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A pilot study on the effects of social skills, self-regulation and executive functioning training.

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HÁSKÓLI ÍSLANDS

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Abstract

The current study examined the effects of the OutSMARTers program on social skills, self-regulation and executive functions compared to a Waitlist group and an ADHD parent training program. Participants consisted of 41 children with ADHD, aged 8-11. All groups were assessed with behavioral checklists and neuropsychological measures at baseline and post-treatment and the two active treatment groups were reasessed with behavioral checklists in a 3-month follow-up. The results showed decreased ADHD symptoms, improved social skills and better emotion regulation at post-treatment for the OutSMARTers compared to the Waitlist group. There was no difference between the OutSMARTers and Parent groups on any measure after treatment. Both treatments were concluded to be effective. In addition, the 3-month follow-up showed that most of the post-treatment changes were maintained for both groups. The results indicate that the OutSMARTers program seems to benefit children with ADHD well, but needs further research.

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Introduction

Children with attention-deficit/hyperactivity disorder (ADHD) display difficulties with attention and behavioral self-control relative to children of the same age and sex (American Psychiatric Association; APA, 2000). They have, further, been found to have deficits in executive functions, e.g. working memory (Barkley 1997c; Klingberg, Forssberg & Westerberg, 2002) and inhibition and impulse control (Barkley, 1999; Rubia et al., 2001). Having these deficits can greatly impact children´s academic performance, social skills and overall daily functioning (Anastopoulos, Shelton & Barkley, 2005).

Executive functions

ADHD has been described to as an executive function disorder and deficits in this process are considered to be at the core of the disorder (Barkley, 1997c). Executive functions refer to self-directed actions that are being used to self-regulate and impulse control is necessary for executive functions to take place. Therefore, a deficit in inhibition control results in a deficit in executive functioning (Barkley, 1997b; 1997c; 1999). Executive functions rely partly on the prefrontal cortex in the brain as can be seen in various different studies (see e.g. Kaine & Engle, 2002; Robbins, Weinberger, Taylor & Morris, 1996; Braver et al., 1997; Cohen et al, 1994) and research has shown decreased brain activity in various brain areas in children with ADHD, e.g. in the inferior frontal cortex (Yu-Feng et al., 2007). Studies also show that children with ADHD have difficulties with inhibiting responses, both on neuropsychological tests (Friedman et al., 2007; Pennington & Ozonoff, 1996; Scheres et al., 2004) and in daily life (Lawrence et al., 2004). However, deficits in executive functions are not implicated in all cases of ADHD (Willcutt, Doyle, Nigg, Faraone & Pennington, 2005) and some

studies indicate that there are differences in such deficits between ADHD subtypes (see e.g. McCandless & O´Laughlin, 2008; Klenberg, Jämsä, Häyrinen, Lahti-Nuuttila & Korkman, 2010).

An important part of the executive function system is working memory. Working memory allows one to temporarily hold information in mind in order to manipulate them in some way. It has been regarded as a fixed trait (Baddeley, 2000; Klingberg et al., 2002) and several working memory models have been set forth (Baddeley, 2000; Cowan, 2010; Erikson & Kintsch, 1995). The role of working memory is important in ADHD since poor working memory affects a range of important skills, e.g. reading, arithmetic and problem solving (Barkley, 1997c; Rapport, 2008) and it has been regarded as a primary deficit in children with ADHD inattentive type (Diamond, 2005).

Barkley (1997b; 1997c; 1999) has argued that ADHD is fundamentally a deficit of self-regulation and that the presence of poor inhibition and impulse control seems to play an important role in maintaining the disorder for many children with ADHD. Self-control occurs when a person has a preference for a long-term outcome of a behavior rather than a short-term outcome (Barkley, 1997b) and self-regulation depends on both response inhibition and interference control (Barkley, 1999). Children with ADHD have trouble delaying gratification and thus tend to make choices that result in immediate reinforcement rather than those that are better for the long run (Gawrilow, Gollwitzer & Oettingen, 2011). Research on training self-control in impulsive children has suggested that it is possible to increase self control by gradually introducing larger delays between reinforcers (Schweiter & Sulzer-Azaroff, 1988) and by teaching the children to use if-then plans, by linking critical situations to a goal directed response (Gawrilow et al., 2011).

Emotion regulation and social skills deficits

Emotion expression serves a regulatory purpose by signaling to ourselves and others our emotional state (Southam-Gerow & Kendall, 2002). ADHD in childhood is associated with abnormal parasympathetic mechanisms involved in emotion regulation (Musser et al., 2011) and research has shown that impulsive boys with ADHD display greater disinhibition and are less effective at emotion regulation than a comparison group (Walcott & Landau, 2004). Children with externalizing disorders display more hostility and surprise when complimented by another child compared to children without clinical problems (Casey & Schlosser, 1994). Hostile attribution of intent (see e.g. Dodge, 1980; Dodge & Frame, 1982; Dodge & Coie, 1987) is believed to cause aggressive behavior, which in turn causes more problematic interactions with peers and as a result prevents aggressive children from getting opportunities to show prosocial behaviors. Problems with peer acceptance and interactions are common for children with ADHD (Bagwell, Molina, Pelham & Hoza, 2001; Hoza et al., 2005b), children with ADHD are not as well liked, and more often rejected socially compared to other children (Hoza et al., 2005b). Peer rejection predicts later global impairment, cigarette smoking, delinquency and anxiety, so it seems important to address peer rejection to improve long term outcomes of children with ADHD (Mrug et al., 2012).

Children with ADHD and comorbid aggression are especially prone to social difficulties and their social problems are more extensive compared to children without such comorbidity (Bagwell et al., 2001). For children without significant aggression, the problem is usually not that they do not have proper social skills, but rather that they do not use their skills in social interactions when they would prove useful (Barkley, 1997c; Smith, Barkley & Shapiro., 2006).

It can be concluded that ADHD is a complex disorder involving deficits in executive functions, emotion regulation and social skills which requires treatment that systematically targets these maintaining factors.

Treatment of ADHD

The National Institute for Health and Clinical Excellence (NICE) has published clinical guidelines for treatment of ADHD. For school-aged children with moderate ADHD and moderate impairment it is recommended to offer parents a parent training program and the child a cognitive-behavioral therapy or social skills training (NICE, 2008). For school-aged children with severe impairment from ADHD, drug treatment is recommended as the first-line treatment (NICE, 2008). The use of stimulant medication to treat children with behavior problems has been extensively researched (see e.g. Greenhill, Halperin & Abikoff, 1999; Van der Oord, Prins, Oosterlaan & Emmelkamp, 2008). Since medication is not always sufficient for treating ADHD, a psychological intervention should always be part of the treatment plan (Smith et al., 2006; NICE, 2008). Contingency management in the classroom and elsewhere, parent training and psychopharmacology has so far shown the greatest empirical support for the treatment of ADHD (Smith et al., 2006).

Parent training. Parent training programs are interventions aimed at training parents in techniques that enable them to better manage their childrens behavior. The NICE clinical guidelines (2008) recommend the use of parent training for children until the age of 12-13. Parent treatment programs have been shown to reduce parenting stress, increase parenting self-esteem and reduce the child´s overall ADHD symptoms (Anastopoulos, Helton, DuPaul & Guevremont, 1993). In a recent meta analysis on parent training programs for parents of children aged 5-18 years old, parent training was

found to have a positive effect on the behavior of children with ADHD and seemed to reduce parental stress and enhance their confidence in the parenting role (Zwi, Jones, Thorgaard, York & Dennis, 2012). There is some evidence to suggest that young school-age children with moderate impairments may benefit from group parent training programs and classroom behavioral interventions as a first-line treatment (Young & Amarasinghe, 2010). In addition, this seems to be the most appropriate intervention for preschoolers (Young & Amarasinghe, 2010). However, parent training does have some shortcomings; it does not necessarily result in behavioral improvements at school (Taylor & Biglan, 1998), many children continue to have peer relationship problems (Hoza et al., 2005a), parents of children with hyperactivity often have limited ability to generate and maintain beneficial change despite the training (Helm & Kozloff, 1986), and not all parents are willing to take on a parent training course. Whether either or both parents also have ADHD impacts the effectiveness of parent training programs. Studies have linked maternal ADHD symptoms with less improvement in the child´s behavior following parent training (Chronis-Tuscano et al., 2011).

