teacher (CADS-T) rating scales. For Jim, two of the remaining seven scales were significantly elevated: Cognitive Problems/Inattention (T score = 70) and Hyperactivity (T-score = 70). Four of the remaining seven subscales were significantly elevated for Tom: Hyperactivity (T-score = 68), Perfectionism (T-score = 69), Social Problems (T-score = 65), Psychosomatic (T-score = 68). Ray's parent responses indicated three additional clinically elevated scales: Cognitive Problems/Inattention (T score = 82),

Hyperactivity (T-score = 87), and Psychosomatic (T-score = 67). Chad's parent indicated one additionally elevated scale Cognitive Problems/Inattention (T-score = 70).

Assessment Measures

ADHD Diagnosis

Empirically based verification of the students' diagnosis of ADHD was necessary for their inclusion in this research project. This was accomplished through completion of parent and teacher behavioral rating scales and a brief clinical interview with the parent. The Conners' Rating Scale-Revised (CRS-R, 2000) was chosen to obtain behavioral ratings of ADHD symptoms from parents and teachers. A subscale of the Conners' Rating Scale –Revised (CRS-R), the ADHD Index, consists of 12 items that were developed to discriminate between children with and without ADHD between the ages of 3 and 17 (CRS-R, 2000). Participation in

this study required ratings of one and a half standard deviations above the mean ($T > 65$) on the ADHD Index of both the parent and teacher ratings scales of the CRS-R. T-scores above 65 are considered clinically significant on the CRS-R (Conners, 2000).

Reliability of the CRS-R is established with internal consistencies of .89 or above on the Parent Rating Scale (PRS) and of .85 or above on the Teacher Rating Scale (TRS) (Conners, 1999). In addition, temporal stability of the scale or test-retest reliability for 6 to 8 weeks was .72 for the PRS and .80 for the TRS (Conners, 2000).

The validity of the CRS-R is supported by a stable factor structure with intercorrelations of the subscales meeting theoretical expectations (Conners, 2000). For example, subscales measuring ADHD were found to be assessing distinctly different dimensions from those assessing oppositional behavior and cognitive problems (Conners,

2000). The ADHD Index was also able to discriminate a sample of children diagnosed with ADHD from both a normative sample and a sample of children with emotional problems (Conners, 2000). The PRS and the TRS were modestly correlated (.49) (Conners, 2000). Sensitivity for this measure ranges from .91 to 1.00 and specificity ranges from .77 to .93 (Conners, 2000).

In addition to the behavior rating scales, each parent participated in a brief semi-structured interview for ADHD based on DSM-IV criteria and adapted from Barkley and Murphy's (1998) Clinical Interview-Parent Form. This interview assisted in the confirmation of the diagnosis by attaining information regarding the early onset, functional impairment, and cross situational display of problematic behavior as required by DSM-IV. See Appendix A for example.

Treatment Progression and Outcome

Behavioral Observations. Behavioral observations were conducted on a daily basis during this study from baseline to behavioral intervention to follow-up. Observations occurred during a period of time when the student was engaged in independent seatwork. The structured observation consisted of 6 child behaviors and 4 teacher behaviors. See Appendix B for an example of the Behavioral Coding Sheet used by the observers. Coding occurred in 15-second intervals over the period of 20 minutes; each 15-second interval included 10 seconds of observation and 5 seconds of recording the behaviors that were observed. An audiotape provided cues (e.g., "observe one," "code one") to coders for intervals of observation and recording of behavior during the observation. Each behavior could only be checked once during an interval.

An adaptation of Barkley's (1990) "restricted academic situation coding sheet" was chosen as an observational measure because it targets 5 ADHD related symptoms (off task, fidgeting, vocalizing, plays with object, out of seat). Barkley's Restricted Academic Coding System has had widespread use to determine the frequency of ADHD related behaviors in the classroom (DuPaul & Stoner, 1994), and it has been used as a measure of behavioral change in the classroom to assess effects of treatment with medication (Barkley, 1998, Northrup, et al., 1997). Operational definitions for the 5 ADHD related behaviors can be seen in Table 3. One additional child behavior, "Bug-in-the–ear," was included in the coding system during the treatment phase of the study. "Bug-in-the-ear" was coded any time the student touched the bug-in-the-ear device during the coding period, and was primarly used to determine if the mechanism was a distraction for the student. Further explanation of the use of the bug-in-the-ear is included in the procedure section.

Both positive and negative attention from teachers has been well-documented to have effects on students with ADHD; thus, structured observations of teacher behavior were also included in each coding period. Four behaviors of interest were targeted (see Table 4).

Interobserver Agreement. Observers were undergraduate students trained in the coding system by the principal investigator. All observers were required to pass a written test on the coding system, which required them to produce all behavioral definitions from memory with 100 percent accuracy. In addition, each observer practiced multiple times within an elementary classroom setting before beginning formal observations for this study. Before entering the classroom, observers were required to complete an

observation in a classroom with the principal investigator, maintaining reliability of .80 or above for each category. Observer reliability was also checked periodically during data collection, approximately once every five sessions for each student.

Interobserver agreement for each observed behavior category was calculated by dividing the total number of agreements (on both occurrence and nonoccurrence of the behavior) by the total number of intervals. Average agreement was 92 percent for Off Task (ranging from 86 to 99 percent), 90 percent for Fidgeting (ranging from 75 to 99 percent), 88 percent for Vocalization (ranging from 75 to 99 percent), 98 percent for Plays with Objects (ranging from 95 to 99 percent), and 98 percent for Out of Seat (ranging from 94 to 100 percent). Average agreement for teacher behaviors was as follows: 96 percent for Teacher Command (ranging from 93 to 99 percent), 99 percent for Repeat Command (ranging from 97 to 100), 99 percent for Teacher Approval (ranging from 98 to 100 percent), 99 percent for Teacher Negative (ranging from 98 to 100 percent).

Teacher Behavior Ratings. Teachers were asked to complete two rating scales, the Conners' ADHD/DSM-IV Scales (CADS-T) and the Academic Performance Rating Scale (APRS), approximately every two weeks to examine behavior change. See Table 5 for specific information regarding administration of questionnaires. The CADS-T is a 27-item scale derived from the CRS-R and composed of four subscales: Conners' ADHD Index, DSM-IV: Inattentive, DSM-IV: Hyperactive-Impulsive, and DSM-IV: Total. As Conners (1999) indicates, the use of the ADHD Index of the CADS-T in tracking treatment response is warranted "if research is highly focused on a narrow condition, such as ADHD" and if frequent repeated administrations of the scale are used. In addition,

Conners (2000) indicates that the CRS-R is best used by teachers for rating student behavior within a structured academic situation. Furthermore, the Conners scales have received the most widespread use in the monitoring of children's response to pharmacological and psychosocial intervention (Hinshaw and Nigg, 1999), and they provide a "sensitive and well-established method for monitoring treatment response (Conners, 2000).

Two administrations of the scales are recommended to constitute a baseline before treatment is implemented (Conners, 2000). Thus, the CADS-T was administered twice before initiation of the behavioral intervention, twice while the behavioral intervention was occurring and twice after the intervention had been completed. For the first administration of the CADS-T, during the behavioral intervention , teachers were asked to rate the student's behavior, thinking specifically of the student's behavior during the class times in which we conducted the intervention within the classroom (Txt S). Teachers were told, "Please fill out this questionnaire regarding your student's behavior while we are working with him in the classroom." For the second administration during the behavioral intervention, teachers were asked to rate student behavior, thinking of the student's behavior in general (Txt G). Teachers were told, "Please fill out this questionnaire regarding your student's typical behavior in the classroom when we are not present." Typically, T-scores are examined to deduce any change, and special attention is made to changes of more than one half standard deviations (5 points) (Conners,2000).

The second measure teachers were asked to complete on a regular basis was the Academic Performance Rating Scale (APRS), a 19-item measure used to briefly and conveniently assess a child's teacher perceived academic productivity and accuracy in a

classroom (Barkley, 1990; 1998). The APRS, designed for teachers of children in first through sixth grade, yields four scores: Total Score, Academic Success, Academic Productivity, and Impulse Control. The APRS has satisfactory internal consistency, test-retest reliability, and concurrent validity with measures such as standardized achievement tests and calculations of review and scoring of work assigned in the classroom (Barkley, 1990). Internal consistencies based on coefficient alphas were above .94 on all subscales except Impulse Control (.72) (DuPaul & Rapport, 1991). Test-retest reliabilities ranged from .88 to .95 (DuPaul & Rapport, 1991). Norms based on grade and gender are available (Barkley, 1990; DuPaul & Rapport, 1991). DuPaul and Stoner (1994) suggest that the APRS be administered frequently (i.e., weekly) throughout treatment phases to determine any treatment induced improvement in academic performance. The APRS was administered in conjunction with the CADS-T, with the same instructions.

Parent Behavior Ratings. The long form of the CRS-R was administered to parents both at the beginning and at the end of data collection for each student. The long form contains the ADHD Index used to measure symptomatology of the diagnosis as well as the Cognitive Problems/Inattention scale, which is valuable in examining the significant cognitive and academic problems that children with ADHD often experience, and the DSM-IV Symptoms scale (Conners, 2000).

Self-Report Measures. Students who participated in the study were asked to complete two self-report measures: the Forced Choice Reinforcer Assessment, and the Behavior Assessment System for Children – Self Report of Personality (BASC-SRP). The Forced Choice Reinforcer Assessment, similar that of Northrup, George, Jones, Broussard, and Vollmer (1996), was administered once before the initiation of treatment

to determine multiple preferred reinforcers for the child (Appendix C). Northrup et al. (1996) originally constructed a questionnaire derived from the Child Reinforcement Survey (CRS; Fantuzzo, Rohrbeck, Hightower & Work, 1991) that included ten questions for five categories of stimuli (activity, attention, edible items, tangible items and escape), so that each category was compared once with every other category. Questions were presented in the following format: "Would you rather *get things to eat like chips, cookies or popcorn* or *get things to do like art projects, play computer games, or go to the library*?" Three examples were always given for each category. As in Northrup et al. (1996) categories were ranked on the basis of the child's selections, and a percentage score was calculated by dividing the number of times a category was chosen by the number of times it was presented as an alternative. In this way categories considered high preference (> 75%) were determined and several items from each category were made available for the self-reinforcement portion of the investigation.

Students were also asked to complete the BASC – SRP, once before the initiation of treatment, and once at the end of the study. The BASC-SRP is a true/false inventory designed to assess the personality and self-perceptions of children, ages 8 to 11 (Reynolds and Kamphaus, 1998). It takes approximately 30 minutes to complete, and contains the following scales: Anxiety, Attitude to School, Attitude to Teachers, Atypicality, Depression, Interpersonal Relations, Locus of Control, Relations with Parents, Self-Esteem, Self-Reliance, Sense of Inadequacy, and Social Stress. Reliability is established for each gender and for both the child version and adolescent version of this measure, with internal consistencies and test-retest values of .70 or above for all scales except self-esteem (.57) and self-reliance (.64) on the child version (Reynolds and Kamphaus, 1998).

The validity of this measure is supported by a stable factor structure, empirical and rational considerations in its construction, and correlations of the SRP with several different measures including the Minnesota Multiphasic Personality Inventory, Achenbach's Youth Self-Report, the Behavior Rating Profile, and Children's Personality Questionnaire (Reynolds and Kamphaus, 1998).

Student-perceived school related issues, such as Attitude Toward School, and Attitude Toward Teachers were of particular interest in this study, and these have adequate test-retest reliability (.80 and .72 respectively) and correlations with other instruments (e.g., CBCL) (Reynolds and Kamphaus, 1998). In addition, scales such as Locus of Control, Self-Esteem and Sense of Inadequacy, appear related to core theoretical assumptions of this study in that techniques of self-management, such as goal setting and achievement, will help students with ADHD improve their sense of adequacy and sense of control of their behavior in the classroom.

Determining Clinical Significant Change. The Reliability Change Index (RCI) as discussed by Jacobson and Traux (1991) was used to assess statistically significant change for rating scales completed by the teachers, the parents, and the students. The RCI is a psychometrically sound criterion for assessing treatment improvement. The standard error of measurement (S_E) of each instrument was used to calculate the S_{diff} or "spread of the distribution of change scores that would be expected if no actual change had occurred." To determine clinically significant change for measures that were administered at pre-test and post-test (CRS-R, BASC-SRP), the score at pre-test was subtracted from the score at post-test, and the difference of those scores was then divided by the S_{diff} to determine if actual change had occurred, taking in consideration measurement

fluctuations. For teacher rating scales the mean of the two baseline administrations was subtracted from the mean of the last two administrations (or the Txt S administration) to determine the RCI. An RCI larger than 1.96 would be unlikely to occur ($p < .05$), and would indicate statistically significant change on these measures.

Experimental Procedure

Referral and Screening

Special Education Coordinators of local school systems were informed of the opportunity to receive behavioral management services for students who met criteria for this study. They then informed and encouraged assistance from school counselors to identify students who might benefit from participation. The Principal Investigator (PI) met individually with the school counselors to ensure that they were aware of the criteria for inclusion and provide them with packets for distribution to parents of children thought to be appropriate for the study.

All packets included a letter from the special education coordinator endorsing the opportunity for these children to participate in the research study, a university IRB-approved parental consent form (Appendix D), a CPRS-R, and a stamped addressed envelope. One hundred packets were distributed and twenty-four parents responded indicating their interest in having their children participate.

Upon receipt of the signed parental consent form and CPRS-R, the PI contacted the parent by phone to complete the clinical interview (see Appendix A) in order to confirm diagnosis of ADHD and to assess current use of medication. Parents were informed of the additional screening process and the need to secure child assent

(Appendix E) and teacher consent (Appendix F), and parents were given the opportunity to ask questions about the research study.

Subsequently, the PI visited the student at his or her school to obtain assent. To deter coercion by the student's teacher or other school personnel, students were called from their classroom to the main office and met with the investigator individually in a conference room near the main office. Assent forms were read to the student. In addition to responding to any questions, students were reminded that they could withdraw from the study at any time. Once student assent was obtained, the BASC-SRP and the Forced Choice Reinforcement Survey were completed.

Teacher's consent was obtained after student assent was established. The PI met individually with each teacher to discuss details of the project and to answer any questions that the teacher may have. If the teachers agreed to participate, they were asked to complete the Conner's Attention Deficit Scale (CADS-T) and the Academic Performance Rating Scale (APRS).

Individual Behavioral Assessment

The first phase of this study consisted of an individual behavioral assessment to determine specific problematic behaviors of each student. Behavioral observations were conducted simultaneously for at least five days within the student's classroom to establish baseline rates of the five behaviors of the student as well as the four behaviors of the teacher that were part of the structured observation protocol. A sample of eight students was included in the first phase of observations.

Before observations began, teachers made a general announcement that college students from Auburn University were making regular visits to observe the class. In

addition, teachers told their class that the observers were there to work and that they should not be disturbed. This was done in an effort to reduce reactivity and decrease potential distractions.

All observations occurred at the same time each day in formal classroom settings to minimize differences across settings in which the data were collected. An appropriate time for the observation was discussed with the teacher so that the observation ideally could occur during a time in which the student would normally be doing independent seatwork. In addition, to make the observation period as naturalistic as possible, the teachers were asked to conduct themselves as they would normally and to give the student typical seatwork assignments (i.e., not change the student's academic requirements).

Teachers were asked for their perception of their student's problematic behaviors and were asked to rank order the five student behaviors being coded in accordance with their preference of being changed. Four of the eight students showed significant difficulties with one or more of the five behaviors that were observed ($\geq$ 30 percent occurrence). Parents of these four students were notified by phone once their child was deemed appropriate for participation in the study.

Training/Matching Phase

After the initial observations were completed, each of the four students were taken out of the classroom and shown a graph of their five behaviors as coded by the observers. The graph was explained to the students so that they were aware of which behaviors appeared to be more problematic. If the student was in agreement with changing his specific behavior, he was read a contract that explained his role in changing his behavior. (Please see attached example of the Student Contract, Appendix G.) The contract also

contained a statement regarding the student's ability to discontinue participating at any time. In addition, within the contract, the student was encouraged to choose a long-term goal (e.g., "I will remain on task 90 percent of the time") for his target behavior that was included in the contract. Primarily students were told that their short-term goal was to make any reduction in their problematic behavior, and to maintain this change. During this training period outside of the classroom the appropriate use of the coding materials was modeled and explained to the student.

Continued training in self-monitoring during the practice session and within the child's classroom was similar to the procedures used by Rhode et al. (1983) and Shapiro et al. (1998). Both of these studies utilized a contingency based, self-management technique that has shown success with students with identified behavior disorders. In this method, desirable rates of behavior in children are first established through the use of external management, then this response is maintained while responsibility for management is gradually and completely shifted to the student (Shapiro et al., 1998).

Students were told that the coders would give them the following instructions before each coding period: "Now it is time to work at your desk. We will tell you when to stop." Students were also given a Self-Recording Form (see attached example, Appendix H) containing the operational definition of the behavior they chose to monitor and simple instructions on how to code their behavior in the classroom. With the help of the research staff, students practiced coding their own behavior during this practice session and were encouraged to think of all the possible behaviors that could be coded as meeting or not meeting the criteria for the operationally defined behavior.

Students were told during the practice session that they would initially receive immediate, direct feedback regarding their behavior every time they were prompted, but that as the study continued they would receive "less and less help" from the observers and would eventually be expected to do well on their own. The student and the classroom coder both wore a "bug-in-the-ear" device that consisted of a walkie-talkie with a single earpiece attachment. A "beeping" sound was emitted through the bug-in-the-ear by the classroom coder on a random interval schedule averaging every two minutes (i.e., 10 prompts in 20 minutes). Attempts were made by the classroom coders to emit the prompts 5 times when the student was engaging in the target behavior and five times when the student was not engaging in the target behavior. After each prompt the student was then told (via the bug-in the-ear) either, "You are (insert chosen behavior)," or "You are not (insert chosen behavior)," and was expected to place a check mark on the Self-Recording Form under either "yes" or "no" to indicate whether or not he was engaging in the target behavior. The student was given the opportunity to practice and receive feedback during the training session as it would occur within the classroom. Once the study began, the amount of feedback the student received from the classroom coders was gradually faded each consecutive day, starting with feedback on all 10 prompts, to feedback on 6 prompts, to feedback on 4 prompts, until the student received no verbal feedback from the coder.

