Once thought to be a disorder limited to children, ADHD is now known to persist in adulthood in approximately 50% of cases, resulting in an adult prevalence of 4% (Kessler et al., 2006), for adults with ADHD. Longitudinal and cross-sectional studies have extensively documented significant impairment in virtually every major domain of functioning—academic, occupational, social and emotional—(Kessler et al., 2006), as well as high rates of comorbid conditions, including mood, anxiety, and substance abuse disorders.

Stimulant (methylphenidate, amphetamine) and non-stimulant (atomoxetine) medications are effective for adults as well as children in alleviating the core symptoms of inattention, hyperactivity, and impulsivity. However, response rates in adulthood are lower than those in childhood such that 30-50% of adults may have an unfavorable response—low efficacy or side-effects (Wilens, Spencer, & Biederman, 2002). Furthermore, there is little clear evidence that ADHD medications enhance everyday self-management skills necessary for effective time-management, organization, and planning. Indeed clinical observation strongly indicates that deficits in these functions persist in many adults even after medications are optimally titrated. These observations, taken together, point to the need for additional interventions to target these problems, as well as to address the substantial comorbidity, negative ingrained maladaptive behavior patterns, obstacles to change, and psychosocial impact of ADHD with which these patients present.

In 1999, when we began this work, there was no literature concerning psychosocial treatments for adult ADHD. Since that time, various approaches, including group-based and individual treatments, and various orientations (cognitive-behavioral, dialectical behavior therapy, behavioral analysis, mindfulness, and multi-modal treatments) have been employed to address these problems, as reviewed most recently by Knouse and Safren (2010). The majority of these studies were open trials, comparing pre- to post-treatment change, and only two studies even had a wait list control (Safren et al., 2005; Stevenson, Whitmont, Bornholt, Livesey, & Stevenson, 2002). Effect sizes for pre- to post-treatment change in total ADHD symptoms in these studies were generally robust, ranging from 0.38 to 1.97 with an average of 1.12, signaling the potential utility of these interventions.

**SYMPTOM MANIFESTATIONS AND TARGETS OF TREATMENT**

In designing a treatment for adults with ADHD, we largely focused on difficulties in the cognitive/attentive and executive function domain because our clinical observations suggested that these difficulties are virtually universal among adults with ADHD. Problems with impulse-control, mood regulation, and interpersonal interaction, albeit significant and important, are limited to subsets of patients. Recent research has supported this approach in documenting that problems in the inattentive domain (Safren et al., 2010) and executive function domain (Barkley & Fischer, 2010) of symptoms are more highly associated with impairment for adults with ADHD than those which emerge from the hyperactive-impulsive domain. Therefore, the program of treatment that we developed was designed to address many of the most common problems and complaints documented as areas of deficit for adults with ADHD and frequently voiced by patients as sources of distress and frustration:

- Inefficiency
- Difficulty initiating and terminating tasks and activities in a timely manner
- Disorganization
- Difficulty prioritizing
- Poor planning
- Tardiness
- Forgetfulness
- Indecisiveness
- Perfectionism

**A COGNITIVE-BEHAVIORAL APPROACH**

Our manualized treatment (Solanto, in press) is grounded in cognitive-behavioral principles and methods. Some components aim to change behavior by imparting new skills and new habits. Other components focus on changing cognitions while also imparting skills. Some of these new cognitions may be considered adaptive internal speech or self-instruction to guide behavior. The unique advantage of the cognitive-behavioral approach is that these interventions are synergistic. The cognitive changes generate adaptive behavioral changes; when these behavioral changes are reinforced they serve in turn to generate more positive cognitions and self-attributions. An important goal of our treatment design was to foster generalization and maintenance so that the adaptive behaviors and cognitions would be assimilated into all the activities of daily life and would become habitual and automatic. The development of new skills and strategies is fostered via intensive practice during the session and during the Home Exercise which follows each session. Group support and positive reinforcement by the therapist and group members also occurs. The Home Exercise is central to the program. It is the opportunity for the participant to actually apply and practice the strategy in the “real world” environment of work, school, or home.
Behavioral Strategies

Examples of explicit skills imparted in the program are the use of the planner for scheduling and prioritizing, and a method to set up filing systems. New habits related to these skills are checking the planner regularly during the day, and restoring possessions to their places in order to maintain organizational systems. Behavioral strategies also include the practice of contingent self-reinforcement upon completion of difficult or aversive tasks, and breaking down complex tasks into manageable parts. These practices are intended to intensify the participant’s experience of reinforcement, thereby counteracting an apparently diminished experience of reinforcement in individuals with ADHD (Luman, Oosterlaan, & Sergeant, 2004; Volkow et al., 2009).