Social skills training. Social skills training usually involves direct training of social skills and everyday problem solving. The evidence for the effectiveness of social skills training programs for children with ADHD has been mixed and treatment outcome studies of such programs often have methodological limitations, e.g. lack of randomization to treatment groups, parents awareness of treatment conditions and lack of alternative treatment groups (Smith et al., 2006). Research has indicated that children attending a social skills training program have more declarative knowledge of skills and show improvement in parent reported social skills, but often fail to generalize those skills to school settings (Pfiffner & McBurnett, 1997). In a group of children who responded well to medication and did not have comorbid conduct problems, a combined

treatment of medication and a multimodal treatment which included social skills training did not show increased effects on any measure of social functioning over medication alone or combined treatment of medication and attention training (Abikoff et al., 2004). It may be that teaching skills to children is not always the most important issue but that it is also necessary to assist them in practicing these skills in the settings where they need them the most (e.g. in the school setting) and which matter the most for their long-term social acceptance (Smith et al., 2006). However, children with ADHD-inattentive type may have a social skill deficit rather than a performance deficit (Maegden & Carlson, 2000), and there is some evidence that this subgroup could benefit more from a social skills training than children with ADHD predominantly hyperactive/impulsive type (Antshel & Remer, 2003). Boo and Prins (2007) reviewed the outcome of four different social skills training programs and state that there is ample evidence which points to adapting social skills training programs to specific needs of children with ADHD. They found that there are potential moderators and mediators that affect treatment efficacy, for example that ADHD subtype and comorbid disorders moderate treatment outcome. Co-morbid oppositional defiant disorder (ODD) was found to lead to less effective outcomes (Boo & Prins, 2007), while children with comorbid anxiety and ADHD were shown to benefit especially well from psychosocial interventions (MTA Cooperative Group, 1999b). It therefore seems that ADHD combined type and ADHD with comorbid ODD gain more from a social skills training which also involves anger control training (Miranda & Presentacion, 2000).

Working memory training. The latest intervention for children with ADHD is working memory training. Working memory training, which usually involves completing computerized training programs, has been found to improve working memory and attention by affecting processes related to cognitive control (Klingberg et

al., 2002; Klingberg et al., 2005; Beck, Hanson, Puffenberger, Benninger & Benninger, 2010; Rutledge, van den Bos, McClure & Schweitzer , 2012). There is some evidence that working memory training also improves aspects of working memory that are not directly involved in the training (Klingberg et al., 2002; Holmes et al., 2010; Rutledge et al., 2012) and reduces motor activity (Klingberg et al., 2002). An initial deficit in working memory is not necessary for the training to be effective, so non-ADHD individuals also improve their performance by training (Klingberg et al., 2002). The gain in working memory has been shown to be maintained significantly after the training period ends (Beck et al., 2010; Rutledge et al., 2012). Working memory training can also involve response inhibiton training in tasks like the Stroop task (e.g. MacLeod, 1991). Cognitive training has led to increased activity in the orbitofrontal cortex and cerebellum in children with ADHD (Hoekzema et al., 2010) and prefrontal and parietal areas in healthy adults (Olesen, Westerberg & Klingberg, 2003).

Multimodal treatments. It is plausible that multimodal treatments are necessary and appropriate for many children with ADHD (Smith et al., 2006). In a summer treatment program, both methylphenidat drug treatment and behavioral treatment consisting of a point system with reward and cost components, time out, social reinforcement, daily report cards, and parent training produced large effect sizes on behavioral measures, but combined treatment was superior to either treatment alone (Pelham et al., 2005).

The National Institute of Mental Health (NIMH) studied the long-term effects of a multimodal treatment study of 600 children with ADHD aged 7-9 years old (MTA Cooperative Group, 1999a). The MTA study assigned children to four treatment groups; medication alone, behavior modification alone (which involved a summer treatment program for the child, parent training, and school consultation service), combination of

both, and a community comparison condition. Children in the combined treatment and medication management groups showed significantly greater improvement on ADHD symptoms than those given intensive behavioral treatment alone and community care. On several measures of e.g. oppositional/aggressive symptoms, internalizing symptoms, teacher-rated social skills, parent-child relations, and reading achievement, the combined treatment proved superior to intensive behavioral treatment and/or community care while medication management alone did not (MTA Cooperative Group, 1999a). Medication alone is the best treatment for core ADHD symptoms but combined treatment has advantages with regard to improved quality of life and functioning, such as better academic performance and family relations (MTA Cooperative Goup, 1999a).

Although both cognitive-behavioral methods/skills training and working memory training has been found to be promising for children with ADHD, no programs so far have combined these two types of treatment techniques. It has been pointed out that there is a need for improved treatments for children with ADHD (Rutledge et al., 2012). The purpose of the current study was to evaluate a new treatment program, the OutSMARTers program, designed for children aged 8-10 years with ADHD. The OutSMARTers (SMART stands for social, mind, affect, and resourcefulness training) program focuses on teaching children social and emotional skills through cognitive behavioral techniques and various executive function training components, including computerized working memory training.

The current study includes two types of comparisons; the OutSMARTERS program was compared to a wait-list control in a randomized-controlled trial, and the program was also compared to a parent training program for ADHD, where parents learned how to use behavior modification and adjust the environment to their children´s difficulties. It was hypothesized that the OutSMARTers program would result in better

social skills, less attention deficits, better emotional control and improvements in working memory compared to the children in the Waitlist group. It was expected that the Parent training would result in improvements in the children´s conduct, but that the OutSMARTers program would show more improvements in social skills, better emotional control and better working memory compared to the Parent training, since these factors were specifically trained with the OutSMARTers kids directly.

Method

Participants

A total of 41 participants (age in years: M = 9.2 , SD = 0.62 , ranging from 8 years 3 months old to 10 years 8 month old), 29 boys and 12 girls took part in the study and all participants were white. All participants had a primary diagnosis of ADHD and most were recruited through the Centre for Children‘s Development and Behavior in Reykjavík, Iceland (n = 35) and a few from other outpatient clinics nearby (n = 6). Exclusion criteria were a diagnosis of an autism spectrum disorder or an IQ below 70. Thirty-six children had a diagnosis of ADHD combined type, 4 had the inattentive ADHD subtype and one child had the hyperactive/impulsive ADHD subtype. Participants had received a diagnose of ADHD at different intervals before they participated in the study.

Assessment Procedure and design

Participants were assigned to three groups: Children who attended the OutSMARTers program (OutSMARTers group; n = 16), children who were on a waitlist to attend the OutSMARTers program (Waitlist group; n = 14), and children whose parents attended an ADHD parent training program (Parent group; n = 11). Children waiting to attend the

OutSMARTers program were randomized either into the OutSMARTers group or the Waitlist group. The third group consisted of children matched in age to the previous two groups, that had parents that had signed up for an ADHD parent training program (Parent group). Unfortunately, it was not possible to randomize children to the Parent group. The waiting period between baseline and posttreatment assessment for all three groups was approximately 5 weeks and the children in the Waitlist group would later receive treatment in the OutSMARTers program. All three groups were assessed at the Centre with behavioral checklists and neuropsychological measures at baseline and post-treatment/post-wait, and the OutSMARTers group and Parent group were assessed by parents with the same behavioral checklists at a 3 month follow-up through an on-line survey system. The Assessment at baseline and posttreatment took about 35 minutes each. The parents signed informed consent for participating in the study and the children granted verbal assent.