The Matching portion of the Training/Matching Phase occurred simultaneously with the fading of feedback. At the end of each observation the classroom coder and the student compared their coding sheets for the prompts in which the student was not given feedback. For example, when the student received verbal feedback on 6 of the 10

prompts, accuracy was determined using the 4 prompts in which the student did not receive feedback. Fading of the feedback that the student received only occurred when he was at least 50 percent accurate and showed improvement/maintenance of the target behavior. If this did not occur, the session was repeated until the student met these requirements and could continue to the next step in treatment.

At the beginning of the Training/Matching Phase, students were also encouraged to code their own behavior at times when they were not prompted, and when doing so they were able to earn a bonus reinforcement if they did this independently at least 8 times. If the student was at least 50 percent accurate and continued to show improvement/maintenance of the appropriate behavior without any feedback for three days, he progressed to the Fading to self-management phase.

Fading to Self-Management

The second phase of treatment included fading the frequency with which the students compared their ratings with classroom coders and the frequency of the times that the student was prompted during the 20-minute observation periods. During this phase students were told that accurately coding their own behavior was still important, but that they would only compare their Self-Monitoring Forms with the classroom coders on a random basis. The students were told that they could earn a reinforcement for accuracy on the days that it was checked. During this time the prompt was also faded from random intervals averaging every two minutes to every four minutes, then to every six minutes, then to every ten minutes, until finally the students had no prompt at all. Students received one prize for coding their own behavior without a cue and one prize for

behavioral improvement/maintenance based upon the observations of the classroom coders.

Complete Self-Management and Post Testing

The final phase was complete self-management. As the accuracy checks and the cues were faded, the procedure culminated in self-management. Students in this phase were given a self-recording form (see Appendix I) and were told to report verbally their class performance to their teacher at the end of the class period. Behavioral observations continued in the classroom during this period so that changes in the target behavior could be recorded. All pretest measures (parent, teacher and child rating scales) were administered at posttest to determine any significant behavior changes.

Reinforcement Periods

Based upon the results of the Child Forced Choice Reinforcer Assessment administered during the assessment portion of the study, multiple reinforcements (congruent with student interests) were made available. Students were given the opportunity to choose a reinforcement from one of four categories: things to eat, things to do, things to keep, or social reinforcement from their parent or teacher. In addition, reinforcement periods occurred immediately after the 20-minute observations, and students chose their own reinforcement.

RESULTS

Observational Data

Baseline

Target Behavior. Baseline rates of the target behaviors (Fidgeting and Off Task) for each student are presented in Figure 1. Students displayed relatively high baseline levels of off task and fidgeting behavior during their independent seatwork, with a mean number of scored intervals of fidgeting for Jim at 56% and for Tom at 37%, and the mean number of scored intervals of off task for Ray at 65% and for Chad at 34%. The students also displayed relatively variable rates of the target behavior during the baseline observations, but all 4 students demonstrated an increasing trend in fidgeting or off task behavior prior to implementing the intervention.

Non-Target Behaviors. The percentage of scored intervals for non-target behaviors during baseline data collection are shown for each student in Figures 2 through 5. Generally, non-target behaviors occurred at consistently low rates for Jim, Ray and Chad. However, these students as well as Tom showed variable, and at times, high rates of Vocalization behavior during baseline. Tom also showed variable, and at times, high rates of Off Task and Out of Seat.

Teacher Behaviors. Observations were structured to occur during periods of independent seatwork. It was expected that interactions between the students and teacher would be minimal. Data were collected on four teacher behaviors for each child: Teacher Command, Repeat Command, Teacher Approval, and Teacher Negative. As expected,

these behaviors occurred at consistently low rates during baseline data collection (e.g., less than 5% of scored intervals).

Intervention

Target Behavior. Response patterns for the target behaviors during the behavioral intervention were similar for 3 of the 4 students. As seen in Figure 1, for Chad, Tom, and Jim, the intervention produced stable behavior at a much lower rate of scored intervals than observed at baseline. For example, the observed range of Jim's fidgeting behavior at baseline was between 48 and 98 percent (M = 65%); however, during the behavior intervention phase Jim's fidgeting behavior ranged from 0 to 31 percent (M = 8%). Likewise, the observed range of Tom's fidgeting behavior at baseline was between 16 and 85 percent (M = 34%); however, during the intervention phase his fidgeting behavior ranged from 1 to 22 percent (M = 7%). Chad showed a similar pattern with a range of off task behavior from 5 to 89 percent (M = 56%) during baseline, and a markedly improved pattern of behavior during the intervention phase ranging from 3 to 26 percent (M = 11%).

For Ray, the pattern of instability seen during baseline continued during the period of intervention, and the difference between the rate of off task behavior at baseline (M = 37%) and during behavior intervention (M = 24%) was not as apparent as the other three students based upon visual inspection.

Sessions of the behavioral intervention were repeated, if the student was not at least 50 percent accurate in recording his own behavior or if he did not show improvement or maintenance of improvements in the target behavior. Generally, maintenance was considered to be less than 20 percent occurrence of the target behavior.

Three (Chad, Jim and Tom) of the 4 students required 1 to 2 repetitions of intervention sessions. Ray required 7 sessions of the intervention to be repeated.

Interpretation of these results would not be complete without considering the participants' use of medication. Changes in medication for two of the students in the study during the intervention did not appear to affect occurrence of target behavior during the intervention. Jim forgot to take his medication for three days during one school week, and the percent of occurrence of fidgeting continued to occur at low, stable rates, as when he was on medication. Ray's behavior was noticeably improved for the first few days that he began taking a new medication during the intervention, but long-term data collection showed no difference between percentage of scored intervals of the target behavior before and after the initiation of his new medication. Perhaps most intriguing from a behavioral standpoint, is the significant positive changes noted in Chad's behavior with the initiation of the behavioral intervention. Chad was not on any medication throughout the study.

It is also important to mention that at the initiation of the behavioral intervention Tom was not receiving his prizes as consistently as the other students in the study. All students were allowed to choose their reinforcements immediately after classroom observations were completed. Students were then asked to place their prizes in a bag to take home with them when they left school. Tom's teacher informed us at the end of the first week of data collection that she was holding many of Tom's prize bags as a consequence for poor classroom behavior during the afternoons after the behavioral intervention. Tom's teacher was asked to find other negative consequences for Tom's behavior outside of the behavioral observation periods, and she agreed to do this.

Non-Target Behaviors. Percent of scored intervals of the non-target behaviors for each student are presented in Figures 2, 3, 4 and 5. It was hypothesized that these behaviors would remain the same, since they were not the focus of the behavioral intervention. However, generalizations of the behavioral intervention were noted by visual inspection for both Jim and Chad. Jim's rate of Vocalization behavior and Chad's rate of Out of Seat behavior significantly decreased during the behavioral intervention and were maintained at a low rate of occurrence. The percentage of scored intervals of Vocalization and Plays with Objects for Chad also became consistently lower. As expected, Tom and Ray evidenced no obvious change in the non-target behaviors during the treatment intervention. Plays with Objects typically occurred at low rates for Tom, although he had two days in which the percentage of scored intervals was elevated. The second elevation during the intervention phase occurred on a day that the class had a substitute teacher. Further examination of Tom's performance on the fifth data collection for all non-target behaviors reveals increases in the percent of scored intervals of three out four of his non-target behaviors.

Bug-In-The-Ear. Classroom observers also coded the percentage of times that each student touched the bug-in-the-ear device during the behavioral intervention. This was done to determine if the use of the device was a distraction to the child during the intervention. As seen in Figure 6, the students typically showed consistently low rates of touching the bug-in-the-ear. Tom had the most difficulty becoming accustomed to wearing the bug-in-the-ear. He frequently complained of it not fitting well and insisted on wearing a knit hat to keep it in place. Tom's most frequent touching of the bug-in-the-ear occurred on the sixth day of data collection during the intervention phase. As mentioned

previously, average occurrence for most observed behaviors were higher on this day, likely due to having a substitute teacher. It should also be noted that students would ask to use the bug-in-the-ear to talk to the research assistants, since it was a walkie-talkie with earphone attachments and the assistants were talking to them toward the beginning of the behavioral intervention. However, it was made clear to the students that the device was only there to help them learn how to pay attention to their own behavior and that the research assistants would not respond to them if they attempted to use it as a walkie-talkie.

Teacher Behavior. Similar to data collected at baseline, the percentage of scored intervals for teacher behaviors was consistently low, as expected, given that it occurred during independent seat work.

Complete Self-Management

Target Behavior. The percentage of occurrence of target behavior during the complete self-management phase (CSM) of the study were maintained at rates lower than those at baseline for two of the participants, Jim and Chad (see Figure 1). Tom chose not to participate in the study after one day of collection in the CSM phase, stating that he no longer wanted the observers to come into his classroom. Ray's rate of problematic target behavior increased dramatically during the CSM phase to rates higher than those at baseline.

Non-Target Behavior. For Jim, Vocalization, a behavior that was not specifically targeted for this intervention, occurred at a visibly lower rate during the Intervention phase and maintained at a rate lower during the CSM phase of the study. Similarly, Chad's non-target behaviors that showed visibly lower rates during the intervention phase

(Vocalization, Plays with Objects, and Out of Seat) also showed consistently lower rates during the CSM phase of the study, although they were more elevated during the CSM phase than during the Intervention phase. Ray engaged in fewer instances of the non-target behavior, Plays with Objects, during the Intervention phase, but this lower rate did not maintain during the CSM phase, and actually increased above rates observed during the baseline phase.

Teacher Behavior. As predicted, rates of teacher behavior continued to occur at consistently low rates during the CSM phase.

Teacher Behavior Ratings

Conners' Attention Deficit Scale (CADS-T)

The ADHD Index of the CADS-T was examined approximately every two weeks to track student's response to the behavioral intervention. Figure 7 is a graphical representation of the T-scores obtained on this measure for each administration. Tom's teacher did not complete the rating scales for the second baseline administration; thus, the data are not reported. Baseline administrations of the CADS-T were fairly stable, with the largest difference being 7 points between the first and second baseline administration.

During the behavioral intervention, teachers were asked to rate students' behavior twice. For the first administration, teachers were asked to rate the student's behavior, thinking specifically of the student's behavior during the intervention within the classroom (Txt S); whereas, for the second administration, teachers were asked to rate student behavior, thinking of the student's behavior in general (Txt G) or across classroom situations other than the intervention. Looking at Figure 7, three of the four teacher responses for Txt S indicated changes of one standard deviation (10 points) or

more in relation to baseline (Pre 1, Pre 2) and resulted in scores that were not indicative of clinically significant symptoms of ADHD.

Using the RCI formula, changes for Jim, Tom and Ray were also shown to be statistically significant. Chad's teacher's responses for Txt S were no different from those of baseline administrations.

The last two data collections (Txt G and Post) assessed student behavior in general across classroom situations, rather than student behavior specifically during the intervention phase (Txt S). ADHD symptomatology, as reported by 3 of the 4 teachers at Txt G and Post, was similar to that of baseline teacher ratings. Responses of Chad's teacher indicated a decrease in his cross-situational symptomatology compared to baseline and treatment specific (Txt S) administrations. This change was also determined to be statistically significant.

Academic Performance Rating Scale (APRS)

The APRS was administered in conjunction with the CADS-T approximately every two weeks to assess teacher perceived academic productivity and accuracy in the classroom for each student. These results are presented in Figures 8 through 11.. Based on the RCI criterion for clinical change, results regarding statistical changes were modest. Tom and Ray showed significant improvements from baseline to post-treatment on two subscales: Total Score, and Academic Productivity. Tom also showed significant improvements on the Academic Success subscale. It is important to note that Tom's improvements post-test placed him within one standard deviation of the mean for typically functioning students on all three subscales; whereas, his functioning at baseline placed him at least one standard deviation below the mean of students at his grade level.

Ray's scores both at pre-test and post-test indicated clinically significant lower levels of performance. It is also important to point out that all four subtests of the APRS for Jim and Chad were similar to norms for typically functioning students during baseline and at post-test.

Parent Behavior Ratings

Conners Rating Scale – Revised: Long-Version (CRS-R:L)

Parents completed the long-form of the CRS-R upon initiation and completion of data collection for each student. See Table 6 for results. Generally, scores on subtests and global indices were consistent, with changes of less than one standard deviation from pre-test to post-test for all four students. Parent ratings of Chad's behavior were the exception. At pre-test Chad's mother's responses resulted in five clinically elevated scales. However, at post-test measurement Chad's mother reported no clinically significant problems. Statistical analysis, taking into account measurement fluctuations using RCI, also showed these changes to be significant. Although Conners suggests a change of 5 points signifies response to treatment, statistical analysis taking into account the standard error of measurement suggests otherwise.

On the ADHD Index Chad was the only participant whose parent responses resulted in statistically and clinically significant change. All other participants' scores remained stable. None of the parent ratings for the Global Index Total resulted in clinically significant or statistically significant change. However, Chad's parent reported improvements that were clinically and statistically significant on the Restlessness/Impulsiveness subscale of the Global Index. Jim's parent's responses showed a clinically significant improvement on this measure, but it was not a statistically

significant improvement. Tom's parent reported both a clinically significant and a statistically significant improvement on the Emotional Liability subscale of the Global Index.

Further examination of the subscales of the CRS-R showed a statistically significant, but not clinically significant decrease on the Hyperactivity scale for Ray. Jim also showed a statistically significant change on the Hyperactivity scale that was not clinically significant; however, his scores on this measure increased from pre-test to post-test. Responses of Chad's parent on the Cognitive Problems scale resulted in a clinically significant decrease from pre-test to post-test that was also statistically significant. Similarly, Tom's parent's report resulted in both clinically significant and statistically significant improvements from pre-test to post-test on the Psychosomatic scale. According to responses of Ray's parent, his social problems elevated to clinically significant levels from pre-test to post test; this change was also statistically significant.

Examination of the DSM-IV subscales shows both clinically and statistically significant improvements for Chad from pre-test to post-test on the Inattentive scale and Total scale. Responses of Jim's parent also showed statistically significant change from pre-test to post-test on the Hyperactive/Impulsive scale of the DSM-IV. However, this change showed an increase in reported behavior problems, and both pre-test and post-test scores were suggestive of clinically significant problems in this area.

Student Completed Measures

Behavior Assessment System for Children-Self-Report of Personality (BSC-SRP)

Students completed the BASC-SRP, once prior to the initiation of the study, and once upon completion of the behavioral intervention. See Table 7 for results. Post

assessment data are not available for Tom because he declined to participate in the study after the completion of the behavioral intervention. Similar to analysis of the APRS subscales, the Reliable Change Index (RCI; Jacobson & Traux, 1991) was used to calculate statistically significant changes from pre-test to post-test.

Reports of School Maladjustment were significantly lower at post than at pre-assessment for Ray. Moreover, Ray's answers at post measurement placed him in the sub-clinical "at risk" range of functioning. Further examination of the clinical scales that compose the School Maladjustment Composite showed a statistically significant improvement on the Attitude to School scale from pre-test to post-test for Ray, resulting in a change from clinically significant difficulties to typically functioning compared to peers. As seen in Figure 7, ratings for Jim and Chad on the School Maladjustment composite and its subscales, Attitude to School and Attitude to Teachers, were subclinical at both pre- and post-test measurement. Statistically significant changes did not occur for either participant on the School Maladjustment composite or its subscales.

Results obtained for the Clinical Maladjustment composite placed Ray in the clinically significant range for problems at pre-test, but at post-test his T-score on this composite was not significant. In addition, the RCI for this composite score indicated statistically significant change from pre-test to post-test. Further examination of the clinical scales that make up this composite showed statistically significant and positive changes for Ray on the Atypicality and Anxiety scales, but not for Locus of Control or Social Stress scales. Ratings of Atypicality, Anxiety, and Social Stress were in the "at risk" range at pre-test, and all three measures were clinically non-significant at post-test. Although there was no statistically significant change on the Social Stress scale, Ray's

responses indicated clinically significant difficulties on this measure at pre-test, but no significant difficulties at post-test. Overall, Jim and Chad's scores at pre-test and post-test were similar on the composite and its clinical scales. No statistically significant differences were noted from pre-test to post-test.

Results of pre- and post-testing on the Personal Adjustment composite showed a statistically significant decrease in t-scores from pre-test to post-test for Ray; however, both scores placed him in the clinically significant range of difficulties on this composite. Jim and Chad's scores at pre-test and post-test were within the range of their typically functioning peers, and no statistically significant differences were noted. Further examination of the clinical scales that compose the Personal Adjustment composite (Relations with Parents, Interpersonal

Relations, Self-Esteem, and Self-Reliance) showed a statistically significant lower score at post-test than at pre-test for both Jim and Ray on the Self-esteem scale. This change was clinically significant for Ray, but not for Jim. Pre-test and post-test t-scores for Jim and Chad on all four subscales of the Personal Adjustment composite were typical of their peers and showed no clinically significant changes. However, Ray's responses evidenced clinically significant problems on all four clinical scales at pre-test and improvement to typical functioning at post-test for three of the four clinical scales.

Similar to the other composite scales, Ray's T-score from pre-test to post-test on the Emotional Symptoms composite showed a statistically significant difference as well as clinically meaningful change, taking him from clinically significant at pre-test to subclinical but "at risk" at post-test. Scores for Jim and Chad on this measure showed no statistically significant change from pre-test to post-test. However, Jim's scores, which

were "at risk" for clinical difficulties at pre-test were similar to those of his typically functioning peers at post-test. Further examination of the clinical scales that compose the Emotional Symptoms composite showed statistically significant improvements for Ray on the Sense of Inadequacy scale. This change was also clinically significant, taking him from clinically significant elevations at pre-test to subclinical ratings at post-test. For Jim, both pre-test and post-test t-scores on the Sense of Inadequacy scale were clinically significant, but no statistically significant change was noted. Chad's scores, as with other clinical scales of this measure, were stable, showing no statistically significant change and similar to his typically functioning peers.

