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Reduced ADHD symptoms in adults with ADHD after structured skills training group: Results from a randomized controlled trial

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ABSTRACT

Objective: Feasibility, acceptability, and efficacy of a Dialectical Behavioral Therapy (DBT) -based method developed in Germany were evaluated in a Swedish outpatient psychiatric context.
Method: Fifty-one adults with ADHD on stable medical treatment or on no medication were randomized to the DBT-based skills training ($n = 26$) or a parallel loosely structured discussion group ($n = 25$). Self-rating scales were administered before randomization and after the treatment.
Results: Feasibility and participant satisfaction were good in both groups while skills training was perceived as more logical and effective for ADHD-related problems. The analyses of the individuals who completed the treatment and remained stable with regard to medication ($n = 19$ in skills training; $n = 18$ in control group) showed a significant reduction in ADHD symptoms in the skills training group, but not in the control group. No reduction of comorbidity was observed in any of the groups.
Conclusions: The treatment was feasible in an outpatient psychiatric context, well tolerated, and significantly reduced ADHD symptoms in on-treatment individuals who remained stable regarding medication status.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neuro-developmental disorder characterized by difficulties with sustained attention, distractibility, and impulse control, as well as hyperactivity or the regulation of activity levels to situational demands (American Psychiatric Association, 1994). The clinical presentation of ADHD may change during the development of the individual (Hart, Lahey, Loeber, Applegate, & Frick, 1995), but at least half of the children with ADHD have persistent dysfunction as adults (Rasmussen & Gillberg, 2000), and the prevalence of ADHD in adults is estimated to be 1.2–7.3% (Fayyad et al., 2007). With regard to cognition, ADHD is related to a significant weakness in several executive function (EF) domains such as impulse inhibition and working memory, as well as organization and planning skills (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005), and the underlying cathecholaminergic frontal-subcortical neural networks (Nigg, 2005; Spencer, Biederman, & Mick, 2007). ADHD in adults is associated with high rates of psychiatric comorbidity and an increased risk of drug abuse and criminality (Biederman, 2004), problems in the areas of employment and relationships (Wender, Wolf, & Wasserstein, 2001), high self-perceived stress, and many stressors in everyday life (Hirvikoski, Lindholm, Nordenstrom, Nordstrom, & Lajic, 2009; Hirvikoski, Olsson, et al., 2011), as well as poor health outcome (Barkley, 2002).

ADHD in adults is usually treated with pharmacotherapy. The initial effect is good and pharmacological treatment is generally well tolerated (Kolar et al., 2008; Meszaros et al., 2009; Torgersen, Gjervan, & Rasmussen, 2008; Wilens, Spencer, & Biederman, 2002). However, 20%–50% of adults are considered non-responders due to insufficient symptom reduction or an inability to tolerate adverse effects of medication (Wender, 1998; Wilens et al., 2002). In addition, adults considered to be responders typically show a reduction in only 50% or less of the core symptoms of ADHD (Wilens et al., 2002). Moreover, studies that report follow-up data found that only a few patients still used ADHD-specific medication at 3–6-month (Gualtieri, Ondrusek, & Finley, 1985) or at 6–12-month follow-ups (Mattes, Boswell, & Oliver, 1984). Alternative treatment methods are therefore needed to address residual symptoms, to learn strategies

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and skills for coping with functional impairments, and probably for support in medication management.

The first studies on psychotherapy for adults with ADHD were retrospective chart reviews that highlighted the importance of evidence-based practices in the psychological treatment of individuals with ADHD and defined guidelines for good treatment strategies (Ratey, Greenberg, Bemporad, & Lindem, 1992; Ratey, Hallowell, & Miller, 1997; Wilens et al., 1999). The following studies on individual psychotherapy (Rostain & Ramsay, 2006; Safren et al., 2005, 2010; Stevenson, Stevenson, & Whitmont, 2003) as well as psychotherapy in groups (Bramham et al., 2009; Hesslinger et al., 2002; Philipsen et al., 2007; Solanto, Marks, Mitchell, Wasserstein, & Kofman, 2008; Solanto et al., 2010; Stevenson, Whitmont, Bornholt, Livesey, & Stevenson, 2002; Virta et al., 2008; Wiggins, Singh, Getz, & Hutchins, 1999; Zylowska et al., 2008) are all based on cognitive-behavioral principles and have shown medium to large reductions in ADHD symptoms and/or other problems related to ADHD. Since only a few studies include a control group (Safren et al., 2005, 2010; Solanto et al., 2010; Stevenson et al., 2003; Stevenson et al., 2002), there is a need for more randomized controlled trials. Other limitations of the published studies are small sample sizes and plausible atypicality of samples, as well as inability to discriminate between the effects of group support and effects of specific treatment methods (Hirvikoski, Haaparanta, Brar, Talvik, 2010; Knouse, Cooper-Vince, Sprich, & Safren, 2008; Torgersen et al., 2008).