Treatments

The OutSMARTers program. The program consisted of 10 afternoon sessions, 2 hours each, over the duration of 5 weeks (2 sessions per week). The group of trainers, 2-4 for each course, consisted of licensed clinical psychologists as primary group leaders, and master's level clinicians as co-therapists. The group of 6 children (except for one group with 5 children) in each class was split into two 3-person groups at the beginning of each session. Each session was set up as multiple work stations with a reward system for completing assignments and following rules. At the end of each session the children could shop using their tokens at the OutSMARTers store, where they could buy trading cards, stickers, raffle tickets, and more. An additional incentive for group work and getting the children to encourage each other to show positive

behavior was the promise of a pizza party if they could collect 450 tokens together over the course of the program. For sessions 1 through 5 children attended the Emotion Station (45 minutes), in which the children learned about correctly identifying facial expressions in others, the necessity of sometimes hiding feelings, relaxation and anger management techniques and how to interpret ambiguous situations in a neutral or positive way, the Friendship Station (45 minutes), which consisted of discussing and practicing meeting new kids, reading non-verbal messages people send out, compromising, working on a group project, and other similar activities and the Brain Training Station (for 20 minutes), in which they practiced solving three executive function tasks on a computer (2 working memory tasks with pictures and letters and 1 Stroop inhibition task, which became increasingly more difficult as the program progressed). For sessions 6 through 9 the children attended the Stopping Station (45 minutes), where they participated in various fun games intended to help them think before speaking or acting, the Problem Solving station (45 minutes) where the children learned a formula for solving everyday problems that they then use to solve various issues concerning school, friendship and family issues, and continued attending the Brain Training Station (20 minutes). Before the OutSMARTers program started the trainers met with the children´s parents. The purpose of the meeting was to show parents how to help their child use the materials in everyday life, how to help children with certain homework activities and to increase the parent´s involvement in helping the child to remember using their newly learned skills. After the program ended the parents were sent a letter informing them which skills were especially important for their child to continue working on. Otherwise, the parents were not involved in the program directly.

ADHD parent training program. The program consisted of 6 weekly parent training sessions, 2 hours each, and was conducted by two licensed clinical

psychologists. The program was based partly on Barkley´s program *Defiant children* (1997a), but various parts were modified and expanded upon to better fit ADHD symptomatology. The first 5 sessions were consecutive but the 6th session was conducted 2 weeks later and was intended as a review session/relapse prevention. Each session consisted of instructions, training and homework. In sessions 1 through 5, parents were taught how children´s behavior is learned and maintained through parental reactions and were educated about ADHD symptoms and skills that are important for their child to master. Importance of daily routine, rules, visual planning and clear instructions were taught. Parents were also taught to use reward systems and mild punishments (such as time-out) and to attend to positive behavior and ignore undesirable behavior.

Measures

Behavioral measures. Parents of children in all groups completed behavioral checklists at baseline and post-treatment. Parents of children in the OutSMARTers group and the Parent group also completed the same checklists at a 3 month follow-up.

ADHD rating scale – IV (DuPaul, Power, Anastopoulos & Reid, 1998). This 18-item questionnaire is based on the DSM-IV diagnostic criteria for ADHD (APA, 2000). The respondent answers 9 questions regarding the child's inattention symptoms and 9 questions regarding hyperactivity/impulsivity on a 0 (never) to 3 (very often) scale. The scale is considered to have excellent test-retest reliability (r =.94) and internal consistency (r = .90) (DuPaul et al., 1998). The scale has been translated and normed for the Icelandic population and has been shown to have very good psychometric properties, including internal consistency (r =.93) (Magnússon, Smári, Grétarsdóttir & Þrándardóttir, 1999).

Social Skills Rating System (SSRS; Gresham & Elliot, 1990). The SSRS is a measure of social skills, and has been used widely in treatment outcome studies (Campbell, 1999; Pfiffner og McBurnett, 1997). The social skills subscale of this questionnaire was used to assess the children's cooperation skills, responsibility, assertion and self-control on a scale from 0 (never) to 2 (very often). Internal consistency of the total social skills score on the parent version is excellent (r = .90) and test-retest reliability for the different scales ranges from .68 to .87 (Gresham & Elliot, 1990). The SSRS is available in Icelandic, but the psychometric properties in the Icelandic population have not been previously explored.

Emotion Regulation Checklist (ERC; Shields & Chicchetti, 1997). This is a 24-item questionnaire on children's emotion regulation skills. Parents answer questions on a scale from 1 (never) to 4 (almost always) that load on two factors: Emotion regulation and Negativity/Lability. The psychometric properties of the Icelandic version of the list that was used in the current study have not yet been examined.

Strengths and difficulties questionnaire (SDQ; Goodman, 2001). This is a 25-item questionnaire which consists of 5 sub-scales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and pro-social behavior. Parents mark each item on a scale from 0 (not true) to 2 (certainly true). Internal consistency is generally satisfactory (r =.73) and retest stability after 4-6 months is .62 (Goodman, 2001). The translated and normed Icelandic version of the list has been shown to have good psychometric properties, including internal consistency (r =.81) (Skarphéðinsson & Magnússon, 2008).

Neuropsychological measures. Children in all groups completed three WISC-IV subtests and two computer tasks at baseline and post-treatment/post-wait.

Icelandic WISC-IV subtests (Námsmatsstofnun, 2006). Three subtests from The Icelandic standardized version of the Wechsler's Intelligence Scale for Children-IV (see Guðmundsson, Skúlason & Salvarsdóttir, 2006) were used to assess possible changes in working memory and processing speed; Coding (which measures processing speed, attention, visual processing, visual short-term memory and coordination of visual and motor skills), Letter-number sequencing (which measures working memory, attention, processing speed, short term auditory memory and auditory sequential processing) and finally Arithmetic (which assesses cognitive factors including short-term memory, fluid reasoning, working memory, attention, and auditory sequential processing).

Lumosity assessment tests. Two tests from the website www.lumosity.com were used to assess impulsivity and working memory; the Stop signal response is a response inhibition task used to assess impulsivity. It is a typical go/no go task (see e.g. Davis, Bruce, Snyder and Nelson, 2003; Casey et al., 1997) in which stimuli are presented in a continuous stream and the participant has to perform a binary decision for each stimuli. One of the outcomes requires participants to make a motor response while the other requires the participant to withhold a response. The second task, Letter memory, was used to assess visual working memory. The task requiers the child to remember strings of letters appearing one at a time on the screen. The children received verbal instructions before performing the tasks.

Statistical analyses

A series of F-tests were used to compare the three groups on various baseline characteristics; age, sex, ADHD subtype, days between measurements, medication, IQ, baseline scores on all behavioral checklists and baseline scores on neuropsychological measures.

The OutSMARTers and Waitlist groups were compared on the one hand and the OutSMARTers and Parent group on the other hand, on all outcome measures after the treatment period. Scores on the ADHD rating scale and SDQ scores were transformed to t-scores. The analyses were a repeated measures ANOVAs with group (OutSMARTers vs. Waitlist and OutSMARTers vs. Parent) as a between-subjects factor and time (baseline vs. post-treatment) as a within-subjects factor. Between-groups (from baseline to posttreatment) effect sizes (Cohen´s d) were calculated between the OutSMARTers and Wait-list groups on the one hand, and between the OutSMARTers and Parent groups on the other hand. Furthermore, 3 month follow-up data for the OutSMARTers and Parent groups were analyzed with a repeated measures ANOVA with group as a between-subjects factor and time (baseline vs. 3 month follow-up) as within-subject factors. Between-groups (from baseline to follow-up) effect sizes were calculated. To evaluate whether gains during treatment were maintained at follow-up for the OutSMARTers and Parent groups a paired sample t-test for differences in mean score was conducted.

Results

Baseline profile

The mean age in the OutSMARTers group was 9.24 years (*SD* = .48), 9.51 years in the Parent group (*SD* = .81) and 8.89 years in the Waitlist group (*SD* = .47). The severity of ADHD symptoms was similar for all groups for both inattention ($F(2, 37) = .05$, $p = .96$) and hyperactivity/impulsivity ($F(2, 37) = .30$, $p = .74$), with t-scores between 1.5 to 2 standard deviations above mean on the ADHD rating scale.