Student Treatment Satisfaction

All four students completed the Student Satisfaction Rating Scale (See Appendix J). Three of the four participants reported that they enjoyed being a part of the research project and gaining assistance with their difficulties in school. Tom, the student who dropped out at the end of the study, reported that he did not like being a part of the research study, and at a later point told one of the research assistants that he did not like wearing the bug-in-the-ear. All of the students reported a favorable relationship with the research assistants and the primary investigator. Three of the four students reported that they felt different, acted different, and learned things that have helped them in school as a result of the being part of the study. However, Tom reported that this did not occur for him. All four of the students reported that their problems in school got smaller and that they liked the help that they received during the study.

DISCUSSION

The purpose of this study was to further evaluate the use of a contingency based self-management program for the treatment of students with ADHD during independent seatwork in the classroom. Students with ADHD are documented to have difficulties in maintaining self-directed behavior (Barkley, 1997a). Nonetheless, demands for their increased independent functioning continue to be a priority for their parents and teachers. Thus, as Barkley (1997a) states, there is a need for treatments that make use of "forms of stimuli comparable to the internal counterparts that are proving so ineffective," and to find effective agents of behavioral change that can be used independently by students with ADHD. Self-management techniques have shown promise, but previous studies on the use of self-management techniques have been compromised by methodological difficulties and have not fully investigated the use of these techniques for the reduction of problematic ADHD related symptomatology in the classroom. In addition, research has generally focused on placing significant others (parents and teachers) in charge of selecting target behaviors to change, setting behavioral goals, and choosing reinforcements for students. However, according to Kanfer and Gaelick-Buy's (1991) theoretical assumption, behavior change occurs when the individual is invested in the process and in agreement with the behavioral goal. This study adds to previous research by promoting active involvement of the student at all stages of behavior change including participation in changing a targeted behavior problem in the classroom, goal setting, and

self-reinforcement. In addition, this study further examined the use of self-management techniques for specific symptoms related to ADHD.

Five broad hypotheses were investigated. First, it was hypothesized that the use of self-management techniques in treating students with ADHD would be effective in improving the targeted behavior problem in the classroom, as evidenced by changes in structured behavioral observations. Other observed problematic behaviors (core ADHD symptoms) were expected to remain unchanged. Second, it was hypothesized that decreases on teacher rating scales would be noted for ADHD core symptoms, reflecting the reduction in the problematic behavior noted during structured behavioral observations. Third, teacher ratings of academic productivity were hypothesized to show significant improvements during the periods of behavioral observation when the intervention was implemented. Fourth, it was hypothesized that there would be a significant difference on pre and post measures of core ADHD symptomatology as rated by parents. Finally, it was hypothesized that self-report measures would indicate fewer clinical elevations at post measurement on scales theoretically related to this experiment, such as attitude toward school, locus of control, self-esteem, and self-reliance.

Results of behavioral observation data support the primary hypothesis that the use of self-management techniques is effective in improving core behavior difficulties of students with ADHD in the classroom. All four students showed significant decreases in problematic behaviors during the behavioral intervention. These results are similar to those of other investigations that have explored the use of contingency based self-management components in the reduction of problematic behaviors (e.g., Edwards et al., 1995; Mathes & Bender, 1997; Stewart & McLaughlin, 1992). Results such as these also

fit with a global observation regarding children with ADHD, that when positive or negative consequences for behavior are delivered immediately, and at a high rate, children with ADHD are often indistinguishable from children without ADHD (Barkley, 1998; Pfiffner & Barkley, 1998).

All four participants showed significant behavioral variability at baseline, but rates of behavior became more stable during the behavioral intervention for three of the four participants. Observed rates of behavior for Ray continued to be variable during the behavioral intervention. This could have been related to a medication change during the study. It is also important to note that Ray was in the custody of his maternal grandmother at the time of the study and that she reported many additional significant behavioral difficulties at home. At the conclusion of the study, Ray's grandmother requested therapy referrals for Ray and for education regarding the use of behavior management techniques within the home. Ray also exhibited more oppositional behaviors than other children in the study. Although a prior diagnosis of Oppositional Defiant Disorder was not reported for any of the participants, research has shown that dually diagnosed children are less responsive to treatment and have a more negative prognosis (Biederman et al., 1991).

Unexpectedly, observational data showed generalization of treatment effects to the non-target problematic behaviors for two of the students. It is important to note that these behaviors were related to each other in such a way that decrease of one behavior would trigger automatic decreases in another behavior. For example, prior to initiation of treatment, Chad spent much of his independent seatwork time socializing at the pencil sharpener. Although Off Task was the targeted behavior for improvement, decreases were also noted for out of seat and vocalization. This would be expected, given the behavioral

definition for Off Task included looking at the materials on his desk. In addition, all students were reminded in the assent form and verbally throughout the training sessions that their target behavior was interfering with their ability to complete their class work. Thus, although the target behaviors, fidgeting and off task, were of primary focus, other observed behaviors, vocalization, plays with objects, and out of seat obviously interfere with completion of class work and are directly tied to the overall focus of this behavioral intervention.

As hypothesized, decreases on teacher rating scales for ADHD core symptoms were noted, concurrent with the changes noted during the behavioral observations. When asked about changes in student behavior within the classroom during the behavioral intervention periods, three of the four teachers reported clinically and statistically significant behavioral changes. Although, it is important to note, when asked about behavior in classroom contexts other than the behavioral intervention, most teachers noted no difference between pre-test and post-test evaluations. Findings such as these are not surprising. As previously mentioned, the literature has pointed out that the "train and hope" method is ineffective and procedures for generalization need to be part of the overall program for optimal effectiveness (Stokes & Baer, 1977). Further research could explore extending the use of the self-management procedures to different classroom contexts, such as periods of classroom instruction in addition to independent seatwork. This will be especially important considering the educational methods used in classrooms in this study. Many of the teachers allowed very little time for independent seatwork (e.g., two 20-minute periods a day) and typically used direct instruction with the class as a whole, taking short breaks for individualized attention to students.

Our third hypothesis, that teacher ratings of academic productivity would show significant improvement during the periods of behavioral observation when the intervention was implemented, was not supported from the data. Results such as this were comparable to findings of other self-management studies that did not specifically target academic accuracy or productivity (e.g., Harris, 1986). Self-management studies that have included academic accuracy and productivity as target behaviors for change have had positive results (Cameron & Robinson, 1980; Chase & Clement, 1985; Edwards, et al., 1995). It is also important to note that all of these studies assessed academic productivity and accuracy through direct observation on set school tasks (e.g., math worksheets). Teacher rating scales were used to assess academic productivity in this study to decrease any interference in school lesson plans, and tasks typically varied for each student from day to day during independent seatwork. For example, tasks for Ray during independent seatwork varied from reading a library book, to defining words to taking a spelling test. The rating scale may have not been sensitive enough to assess changes in academic productivity for the students, since individual tasks were so variable and did not always produce work that was graded or checked by teachers. Future investigators may find it beneficial to incorporate standardized measurements of students' independent work so that academic productivity and accuracy can be assessed. Moreover, inclusion of assessments of academic productivity and accuracy in addition to ADHD related symptomatology would be advantageous in developing an overall behavior management program in the classroom. Previous researchers have also shown that behaviors related to productivity and accuracy are incompatible with inattentive and disruptive behaviors (Pfiffner & O'Leary, 1993).

It was hypothesized that there would be a significant difference on pre and post measures of core ADHD symptomatology as rated by parents. However, only one parent reported clinically and statistically significant changes for her son (Chad) from pre-test to post-test on the ADHD Index of the CRS-R. Because the CRS-R is a broadband rating scale it may be less effective in capturing short-term treatment sensitive changes (Anastopolous & Shelton, 2001). Chad's mother also reported clinically and statistically significant changes on four other subscales of the CRS-R, suggesting that there was a significant decrease in Chad's overall problematic behavior during the course of the behavioral intervention. One reason for the improvements noted by his parent could be response bias. Although no data were collected, communication between this teacher and parent was frequent and likely occurred more often than communication between other teachers and parents in this study. In addition, Chad's teacher was very pleased with behavioral changes noted during the intervention phase and frequently reported these improvements to Chad's parent. Chad's teacher also appeared more invested than other teachers in learning and incorporating skills from the behavioral intervention, and she requested information regarding our procedures and purchasing equipment (e.g., bug-in-the-ear). In addition to response bias, regression effects could account for changes in behavior rating scales completed by Chad's mother. Regression effects are an inherent problem when ratings scales are administered at pre-test and post-test to detect change (Hinshaw & Nigg, 1999).

Finally, it was hypothesized that self-report measures would indicate fewer clinical elevations at post measurement on scales theoretically related to this experiment, such as attitude toward school, locus of control, self-esteem, and self-reliance. Results in

support of this hypothesis were meager, and a minimal number of clinical elevations were noted at pre-test for three of the four students who participated. Previously, researchers, who have studied self-management techniques, have not included self-report ratings scales completed by students. Students in this study did not perceive their behavior as problematic as their parents and teachers perceived their behavior. Prior investigators have shown that children with disruptive behavior disorders are typically not as accurate as their parents in reporting their behavior (DuPaul & Stoner, 1994). It is possible that the students in this study minimized their difficulties. It is also important to note that the BASC is broad band self-report measure; thus, it may be less sensitive in capturing treatment changes from pre to post measurement.

Only one student (Ray) showed clinically and statistically significant improvements from pre-test to post-test on subscales of the BASC-SRP. Six subscales of this measure, including Attitude Toward School, and Self-Esteem, went from clinically significant elevations at pre-test to subclinical at post-test. Positive interpretation of these results should be done cautiously, given that the results are based on pre and post assessment measures and changes could also be explained by regression effects (Kamphaus & Frick, 1996). Ray's scores on most scales were clinically elevated at pre-test, while T-scores of other students at pre-test were typically close to the mean of the standardization sample. Another explanation for these results could be a socially desirable response set. The BASC-SRP was read to the students and administered shortly after the behavioral intervention, which was defined as a way to improve school work. It is possible that Ray responded in a way to please the investigators by indicating improvement.

Broad conclusions based on the overall results are limited due to small sample size and sample selection. Although females were not excluded from this study, the females that were referred for participation did not qualify for the study because baseline rates of problematic behavior in the classroom were not elevated. Teachers reported that behavior of the females was typical during classroom observations; thus, it is thought that reactivity to the observation was not a confounding factor for their selection. It may be that the behaviors chosen for observation in this study are more frequently exhibited in males than in females diagnosed with ADHD, or that these behaviors occur at a higher rate in males than in females diagnosed with ADHD. For example previous research has shown that a smaller percentage of females with ADHD are defiant and aggressive, and certain observation categories may be less discriminatory for females with ADHD (DuPaul and Stoner, 1994). More research is needed on expression of these symptoms in females compared to males.

Students in this study were also from the same rural community, attending the same school. The choice was made to conduct the study at one location to reduce cost and logistical difficulties; however, this also creates a more geographically homogenous sample. Likewise, participation in this study required a diagnosis of ADHD, Combined Type, and comorbid diagnoses, such as Oppositional Defiant Disorder, were not reported by parents during the brief interview or on rating scales. Given the high degree of comorbidity of ADHD with these diagnoses (Shelton & Barkley, 1995), this sample would be considered clinically homogeneous as well, and may not represent the breadth of problematic behaviors often associated with ADHD. In addition, students diagnosed with Oppositional Defiant Disorder in conjunction with ADHD may have more difficulty

actively participating in goal setting and changing behavior. Ray's parent reported more oppositional behaviors and eventually sought therapy referrals during the course of the study. His overall observed behavioral improvements were not as evident as those of other students.

A more significant concern of this study may be confounds of medication effects. Attempts were made to ensure that medication status was stable for participants. However, due to ethical concerns, changes in medication throughout the study could not be prevented. Parents were asked to report any changes to the Principal Investigator, and two parents reported changes during the study. Ray initiated a new medication twice during the study, once during the behavioral intervention, and once at the initiation of complete self-management phase. The first change in medication did not appear to have significant effect on observed behaviors during the intervention phase. However, initiation of a new medication at the beginning of the complete self-management phase occurred concurrently with a significant escalation in the target behavior and detracted from any overall conclusions that can be made regarding long-term treatment effects. Jim did not take his medication for three days during the behavioral intervention, and he maintained overall behavioral improvements throughout the intervention phase.

Another criticism of this study is the lack of follow-up booster sessions to reinforce the skills trained during the intervention. Results for two of the four students showed maintenance of treatment gains after the intervention and through the complete self-management phase. However, Tom chose to discontinue participation, and Ray's behavior increased significantly at the end of the intervention phase, congruent with a medication change. Planning booster sessions at regular intervals after the intervention

may have been helpful to carry over treatment effects and maintain the positive results of the intervention.

Conducting the intervention in the natural setting was an attempt to extend generalization of the treatment results. Previous research has shown that similarity between treatment setting and the natural setting plays a role in the effectiveness of treatment (Whalen, et al., 1985). However, as mentioned previously, this study did not train for generalization to occur outside the context of the behavioral intervention. Thus, it is not surprising that improvements in behavior were only noted during the behavioral intervention phase.

At the initiation of the study, it was hoped that teachers would be able to have more active involvement, especially during the intervention phase; however, time demands and workloads often prevented them from participating. Difficulties arranging teacher involvement are certainly concerns for endorsing the use of this intervention in schools. Even brief time commitments of 15 to 20 minutes were difficult for teachers to uphold. It is felt that regular educational demands on the teachers, rather than demands of participating in this study, prevented teachers from being as actively involved as they could be. Future school related intervention programs, such as this, would benefit from evaluating teacher stress and workload prior to the initiation of the study to make accommodations or changes for planned behavioral interventions on behalf of ADHD students (Barkley, 1997b; DuPaul & Stoner, 1994), especially considering that studies have shown that increased teacher stress related to provision of accommodations for students with ADHD within the classroom can adversely affect the behavioral adjustment and academic success of students with ADHD (Greene, 1996).

Planned parent components to accompany this program could also prove effective in further studies. Parent components in previous studies of self-management have shown promise (Cameron & Robinson, 1980). In addition, parent components for cognitive-behavioral treatment components for students with ADHD have been shown to be effective in the facilitation of treatment effects (Frankel et al., 1997; Whalen et al, 1985). Students in our study were given the option to have a positive note regarding their progress given to their teachers or sent home to their parents; however, this was not a planned component. It is possible that reductions of behavior problems reported by Chad's parent were related to frequent parent-teacher communication providing the parent with positive verbal feedback regarding behavior change in the classroom. Naturalistic consequences such as positive parental attention to improved behavior in school would likely prove to be a powerful reinforcement for sustaining these behavioral improvements. Further exploration of increased parental and teacher involvement , specifically in the form of progress notes regarding positive behavior change, would be worth investigating.

Despite the limitations of this study, overall results are promising and suggest that programs of self-management for students diagnosed with ADHD are effective in reducing problematic related ADHD symptomatology in the classroom. General goals for studies of clinical intervention include reducing observed and/or reported symptomatology, and placing the individual in the typical range of functioning, comparative to that of peers. Teacher ratings of associated ADHD symtomatolgoy during the behavioral intervention phase in our study showed statistically significant reductions in symptomotology, resulting in subclinical scores that would be comparative to those of

typically functioning peers. Although the techniques require some time and effort to introduce, the reward of the student's independent functioning in the classroom is valuable for teachers and is typically a primary goal of instruction.

Observed behavioral changes noted during the intervention phase were sustained for two of the participants during the complete self-management phase, which included no tangible rewards. It is also important to note that, as with other self-management studies (e.g., Edwards et al., 1995), students in this study typically reported that the tasks of self-management were enjoyable and helpful in reducing their difficulties in school. These results are promising and deserve further empirical exploration. Theoretically and empirically, children with ADHD generally have been characterized as being able to acquire the knowledge they need to function independently, but having significant difficulty with using this knowledge or executing the behaviors necessary to function independently. Self-management techniques can be used by professionals to address skill acquisition by teaching students how to label and observe their own behavior, and by frequently prompting students to observe and correct their own behavior. With appropriate salient reinforcement and frequent practice students with ADHD can show significant behavioral changes in the classroom.