The aim of the current study was to evaluate the feasibility, acceptability, and efficacy of a Dialectical Behavioural Therapy (DBT)-based method developed in Germany (Hesslinger, Philipsen, & Richter, 2004; Hesslinger et al., 2002; Philipsen et al., 2007) in a Swedish outpatient psychiatric context.

The participants were randomized to the skills training or the more loosely structured discussion group/control. For adults with ADHD, the support of other adults in the same situation is valuable. During a diagnostic assessment, they often express a wish to meet others with the same diagnosis and similar experiences. Thus, our hypothesis was that participation in the discussion/control group would also give positive effects. However, we also expected that participation in the skills training group would lead to larger reductions in the ADHD as well as comorbid symptoms, in those participants that would finish the treatment and stay on stable medical treatment/no medical treatment.

Methods

The clinical part of the study was conducted as part of the clinical work at Neuropsychiatric Unit Karolinska, Psychiatry Northwest, Stockholm County Council. The study was approved by the Regional Ethics Committee of Stockholm.

Participants

The participants were mainly recruited from the Neuropsychiatric Unit Karolinska, Karolinska University Hospital, Department of Psychiatry; a clinical unit specialized in the assessment of developmental disorders in adults (two patients were recruited from other psychiatric clinics in Stockholm). The diagnostic assessment at the Neuropsychiatric Unit was based on multiple sources of information: *a clinical interview* based on the DSM-IV criteria (American Psychiatric Association, 1994) was conducted in all cases. The patients also completed *standardized self-rating questionnaires* such as the Wender Utah Rating Scale, WURS (Ward, Wender, & Reimherr, 1993) for the assessment of childhood ADHD symptoms. In 82% of the cases, further information could be gathered by *interviewing the participants' significant others* in order to obtain a more complete diagnostic history of each individual. When available, *additional objective information* was obtained from records from child- and adolescent psychiatry, school health services, as well as adult psychiatry. The assessment also included *neuropsychological testing* with WAIS-R (Wechsler, 1981) or WAIS-III (Wechsler, 1997) and, in most cases, also other standardized tests, such as a continuous performance test (Conners, 2002; Leark, Dupuy, Greenberg, Corman, & Kindschi, 1996). Furthermore, urinary *drug screening* was a clinical practice in the diagnostic assessment of ADHD at Neuropsychiatric Unit Karolinska. The diagnosis of ADHD (American Psychiatric Association, 1994) was established after reaching consensus between the managing psychiatrist and clinical psychologist, both of whom had solid professional experience in the field of developmental disorders.

An explicit goal of the study was to include as many as possible, i.e. not to select the group with the least comorbidity and best level of functioning in everyday life. The inclusion criteria were ADHD as the main neurodevelopmental diagnosis; age of 18 years or older; if on any psychoactive drug treatment (for ADHD or other diagnoses), the treatment should have been stable for at least three months. Another explicit goal was to control for effects (both negative and positive) of medical treatment. The participants in both groups were asked to try to stay on stable pharmacological treatment during the whole group treatment. However, the responsibility for the participants' pharmacological treatment stayed with their local psychiatrist. According to the study plan the individuals who could not stay on stable pharmacological treatment would not be included in the statistical analysis of the data (on-treatment or per protocol analyses) but they were allowed to finish their group treatment if they wished to do so. The exclusion criteria were ongoing substance abuse (during the last 3 months); diagnosed mental retardation (IQ $\leq$ 70); diagnosed organic brain injury; autism spectrum disorder; suicidality; all clinically unstable psychosocial circumstances or psychiatric disorders that were of such a severity that participation was impossible such as being homeless, or having severe depression, psychosis, or bipolar syndrome not under stable pharmacological treatment (judged by a clinical psychologist and a psychiatrist).

Overall recruitment process for the groups and power

During the fall of 2005, 8 individuals with ADHD were invited to participate in the DBT-based skills training pilot group. The goal of this group was to provide us with feedback on the material and to educate the clinical psychologists involved in the treatment method. The results were not considered as a part of the study proper and the data from this group are not shown. Power for the RCT was based on existing literature showing medium to large effect on ADHD symptoms and using standard web-based power calculator. A total recruitment of 60 patients would result in 80% power at a .05 level, and to adjust to expected drop out (Hesslinger et al., 2002) the ethical application and study plan embraced 70 individuals. Two parallel groups (one skills training and one control) were started during the winter 2006, fall of 2006, winter of 2007, as well as the winter of 2008. Due to changes in organization and resource allocations, the recruitment for the study had to be stopped earlier than planned.