There was a significant difference in age between the three groups at baseline ($F(2, 38) = 3.61$, $p < .05$). However, when the age differences between the

OutSMARTers group and the Waitlist group were compared on the one hand ($F(1, 28) = 4.01$, $p = .06$) and the OutSMARTers group and Parent group on the other hand ($F(1, 25) = 1.22$, $p = .28$) they failed to reach statistical significance. There were differences in days between measurements between the three groups ($F(2, 38) = 18.23$, $p < .01$). The main concern about number of days between measurements is the possibility of practice effects on the WISC-IV and Lumosity subtests. The Waitlist group has the fewest days between measurements, so practice effects would have most likely occurred in that group (see Table 1). Finally, we found a statistical difference in medication at baseline ($F(2, 38) = 12.33$, $p < .01$). At the beginning of treatment all children in the OutSMARTers group were on medication, while 4 children (36.4%) were on medication in the Parent group and 12 children (85.7%) in the Waitlist group (see Table 1). When making planned comparisons between the groups, there was a statistical difference between the OutSMARTers group and the Parent group ($F(1, 25) = 25.93$, $p < .01$) but not between the OutSMARTers group and the Waitlist group ($F(1, 28) = 2.49$, $p = .13$). After treatment there were no changes in the number of children on medication in the OutSMARTers group but 3 (18.8%) children had some change to their medication regimen. Children on medication in the Parent group had gone up to 6 (54.5%) and 3 children (27.3%) had some medication change. After treatment 11 (78.6%) of the children in the Waitlist group were on medication and 1 (7.1%) of them had some changes to their medication.

There were no significant differences in baseline scores on behavioral checklists or on neuropsychological measures between the three groups, except on the SDQ subscale peer relationship problems ($F(2, 37) = 7.13$, $p < .01$) in that children in the Parent group had the mildest peer relationship problems, and children in the Waitlist group had the most severe peer relationship problems.

Attrition Rates

The OutSMARTers attended over 90% of the sessions and no child missed more than two sessions. Attrition rates were extremely low for this group; only one child did not complete the treatment (6%). In the Parent group parents of 2 children did not complete the treatment (15%). The rest of the parents attended over 90% of the sessions. A one tailed chi square test was administered to see if the two groups differed in attrition rates, and it turned out that the difference is not significant ($p = .40$).

Post-treatment Comparisons

The OutSMARTers group versus Waitlist group. There were significant main effects of time on inattention ($F(1, 27) = 4.63$, $p < .05$) but not hyperactivity/impulsivity ($F(1, 27) = 1.33$, $p = .26$) on parent-rated symptoms on the ADHD rating scale.The repeated measures ANOVAs between the two groups showed significant interactions between group and time on ADHD symptoms on parent-rated inattention and hyperactivity/impulsivity on the ADHD rating scale, such that the OutSMARTers group was rated with less inattentive symptoms ($F(1, 27) = 11.48$, $p < .01$) and less hyperactivity/impulsivity symptoms ($F(1, 27) = 8.35$, $p < .01$) than the Waitlist group after treatment (see Table 2). The effect size on inattentive symptoms is large ($d = 0.90$) and the effect size on hyperactivity/impulsivity symtoms is moderate ($d = 0.74$).

There were no significant main effects of time on the SDQ measures. There was a significant interaction between group and time for the total score ($F(1, 27) = 5.71$, $p < .05$) of the SDQ checklist and on the inattention/hyperactivity subscale ($F(1, 27) = 6.07$, $p < .05$). The OutSMARTers group made significantly greater gains on the total score (less problems) than the Waitlist group with a moderate effect size ($d = 0.75$) and

showed less inattention/hyperactivity symptoms with a moderate effect size (d = 0.75). Other SDQ subscales did not show significant time x group interaction.

There were main effects of time on parent-rated symptoms on one SSRS subscale; cooperational skills (F(1, 27) = 5.48, p = .03). Parent-rated social skills on the SSRS checklist showed interactions between group and time for the total score (F(1, 27) = 4.95, p < .05) and three of four subscales; cooperation (F(1, 27) = 4.57, p < .05), assertion (F(1, 27) = 7.76, p = .01) and responsibility (F(1, 27) = 6.21, p <.05), such that the OutSMARTers group had significantly more social skills than the Waitlist group after treatment. Between-group effect sizes ranged from small to moderate. The fourth subscale, self-control was close to reaching statistical significance (F(1, 27) = 3.06, p < .10) such that the OutSMARTers group had more self-control after treatment compared to the Waitlist group, with a small effect size (d = 0.46) (see Table 2).

No significant main effects of time were found on the ERC subscales. There was a significant group x time interaction on parent-rated symptoms on the emotion regulation ERC subscale (F(1, 27) = 5.37, p < .05) with a moderate effect size (d = 0.67). The negativity/lability subscale did not show a significant interaction (F(1, 27) = 2.31, p = .14).

There were significant main effects of time on two of the WISC-IV subtests; Coding (F(1, 28) = 17.54, p < .01) and letter-number sequencing (F(1, 28) = 4.27, p < .05). There were no significant interactions between group and time on the WISC-IV subtests but the differences between the groups were close to reaching statistical significance (with the OutSMARTers group making greater gains compared to the Waitlist group) on both the Coding subtest (F(1, 28) = 3.53, p < .10) and on the letter-number sequencing subtest (F(1, 28) = 3.53, p < .10), both between-group effect sizes are moderate.

There were significant main effects of time on both Lumosity tests; Stop signal correct ($F(1, 28) = 4.48$, $p < .05$) and Letter memory ($F(1, 26) = 10.12$, $p < .01$). There were no significant time x group interactions on either of the Lumosity tests.

The OutSMARTers versus the Parent group. There were significant main effects of time for both ADHD subscales; hyperactivity/impulsivity ($F(1, 24) = 5.22$, $p < .05$) and inattention ($F(1, 24) = 21.37$, $p < .01$), SDQ total score ($F(1, 25) = 20.84$, $p < .01$), emotional symptoms ($F(1, 25) = 15.06$, $p < .01$) and hyperactivity/impulsivity ($F(1, 25) = 17.53$, $p < .01$) SDQ subscales, SSRS total score ($F(1, 24) = 12.3$, $p < .01$) and all SSRS subscales; Cooperational skills ($F(1, 24) = 13.87$, $p < .01$), Assertion ($F(1, 24) = 9.06$, $p < .01$), Responsibility ($F(1, 24) = 14.66$, $p < .01$) and Self-control ($F(1, 24) = 8.96$, $p < .01$), ERC negativity/lability subscale ($F(1, 24) = 7.96$, $p < .01$), Coding ($F(1, 25) = 18.4$, $p < .01$) and Letter-number sequencing ($F(1, 25) = 9.33$, $p < .01$) WISC-IV subscales and the Stop signal correct Lumosity test ($F(1, 25) = 9.93$, $p < .01$). The repeated measures ANOVAs on the various measures revealed that there were no significant differences in the interactions between group and time between the OutSMARTers group and the Parent group (see Table 3). On the Coding subtest of the WISC, the OutSMARTers group was close to making greater treatment gains compared to the Parent group ($F(1, 25) = 4.01$, $p = .06$), with a small effect size ($d = 0.42$).

3 month follow-up. Many scales show significant main effects of time; both inattention ($F(1, 15) = 16.96$, $p < .01$) and hyperactivity/impulsivity ($F(1, 15) = 11.13$, $p < .01$) ADHD subscales, SDQ total score ($F(1, 17) = 10.75$, $p < .01$) and hyperactive/inattentive subscale ($F(1, 17) = 16.34$, $p < .01$), SSRS total score ($F(1, 17) = 12.3$, $p < .01$) and all SSRS subscales; Cooperational skills ($F(1, 17) = 25.97$, $p < .01$), Assertion ($F(1, 17) = 23.35$, $p < .01$), Responsibility ($F(1, 17) = 29.4$, $p < .01$) and Self-control ($F(1, 17) = 12.87$, $p < .01$) and finally ERC negativity/lability subscale ($F(1, 17)$

= 6.96, $p < .05$). There were no significant group x time differences comparing the baseline and 3 month follow-up scores between the OutSMARTers and Parent groups (see Table 4).

A paired t-test was administered to see if gains during treatment were maintained at 3 month follow-up. For the OutSMARTers group there were no significant differences in means during the follow-up period, although the deteriation on the SDQ total score (see figure 3) ($t(10) = -2.19$, $p = .05$) and SDQ emotional symptoms subscale (t(10) = -2,1, $p = .06$) was close to reaching statistical significance. The reduction in inattention scores for the OutSMARTers group were maintained at a 3 month follow-up ($t(9) = 0.6$, $p = .55$) (see figure 1), and the same applies to hyperactivity/impulsivity scores ($t(9) = 0.63$, $p = .55$) (see figure 2). The SSRS total score (see figure 4) was also maintained at a 3 month follow-up ($t(10) = -.83$, $p = .43$), and all SSRS subscales; Cooperational skills ($t(10) = -1.29$, $p = .23$), Assertion ($t(10) = -1.21$, $p = .26$), Responsibility ($t(10) = -1.41$, $p = .19$) and Self-control ($t(10) = -1.11$, $p = .30$). The ERC negativity/lability score (see figure 5) was maintained at a 3 month follow-up ($t(10) = .71$, $p = .46$).