Visualization of long-term rewards of present behavior is another example of a strategy that is neuropsychologically informed. This strategy is intended to counteract the steeper delay discounting of reinforcement in individuals with ADHD. The “delay of reinforcement gradient” describes the fall-off in the reinforcing values of distant rewards as a function of time into the future. Thus, the more distantly a reward will occur, the less power it has to motivate behavior in the present. Although applicable to everyone, this delay gradient appears to be steeper for individuals with ADHD. This has been demonstrated in the finding that children with ADHD are more likely to choose an immediate reward in preference to a larger, but delayed reward (Aase & Sagvolden, 2006). Adults with ADHD appear to be similarly more inclined to choose activities which deliver immediate gratification over those which entail protracted effort over longer periods of time before they reach fruition. Since the latter include many of the important rewards of life—for example, higher academic degrees, job advancement, saving money for the purchase of a home—it seems clear that this scenario, repeated many thousands of times during the course of development and into adulthood, may account for the lower ultimate academic and occupational attainment of adults with ADHD.

In our treatment program, this problem is addressed by a strategy to make distant rewards more salient so that they can serve to motivate behavior in the present. The participant is guided to generate a well-elaborated rewards scenario for a long-term goal, imagining as vividly as possible the material and non-material rewards which will be available upon achievement of the goal. Each participant is encouraged to review this rewards scenario at junctures when choosing between an immediate reinforcer (e.g., watching television) and an effortful task that is one step of a project which will yield reinforcement in the long term (e.g., eschewing television to work on a new business proposal).

Other behavioral strategies include modifications of the physical environment to decrease distraction and increase efficiency.

Cognitive Strategies

Among the cognitive interventions, the program aims to impart “rules” for daily scheduling, prioritizing, and organization. An example of such a rule is the advice to enter all appointments and tasks into planner. Participants are also helped to develop adaptive cognitions to facilitate task initiation, completion, and planning. An example of this is “Getting started is the hardest part” which highlights that anything that aids in starting a task will have significant payoff, and ensures the participant that, once started, the going will get easier. Some of these adaptive cognitions are encompassed in the form of “mantras” which are maxims to self-cue the application of the strategy in daily life. These mantras are repeated strategically throughout the program so that they will become internalized and thereby facilitate the maintenance of treatment benefits. One example is “If it’s not in the planner, it doesn’t exist,” meaning that unless appointments and tasks are entered into the planner they are highly unlikely to be accomplished. Another mantra is, “If I’m having trouble getting started, then the first step is too big,” which is the cue to break down a difficult or aversive task into more manageable parts.

In addition to employing these methods developed specifically to treat ADHD, the program also incorporates traditional CBT as it has been used to address anxiety, depression, and demoralization (Beck, 1995). In this context, participants are taught to recognize and challenge irrational automatic thoughts such as “all-or–none thinking” (perfectionism), overgeneralization, selective attention, and catastrophizing. During the sessions following their introduction into the program, these irrational cognitions are flagged as appropriate for individual participants.

Treatment Parameters

The treatment is rendered in a group modality, consisting of six to eight adults, meeting for 12 weekly sessions of two hours each. Although easily adapted for individual treatment, the group-based intervention offers unique advantages of mutual support and encouragement, positive modeling and vicarious reinforcement of successful strategies. The structured set of skills to be learned also lends itself to presentation in a group format.

Each session has four parts: the review of the previous week’s Home Exercise, the presentation of new material, the In-Session exercise, and discussion of the next week’s Home Exercise. Given the importance of the Home Exercise for generalization and maintenance of treatment gains, fully the first hour of the session is devoted to a roundtable review of each participant’s experience with the Home Exercise, including successes, failures and partial successes, which are analyzed to ascertain what additional or alternate strategies might be utilized in the next iteration. Positive efforts as well as positive outcomes are reinforced and it is emphasized to the participants that long-term improvement occurs only through “successive
approximations” of the desired behaviors. Following the review of the Home Exercise, the new material for the session is presented using the Socratic Method, which encourages active participation by group members. The session proceeds with an In-Session exercise to illustrate application of the strategies discussed during the session. Material for the exercise is taken from the participants’ own experiences, difficulties and goals. One particularly important tool is the Project flow Sheet that is introduced in the first session on Planning. This flow sheet is an aid in planning out a multi-step, multi-component project that involves both time-management and organization. It is intended to help adults with ADHD counteract their tendency to overlook the multiple steps in the planning process and to telescope time, resulting in their typically trying to do everything at once at the last minute.

The session concludes with a presentation and anticipatory troubleshooting of the next Home Exercise. Weekly handouts include not only the next Home Exercise, but also a pithy summary of the session content to serve as an aid to learning (particularly for those whose attention may have lapsed during the session), and which can be emailed to any who missed the session.