Enrollment and randomization of participants

The participants in the randomized controlled trial were first contacted by mail containing written information about the study and those who were interested in participation were invited to the Neuropsychiatric Unit Karolinska for inclusion. They were first informed of the trial in small groups after which they completed the questionnaires. Then they were interviewed (individually) in order to further assess eligibility. The participants' case files were

also studied in order to assess eligibility, which all participants agreed to by giving their informed consents. After inclusion the participants were individually randomized to one of two parallel groups (skills training or control). Groups were not stratified by any variable. However, blocked randomization was used in order to ensure that the groups would be of approximately same size (1:1 ratio). The block sizes varied between 10 and 24, and the block sizes were not known by the participants. After determination of the block size (that varied as a function of how many participants had announced interest in participation), folded opaque information cards were created (by project leader) containing information on one of the groups and the group leaders for that group. The cards were placed in a container and mixed, the container was placed so that the cards could not be seen and a clinical psychologist that assessed the participant (not always one of the group leaders in any of the groups) then drew a card for the participant. The participants were thus able to follow the randomization, and their responses on the results of the randomization could be responded to immediately.

Treatment method

DBT-based skills training group. In this group the original manual/workbook (Hesslinger et al., 2004) was followed with only a few modifications that were made in order to adapt the material to a Swedish context, mainly based on the feedback from the pilot group. Moreover, some written descriptions of mindfulness meditation exercises were added to the material given to the participants and one session with the theme "Homework" was added (in the manual/workbook, this theme is discussed with the participants prior to the therapy). In the current study, the treatment program thus consisted of 14 sessions described in Table 2 (for a further description, see Hesslinger et al., 2002, and Philipsen et al., 2007).

The group sizes ranged between 4 and 8 individuals at the beginning of the group therapy. The groups were chaired by two clinical psychologists trained in CBT (a few being trained in DBT as well), who were supervised by a clinical psychologist/licensed psychotherapist trained in both CBT and DBT. The 2-h sessions always followed the same structure: after a short repetition and opportunity to give feedback on the previous session, homework was reviewed during the first hour. After a break, a new topic and homework for the following week were introduced. The participants got written material from each session which they placed in folders ("workbooks"; the workbook had not been published in Swedish Hesslinger, Philipsen, & Richter, 2010) and brought to the sessions. A contract regarding the rules of participation was signed during the first session (Hesslinger et al., 2004), according to which participants were excluded from the group if they failed to attend more than two sessions in a row without a legitimate excuse.

The control group consisted of a loosely structured discussion group, supported by two clinical psychologists. The controls had 14 sessions like the skills training group. The sessions were 2 h long with a pause in the middle. The participants chose an ADHD-related theme which was discussed during the session. The participants were asked to follow certain rules during the session (not to interrupt others; everyone was encouraged to participate actively; try to adhere to the theme of the session) and they also signed a contract comparable to the one in the skills training group (influence of alcohol or drugs was forbidden during the session; the participants were expected to come to as many sessions as possible although they were not excluded if they failed to attend). The clinical psychologists reminded the participants of the rules during the sessions, if necessary. Otherwise, the psychologists' role was passive. However, some psychoeducation was included (as an answer to a question addressed to the group leaders) and if the discussion became very problem-oriented, the psychologists directed the content by asking the participants about possible solutions and strategies. During these discussions the psychologists always referred to the experiences of the participants and avoided the use of the treatment components included in the skills training group. However, the group leaders were encouraging and supportive and gave positive feedback for constructive and creative problem solving.

In order to avoid group leader effects and to facilitate the work of the group leaders in the control group (it would be easier not to use the treatment components from the skills training group with a thorough knowledge on them), we shifted group leaders after each semester i.e. those clinical psychologists that started as group leaders for skills training group shifted to control group and vice versa.

Measures

Major study assessments were at baseline (before randomization) (T1), post treatment (T2), 3 months after completed treatment (T3) and one year after finished treatment (T4). The last follow-ups of the two parallel groups occurred during 2009 after which participants in the control group were invited to participate in a skills training group (long-term follow-up of these participants have not been finished). The current paper includes data from baseline to post treatment.

The demographic and background information, as well as information on psychiatric comorbidity, was obtained from the participants' case files. Moreover, they completed a questionnaire surveying demographic information and current stressors within different areas or life activities (Hirvikoski et al., 2009).

Outcome measures

Feasibility was evaluated using three criteria for good feasibility: (1) a clear majority (at least 75%) of all individuals assessed at the Neuropsychiatric Unit Karolinska with ADHD as the main neurodevelopmental diagnosis should be considered to be potential candidates for the treatment, as judged by one of the clinical psychologists involved in the project after consulting a clinical psychiatrist at the Neuropsychiatric Unit Karolinska; (2) a dropout rate of $<25\%$ (i.e., a clear majority finishing the treatment); (3) the participants should attend a clear majority (at least 75%) of the sessions.