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Table 1
CBT Treatment Outcome Studies

Article	Participants	Design	Treatment	Dependent Variable	Results
Ajibola & Clement (1995)	males, 9-12, no meds, CTRS ≥ 15, disruptive, impulsive, inattentive, hyperactive, avg IQ, N =6	Within-Subj. I. Placebo & Noncontingent R+ II. Low Dose & Noncontingent R+ III. High Dose & Noncontingent R+ IV. Low Dose & S-R V. High Dose & S-R VI. Placebo and S-R	S-R, meds, Noncontingent R+ (fast food, afternoon at the park)	Inattention, Impulsivity, Hyperactivity, Accurate counter usage, Accurate S-R, amount, Amount & Accuracy of academic performance (reading)	No diff. btwn baseline & I, Meds decreased impulsivity hyperactivity, accuracy & amount of performance, No effect on attention, Low Dose better, S-R improved target behavior, comb Med & S-R better than either alone
Barkley, Copeland & Sivage (1980)	Hyperactive males, 7-10 avg IQ, CTRS & activity rating scale > 2 SD's	Within-subj. reversal I. Baseline(1wk) II. S-I, S-M, S-R(3wk) III. Baseline(1wk)	S-I: 20 min./day S-M: 30 min./day S-R: pts for activities Large group	# of misbehaviors/min. during large group, # of misbehaviors during small group, % time on task during individual work time, wrist and ankle actometer scores, # of mis-behaviors/ min. during reg. school hours	Increased time on task, Decrease in # ofmisbehaviors in individual work , No change in actometer, No generalization to reg. ed. classes, No change in large group settings
Cameron & Robinson (1980)	behaviorally defiant elem. school age children, N=3 CTRS-HI ≥1sd	Within Subjs I. Baseline II. Training III. S-I & S-R	Self-Instruction Self-Reinforcement 30 min/day (12) Math R+ = special activity	On-task, % correct math, % errors self-corrected in reading	Increased on-task behav. for 2 of 3 Ss Increased % correct for all 3, % errors self-corrected increased

Article	Participants	Design	Treatment	Dependent Variable	Results
Chase & Clement (1985)	boys, 9-12 avg IQ, reading diff., CPRS≥15, Bender ≥ 1SD ADHD diag on meds, N=6	Within-Subj. I. Baseline II. Ritalin & Nocontingent R+ III. S-R & placebo IV. Ritalin & S-R	S-R: 30-45 min/day Meds, backup R+	Counter usage, academic performance, accuracy of academic performance	For amount: S-R > med, S-R + med > med or S-R For accuracy: SR > med, S-R + med > med or S-R (but only marginally
Douglas, Parry, Marton, & Garson (1976)	boys 7-9 w/ hyperactive syndrome, avg IQ, ACTRS or ACPRS ≥ 1.5 MFF x latency = 10 sec, N = 18	Between Grp Pre/Post I. Training II. Control	S-I, Modeling, S-R 1hr/2x's/wk (3mos) 6 sess. w/ parents & 12 sess. w/teacher to instruct on techn.	MFF, Story Completion, Porteus Mazes, Bender, Memory tests from the Detroit Tests of Learning Aptitude, Durrell analysis of reading diff., WRAT-arithmetic subtest, CTRS CPRS (short forms)	The txt group-less errors & more latency on MFF, decreased aggression, & increase in relistic responses on story completion, showed sig. improvement in 9 variables at post-test
Edwards, Salant, Howard, Brougher & McLaughlin (1995)	males, 7-9 no meds, diag. ADHD N = 3	Within-subj. I. Baseline II. Training III. Treatment (3wk) IV. Baseline 2 V. Txt & fading	S-M, S-R	attention to task, reading comprehension	Increased attention to task task & improved comprehension (% correct)
Harris (1986)	diag LD, inattentive, unproductive avg IQ,below avg achvmt., 2 males, 2 females, N=4	Within-subj I. Baseline II. S-M attention III. S-M productivity IV. Choice	Self-Monitoring Choice	On-task, Academic Productivity	Increase in On-Task, Productivity results not clear On-task generalized, Choice preference for productivity

Article	Participants	Design	Treatment	Dependent Variable	Results
Hertz & McLauglin (1990)	males 13 - 14 LD, avg IQ, difficulties staying on task, 1 - meds N = 2	Within-subj I. Baseline II. Treatment III. 9 week follow-up IV. 13 week follow-up	Self-monitoring 1 session Reinforcement	On-Task	Increase in on-task behavior maintained at follow-ups
Hinshaw, Henker, & Whalen (1984a)	boys 8-13, DSM-III ADHD, on meds, avg IQ, >cutoff on CASQ N = 24	Btwn grp I. Extrinsic R+ II. S-E & R+ Control group N = 9	Self-evaluation 75 min a day, 5 weeks, sm grp extrinsic R+ or R+ S-E based on accuracy, meds or placebo	Appropriate social behav., negative social behav., nonsocial behav., pts of R+, accuracy	R+self-eval grp. had sig. fewer negative social behaviors and greater appropriate social behav., combo of med & S-E rated highest, no difference based on age at treatment, meds facilitated more accurate S-E
Hinshaw & Melnick (1992)	males 9-10 diag-ADHD CASQ $\geq$ 16 inattention, hyperactivity on meds, N = 2	Single Subject Pre/Post Case Studies	Self-Monitoring Anger Management R+ for accuracy	child's choice	self-control increased, S-M reduced noncompliance and aggression
Horn, Chatoor Conners (1983)	male, age 9, inpatient, hyperactive, distractable, destructive, ACPRS>2 SD N = 1	Single Subj. Case Study I. Placebo II, Ttitration III. Full dose IV. Placebo & CBT V. Titration & CBT VI. Full dose & CBT	CBT = S-I 30min/2x wk, problem solving self-monitoring self-reinforcement Meds = dexedrine titration & full dose	Obs. data = gross motor noise and vocalization off task, noncompliance, Teacher ratings = ACTRS, academic performance, CPT and MMFT	CBT resulted in decrease in off-task, gross motor, & vocalizations. Combination of meds & CBT found most effective, especially in reducing teacher ratings

Article	Participants	Design	Treatment	Dependent Variable	Results
Mathes & Bender (1997)	males 8-11, diag ADHD Low-Avg IQ N = 3	Within-Subject I. Baseline II. Training III. Fading IV. Reversal	Self-Monitoring 15min/3days (no accuracy check)	On-Task behavior	On Task behavior improved for all three subjects during treatment phase, improvemt was maintained at a lesser degree during fading and reversal
Rhode, Morgan & Young (1983)	behaviorally handicapped 1st -5th grade, disruptive, work refusal excessive talk, out of seat, aggression, day-dreaming noncompliant no meds avg IQ, N = 6	Within-subj. I. Baseline II. Token R+ III. S-E (matching) IV. S-E (3 match) V. S-E (2 match) VI. S-E (1 match) VII. S-E (no match) VIII. S-E (regular class) IX. Fading in class X. Points exchange XI. No points XII. S-E XIII. No S-E	Self-Evaluation, 30min/2x/week Self-Reinforcement 1hr/2x/wk (15wks) generalization Booster session	Appropriate classroom behavior (attend, work, volunteer, reading aloud, answering questions, ask teacher questions, other) & Inappropriate classroom behav. (talking out, out of chair, modified out of chair, noise, rocking, aggression, noncompliance, other)	S-E improved behavior in resource room, improved behavior generalized & was maintained in regular class, reaching levels similar to randomly selected students (generalization was introducedin modified, less intense form in class), matching accuracy was imp.
Shapiro, DuPaul, Bradley-King (1998)	LD/ADHD CTRS-R ADHD-RS 15mg Ritalin Age=12 N =2	Within Subj. Same as above	Same as above	Having all materials, Attending to task not talking to peers using appropriate language raising hand when called	Substantial reductions in CTRS-R: Attention & Hyperactivity Scales, Improvement on ADHD Rating Scale, Improvements on targeted behaviors

Table 2

Descriptive Characteristics of Child Participants

Participant	Age	ADHD INDEX CRS-R	ADHD INDEX CADS-T	Medication	Dose	Academic Problems	Prior Psychological Treatment
Jim	10 - 1	73	66	Concerta	36mg	Yes	No
Chad	8 - 4	74	71	None	N/A	Yes	No
Tom	9 - 2	70	78	Adderall, Celexa	20mg 20mg	No	No
Ray	8 - 0	81	67	Concerta Claratin	36mg	Yes	Therapy 1x per month

Table 3

Operational Definitions for Observed ADHD Related Behaviors

Behavior	Definition
Off Task	Child interrupts his or her attention to the task to engage in some other behavior. Attention is defined as visually looking at the task materials. If the child breaks eye contact with the task materials for more than three seconds,[a] then he or she is coded as off task. However, if the child appeared to be maintaining attention to the task in some way without looking at the materials (e.g., counting on his or her fingers for math problems), off task was not coded.[a]
Fidgeting	Any repetitive, purposeless motion of the legs, arms, hands, buttocks or trunk. It must occur at least twice in succession to be considered repetitive, and it should have served no purpose. Examples include swaying back and forth, kicking one's legs back and forth, swinging arms at one's side, shuffling feet from side to side, shifting one's buttocks about in the chair, and tapping a pencil or finger repeatedly on the table.
Vocalizing	Any task irrelevant vocal noise or verbalization made by the child. Examples: speech, whispering, singing, humming, making odd mouth noises, clicking one's teeth, and so on.
Plays with Objects	Touching any object in the room besides the table, chair, task materials, and pencil. The child could touch his or her own clothing without being considered playing with object. However, touching toys, walls, light switches, curtains or any other object in the room was coded in this category.
Out of Seat	Any time that the child's buttocks broke contact with the flat surface of the seat.

[a] These specifications were added to the Off Task definition in the Restricted Academic Coding System by DuPaul and Stoner (1994) and subsequently used for this study.

Table 4

Operational Definitions for Observed Teacher Behaviors

Behavior Category	Definition
Teacher Command	Direct commands or statements that contain imperatives or indirectly stated or implied commands that may be stated as interrogatives. Examples include the following: "Come here," "No!," "Stop that!," "I want you to sit down," "Will you hand me the eraser?"
Repeat Command	Any repetition of a command previously given by the teacher where no new command had been given by the teacher between the original command and its repetition. If the teacher gave a new command, then gave a different command and then went back to repeat the first command, each of these was scored as original commands, not as a repetition of the command. Example: "Pick up the crayon.". . . "Pick it up!" . . . "I said pick up the crayon!" – This would be coded as a teacher command, repeat command and repeat command.
Teacher Approval	Verbal and nonverbal actions that conveyed teacher approval, encouragement or acceptance of the child's activities. Judgment was required to determine the context and the emotional tone of the remarks or gestures. Verbal remarks included: OK, Good, That's fine, I like it when you do that. Nonverbal actions included: a pat on the back a hug, clapping, and winking.
Teacher Negative	Coded for both verbal and nonverbal actions that conveyed discouragement, non-acceptance, or disapproval of the child's activities. Again some judgment was needed concerning the context and emotional tone accompanying the gesture. It is also important to note that Teacher Negative could be coded simultaneously with Teacher Command. Verbal teacher negatives include the following examples: "That is all wrong!" "I don't like that!" "No!" "Stop that!" "You better watch it!" "[Child's name]!!!! (in a negative tone). Nonverbal teacher negatives include the following examples: spanking, hitting, pinching, yank at child, shove child.

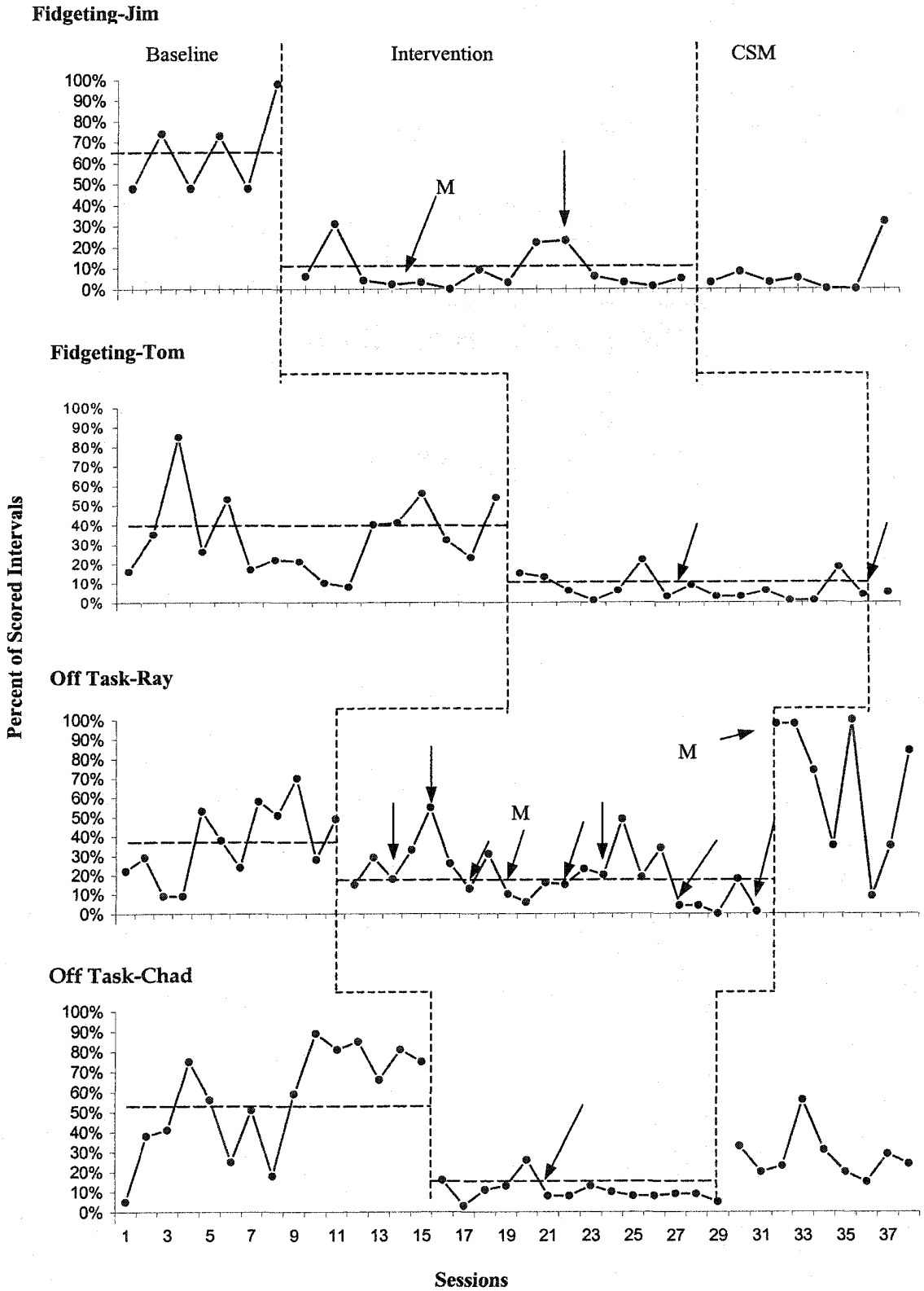
Table 5

Administration of Questionnaires

Session	Questionnaire's Administered
Pre-Test 1	CPRS-R, BASC-SRP, Forced Choice Reinforcement Assessment, CADS-T, APRS
Pre-Test 2	CADS-T, APRS
Treatment – Specific (Txt-S)	CADS-T, APRS
Treatment – General (Txt-G)	CADS-T, APRS
Post-Test	CPRS-R, BASC-SRP, CADS-T, APRS

Figure Caption

Figure 1. Percent of Scored Intervals of Student Target Behavior During Classroom Observations of Independent Seatwork



Note: Arrows indicate repetition of a session; M = Medication change; dotted lines represent means