For the Parent group there were no significant differences in means during the follow-up period, although the gain in SSRS subscales; Cooperational skills ($t(7) = -2.15$, $p = .07$) and Assertion ($t(7) = -2.32$, $p = .05$) and SDQ subscale Prosocial behavior ($t(7) = -2.2$, $p = .06$) was close to reaching statistical significance.

Discussion

The objectives of this study were to examine the effectiveness of the OutSMARTers program, a training program for children with ADHD with regard to social skills, self-regulation and executive functions. This new program was compared to a Waitlist group on the one hand and an active treatment program, i.e. parent training, on the other hand.

It was hypothesized that the OutSMARTers program would show improvement on all measures compared to the Waitlist group and that the OutSMARTers would show greater improvement in social skills, emotional control and working memory compared to the Parent training group. The Parent training, however, was expected to show greater improvements in the children´s conduct.

The results indicated that the OutSMARTers program was effective for children with ADHD. According to their parents, the children showed decreased ADHD symptoms, improved social skills and better emotion regulation at post-treatment compared to the Waitlist group. The impact of the working memory training was however not as clear as had initially been expected. Results of the Lumosity tasks; Letter memory and Stop signal response, and Arithmetic WISC-IV subtests did not reveal differences between the OutSMARTers group and the Waitlist group. When attention and processing speed was assessed post-treatment on the Coding and Letter-number sequencing WISC-IV subtests, results suggested greater gains for the OutSMARTers group compared to the Waitlist group.

There were no differences between the OutSMARTers group and Parent group on any measures after treatment, except for one indication (not statistically significant) that the OutSMARTers improved more on the Coding WISC-IV subtest. The overall conclusion was that *both* treatments were effective in treating children with ADHD, resulting in less inattention and hyperactivity/impulsivity symptoms, less emotional symptoms and better social skills for both groups. At a 3 month follow-up no differences emerged between the two groups, and the treatment gains were maintained.

Parent training programs have been thoroughly researched and have been found to be effective in reducing ADHD symptoms, behavioral problems and parental stress (see e.g. Smith et al., 2006; Anastopoulos et al., 1993). One surprising finding in this

study was that children in the OutSMARTers group had reduced inattentive and hyperactive/impulsive symptoms after treatment and the effect sizes were moderate to large compared to the Waitlist group and the effects were maintained at 3 month follow-up, suggesting a stable and robust effect. This finding is not in line with most research on the effect of CBT training on ADHD symptoms (Smith et al., 2006; Young & Amarasinghe, 2010). However, it has been reported that CBT affects parent-rated hyperactivity but not parent-rated inattention (Fehlings, Roberts, Humphries & Dawe, 1991) and that it may be more effective when the children are also on medication for ADHD (Abikoff & Gittleman, 1985). Since all the children in the OutSMARTers groups were on medication when they joined the program, the effects of the program may have been enhanced. It may be that the children´s experience of being able to follow rules and get constant positive feedback from adults makes them better able to do so at home and thus influence the outcome on the ADHD symptoms checklist.

Working memory training has been shown to increase brain activity (Olesen et al., 2003) and improve attention (see e.g. Beck et al., 2010). It is therefore likely that the working memory training accounts for some of the decrease in parent-rated inattentive symptoms. As a partial explanation for why the working memory training was not maximally effective, it is possible that groups of children with ADHD may need a new set of stimuli every session instead of every third session to maintain motivation, ambition and attention. This training might also have been more effective if it had been adjusted to the child´s performance and presented the next problem as more difficult or easy depending on their previous performance. Even though previous working memory training programs (e.g. Klingberg et al., 2002) have shown improvements in this skill, the effects were not as evident in the present study despite an extensive contingency management system based on the children´s performance. It is possible that more

intensive training is needed (20 minutes a day for 2-4 weeks), as has been done in previous studies with promising results (e.g., Klingberg et al., 2002).

The social skills of children in both the OutSMARTers group and the Parent group increased after treatment and the effects were maintained at 3 month follow-up. The OutSMARTers program targets these skills directly but the Parent training program does not. It is possible that the questions on the SSRS checklist can partly explain why the two groups did not differ in social skills after treatment. The questions on the SSRS are not just about peer related behaviors but also about behaviors that the parents might be training directly at home, such as being helpful, complimenting other members of the family and being cooperative. The social skills training in the OutSMARTers group may help the children to better control their behavior at home, take more responsibility for their own behavior and to step up to solve various situations and problems at home instead of relying mostly on their parents. Thus, it may be that the children gained increased confidence and a set of skills to deal with everyday problems, hopefully resulting in increased positive interactions with other kids and adults and fewer conflicts.

The fact that the OutSMARTers attended over 90% of group sessions and attrition rate were extremely low is important to note. It is likely that these excellent retention rates are due to the extensive reward system that seems to work well to encourage the children to attend the sessions, be active in sessions and complete the treatment. Other treatments for children have had problems with attrition, CBT for children with cronic illnesses has had an average 20% attrition rate and 37% refuse to enroll in treatment (Karlson & Rapoff, 2009) and a CBT group for adolescence with depression had 15% attrition in the first 12 weeks (TADS team, 2007).

Limitations

There are several limitations to this study. First, the sample was small and it is important to replicate this study in a considerably larger sample of children. Furthermore, increased statistical power is needed in order to examine predictors of treatment response, such as differential treatment effects for different genders, ADHD subtypes and the role of medication.

Some limitations apply regarding the use of parent questionnaires to evaluate benefits of the program. The parents in the different groups who rated the children in terms of their social skills and behavior and emotional states were obviously aware of group assignment. Optimally, the children would be observed by raters blind to treatment assignment in a structured interaction setting with other children or in the classroom. It would also be beneficial to include teacher reports of the children´s behavior, social skills and emotional control at school and to examine whether treatment gains generalize to the school setting.

It must be noted that it was not possible to include the Parent Group in the randomized assignment to groups. Statistical analyses of baseline characteristics revealed that the groups were comparable in most ways, but variables like medication use were not equal between the two groups and medication should optimally be controlled. In addition, two children in the Parent group started medication while the parent participated in the program and some of the improvements in that group at post-treatment may be partly explained by the medication effects. However, it is unlikely that changes in medication account for the considerable gains during the treatment process for both the OutSMARTers and the Parent Group. Finally, the children were diagnosed with ADHD at various intervals before participating in the study and should optimally be reevaluated before participating.

Conclusions and Future Direction

This pilot study explored the possibility of using a new multi-component treatment program to help children with ADHD become better at interacting with others, controlling their emotions, behavior and attention and solving problems in everyday life. The OutSMARTers program emerges as very promising treatment for children with ADHD, and it is important to note that the OutSMARTers program is much briefer and less expensive than programs like Pelhams and colleagues Summer treatment program, in which children attend for 9 hours a day for 8 weeks (Pelham & Hoza, 1996). Future treatment development will focus on improving the working memory tasks, as noted above, to examine further whether children can improve their skills. The main conclusion of the present study is that both the OutSMARTers and Parent programs are effective, and possibly in different ways. It will be important to not only explore whether children do better with this treatment if their parents are at the same time enrolled in a Parent group, but also to incorporate the parents more fully into the treatment program. It might be that more involvement of parents in the program, and getting them to actively seek out opportunities for their child to interact with peers in a positive way may increase the positive effects of the program. Parental involvement may be especially important because negative parenting styles have been found to predict poor treatment response in children that have attended social skills and problem solving training (Webster-Stratton, Reid & Hammond, 2001; Hinshaw et al., 2000).

Furthermore, it may be essential to involve the teachers of the participating children in encouraging the children to use their skills in the school setting. The next logical step, based on the current study, would be to conduct a randomized-controlled trial comparing the OutSMARTers program with a comparison group receiving treatment in the community (for example a social skills program not specifically for children with

ADHD), a Parent Group only condition and then a combined group with an integrated OutSMARTers program and parent training program.