Treatment acceptability was evaluated using the patient evaluation formthe manual/workbook (Hesslinger et al., 2004; Hesslinger et al., 2002; Philipsen et al., 2007), completed anonymously during the last session. This form focused on the specificity of the program, therapeutic effects, and other aspects of treatment satisfaction, scored on a Likert scale from 0 ("I disagree") to 4 ("I strongly agree"). According to the manual, the treatment should engender expectation for positive change and to measure credibility, "face validity", and expectation of improvement, the Treatment Credibility Scale (TCS) (Borkovec & Nau, 1972) was completed during sessions 1, 5, 10, and 14. The starting values were analyzed from data from session 1 (or the closest subsequent value when data were missing) and end values from session 14 (or the closest previous value when data were missing). The items were answered on a visual analog scale from 0 (low credibility) to 10 (high credibility). The total TCS score was calculated as a mean of all five items.

Efficacy. The primary outcome measure of the study was a self-rating of current ADHD symptoms, measured by the Current ADHD Symptom Scale – Self Report Form (Barkley & Murphy, 1998), a scale containing the 18 symptom items for ADHD from the DSM-

IV cast in the form of a self-report scale. Moreover, the participants completed self-rating questionnaires for assessing symptoms of psychiatric comorbidity: the Beck Depression Inventory (BDI) (Beck, Steer, & Garbin, 1988; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988), both of which contain 21 items (BAI is scored 0–2; BDI 0–3); and the Karolinska Sleep Questionnaire (Kecklund & Åkerstedt, 1992) for assessing sleep problems; as well as the Swedish version of the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983; Eskin & Parr, 1996), which is based on the original 14-item scale (scored 0–4) and measures the degree to which situations in one's life are appraised as stressful. The subjective appraisal of functional impairment or disability as related to familial, social, and vocational aspects of life was assessed using the Sheehan Disability Scale (Sheehan, 1983), a scale scored on a visual analogue scale from 0 (not at all) to 10 (very much). A visual analog scale ranging from 0 (worst) to 10 (best) was used to measure overall personal health/general well-being (Hesslinger et al., 2002; Luria, 1975).

Adverse events and serious adverse events

Adverse events (AE) were defined in the Case Report Forms as "any inconvenience that participant reported" and serious adverse events (SAE) as "anything that has required inpatient hospitalization".

Statistical analyses

The demographic data and background variables were analyzed using Student's *t*-test for continuous variables and the chi-square test for category variables. To avoid confounding effects of psychoactive drugs, only those individuals who remained on stable pharmacological treatment and completed the treatment ("on-treatment" or "per protocol" analysis) were included in the main statistical analysis of outcome measures of treatment acceptability and treatment efficacy. Student's *t*-test was used to compare the two groups (Skills training/Control group) regarding the measures of treatment acceptability. The measures of efficacy were analyzed by a repeated measures mixed design ANOVA (rmANOVA), with group (Skills Training/Control) as a between-subjects factor, and the pre-randomization score as well as the post-treatment score of the outcome measures as a within-subjects repeated measure factor. The primary outcome measure of the study (current ADHD symptoms) was further (a posteriori) analyzed by categorizing the participants into responders versus non-responders. We used different cut-off limits for categorization: 30% reduction (Safren et al., 2010) as well as 21% reduction in ADHD symptoms (Rostain & Ramsay, 2006). We further explored the cut-off limit for responders/non-responders to detect the level at which first controls could be categorized as responders. The between-group effect size for the measures with significant differences was calculated (d = Meanchange score skills training group − Meanchange score control group/SDpooled). Although the study plan described on −treatment analysis, i.e. analysis of those that completed the treatment staying stable on medication (if they had any), we also wanted to a posteriori explore whether the results would change if those cases who did not fulfill these criteria were included in the analyses (Intention To Treat, ITT, analyses with LOCF, last observation carried forward).

It can be argued that measures based on visual analogue scales (TCS and the measurement of general well-being from the manual/workbook) should be treated as ordinal data and analyzed using nonparametric analysis. Therefore, the results from the parametric analyses were controlled for, using Mann-Whitney and Friedman's tests and analogous results were obtained; only parametric statistics are presented for the sake of brevity. The alpha level was set at $p \leq 0.05$, and the p values ≤ 0.10 were regarded as statistical trends.

Results

Demographic and background information

Most participants had one or more comorbid diagnoses according to DSM-IV, the most common diagnoses being mood disorders (13 in skills training group, 16 in control group), anxiety disorders (7 in both groups) and learning disabilities such as dyslexia (3 in both groups). Some individuals had several comorbid diagnoses. There were no differences in comorbidity between the skills training group and the control group (Table 1). The skills training group was comparable to the control group also with regard to other background variables and characteristics (Table 1).