Figure Caption

Figure 2. Percent of Scored Intervals of Non-Target Behaviors for Jim

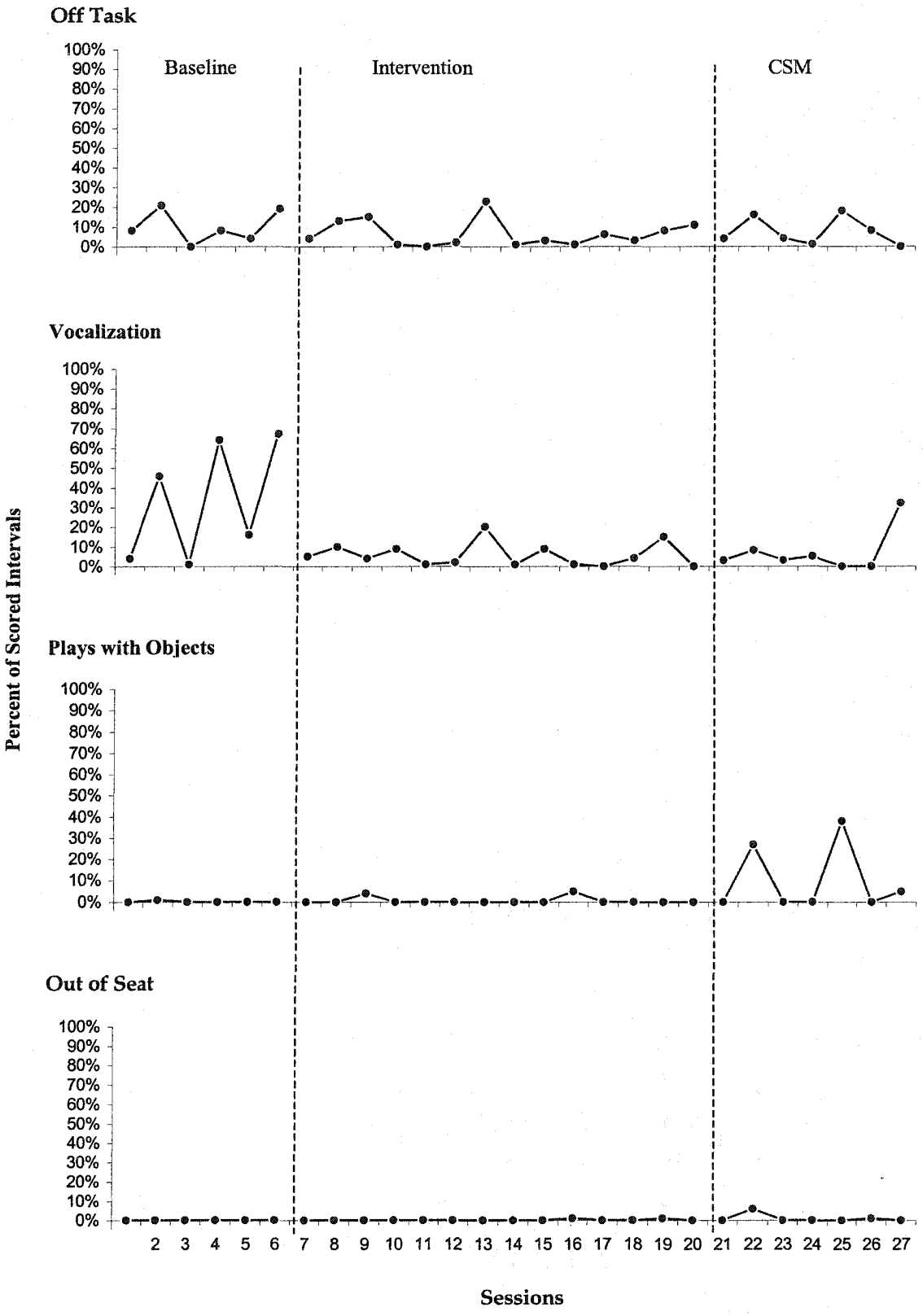


Figure Caption

Figure 3. Percent of Scored Intervals of Non-Target Behaviors for Tom

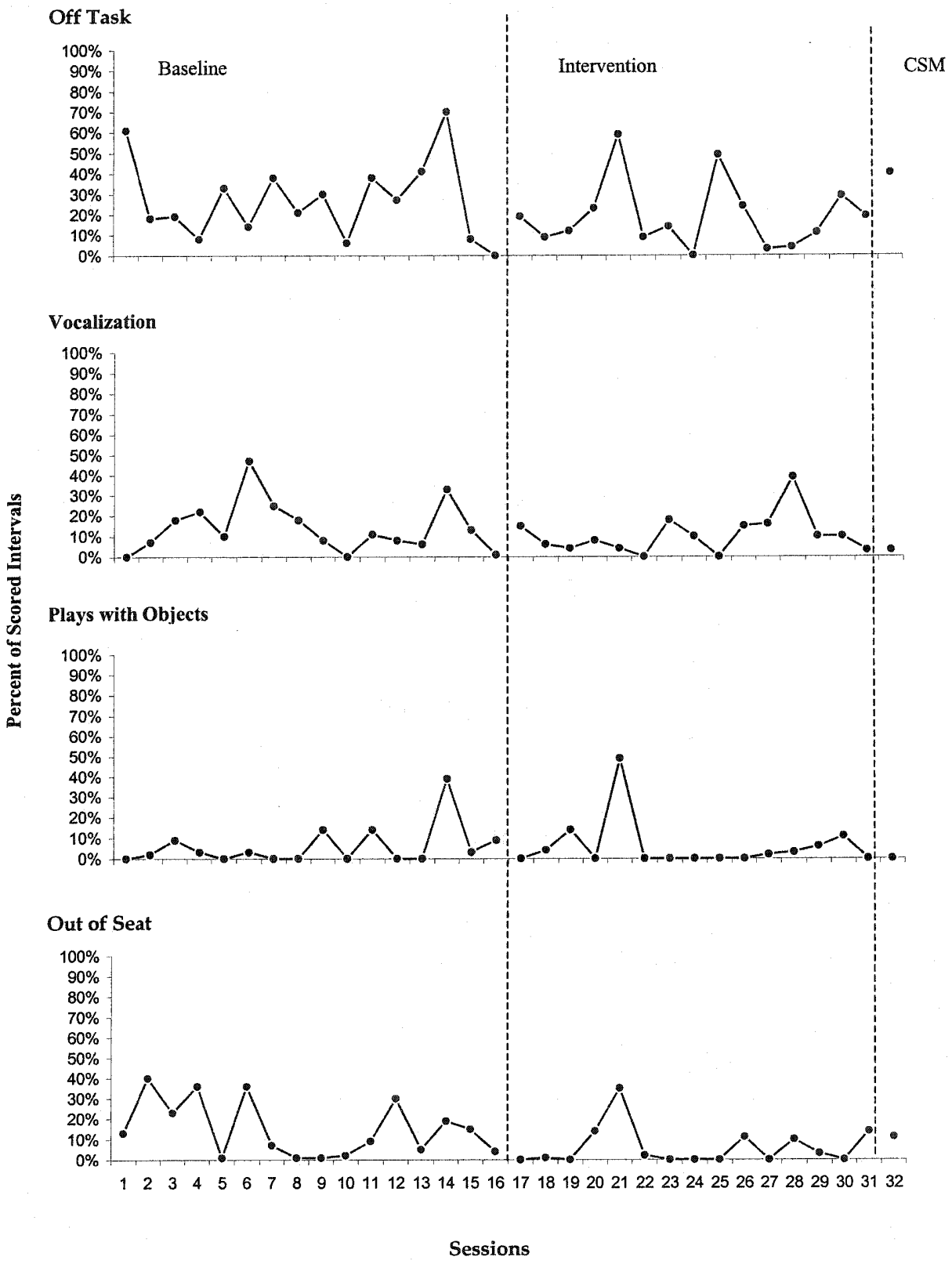


Figure Caption

Figure 4. Percent of Scored Intervals of Non-Target Behaviors for Ray

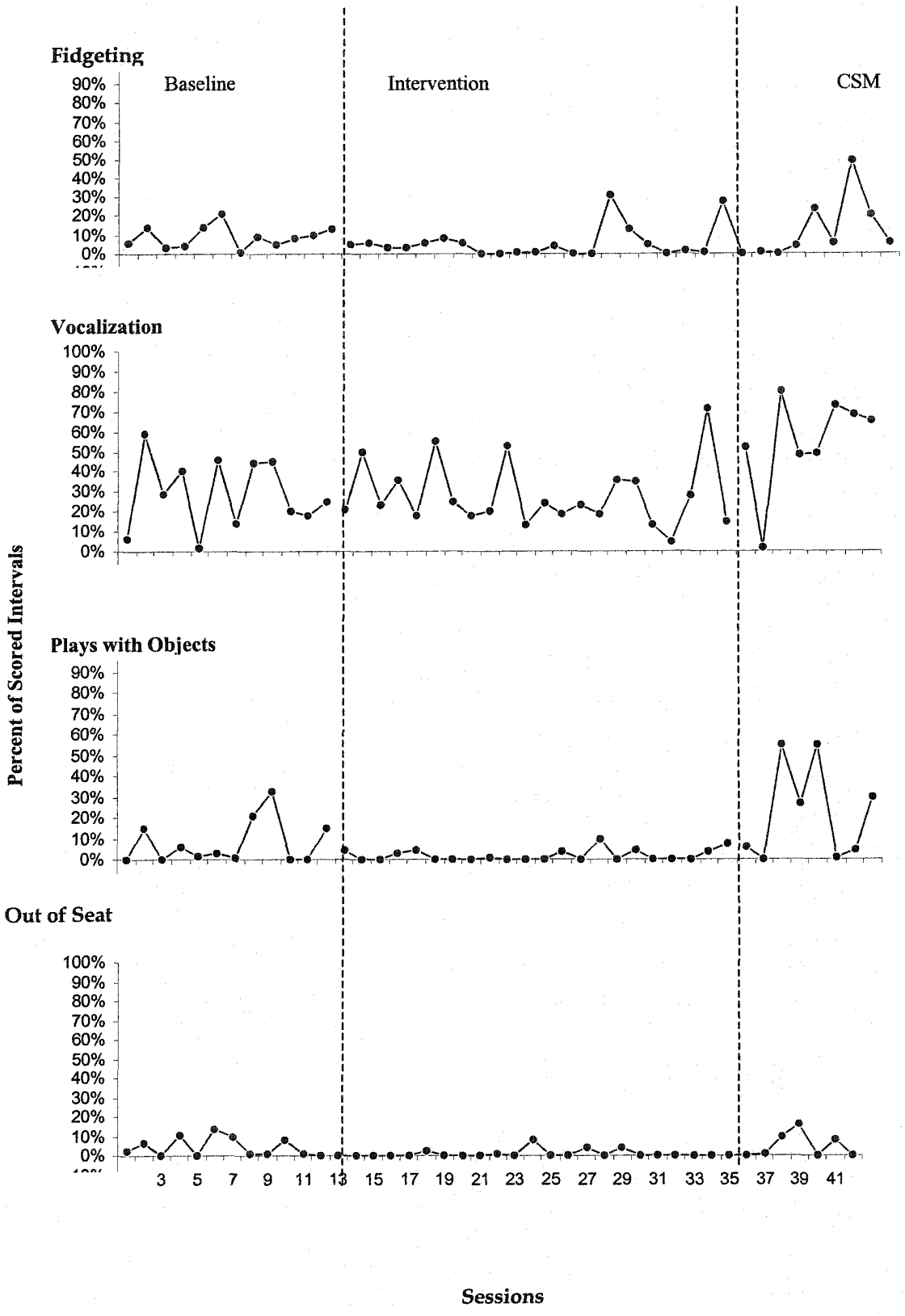


Figure Caption

Figure 5. Percent of Scored Intervals of Non-Target Behaviors for Chad

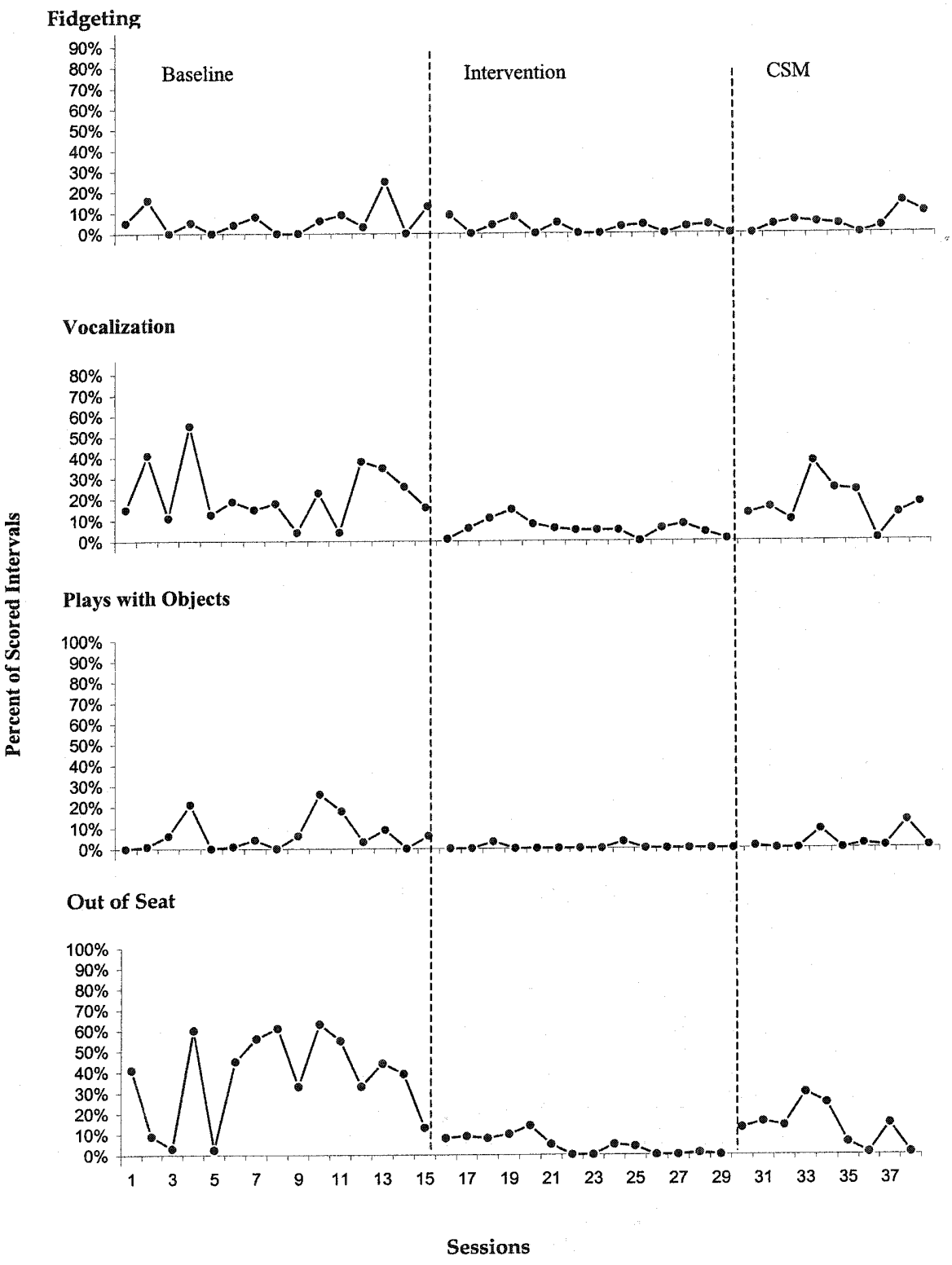


Figure Caption

Figure 6. Percent of Scored Intervals of Touching the Bug-in-the-Ear

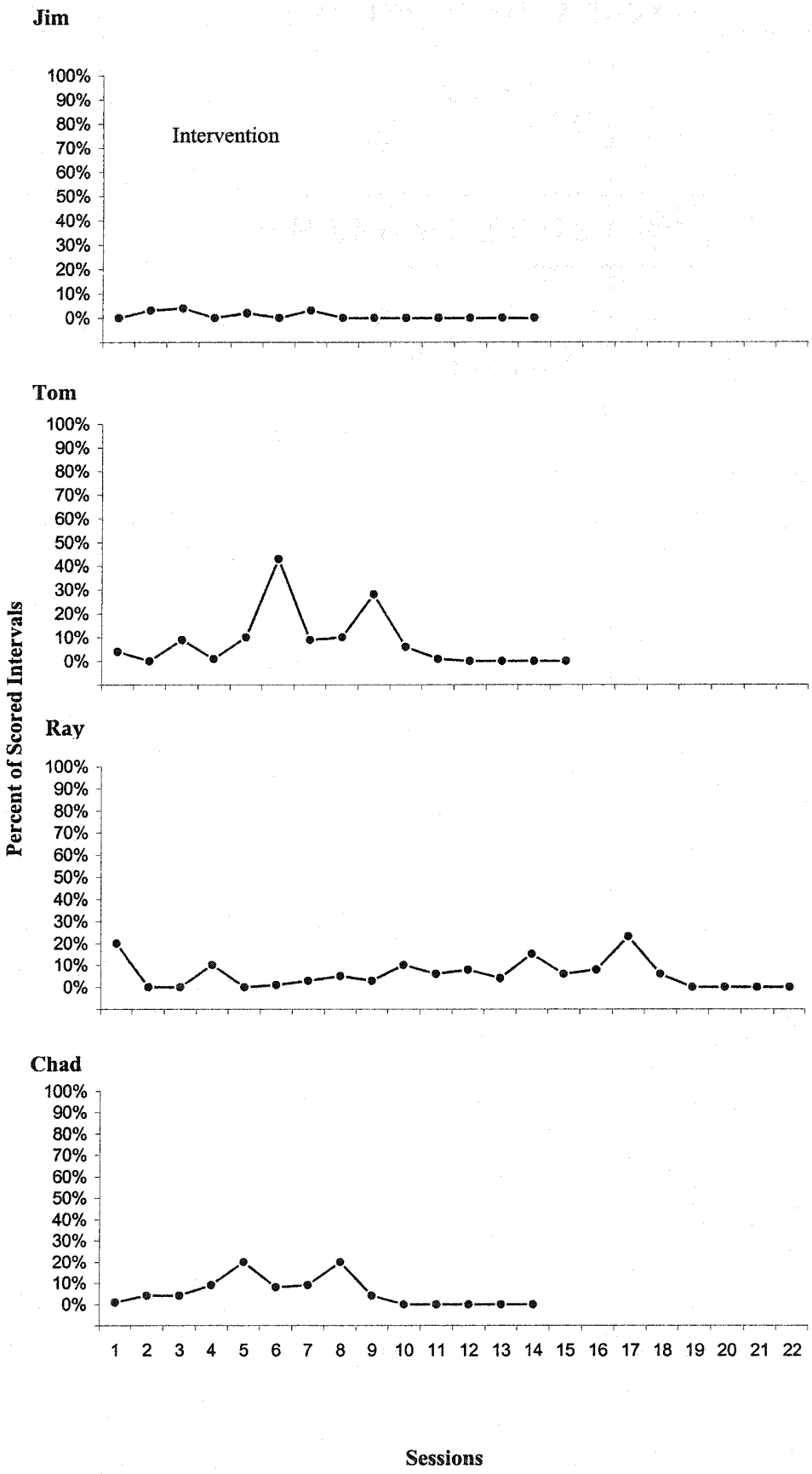


Figure Caption

Figure 7. ADHD Index of CADS-T at Baseline, Intervention, and Post Intervention

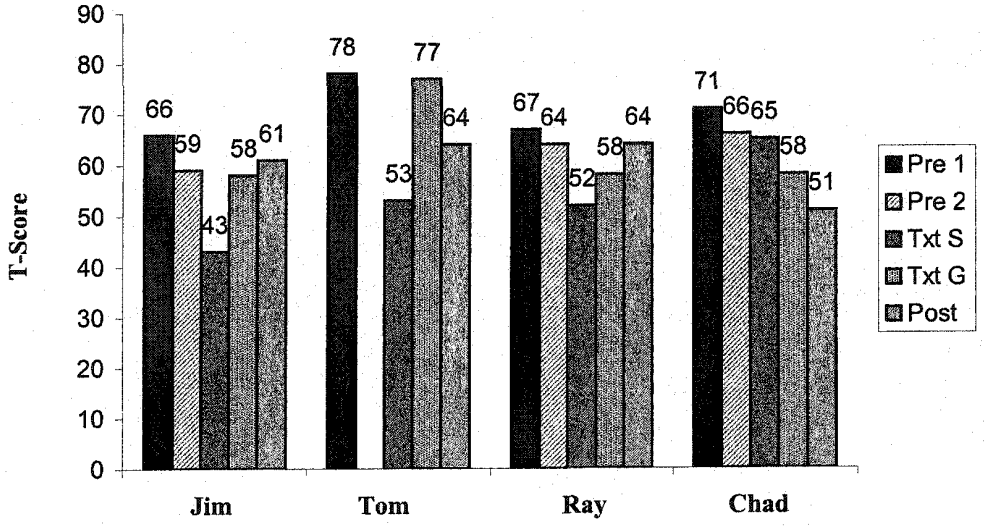


Figure Caption

Figure 8. Total Score on the APRS at Baseline, Intervention, and Post Treatment

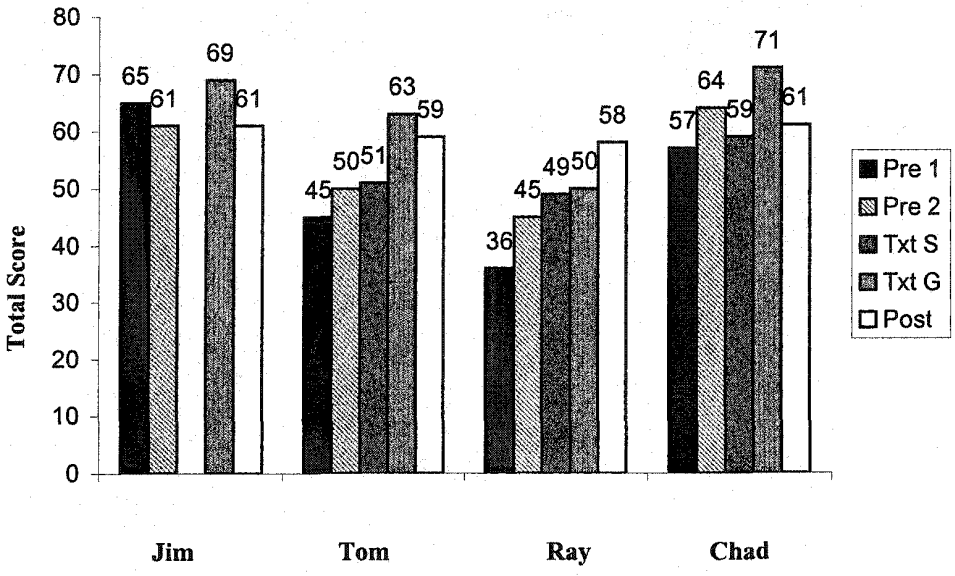


Figure Caption

Figure 9. Academic Success Scores on the APRS at Baseline, Intervention, and Post Treatment