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Tables and figures

Table 1

Participant characteristics at baseline.

	OutSMARTers n = 16	Waitlist n = 14	Parent n = 11	*F*(2,38)
Age in years				
Mean (SD)	9.24 (.48)	8.89 (.47)	9.51 (.81)	3,61*
Range	8.42 -10.08	8.25 - 9.75	8.58 - 10.67	
Gender, n (%)				
Boys	12 (75)	8 (57.1)	9 (81.8)	0.99
ADHD subtype, n (%)				0.32
ADHD combined	14 (87.5)	13 (92.9)	9 (81.8)	
ADHD inattentive	1 (6.3)	1 (7.1)	2 (18.2)	
ADHD hyperactive-impulsive	1 (6.3)	0	0	
Days between measurements				
Mean (SD)	53.1 (6.25)	42.71 (9.25)	60 (4.98)	18.23**
Min, max	43, 71	34, 62	55, 71	
Medication, n (%)				
Baseline	16 (100)	11(78.6)	4(36.4)	12.33**
IQ [a]				
Mean IQ (SD)	105.8 (10.51)	110.6 (14.93)	109.7 (13.18)	0.34
n	9	9	7	
VCS (SD)	104.7 (13.17)	108.5 (13.87)	110.8 (12.45)	0.68
n	15	13	10	

ADHD = Attention Deficit Hyperactivity Disorder VCS = Verbal Comprehension Subscale

*p < .05, **p < .01

a = total IQ score was only available for part of the children, but a Verbal comprehension score was available for most of the children

Table 2

Post-treatment outcome for OutSMARTers and Waitlist groups on all measures.

			Baseline		*Post-treatment*			
Measures	*Group*	*n*	*M*	*SD*	*M*	*SD*	*F*	*d*
ADHD rating scale								
Inattention	OutSM.	15	68.85	8.92	61.69	11.76	11.48**	0.9
	Waitlist	14	69.98	10.77	71.58	12.16		
Hyperactivity/impulsivity	OutSM.	15	68.01	8.95	61.66	7.36	8.35**	0.74
	Waitlist	14	68.69	15.35	71.41	6.58		
SDQ								
Total score	OutSM.	16	74.39	10.26	67.58	10.97	5.71*	0.75
	Waitlist	13	80.74	12.41	82.52	9.63		
Emotional symtoms	OutSM.	16	64.58	18.22	57.14	11.58	2.16	0.45
	Waitlist	13	68.06	11.2	67.44	13.42		
Conduct problems	OutSM.	16	66.46	14.95	64.43	18.79	1.92	0.44
	Waitlist	13	70.9	16.03	75.58	11.82		
Hyperactivity/inattention	OutSM.	16	72.05	7.89	67.81	7.5	6.07*	0.75
	Waitlist	13	73.23	10.99	75.92	12.76		
Peer rel. problems	OutSM.	16	64.58	11.16	60.46	12.13	0.48	0.21
	Waitlist	13	75.4	15.98	74.31	15.2		
Prosocial behavior	OutSM.	16	43.73	11.94	42.31	12.34	0.21	0.04
	Waitlist	13	45.62	12.83	43.7	13.01		
SSRS								
Total score	OutSM.	15	36.73	11.54	41.6	12.12	4.95*	0.54
	Waitlist	14	40.56	7.62	40.14	8.09		
Cooperational skills	OutSM.	15	29.27	9.22	33.2	8.6	4.57*	0.47
	Waitlist	14	32.79	6.43	32.97	6.57		
Assertion	OutSM.	15	25.2	9.23	29	9.73	7.76*	0.71
	Waitlist	14	29.41	6.74	27.32	6.42		
Responsibility	OutSM.	15	24.93	8.49	28.6	9.27	6.21*	0.66
	Waitlist	14	29.19	6.83	27.66	5.97		
Self-control	OutSM.	15	28.34	8.03	31.53	9.13	3.06×	0.46
	Waitlist	14	30.98	6.99	30.74	6.61		
ERC								
Emotion regulation	OutSM	15	24.73	3.59	25.8	2.73	5.37*	0.67
	Waitlist	14	26.29	3.1	25.07	3.65		
Negativity/lability	OutSM	15	35.39	7.45	31.79	6.17	2.31	0.51
	Waitlist	14	35.5	6.15	35.36	6.16		
Neuropsych. measures								
Arithmetic	OutSM	16	8.13	2.78	8.69	3.59	0.59	0.21
	Waitlist	14	8.07	2.65	8.07	2.24		
Coding	OutSM	16	9.06	3.89	11.56	4.08	3.22×	0.4
	Waitlist	14	9.36	3.69	10.36	3.34		
Letter-number seq.	OutSM	16	7.63	2.96	9.13	2.94	3.53×	0.59
	Waitlist	14	8.71	1.49	8.79	0.89		
Stop signal correct	OutSM	16	55.44	2.5	56.56	2.34	0.66	0.28
	Waitlist	14	54.86	1.88	53.36	1.78		
Letter memory	OutSM	14	3.71	0.83	4.36	0.84	0.41	0.26
	Waitlist	14	3.36	0.84	3.79	0.58		

ADHD = Attention Deficit Hyperactivity Disorder, SDQ = Strengths and difficulties questionnaire
SSRS = Social skills rating scale, ERC = Emotion Regulation Checklist, *SD* = Standard deviation
× $p < 0.1$, * $p < .05$, ** $p < .01$ *M* = mean, *d* = Cohen´s d

Table 3

Post-treatment outcome for OutSMARTers and Parent groups on all measures.

			Baseline		*Post-treatment*			
Measures	*Group*	*n*	*M*	*SD*	*M*	*SD*	*F*	*d*[a]
ADHD rating scale								
Inattention	OutSM.	15	68.85	8.92	61.69	11.76	1.76	0.33
	Parent	11	69.34	10.54	65.29	7.96		
Hyperactivity/impulsivity	OutSM.	15	68.01	8.95	61.66	7.36	2.61	0.47
	Parent	11	64.87	13.86	63.78	12.12		
SDQ								
Total score	OutSM.	16	74.39	10.26	67.58	10.97	0.64	-0,28
	Parent	11	75.67	11.14	65.97	10.94		
Emotional symtoms	OutSM.	16	64.58	18.22	57.14	11.58	0.89	-0.28
	Parent	11	73.55	14.18	61.32	12.08		
Conduct problems	OutSM.	16	66.46	14.95	64.43	18.79	0.06	-0.09
	Parent	11	62.28	10.52	59.05	10.34		
Hyperactivity/inattention	OutSM.	16	72.05	7.89	67.81	7.5	1.64	-0.42
	Parent	11	77.44	9.77	69.45	11.37		
Peer rel. problems	OutSM.	16	64.58	11.16	60.46	12.13	0.11	0.11
	Parent	11	55.16	12.08	52.4	14.89		
Prosocial behavior	OutSM.	16	43.73	11.94	42.31	12.34	0.78	-0.28
	Parent	11	44.31	11.9	46.12	12.55		
SSRS								
Total score	OutSM.	15	36.73	11.54	41.6	12.12	0.07	0.02
	Parent	11	39.64	8.35	44.27	4.54		
Cooperational skills	OutSM.	15	29.27	9.22	33.2	8.6	0.00	-0.01
	Parent	11	32	7.25	36	4.07		
Assertion	OutSM.	15	25.2	9.23	29	9.73	0.35	0.16
	Parent	11	27.36	5.66	29.91	2.34		
Responsibility	OutSM.	15	24.93	8.49	28.6	9.27	0.05	-0.06
	Parent	11	26.72	6.89	30.84	4.29		
Self-control	OutSM.	15	28.34	8.03	31.53	9.13	0.01	0.03
	Parent	11	30.46	5.77	33.47	3.96		
ERC								
Emotion regulation	OutSM	15	24.73	3.59	25.8	2.73	2.08	0.38
	Parent	11	26.18	3.63	25.88	3.74		
Negativity/lability	OutSM	15	35.39	7.45	31.79	6.17	0.65	0.23
	Parent	11	33.91	5.99	31.91	4.97		
Neuropsych. measures								
Arithmetic	OutSM	16	8.13	2.78	8.69	3.59	0.05	0.07
	Parent	11	8.91	2.91	9.27	2.15		
Coding	OutSM	16	9.06	3.89	11.56	4.08	4.01×	0.42
	Parent	11	8.18	3.68	9.09	3.7		
Letter-number seq.	OutSM	16	7.63	2.96	9.13	2.94	0.13	0.12
	Parent	11	8.55	2.21	9.73	1.9		
Stop signal correct	OutSM	16	55.44	2.5	56.56	2.34	1.02	-0.37
	Parent	11	54.09	3.24	56.27	1.49		
Letter memory	OutSM	14	3.71	0.83	4.36	0.84	2.76	0.74
	Parent	10	4.2	0.92	4.2	0.79		

ADHD = Attention Deficit Hyperactivity Disorder, SDQ = Strengths and difficulties questionnaire
SSRS = Social skills rating scale, ERC = Emotion Regulation Checklist, *M* = mean, *SD* = Standard deviation, *d* = Cohen´s d
× $p < 0.1$, [a] A positive d score shows an effect size for the OutSMARTers group over the Parent group.