### EVIDENCE-BASE FOR COGNITIVE-BEHAVIORAL TREATMENT OF ADULT ADHD

The first study using our cognitive-behavioral treatment was an open trial of 38 adults (16 men, 22 women) with ADHD who participated in either 8- or 12-week iterations of the manualized group program (Solanto, Mark, Mitchell, Wasserstein, & Kofman, 2008). Participants ranged in age from 23 to 65 years [M (SD) age = 41.82 (9.98) years] and met criteria for either ADHD Combined Type (n = 14; 36.8%) or ADHD, Predominantly Inattentive Type (n = 24, 63.2%) on the basis of a comprehensive clinical evaluation and the relevant DSM-IV symptom scales (T-score ≥ 65) on the Conners Adult ADHD Rating Scale-Self-Report: Long Form (CAARS-S:L) (Conners et al., 1999). Twenty-six (68.4%) participants were concomitantly receiving psychotropic medication for ADHD. CBT yielded significant post-treatment decreases in: CAARS DSM-IV Inattentive Symptoms; composite and individual domain scores from the Brown Adult ADD Scale; as well as the total score from the On Time Management, Organization, and Planning Scale (ON-TOP)—a 24-item self-report inventory developed within our program to assess perceived competencies in the realms of time management, organization, and planning skills. Categorical analysis of pre- to post-treatment ratings on CAARS DSM-IV Inattentive Symptoms revealed that 46.7% of participants decreased from the clinical range (T -score ≥ 65) to below the clinical threshold (T -score < 65), a pattern that was not impacted by medication status.

### Randomized Controlled Trials

Despite the apparent benefits of CBT, the preliminary investigation did not control for expectancy of change and spontaneous diminution of symptoms over time, nor did it take into account the nonspecific effects of therapy (e.g., mutual support and information sharing). Therefore, with the support of NIMH,1 we undertook a randomized controlled trial (Solanto et al., 2010), hypothesizing that more robust therapeutic change would occur for individuals receiving CBT compared to a supportive psychotherapy group that controlled for non-specific therapeutic elements. In addition, despite the absence of effects of medication in the small open trial, it was hypothesized that medication would interact with treatment group such that CBT participants taking medication would better assimilate the treatment techniques and more successfully apply the interventions between sessions and thereby achieve better outcomes.

Eighty-eight adults rigorously diagnosed with ADHD (see diagnostic procedures below) were stratified with respect to use or non-use of ADHD medications (i.e., psychostimulants or atomoxetine) and randomly assigned to either our 12-week manualized CBT program (n = 45) or a 12-week supportive psychotherapy (SP) group (n = 43). Response was assessed via a structured interview completed by an independent (blind) evaluator (IE), and by questionnaires completed by the participant and a collateral informant immediately pre- and post-treatment.

As was also true for the earlier pilot investigation, inclusion criteria required that participants be between the ages of 18 and 65 with a diagnosis of ADHD (Predominantly Inattentive or Combined Type). Potential candidates were excluded on the basis of the following criteria: active substance abuse or dependence; suicidality; asocial characteristics (e.g., Pervasive Development Disorder Spectrum; cognitive disability (estimated FSIQ < 80); Borderline Personality Disorder; Alzheimer’s Disease or suspected dementia; childhood history of trauma or other severe psychiatric disorder that confounded the determination of childhood ADHD symptoms; and/or the presence of acute psychiatric disturbance(s) considered to represent the essential focus of clinical attention.

The diagnosis of ADHD was determined on the basis of the Conners Adult ADHD Diagnostic Interview for DSM-IV (CAADID) (Epstein, Johnson, & Conners, 2001), along with a T-score ≥ 65 (93rd percentile) on the CAARS-S:L DSM-IV Inattentive subscale. In addition, potential candidates were required to show impairment (T-score ≥ 63, 90th percentile) on the CAARS-S:L Inattention/Memory subscale (CAARS-IN) which contains a predominance of items relevant to time-management, organization, and planning. The presence of childhood ADHD symptoms was validated by at least one of the following: self-report of ≥ 4 childhood symptoms in one domain on the CAADID; collateral report using the Childhood Symptom Scale – Other Report (Barkley & Murphy, 1998) or reports of symptoms on school report or a childhood psychological evaluation.

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Participants were assessed by the IE pre-and post-treatment using the Adult ADHD Investigator Symptom Rating Scale (AISRS) (Adler, Spencer, & Biederman, 2003) which is a structured diagnostic interview designed to gauge the presence and severity of the 18 DSM-IV symptoms of ADHD. The total symptom score, summed across the nine AISRS Inattention items (AISRS-IN) and the CAARS-IN subscale served as the primary outcome measures.