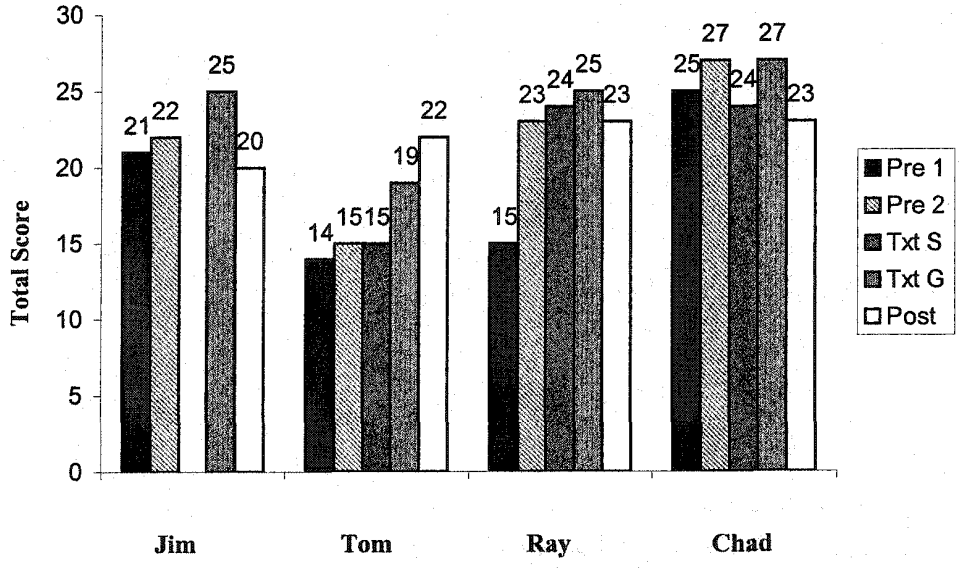


Figure Caption

Figure 10. Academic Productivity Scores on the APRS at Baseline, Intervention and Post Treatment

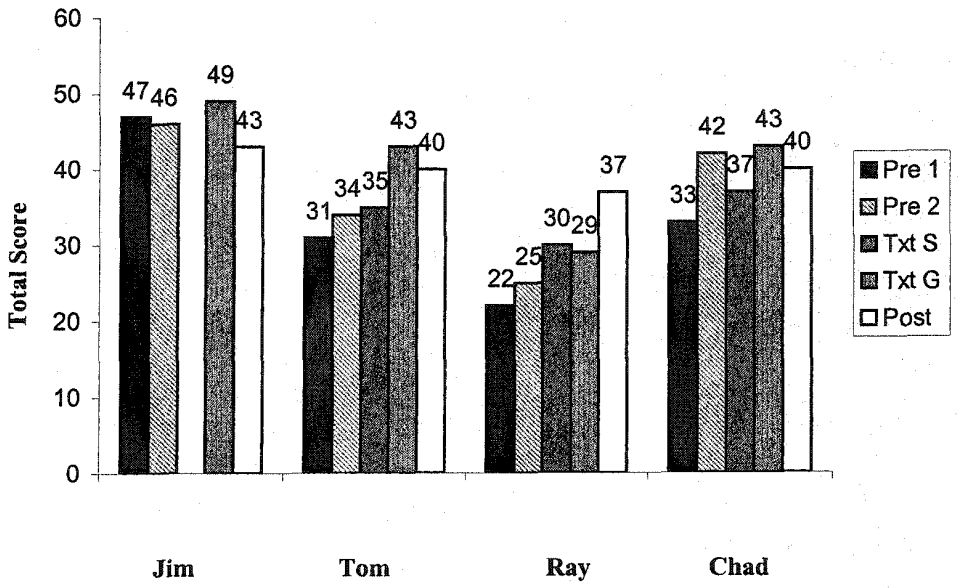


Figure Caption

Figure 11. Impulse Control Scores on the APRS at Baseline, Intervention and Post-Treatment

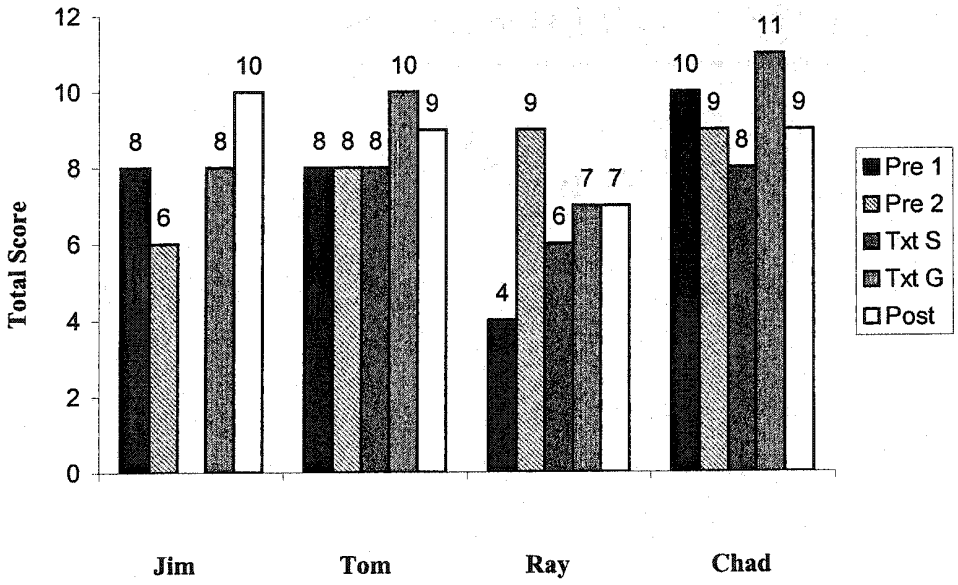


Figure Caption

Figure 12. T-scores at pre-test and post-test on the parent completed CRS-R for Jim

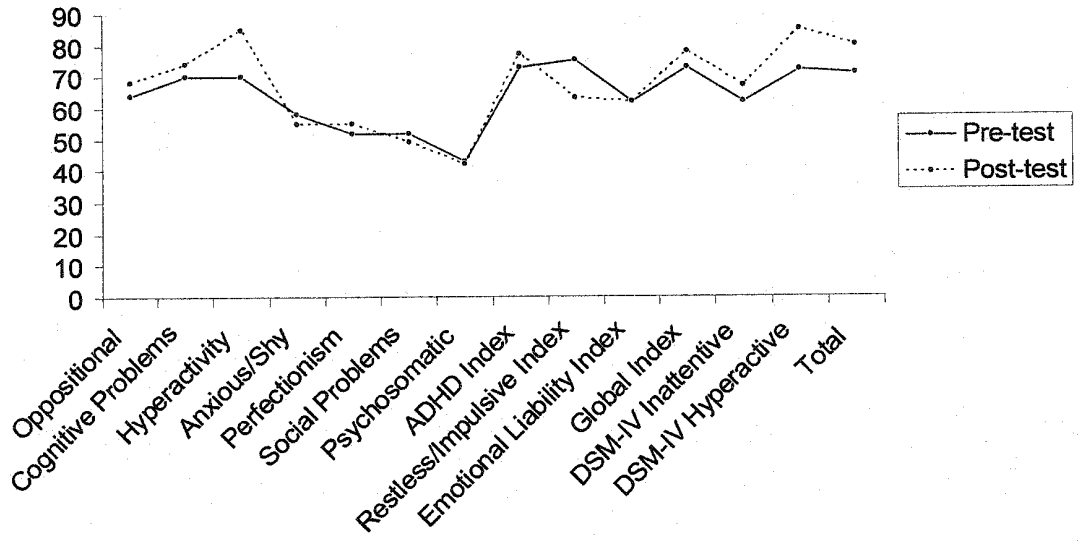


Figure Caption

Figure 13. T-scores at pre-test and post-test on the parent completed CRS-R for Tom

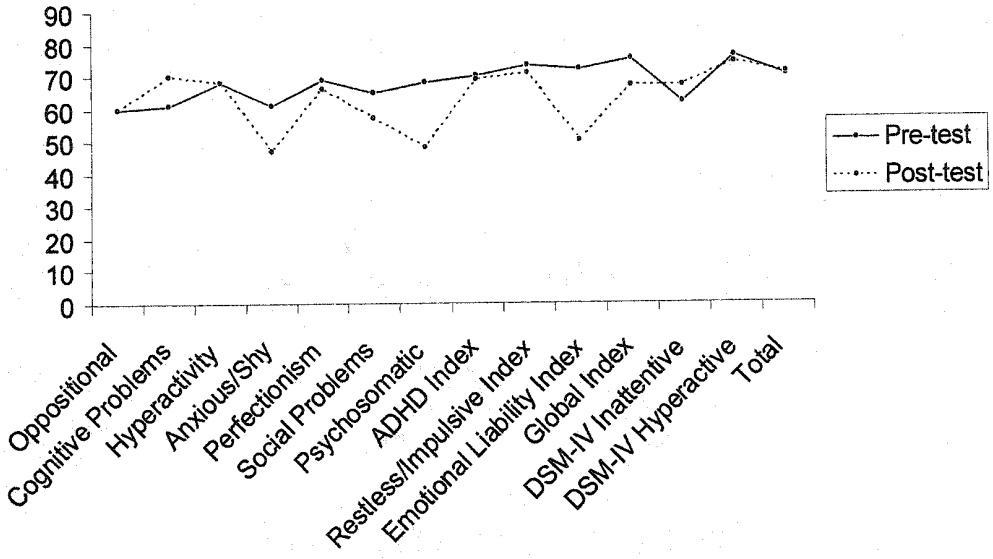


Figure Caption

Figure 14. T-scores at pre-test and post-test on the parent completed CRS-R for Ray

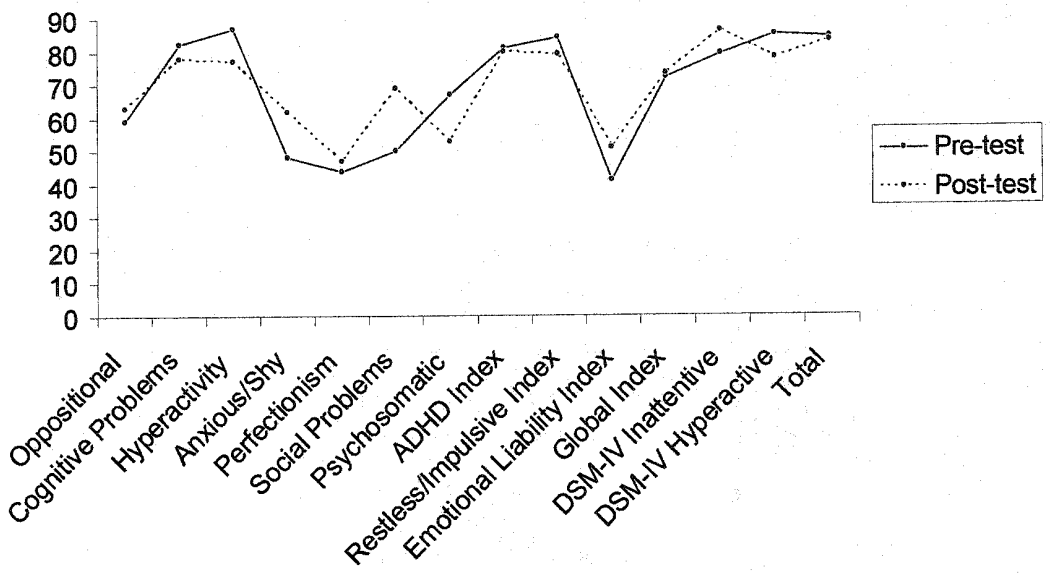


Figure Caption

Figure 15. T-scores at pre-test and post-test on the parent completed CRS-R for Chad