Medication status

According to the study plan, the main statistical analyses were performed per protocol i.e. including individuals who completed the treatment and stayed on stable pharmacological treatment or without any psychoactive medication. Among those individuals who finished the group (21 in skills training; 20 in control group), a majority of participants fulfilled the criteria of stable medication status and were included in the main statistical analysis ($n = 19$ in skills training, 12 women and 7 men; $n = 18$ in control group, 10 women and 8 men). However, two individuals in the skills training group started pharmacological treatment during ongoing skills training (one two different sedatives, antidepressants as well as sleeping pills; one antidepressant). Likewise, two individuals in the control group were defined as unstable with regard to psychoactive medication (one started methylphenidate medication but also discontinued the treatment due to side effects while still in control group; one started mood stabilizing medication). The group of four individuals that started pharmacological treatment during ongoing group was analyzed in more detail, and this group was characterized by psychiatric instability and two individuals also reported adverse events (described in detail in next section). A large increase in symptoms/perceived disability was observed in basically all rating scales for these four individuals, although (due to the small group size) statistical significant increase was observed only in Perceived Stress Scales (described in ITT section). All of these four individuals had contact with a clinical psychiatrist at their local clinic at the time point of T2/post treatment.

Adverse events and serious adverse events

Two individuals (2/21 who completed the treatment) in the skills training group reported adverse events (AE) to the group leaders at T2/post treatment assessment. Both of them reported anxiety related to separation from the group. They had both started pharmacological treatment during ongoing group treatment. In the control group, two individuals (2/20 who completed the group) reported AE to the project leader (TH). These individuals also experienced temporary anxiety due to separation from the group and they especially missed other participants in the group, rather than group leaders or the sessions as such. No serious adverse events were reported.

Feasibility

During the years 2001–2007, 144 individuals were diagnosed at the Neuropsychiatric Unit Karolinska with ADHD as the main neurodevelopmental diagnosis (i.e. no comorbidity with mental retardation or autism spectrum disorder) (Flow chart, Fig. 1). After establishing the pilot group ($n = 8$), 136 patients remained as

Table 1
The two groups were comparable regarding the background variables and psychiatric symptoms.

	Skills Training group $n = 26$	Control group $n = 25$	t or χ^2	p
Age	M = 40.65 SD = 9.35 Range: 21–58 years	M = 37.20 SD = 9.30 Range: 23–66 years	$t(50) = -1.32$	.19
Gender	7 males	12 males	$\chi^2 = 2.42$	.12
ADHD subtype[a]	ADHD-C: 18 ADHD-A: 6 ADHD-HI: 1	ADHD-C: 20 ADHD-A: 6 ADHD-HI: 0	$\chi^2 = 1.09$	.58
Pharmacological treatment of ADHD	15 (58%) (methylphenidate in 14 cases; dextro-amphetamine in one case)	14 (56%) (methylphenidate in all cases)	$\chi^2 = .015$	.90
Any psychoactive drugs	17 (65%)	18 (72%)	$\chi^2 = .26$	.61
At least one comorbid DSM-IV diagnosis	19 (73%)	18 (72%)	$\chi^2 = .007$	.93
Documented lifetime substance abuse[b]	11 (42%)	12 (48%)	$\chi^2 = .167$	.68
Employment	Full-time work or studying: 11 Part-time work: 3 Unemployed or vocational training: 3 Long-term sick leave or disability pension: 9	Full-time work or studying: 10 Part-time work: 3 Unemployed or vocational training: 2 Long-term sick leave or disability pension: 9 Retired: 1	$\chi^2 = 1.23$	.87
Education	Academic: 6 Upper secondary: 15 Nine-year compulsory school or less: 5	Academic: 4 Upper secondary: 12 Nine-year compulsory school or less: 9	$\chi^2 = 1.86$	.40
WURS-25 score[c]	61.48 (16.96)	55.90 (20.05)	$t(42) = -.998$	.32
Full Scale IQ[d]	M = 99.92 SD = 12.58 Range: 76–121	M = 99.87 SD = 12.85 Range: 79–122	$t(46) = -.01$	.99
Beck Depression Inventory[e]	M = 16.60 SD = 10.19	M = 14.36 SD = 11.41	$t(48) = -.73$	.47
Beck Anxiety Inventory[e]	M = 15.08 SD = 11.06	M = 13.83 SD = 10.14	$t(48) = -.41$	.68
Perceived Stress Scale[e]	M = 25.23 SD = 9.39	M = 26.00 SD = 7.74	$t(48) = .32$	.75
Karolinska Sleep Questionnaire[e]	M = 31.88 SD = 15.24	M = 28.88 SD = 14.23	$t(48) = -.72$	.46
Sheehan Disability Scale[e]	M = 6.23 SD = 1.99	M = 6.00 SD = 2.40	$t(48) = -.36$	.72

[a] ADHD-C = ADHD combined type, ADHD-A = predominantly inattentive type, ADHD-HI = predominantly hyperactive/impulsive type.
[b] Defined as overconsumption of alcohol, abuse or dependency of alcohol or illegal drugs.
[c] Data missing for seven individuals.
[d] Data missing for three individuals.
[e] Data missing for one individual.

potential candidates for the randomized clinical trial. Of these individuals 36 (i.e. 25% of the 144 individuals with ADHD diagnosis) were considered to have psychiatric and/or psychosocial problems to an extent that made participation in the skills training group impossible, i.e. the skills training was considered to be a suitable treatment for 75% of adults with ADHD presenting at the clinic. Approximately 80% of the participants in both groups completed the group program (21/26 in the skills training group; 20/25 in the control group) (Fig. 1). There were no differences between the two groups with regard to the rate of attendance at the sessions: in both groups, the participants were present at 82% of the sessions.