Table 4

3 month follow-up outcome for OutSMARTers and Parent groups.

			Baseline		*3 month follow up*			
Measures	*Group*	*n*	*M*	*SD*	*M*	*SD*	*F*	*d*[a]
ADHD rating scale								
Inattention	OutSM.	10	66.93	7.96	56.1	4.79	1.1	0.55
	Parent	7	67	8.58	60.57	9.22		
Hyperactivity/impulsivity	OutSM.	10	68.4	8.88	58.55	6.14	0.6	0.33
	Parent	7	61.9	13.96	55.77	10.31		
SDQ								
Total score	OutSM.	11	73.03	10.97	68.99	12	1.36	-0,95
	Parent	8	74.58	11.74	60.09	13.91		
Emotional symtoms	OutSM.	11	67.15	20.9	63.9	19.08	0.65	-0.23
	Parent	8	73.18	13.37	65.79	14.48		
Conduct problems	OutSM.	11	61.12	11.65	61.41	13.56	1.65	-0.55
	Parent	8	64.59	11	58.68	9.48		
Hyperactivity/inattention	OutSM.	11	72.88	7.96	66.24	5.75	0.02	-0.05
	Parent	8	75.38	10.88	68.25	13.02		
Peer rel. problems	OutSM.	11	61.02	10.55	61.1	8.78	0.5	-0.28
	Parent	8	52.85	9.73	49.84	12.35		
Prosocial behavior	OutSM.	11	43.1	14.48	44.13	9.81	0.48	-0.27
	Parent	8	42.76	13.67	47.49	11.59		
SSRS								
Total score	OutSM.	11	39.27	12.18	45.9	10.31	0.01	0.02
	Parent	8	40	9.89	46.88	9.26		
Cooperational skills	OutSM.	11	30.83	9.93	37.45	8.93	0.04	0.05
	Parent	8	32.13	8.43	38.25	7.09		
Assertion	OutSM.	11	27.45	9.48	33.27	9.61	0.07	-0.08
	Parent	8	27.75	6.23	34.25	5.9		
Responsibility	OutSM.	11	26.99	8.95	33.64	10.48	0.04	-0.06
	Parent	8	27.63	8.02	34.75	7.44		
Self-control	OutSM.	11	29.83	8.77	35.18	9.99	0.01	0.03
	Parent	8	30.38	6.84	35.5	7.19		
ERC								
Emotion regulation	OutSM	11	24.82	4	25.05	2.97	0.17	0.16
	Parent	8	25.63	3.54	25.25	3.65		
Negativity/lability	OutSM	11	34.82	7.63	31.18	5.12	0.48	0.22
	Parent	8	32.63	6.12	30.5	5.76		

ADHD = Attention Deficit Hyperactivity Disorder, SDQ = Strengths and difficulties questionnaire
SSRS = Social skills rating scale, ERC = Emotion Regulation Checklist, *M* = Mean, *SD* = Standard deviation, *d* = Cohen´s d
[a] A positive d score shows an effect size for the OutSMARTers group over the Parent group. Scores are for the participants who had follow up scores.

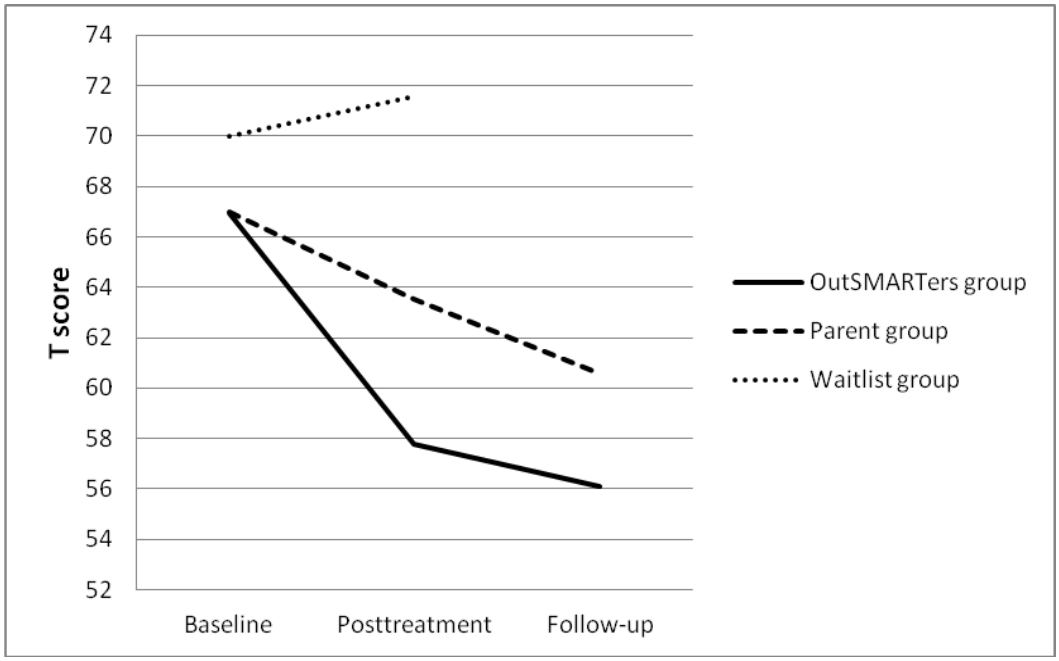

Figure 1. Inattention at baseline, post-treatment and follow-up on the ADHD rating scale. Scores for the OutSMARTers and Parent groups are for the participants who had follow-up scores.

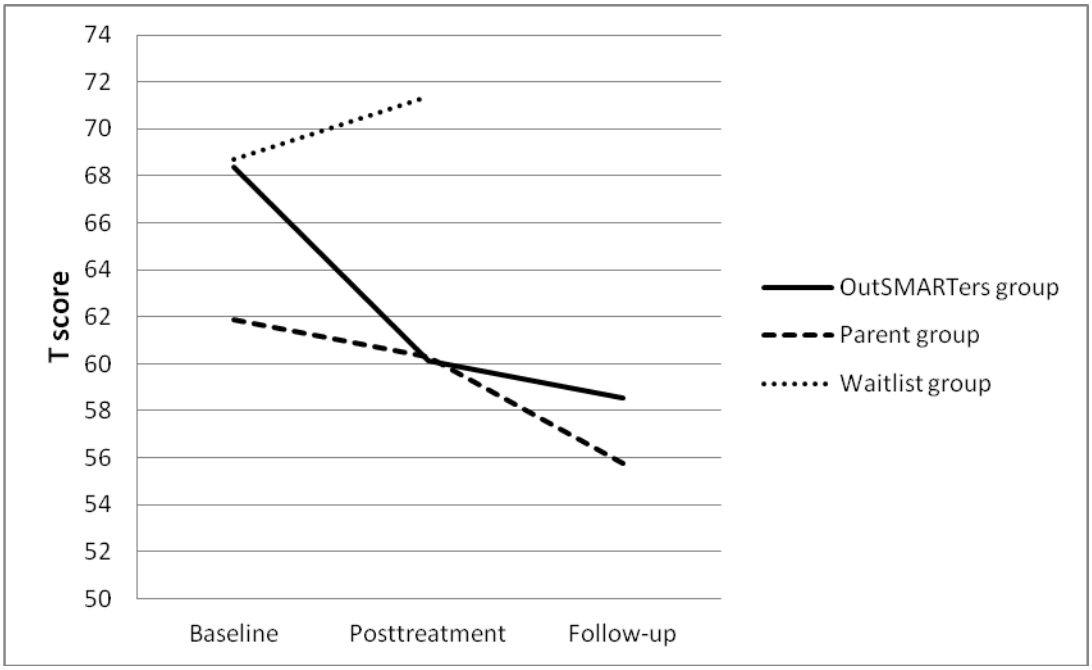

Figure 2. Hyperactivity/impulsivity symptoms at baseline, post-treatment and follow-up on the ADHD rating scale. Scores for the OutSMARTers and Parent groups are for the participants who had follow-up scores.