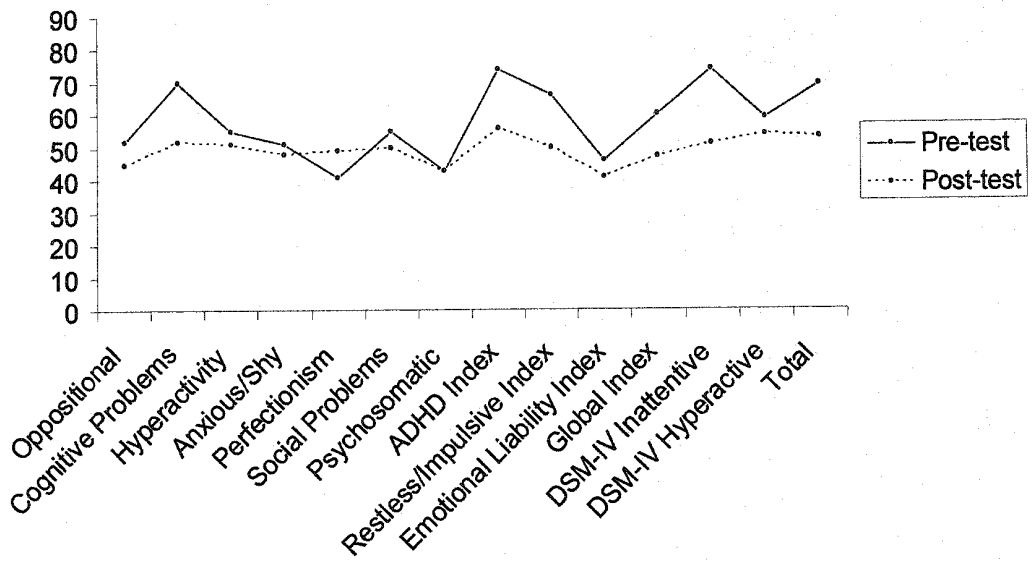


Figure Caption

Figure 16. T-scores at pre-test and post-test on the BASC-SRP for Jim

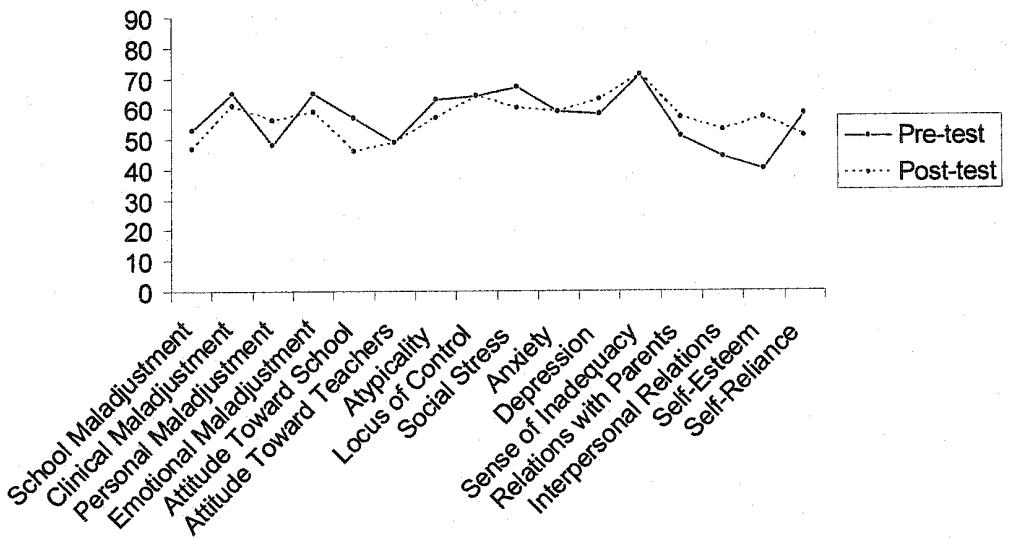


Figure Caption

Figure 17. T-scores at pre-test and post-test on the BASC-SRP for Tom

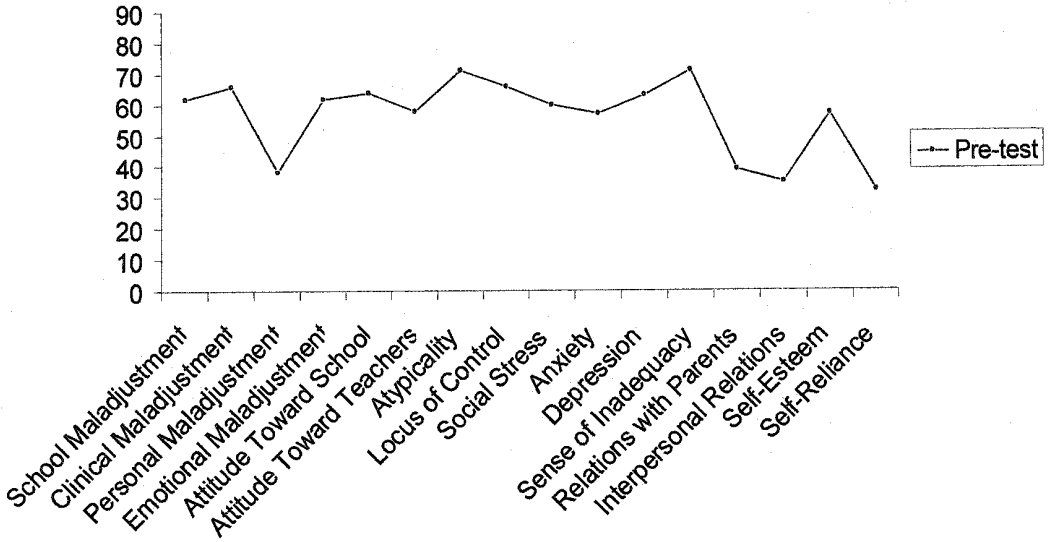


Figure Caption

Figure 18. T-scores at pre-test and post-test on the BASC-SRP for Ray

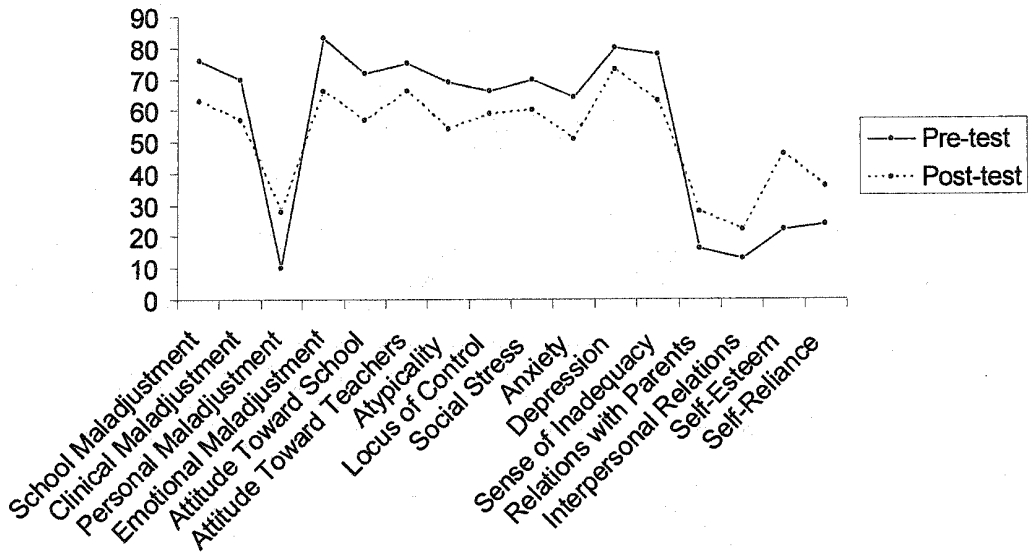
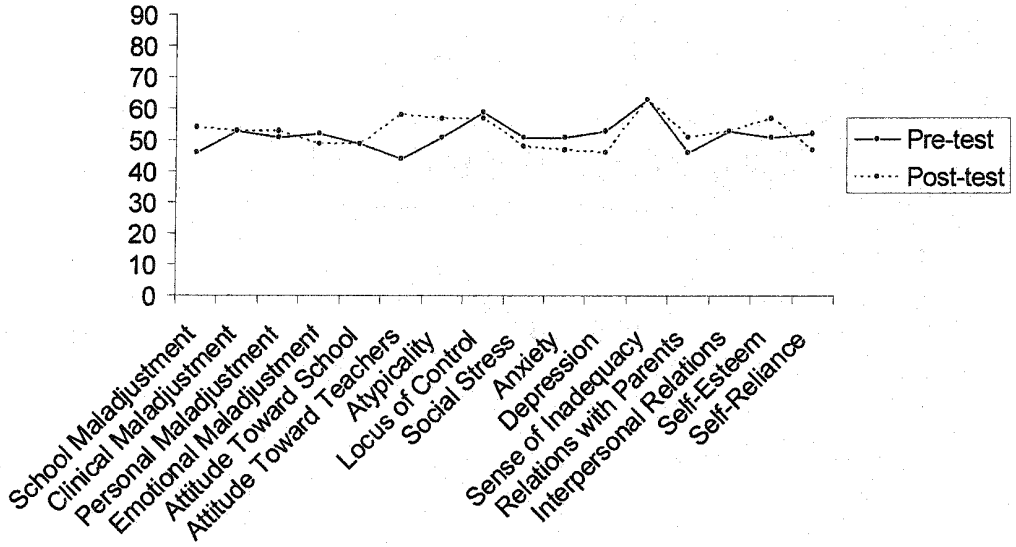


Figure Caption

Figure 19. T-scores at pre-test and post-test on the BASC-SRP for Chad



APPENDICES

APPENDIX A
Brief Phone Interview with Parent
(Adapted from Barkley & Murphy, 1998)

Attention-Deficit/Hyperactivity Disorder

[Interviewer: Diagnosis requires six Inattention symptoms and/or six Hyperactive–Impulsive symptoms. Symptoms must also be inappropriate for child's age, have lasted at least the past 6 months, and have caused some impairment prior to age 7 years; presently must be causing impairment in two situations (home, school, or work functioning); and must be producing clear evidence of clinically significant impairment in social or academic functioning.]

Let me ask you about some other behaviors that your child may have shown during the past 6 months. Again, for each of the behaviors I ask you about, please tell me if your child shows that behavior to a degree that is inappropriate compared to other children of your child's age.

A. Inattention List [*Enter 1 if present, 0 if absent, and ? if unknown.*]

During the past 6 months, did your child show any of the following:

1. Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities ____
2. Often has difficulty sustaining attention in tasks or play activities ____
3. Often does not seem to listen when spoken to directly ____
4. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties at work [*Interviewer: Inquire to be sure this is not due solely to oppositional behavior or failure to understand instructions.*] ____
5. Often has difficulty organizing tasks and activities ____
6. Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework) ____
7. Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools) ____
8. Is often easily distracted by extraneous stimuli ____
9. Is often forgetful in daily activities ____

B. Hyperactive–Impulsive List [*Enter 1 if present, 0 if absent, and ? if unknown.*]

During the past 6 months, did your child show any of the following:

1. Often fidgets with hands or feet or squirms in his/her seat ____
2. Often leaves his/her seat in the classroom or in other situations in which remaining seated is expected ____
3. Often runs about or climbs excessively in situations in which it is inappropriate to do so [*Interviewer: For adolescents, this may be limited to subjective feelings of restlessness.*] ____
4. Often has difficulty playing or engaging in leisure activities quietly ____
5. Is often "on the go" or often acts as if "driven by a motor" ____
6. Often talks excessively ____
7. Often blurts out answers before questions have been completed ____
8. Often has difficulty awaiting his/her turn ____
9. Often interrupts or intrudes on others (e.g., butts into conversations or games) ____

C. Have these behaviors existed for at least the past 6 months? [*Enter 1 if present, 0 if absent, and ? if unknown.*] ____

D. At what age did these behaviors first cause problems for your child? [*Interviewer: Onset by age 13 is acceptable, although DSM-IV stipulates age 7.*] ____ (yrs.)

E. During the past 6 months, have these behaviors caused problems for this child in any of these situations? [*Enter 1 if present, 0 if absent, and ? if unknown.*]

At home ____ In school ____ At daycare or babysitters ____

In community activities (clubs, sports, scouts, etc.) ____

F. Have these behaviors created problems or impairment for your child in any of the following areas? [*Enter 1 if present, 0 if absent, and ? if unknown.*]

Social relations with others ____ Academic performance ____

G. Exclusion Criteria: [*Interviewer: Enter 1 if symptoms occur only during a Pervasive Developmental Disorder or Psychotic Disorder or are better accounted for by another mental disorder, such as a Mood, Anxiety, Dissociative, or Personality Disorder. Enter 0 if not, ? if unknown.*] ____

Diagnostic Code

Requirements for diagnosis:

Does section A total 6 or more, or does section B total 6 or more? ____
Does section C total 1? ____
Does section E total 2 or more? ____
Does section F total 1 or more? ____
Does section G total 0? ____

[*Check one subtype if all requirements are met.*]

☐ ADHD, Combined Type (314.01) [*Meets criteria for both Inattention and Hyperactive–Impulsive lists*]
☐ ADHD, Predominantly Inattentive Type (314.00) [*Meets criteria only for Inattention items*]
☐ ADHD, Predominantly Hyperactive–Impulsive Type (314.01) [*Meets criteria only for Hyperactive–Impulsive items*]
☐ ADHD, NOS (Not Otherwise Specified) (314.9) [*For disorders with prominent symptoms that do not meet full criteria for any subtype of ADHD*]

For individuals (especially adolescents and adults) who currently have symptoms that no longer meet full criteria, specify "In Partial Remission": _____

Please ask the parents the following questions in addition to the questions on the structured interview:

(1) Does your child take any prescription medication(s)? _____

If yes, what medication(s) is your child taking?

Medication	Dose	Time of Administration

(2) Does your child take any nonprescription medication or "over the counter" medication(s)? (e.g., allergy or sinus medication)

If yes, what medication(s) is your child taking?

Medication	Dose	Time of Administration

(3) How did you find out that your child was diagnosed with ADHD?

How old was your child at the time s/he was diagnosed?_____

Who diagnosed your child with ADHD?

school system your child's pediatrician a psychologist

other: _____

(4) Has your child received any treatment other than medication for his/her symptoms of ADHD?

(5) Is your child allergic to plastic (if necessary discuss the bug-in-the-ear)?

Please inform parents that we will be contacting their child at school within the next few days. Also ask the parents to notify us with any changes in their child's medication (prescription or nonprescription). This can be done by writing a letter to the teacher and asking her to forward the letter to Ms. Shepard, or by contacting Ms. Shepard by phone.

APPENDIX B

Subject #:_____ **Date:**_____

BEHAVIOR CODING SHEET

INTERVAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OFF TASK																
FIDGETING																
VOCALIZING																
PLAYS WITH OBJECTS																
OUT OF SEAT																
TEACHER COMMAND																
REPEAT COMMAND																
TEACHER APPROVAL																
TEACHER NEGATIVE																
BUG-IN-THE-EAR																

INTERVAL	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
OFF TASK																
FIDGETING																
VOCALIZING																
PLAYS WITH OBJECTS																
OUT OF SEAT																
TEACHER COMMAND																
REPEAT COMMAND																
TEACHER APPROVAL																
TEACHER NEGATIVE																
BUG-IN-THE-EAR																

INTERVAL	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
OFF TASK																
FIDGETING																
VOCALIZING																
PLAYS WITH OBJECTS																
OUT OF SEAT																
TEACHER COMMAND																
REPEAT COMMAND																
TEACHER APPROVAL																
TEACHER NEGATIVE																
BUG-IN-THE-EAR																

INTERVAL	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
OFF TASK																
FIDGETING																
VOCALIZING																
PLAYS WITH OBJECTS																
OUT OF SEAT																
TEACHER COMMAND																
REPEAT COMMAND																
TEACHER APPROVAL																
TEACHER NEGATIVE																
BUG-IN-THE-EAR																

INTERVAL	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
OFF TASK																
FIDGETING																
VOCALIZING																
PLAYS WITH OBJECTS																
OUT OF SEAT																
TEACHER COMMAND																
REPEAT COMMAND																
TEACHER APPROVAL																
TEACHER NEGATIVE																
BUG-IN-THE-EAR																

BEHAVIOR	TOTAL
OFF TASK	/80
FIDGETING	/80
VOCALIZING	/80
PLAYS WITH OBJECTS	/80
OUT OF SEAT	/80
TEACHER COMMAND	/80
REPEAT COMMAND	/80
TEACHER APPROVAL	/80
TEACHER NEGATIVE	/80
TOTAL	

APPENDIX C

Subject #: _____ Date: _____

Child Forced Choice Reinforcement Survey

(Adapted from Northrup et al., 1996)

Instructions for child:

"I am going to name things that kids sometimes get in school. I want to know how much you like each of these things. After I name each thing, you like it a little, a lot, or not at all. For example, if I say, 'Going to the supermarket' you might say you like it a little, but if I say 'Going to your favorite movie' you might say a lot.

Instructions for administration: For each Item in the following four categories indicate if the child likes it a little (1), a lot (2) or not at all (0) by putting the # of the ranking next to the item.

	Edibles	**Activities**
___	Fruit	___ Free time for art projects
___	Juice drinks	___ Class chores (grading, errands)
___	Pretzels, chips	___ Choosing who you want to sit by
___	Cookies	___ Free time in the Library
___	Popcorn	___ Taking a walk
___	Candy (M&M's or gum)	___ Visiting a favorite school adult
___	Crackers	___ Playing a game (computer game)
___	Nuts	___ Choosing a story to read
___	Ice Cream	___ Being first in line
	Tangibles	**Social**
___	Certificates, awards, medals	___ Saying "Good job"
___	Stickers, stars	___ Saying "Your Improving"
___	Paper (pads, drawing paper)	___ Saying " You are really ___" (e.g., payingattention)
___	Books	___ Saying, "That's right, that's correct"
___	Buttons (pin on shirt)	___ Saying, "I like that"
___	Pencils or pens	___ Tell class you are a hard worker
___	Magazines	___ Smile at you
___	Crayons or markers	___ Hug you
___	Small toys	___ Say, "I am going to let your parents know that you are doing a great job"

After completing this portion of the assessment, ask the child the following questions:

Would you rather get thing to eat like chips, candy or popcorn or would you rather get things to do like art projects, play computer games or go to the library?

Would you rather get things to keep, like markers, stickers, or books or would you rather get your teacher to say nice things to you like "Good job," "You're improving, " or hug you?

Would you rather get things to eat like chips, candy or popcorn or get things to keep, like markers, stickers, or books?

Would you rather get things to do like art projects, play computer games or go to the library or get your teacher to say nice things to you like "Good job," "Your improving, " or hug you?

Would you rather get your teacher to say nice things to you like "Good job," "Your improving, " or hug you or would you rather get things to eat like chips, candy or popcorn

Would you rather get things to keep, like markers, stickers, or books or get things to do like art projects, play computer games or go to the library

APPENDIX D

Auburn University
Auburn University, Alabama 36849-5214

Department of Psychology
226 Thach

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INFORMED CONSENT
FOR
Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD

Dear Parent or Legal Guardian:

Introduction/Purpose

Your child is invited to participate in a study that will examine the use of self-management procedures during independent seatwork to decrease symptoms commonly associated with Attention-Deficit/Hyperactivity Disorder (ADHD). These symptoms (e.g. fidgeting, talking, inattention, playing and not remaining seated) often prevent students from getting their work done. This study will be conducted by Heather A. Shepard, a doctoral student in Child Clinical Psychology at Auburn University, under the supervision of Steven K. Shapiro, Ph.D., Associate Professor in the Department of Psychology. We hope to develop evidence for the effectiveness of this type of treatment in the classroom with children who are diagnosed with ADHD, such as yours. Your child was selected as a possible participant because the Special Education Coordinator in your child's school system felt that he/she had difficulties during independent seatwork and could benefit from these services. Please be assured that your identity will become known to me only if you choose to complete and return this consent form.

Parent Participation

In order for us to confirm that your child is eligible for involvement in the study, we will ask you (and your child's teacher) to complete behavior rating scales (15 to 20 minutes) and be phone interviewed about your child's behavior (20 to 30 minutes). If your child is not eligible to participate, this will not influence the services your child receives from his/her school. If your child is eligible to participate, you will be asked to fill out the same rating scales at the end of the study, and your child's teacher will be asked to fill out these rating scales about once a week to keep track of your child's progress in the program.

Treatment Procedures

The treatment is a free service for your child's participation in the study. If you agree to let your child participate, two undergraduate research assistants from Auburn University will come into your child's classroom every day for twenty minutes for six to ten weeks to observe your child during independent seatwork. They will be there to record detailed information about how your child's behavior changes while he or she is participating in the study. Your child will be able to earn points for correctly observing their own behavior. These points can be traded for fun activities agreed upon by you, your child's teachers, and the child. The times that your child can earn these activities will decrease over time as your child's behavior improves.

_____
Parent's initials

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #01-020 MR 0102
APPROVED 2/21/01 TO 7/9/03

Page 2: Informed Consent for "Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD"

Risks/Precautions

It is also important for you to know that your child will wear a walkie-talkie device with an earphone for one ear. We call this a "bug-in-the ear." This device is used to let your child know when to record his or her own behavior. Because your child will be wearing this device during class and possibly interacting more frequently, the child's peers will be aware that your child is wearing something that they are not wearing and getting special attention. In addition, your child's peers may come to realize that the two classroom coders are there primarily to observe your child. Therefore, it is possible that your child may receive increased peer attention because of this. We will be doing as much as possible to make the time period that we are in the classroom as naturalistic as possible. For example, we will be coming during a time that your child typically does independent seatwork rather than at a time where your child would be made to do seatwork while the rest of the class engages in another activity. In addition, we will be coming after your child has already had the opportunity to establish relationships with his/her peers. In addition, your child's participation will be voluntary and they can make a decision not to participate at any time if they are uncomfortable with the situation. Your child will also be shown the bug-in-the-ear before they will wear it in the classroom in order to know what they will be expected to wear. It has been our experience that children become accustomed to the device and are not as concerned with it as they gain more experience with it. Due to the procedures involved your child may also become more sensitized (purposely so) to his/her behavioral difficulties. Another potential risk to your child is that his/her behavior will not improve and he/she will become frustrated after several attempts to self-monitor. Since this is a possibility we will be asking your child's teacher to keep us informed of your child's general attitude toward their involvement in the study so that he/she is not subjected to continual frustration. We will also terminate your child's involvement in the study if this occurs. Further, your child's participation and progression will be monitored by Dr. Shapiro, a licensed psychologist, who specializes in clinical child psychology.