Treatment acceptability

The main statistical analysis of treatment acceptability were performed on those individuals who completed the group and stayed on stable pharmacological treatment/no pharmacological treatment.

The patient evaluation forms (Hesslinger et al., 2004; Hesslinger et al., 2002; Philipsen et al., 2007) showed that both groups rated the treatment as very adequate for their ADHD-related deficits ($t(34) = -.70$, $p = 0.49$; data missing for one control) (Fig. 2). Likewise, both groups felt better educated after the treatment ($t(34) = -.65$, $p = 0.52$), and almost all patients in both groups would have attended similar group again ($t(34) = .03$, $p = 0.97$). The participants in skills training reported more often that they were more able to cope with their deficits after the treatment ($t(34) = -2.00$, $p = 0.05$, $d = .67$ which lies between .00 and 1.34 with 95% confidence), while the controls quite expectedly reported that they had had several opportunities to make own suggestions about the content of the group discussions ($t(34) = 2.18$, $p = 0.04$, $d = .74$ which lies between .06 and 1.41 with 95% confidence). The participants also rated the overall treatment from "with honors" (scored 1) to "failed" (scored 4). There was no difference between the two groups' mean scores (Skills training group, M = 1.58 (±.69); control group, M = 1.76 (±.75); $t(34) = .74$, $p = 0.46$). The participants in the skills training group reported that the setting as a group was the most helpful factor in the treatment, followed by the group leaders, exercises, and psychoeducation, in that order. The participants in the control group rated the group setting together with the discussion as the most helpful factors, followed by the themes for the discussions and group leaders.

At the beginning of the treatment, the skills training group scored higher on Treatment Credibility Scale item 1 (how logical the group seemed to them: $t(35) = -3.11$, $p = 0.004$, $d = 1.02$ which lies between .34 and 1.71 with 95% confidence), item 2 (how confident they felt that the group would reduce their ADHD-related problems: $t(35) = -2.31$, $p = 0.027$, $d = .76$ which lies between .09 and 1.43 with 95% confidence), and item 4 (how successful the participants thought that the treatment would be for other kinds of problems: $t(35) = -2.06$, $p = 0.049$, $d = .67$ which lies between .00 and 1.33 with 95% confidence), while there were no between-group differences on item 3 (how confident they would be in recommending this kind of group to a friend with ADHD) and item 5

Table 2
The themes and contents of the sessions in the order employed in the current study.

	The theme and the contents
1	*Clarification*: After a general introduction, the participants were educated about the symptoms of ADHD. The overall goal of the group therapy was defined according to the manual/workbook: to control ADHD rather than to be controlled by ADHD. The participants got a list of literature and internet sites for self-studies.
2	*Neurobiology and Mindfulness I*: The neurobiology of ADHD and the consequent cognitive dysfunctions were discussed. Subsequently, the participants were familiarized with mindfulness training (Linehan, 1993a). The first of the three "what skills" (observing, describing, participating) were introduced together with the first of the three "how skills" (taking a nonjudgmental stance, focusing on one thing at a time, being effective) (Linehan, 1993b). A written rationale for mindfulness training was given. Following this session, mindfulness training was a central part of the sessions as well as homework.
3	*Homework and Mindfulness II*: To generalize the learned skills into everyday life, the importance of homework was emphasized. Possible obstacles to completing homework were discussed, together with strategies that facilitate carrying out the assignments. A written rationale for the homework was also given to the participants. Mindfulness training was continued during the second part of the session.
4	*Mindfulness III*: Mindfulness training was continued, and the dialectic balance between acceptance and change was elaborated on.
5–6	*Dysfunctional Behavior/Behavior Analysis*: In addition to mindfulness ("an acceptance tool"), behavioral analysis ("a change tool") was presented and practiced during all following sessions. Dysfunctional behavior was defined as the kind of behavior the participant wanted to change. The participants learned to describe problems as behaviors, in a nonjudgemental way, i.e. to perform an analysis of "S-R-C": Stimulus (preceding events, "triggers" for a behavior); Response (exact description of the individual's overt and covert behaviors); and Consequences of behavior in the short-term as well as long-term. Alternative strategies as well as how to correct problems that have already come up were also discussed.
7	*Emotion Regulation*: A brief theory of emotions was presented (primary emotions, signal and communicatory aspects of emotions, relationship between cognition and emotion, especially in adults with ADHD). The exercises in both mindfulness and behavioral analysis were linked to emotional regulation.
8	*Depression/Medication in ADHD*: A psychiatrist from the Neuropsychiatric Unit informed the participants about the pharmacological treatment of ADHD. Symptoms of depression and pharmacological treatment of depression were also described. The participants had the opportunity to discuss their expectations or experiences of medical treatment. The homework (both mindfulness exercises and behavioral analysis) was related to emotional regulation.
9	*Impulse Control*: Different aspects of impulsivity were discussed. The participants learned how to use mindfulness and behavioral analysis as strategies for improved impulse control. Positive aspects of impulsivity (spontaneity, creativity) were discussed.
10	*Stress Management*: A theoretical model for stress and stress reactions was presented (Hesslinger et al., 2004; Karasek & Theorell, 1990). The relationship between stress and performance was explained, and strategies for stress management were trained.
11	*Chaos and Control*: Difficulties with organization and planning are closely related to stress in adults with ADHD. During this session disorganized behavior was discussed and organizational strategies presented and trained as homework.
12	*Dependency*: Information on symptoms of substance abuse as well as local dependency clinics was presented. Other risk behaviors and overconsumption of games, Internet, sport, sensation-seeking activities, sex, etc. were discussed.
13	*ADHD in Relationships/Self-Respect*: The impact of ADHD on self-respect was elaborated. The participants and their significant others were offered an individual session with one of the group leaders. The significant others received information on ADHD and the content and objectives of the current group therapy.
14	*Retrospect and Outlook*: The attained individual goals were discussed, as well as strategies for achieving the remaining ones. Possibilities of attending an existing self-help group or of transforming the current therapy group into a self-help group were discussed.