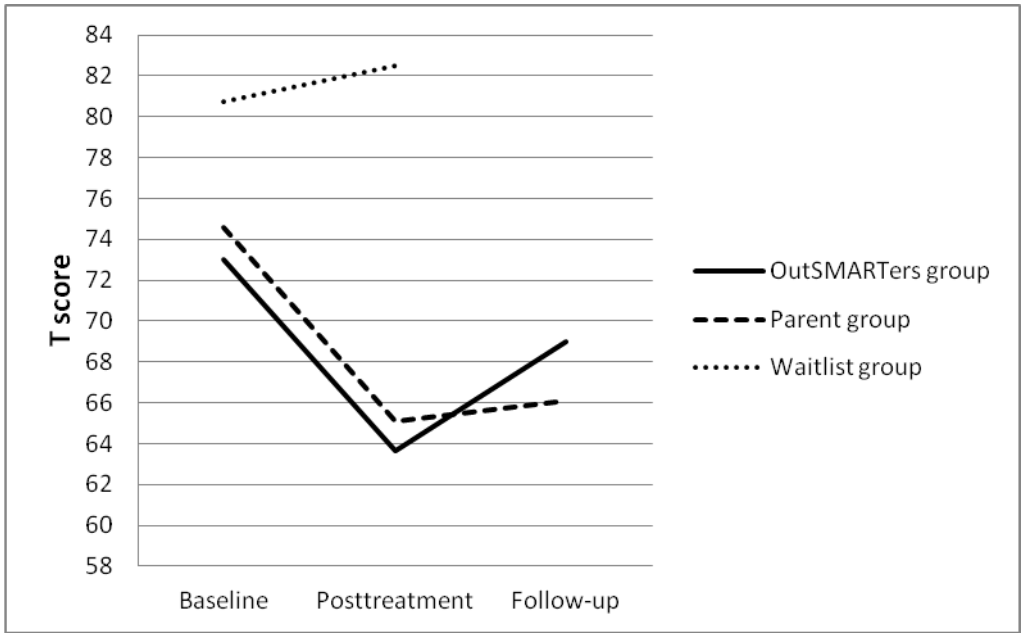

Figure 3. SDQ total score at baseline, post-treatment and follow-up. Scores for the OutSMARTers and Parent group are for the participants who had follow-up scores.

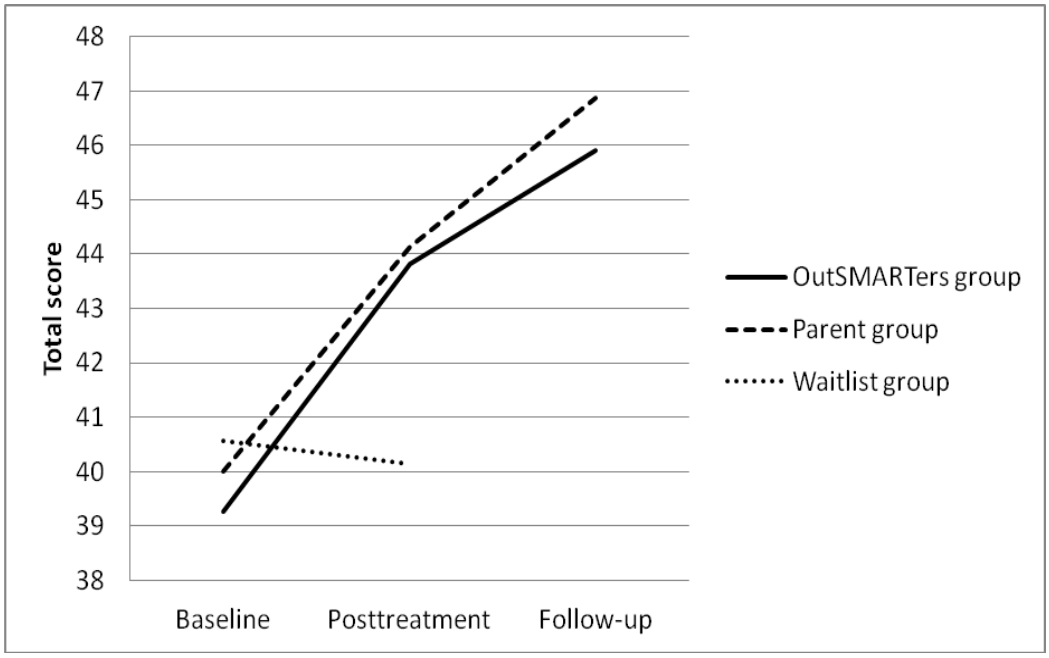

Figure 4. Social skills total score (SSRS) at baseline, post-treatment and follow-up. Scores for the OutSMARTers and Parent group are for the participants who had follow-up scores.

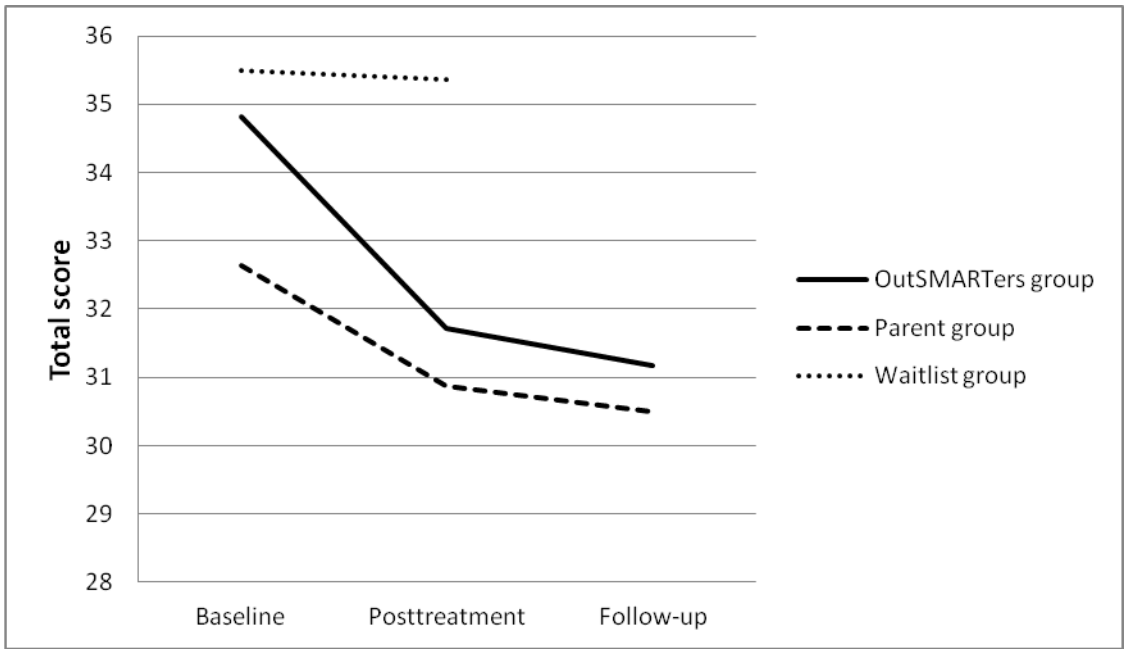

Figure 5. ERC lability/negativity score at baseline, post-treatment and follow-up. Scores for the OutSMARTers and Parent group are for the participants who had follow-up scores.