Benefits

This service for your child will be free of cost and is not a service that your child would typically receive in the classroom. Despite the risks discussed above, both the design and goal of the study are to improve behaviors that have been considered problematic by your child's teacher (and perhaps you). So even though there may be increased attention toward your child, this attention is designed to be positive and may decrease negative interactions your child has had with others because of his/her classroom difficulties. Previous studies using this technique have shown positive effects for behavior change in the classroom, and your child's behavior during independent seatwork may also improve as a result of their participation. In addition, it is hoped that your child will gain independence in their ability to monitor and change his/her own behavior in the classroom. However, we cannot promise you that your child will receive any or all of the benefits described. In addition, your child's teacher, if she consents to participate, will have a valuable opportunity to learn how to use self-management and behavioral feedback techniques in the classroom and may be able to use it with many other children for various behavior problems. In addition, the results of this study will be valuable for psychologists and educators to know what improvements can be made to this treatment based upon the information gathered.

_____
Parent's initials

Page 3: Informed Consent for "Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD"

Protection of Confidentiality

Any information obtained in connection with this study and that can be identified with you or your child will remain confidential. Information gathered in this study will be protected by assigning a code number to your child so that all data will be gathered under the code number rather than your child's name. After the study is completed, all identifiable information will be destroyed. You may withdraw your child from participation at any time, without penalty, and you may withdraw any data that has been collected about your child, as long as that data is identifiable. The plan for the disclosure of non-identifiable information will be in the form of a doctoral dissertation. The results of this study may also be presented through professional conferences and publication.

Your decision whether or not to allow your child to participate will not jeopardize your future relations with Auburn University or your child's school system.

Contact Information

If you have any questions we invite you to ask Ms. Shepard (334-844-4889; shepaha@auburn.edu) or Dr. Shapiro (334-844-6499; shapisk@auburn.edu). You may also contact the Special Education Coordinator of your child's school system. Eddie Clark (334-745-0258) is the Special Education Coordinator for Lee County School System, and Diane Sherriff (334-864-9466) is the Special Education Coordinator of the Chambers County School System. An extra copy of this form is enclosed for you to keep for your records. We would like to begin working with your child as soon as possible, so we would appreciate your prompt response. If you consent to your child's participation, please sign the consent form, complete the enclosed rating scales and return both in the enclosed, self-addressed, stamped envelope.

For more information regarding your rights as a subject you may contact the Office of Research Programs. The people to contact there are Ms. Jeanna Sasser (IRB Program Administrator; 334-844-5966; sassejb@auburn.edu) or Dr. Peter Grandjean (IRB Chair; 334-844-1462; grandpw@auburn.edu).

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH PROJECT. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Child's Name	Child's birthdate	Parent's or Guardian's phone number
		Best time to call:

Parent's or Guardian's signature	Date	Investigator's signature	Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT # 01-020MR0102
APPROVED 2/21/01 TO 7/9/03

APPENDIX E

Auburn University
Auburn University, Alabama 36849-5214

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226 Thach

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CHILD ASSENT FORM
FOR
Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD

Dear Student:

You are being asked to take part in a study about students who have problems paying attention, sitting in their chairs, sitting still, talking, or playing when they are supposed to be working. This study is going to be done by Heather A. Shepard, a graduate student at Auburn University, and Dr. Steven K. Shapiro, a teacher at Auburn University. We hope to learn more about how to work with kids who have these problems during times when they are supposed to be working by themselves. We are going to try to teach you how to cut down the problems that you have when you are working alone at your desk. We chose you to help us because your teacher said that sometimes you have difficulty working alone at your desk and your parent said that it was okay for you to help us. But it is your decision to work with us. If you do not want to, that is perfectly fine and you won't hurt our feelings.

If you decide to help us, we will work with you and your teacher and show you how to change what you do at your desk with less and less help from your teacher. Two college students from Auburn University will come into your classroom everyday for about 20 minutes to watch your class work, and help you keep track of how you are doing. You will choose one of your behaviors that is not helpful to you when you are trying to get your work done, and you will work at changing it. In order to change it we will show you how to keep track of it. After a while you and the students from Auburn University will be keeping track of any changes or improvements you make.

When you are working on changing your behavior you will wear a "bug-in-the-ear." It's not really a bug! It is something that you put on one of your ears that makes a "beep" noise. When the bug-in-the-ear makes the noise you will write down what you are doing. If you and the college students write down the same things, you will get points that you can trade for things that you like to do. If your problem gets smaller because you worked hard you will get even more points to trade for things to do. As time goes on, we will see how well you can do on your own without out as much help from the college students or as many rewards. One thing that you need to know is that other kids in your class will be able to see the bug-in-the-ear because you will be wearing it in front of them. We will work with your teacher to make sure that the other children do not tease you because of it. You will wear it during times that you would normally do your seatwork, so you won't miss out on other fun things that you do in the classroom. If it does make you feel bad to wear it in front of other children, you can take it off and tell us that you do not want to take part in what we are doing anymore. You can quit working with us at anytime or take the bug-in-the-ear out of your ear at any time for any reason, and we will not be upset with you.

_____
Child's initials

HUMAN SUBJECTS
OFFICE OF RESEARCH
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You will also be asked to answer some questions on a sheet of paper about how you feel about yourself, school, your parents and your teacher. We will ask you to answer these questions before we start working with you and after we finish working with you. We will work with you for six to ten weeks.

If you do take part in this study we will be able to learn more about how children can change what they do at their seat in order to get more work done. But we cannot promise that you will be able to change the things that make it hard for you to get your work done. You will also get a chance to earn points if you and the college students agree about how you acted during class and if you improve your behavior at your desk. You can trade these points for fun things to do and fun things to eat, with your parent's and teacher's permission.

When we are working with you any thing that you tell us or that we watch you do will not be told to anyone. You do not have to do this if you do not want to. If you sign this letter saying that you want to do it, you can still change your mind at anytime and no one will be upset. We will mark all the information that we collect with a number rather than your name so no one will know the information we have is about you. At the end of the study we will also rip up any lists that have your name on them for us to keep track of how you do. You can also tell us you do not want us to use any of the information about you and we will not do that as long as we can still find out which information is yours.

Since we are going over this form together, this would be a good time for you to ask any questions. If you have questions later, your parent can call us since she has our phone number.

I HAVE HAD A CHANCE TO READ THIS LETTER OR HAVE THE LETTER READ TO ME. IF I SIGN MY NAME BELOW, I UNDERSTAND THAT IT MEANS I WANT TO PARTICIPATE IN THIS STUDY.

_____	_____	_____	_____
Child's signature	Date	Investigator's signature	Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #01-020MR0102
APPROVED 2/21/01 TO 7/9/03

APPENDIX F

Auburn University
Auburn University, Alabama 36849-5214

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INFORMED CONSENT
FOR
Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD

Dear Teacher:

Introduction/Purpose

You are invited to participate in a study that will examine the use of self-management procedures during independent seatwork to decrease symptoms commonly associated with Attention-Deficit Hyperactivity/Disorder (ADHD). These symptoms (e.g. fidgeting, talking, inattention, playing and not remaining seated) often prevent students from getting their work done. This study will be conducted by Heather A. Shepard, a doctoral student in Child Clinical Psychology at Auburn University, under the supervision of Steven K. Shapiro, Ph.D., Associate Professor in the Department of Psychology. We hope to develop evidence for the effectiveness of this type of treatment in the classroom with children who are diagnosed with ADHD. A student in your class was selected as a participant because it was felt that he/she had difficulties during independent seatwork and could benefit from these services.

Teacher Involvement

If you agree to participate, we will first need to confirm that your student is eligible for involvement in the study, by asking you (and your student's parent) to complete behavior rating scales (15 to 20 minutes). If your student is not eligible to participate in the study, this will not influence the services your student receives from his/her school.

With your consent, two undergraduate research assistants from Auburn University will come into your classroom every day for twenty minutes for six to ten weeks, to observe your student during independent seatwork. The time for this observation to occur is flexible, but it must occur everyday, at the same time, during independent seatwork. The primary goal will be to observe any changes in the student's behavior, but they will also be recording the way you give instructions and feedback to your student. As you are aware, teacher behavior has a great impact on student behavior, and we will be taking data on your behavior to more accurately evaluate any influences on the student's behavior other than the treatment. We will discuss appropriate times for the observation with you so that we can accomplish this without having to change your lesson plan. The primary investigator will also notify you in advance so that you will be prepared for your student's active involvement. You will also be asked to fill out two brief rating scales (20 minutes) frequently throughout the study. Your student will be able to earn points for correctly observing their own behavior. These points can be traded for fun activities agreed upon by you, the student, and his/her parents. The times that your student will

_____
Teacher's initials

HUMAN SUBJECTS
OFFICE OF RESEARCH
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be able to earn these fun activities will decrease over time as the student's behavior improves, and it will be feasible to do various activities with other students in the classroom during the 20 minutes in which your student is being observed. The final result will be your student reporting to you about how they did in class without any structured observation time.

Risks/Precautions

It is important for you to know that during data collection your student will be asked to wear a walkie-talkie device with an earphone for one ear. We call this a "bug-in-the ear." This device emits a prompt (tone) and is used to let your student know when to record his/her behavior. Since your student will be wearing this device in the classroom other children in the classroom will see him/her using the device. Therefore, it is possible that your student may receive attention because of this. We will be doing as much as possible to make the time period that we are in the classroom as naturalistic as possible. For example, we will be coming during a time that your student typically does independent seatwork rather than at a time where your student would be made to do seatwork while the rest of the class engages in another activity. In addition, we will be coming after your student has had the opportunity to established relationships with his/her peers. In addition, your student's participation will be voluntary and your student will be informed of that and can make a decision not to participate at any time if they are uncomfortable with the situation. Your student will also be shown the bug-in-the-ear before they will wear it in the classroom in order to know what they will be expected to wear. It has been our experience that children become accustomed to the device and are not as concerned with it as they gain more experience with it. Due to the procedures involved your student may also become more sensitized (purposely so) to his/her behavior. Another potential risk to your student is that his/her behavior will not improve and he/she will become frustrated after several attempts to self-monitor. Since this is a possibility we will be asking you to keep us informed of your student's general attitude toward their involvement in the study so he/she is not subjected to continual frustration. We will also terminate the students' involvement in the study if this occurs. Your student's participation and progression will also be monitored by Dr. Shapiro, a licensed psychologist, who specializes in clinical child psychology.

Benefits

Despite the risks discussed above, both the design and goal of the study are to improve behaviors that have been considered problematic in the classroom, and the benefits of this program are many. First, it may teach the student to better recognize his/her difficulties with independent seatwork and to be more independent. Second, it may decrease the amount of time that he/she engages in problematic behaviors during independent seatwork time. Third, as a teacher you will have the opportunity to learn how to incorporate a valuable tool for use with multiple behavior problems. Fourth, it will also decrease the amount of time you need to focus on discipline with the student, rather than other important educational goals for your student. Finally, the results of this study will be valuable for psychologists and educators to know what improvements can be made to this treatment based upon the information gathered. However, we cannot promise you that you or the students will receive any or all of the benefits described.

_____
Teacher's initials

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT # 01-620 MR0102
APPROVED 2/21/01 TO 7/9/03

Page 3: Informed Consent for "Use of Self-Management Techniques for the Treatment of Students Diagnosed with ADHD"

Protection of Confidentiality

Any information obtained in connection with this study and that can be identified with you, your student, or your student's parent will remain confidential. Information gathered in this study will be protected by assigning a code number to your student, so that all data will be gathered under the code number rather than your student's name. After the study is completed, all identifiable information will be destroyed. You may withdraw from participation in this study at any time, without penalty, and you may withdraw any data that has been collected about you, as long as that data is identifiable. The results of this study may also be presented through professional conferences and publication.

Your decision whether or not to participate will not jeopardize your future relations with Auburn University or your employer.

Contact Information

If you have any questions we invite you to ask Ms. Shepard (334-844-4889; shepaha@auburn.edu) or Dr. Shapiro (334-844-6499; shapisk@auburn.edu). You may also contact the Special Education Coordinator of your school system. You will be provided a copy of this form to keep. For more information regarding your rights as a subject you may contact the Office of Research Programs. The people to contact there are Ms. Jeanna Sasser (IRB Program Administrator; 334-844-5966; sassejb@auburn.edu) or Dr. Peter Grandjean (IRB Chair; 334-844-1462; grandpw@auburn.edu).

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH PROJECT. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Teacher's signature	Date	Investigator's signature	Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #01-020MR0102
APPROVED 2/21/01 TO 7/9/03

APPENDIX G

Subject #:_____ Date:_____

STUDENT CONTRACT

I, _____, agree to do the following:
(student's name)

1. I will learn how to keep track of what I am doing during seatwork, and I choose to keep track of the time that I am **Off Task** or times when I have difficulties paying attention and I stop doing my work and start doing other things, like looking around the room. I am off task if I am not looking at the materials that I am supposed to be doing at my desk.

2. I will make sure to keep track of what I do just like it happened on the Self-Recording Form, and the coders will also keep track of what I do.

3. The coders and I will share what we saw with each other. I can earn a prize if my marks are the same as the coders.

4. I may also earn prizes for improving in the way I act during my seatwork time.

5. I will be able to choose these prizes right after class, but I will have to keep anything that I get in a bag until I get home.

6. If I argue about getting prizes, I will not get any prizes.

7. Right now I am off task _____ percent of the time during class. My long-term goal to work toward is to be doing what I am supposed to be doing _____ percent of the time.

8. I understand that I do not have to do this if I do not want to, and I can stop at any time without anyone being upset.

_____ _____ _____
Student's Signature Teacher's Signature Investigator's Signature

Subject #:_____ Date:_____

STUDENT CONTRACT

I, _____, agree to do the following:
(student's name)

1. I will learn how to keep track of what I am doing during seatwork, and I choose to keep track of the times that I am **Fidgeting** or times when I have difficulty sitting still in my seat and I squirm and move my legs, arms, hands, buttocks or trunk. If I sway back and forth, kick my legs back and forth, swing my arms at one's side, shuffle my feet from side to side, or shift my buttocks about in the chair, or tap my pencil or finger repeatedly on the table I am fidgeting.

2. I will make sure to keep track of what I do just like it happened on the Self-Recording Form, and the coders will also keep track of what I do.

3. The coders and I will share what we saw with each other. I can earn a prize if my marks are the same as the coders.

4. I may also earn prizes for improving in the way I act during my seatwork time.

5. I will be able to choose these prizes right after class, but I will have to keep anything that I get in a bag until I get home.

6. If I argue about getting prizes, I will not get any prizes.

7. Right now I am off task _____ percent of the time during class. My long-term goal to work toward is to be doing what I am supposed to be doing _____ percent of the time.

8. I understand that I do not have to do this if I do not want to, and I can stop at any time without anyone being upset.

_____ _____ _____
Student's Signature Teacher's Signature Investigator's Signature

APPENDIX H

Subject #:_____ Date:_____

SELF-RECORDING FORM

Fidgeting = times when I have difficulty sitting still in my seat and I squirm and move my legs, arms, hands, buttocks or trunk. If I sway back and forth, kick my legs back and forth, swing my arms at one's side, shuffle my feet from side to side, or shift my buttocks about in the chair, or tap my pencil or finger repeatedly on the table I am fidgeting.

WAS I FIDGETING WHEN I HEARD THE TONE?

YES	NO

THESE ARE THE TIMES I PAID ATTENTION TO WHAT I DID WITHOUT HEARING THE TONE:

Times I was Fidgeting

Times I was Sitting Still

Subject #:_____ Date:_____

SELF-RECORDING FORM

Off Task = I am not paying attention or I am off task when I am supposed to be doing work. If I stop doing my work and I am doing other things then I am not on task. When I am not on task I will not be doing as my teacher asked. When I am off task I am not looking at my work.

WAS I OFF TASK WHEN I HEARD THE TONE?

YES	NO

THESE ARE THE TIMES I PAID ATTENTION TO WHAT I DID WITHOUT HEARING THE TONE:

Times I was Off Task

Times I was on Task

APPENDIX I

Subject #:_____ Date:_____

SELF-RECORDING FORM

Fidgeting = times when I have difficulty sitting still in my seat and I squirm and move my legs, arms, hands, buttocks or trunk. If I sway back and forth, kick my legs back and forth, swing my arms at one's side, shuffle my feet from side to side, or shift my buttocks about in the chair, or tap my pencil or finger repeatedly on the table I am fidgeting.

THESE ARE THE TIMES I PAID ATTENTION TO WHAT I DID WITHOUT HEARING THE TONE:

Times I was Fidgeting

Times I was Sitting Still

Subject #:_____ Date:_____

SELF-RECORDING FORM

Off Task = I am not paying attention or I am off task when I am supposed to be doing work. If I stop doing my work and I am doing other things then I am not on task. When I am not on task I will not be doing as my teacher asked. When I am off task I am not looking at my work.

THESE ARE THE TIMES I PAID ATTENTION TO WHAT I DID WITHOUT HEARING THE TONE:

Times I was Off Task

Times I was On Task

APPENDIX J

Child weekly Satisfaction Ratings

We would like to know more about how you feel about being a part of this research. Some kids like being a part of this research and some kids don't like being a part of this research. We are going to ask you a bunch of questions to see what you like and what you don't like. This will not change how we feel about you or how many prizes you will be able to earn. We just want you to be honest with us.

1. How do you like being a part of this research project/getting help in school?

Don't like it at all Mostly don't like it Mostly like ii Like it all

2. How do you like the people that are helping you?

Don't like them at all Mostly don't like them Mostly like them Like them all

3. Do you feel differently now because of getting help in school?

Don't feel different at all Mostly don't feel different Mostly feel different Feel really different

4. Do you act differently because of the help that you have gotten in school?

Don't act different at all Mostly don't act different Mostly act different Act really different

5. Have you learned things that have helped you?

Have not learned at all Mostly have not learned Mostly learned Learned a lot

6. Did the help you received in school make your problems get better?

Didn't help at all Mostly didn't help Mostly helped Really helped

7. All in all, how do you feel about the help that you received in school?

Didn't like it at all Mostly didn't like it Mostly like it Like it all