(how much improved they expected to become with this treatment) (both p values >.10) (Fig. 3). After completion of treatment, the skills training group scored higher on item 1 ($t(35) = -2.38$, $p = 0.02$, $d = .78$ which lies between .11 and 1.45 with 95% confidence), item 2 ($t(35) = -2.92$, $p = 0.006$, $d = .95$ which lies between .27 and 1.63 with 95% confidence), and item 3 ($t(35) = -2.05$, $p = 0.048$, $d = .67$ which lies between .00 and 1.33 with 95% confidence). The between-group differences did not reach statistical significance in item 4 ($p = 0.11$) or item 5 ($p = 0.11$). The total TCS score (mean of all five items) did not correlate with the treatment effect either at the beginning of the treatment or at the end of the treatment (Pearson's correlation with mean score on the Current ADHD Symptom Scale, both p values > 0.10).

Efficacy

Just as for treatment acceptability, the individuals who finished the treatment and did not change their pharmacological treatment status were included in the main analyses of treatment efficacy.

The repeated measures ANOVA of the Current ADHD Symptom Scale – Self Report Form showed a nonsignificant trend to a general decrease in the ADHD symptoms over time ($p = 0.08$). However, this effect appeared to be due to the symptom reduction in the skills training group only, as shown by the significant group-by-time interaction effect ($F_{(1,35)} = 4.35$, $p = 0.04$, $\eta_p^2 = .11$, $d = .57$ which lies between −.08 and 1.23 with 95% confidence), i.e. a reduction in ADHD symptoms in the skills training group but not in the controls (Fig. 4).

Analysis of responders versus non-responders showed that regardless cut-off criteria the participants in the skills training group were significantly more often categorized as responders (Table 3). Finally, when the cut-off criterion was lowered to 15% reduction of ADHD symptoms, the first two controls were categorized as responders.

With regard to psychiatric comorbidity (Beck Depression Inventory, Beck Anxiety Inventory), sleep problems (Karolinska Sleep Questionnaire), self-perceived stress (Perceived Stress Scale), and self-perceived disability in everyday life (Sheehan Disability Scale), the groups did not differ from each other in the beginning of the treatment (Table 1). This was also observed in rmANOVA analyses as nonsignificant between-subjects effects (all p values > .10). Moreover, participation in the project did not affect these measurements either generally (main effect for the repeated factors, i.e. the scores, all p values >.10) or in a specific group (group × repeated factor interaction effects, all p values >.10).

The participants in both groups reported that their general well-being was increased after participation in the group program ($F_{(1,34;\text{ data missing for one person})} = 38.37$, $p < 0.001$, $\eta_p^2 = .53$) (Fig. 5). There were no general differences between the two groups ($p = 0.91$), or group by repeated factor interaction effect ($p = 0.96$).