General Linear Modeling (GLM) analyses, comparing change from baseline between treatment groups, revealed significant effects for IE measures of inattention (AISRS-IN) and a subset of items on the AISRS that reflected time management, planning, and organizational skills (AISRS-TMOP), as well as collateral ratings of DSM-IV inattentive symptoms (CAARS-IN Observer). Statistically, the decrement in severity from pre- to post-test periods, controlling for initial ratings, was more robust for individuals assigned to CBT. Only one statistically significant interaction was observed between baseline score and response to treatment: the larger (more severe) the CAARS-IN score at baseline, the greater the differential improvement with CBT; change in the SP group, by contrast, was stable across the entire range of initial CAARS-IN scores.

Categorical analyses of therapeutic response were examined to determine the percentage of participants who exhibited a clinically meaningful response to treatment. On the AISRS, a positive response was operationalized as a decrease of ≥ 30%; positive response on the CAARS-IN was defined as a decrease of ≥ 10 T-score points (SD). Using these criteria, a significantly greater proportion of CBT participants were classified as responders vs. SP participants (42% and 12%, respectively). A statistically significant difference in response rate was also observed using self-report (CAARS-IN) ratings (53% and 28% respectively). Thus, while indicators of change for the primary outcome measures clearly favored the CBT group, it is important to emphasize that individuals assigned to the SP group also derived appreciable benefit.

Additional analyses indicated no significant difference between groups vis-à-vis expectancy ratings obtained pre-treatment or after the first two treatment sessions. Moreover, age, gender, ethnicity, education, household income, marital status, employment status, IQ, ADHD subtype, concurrent medication for ADHD, and presence of a comorbid mood and/or anxiety disorder did not interact with the effects of treatment and in each analysis, the effect of CBT vs. SP remained significant while controlling for each of the above variables. However, within the CBT group, completion of the Home Exercise was significantly related to change in AISRS-IN score, highlighting the importance of this treatment component.

Several factors may have accounted for the fact that medication did not interact with treatment group to moderate treatment response. First, the fact that participants were required to meet entry criteria for minimum levels of symptom severity may have oversampled for non-responders or suboptimal responders to medication. This may be especially likely given that medicated and non-medicated participants did not differ with respect to baseline levels of ADHD severity. Although analyses were repeated using a subset of participants considered to be adequately medicated, with the same result, it is conceivable that specific medication(s) and dosage(s) may not have been optimally titrated by individual practitioners. A final possibility, and one that is consistent with findings from our initial investigation of primarily medicated participants (Solanto et al., 2008), is that the CBT intervention is sufficiently structured for participants to benefit irrespective of medication status.

Almost simultaneously with our own study, Safren and colleagues (Safren, Sprich, Mimiaga et al., 2010) completed a randomized controlled trial examining the effectiveness of individual CBT for medicated adults with ADHD who continued to display clinically significant symptoms. As in their pilot study with wait-list controls (Safren et al., 2005), CBT was comprised of manualized modules targeting organization and planning, distractibility, and cognitive restructuring. Optional modules were also offered that focused on procrastination, anger-management, assertiveness training and communication skills, for a maximum of 15 weekly sessions. Eighty-eight adults were randomized to receive either CBT or a comparison treatment consisting of relaxation training with psychoeducation. Results indicated that a significantly greater proportion of individuals assigned to CBT (vs. comparison) were classified as treatment responders on the basis of blind clinician ratings on the Clinical Global Index (CGI), and the ADHD Rating Scale (ADHD-RS) consisting of all 18 DSM-IV symptoms of ADHD: CGI: 53% vs. 23%; ADHD-RS: 67% vs. 33%. Analogous findings were observed using self-report ratings.

A comparison of these two randomized controlled trials revealed robust effect sizes of 0.73 for DSM-IV Inattentive symptoms (Solanto et al., 2010) and 0.60 for all DSM-IV symptoms (Safren, Sprich, Mimiaga et al., 2010).

CONCLUSIONS
As demonstrated by the above studies, cognitive-behavioral treatment, delivered in individual or group modalities, in the presence or absence of psychopharmacological intervention, can help to mitigate the core features of ADHD (i.e., inattention) and associated impairments in executive skills (e.g., time-management, organization and planning skills). Further studies are needed to ascertain the duration of improvement beyond the end-point of treatment, and the possible utility of “booster” sessions to maintain benefits. Also of great interest would be comparisons of efficacy of ADHD medications and CBT, separately and together, with respect to effects on core symptoms and executive functions. Larger-scale studies may, in addition, allow for identification of clinical variables that predict differential response to medication and psychosocial treatment. Neuroimaging may have utility in documenting changes in patterns of activation (fMRI)
as a function of treatment and may as well identify neurophysiological predictors of response.

All in all, the future looks very promising for the continued development and application of CBT in the treatment of deficits associated with ADHD in adults.

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