Intention to treat –analysis (ITT)

Treatment acceptability

Including the individuals who were unstable on medication resulted in larger variability and unequal variance which we corrected for. The patient evaluation forms ($n = 21$ skills training, data missing for excluded individuals; $n = 21$ controls, data missing for four drop outs) (Hesslinger et al., 2004; Hesslinger et al., 2002;

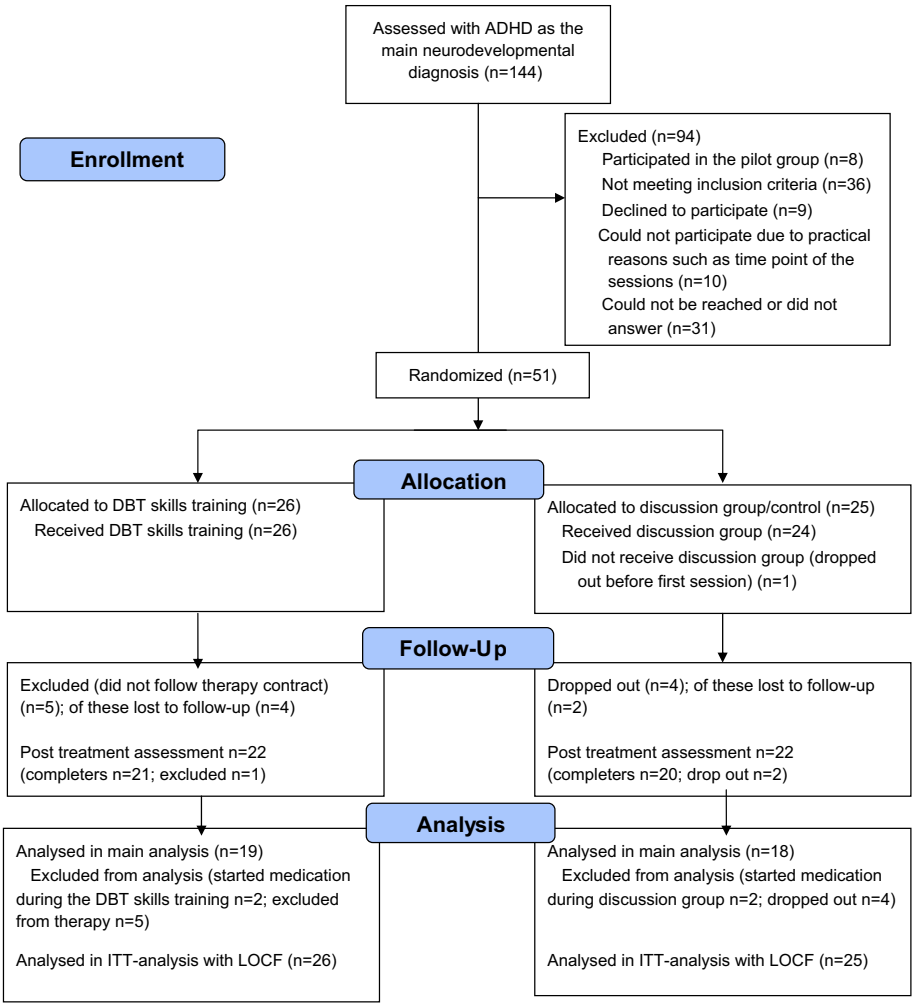

Fig. 1. A flowchart of the recruiting process and the participants in the study.

Philipsen et al., 2007) showed statistical trends ($.05 \leq p \leq 0.10$) in the previously described items " more able to cope" (higher in skills training) and "opportunities to make own suggestions about the content of the group discussions" (higher in control group). In the ITT-analysis, the participants randomized into skills training rated higher on all items of Treatment Credibility Scale, both before and after treatment (all $ps < .05$) (Skills training $n = 25$, data missing for one individual; control $n = 21$, data missing for four individuals).

Efficacy

In the repeated measures ANOVA of the Current ADHD Symptom Scale – Self Report Form, including the individuals who dropped out/were excluded and who were not able to stay stable regarding medication status, the interaction effect no longer reached statistical significance ($p = 0.167$). Thus, as hypothesized, the treatment seemed to be effective only for the group that finished the treatment and stayed on stable medication/no medication. In general well-being, the effect was significant also in the ITT –analyses ($p < 0.05$).

In the ITT-analyses of comorbidity, no changes on the results were observed except in Perceived Stress Scale, in which a general increase in self-perceived stress was observed ($p = 0.02$), regardless of group (interaction effect $p = 0.376$). Thus, this effect was significant when individuals who started medication during ongoing group ($n = 4$) were included. They reported more than 100% increase in subjective stress from pretreatment to posttreatment. They also reported increase in other scales than PSS but these did not reach statistical significance.

Discussion

In this randomized controlled study, comparing a dialectical behavior therapy-based skills training group (Hesslinger et al., 2004; Hesslinger et al., 2002; Philipsen et al., 2007) with a loosely structured discussion group (control), we observed a significant reduction of ADHD symptoms in the skills training group but not in the controls. As hypothesized, this result was significant for the individuals who finished the treatment and remained stable regarding pharmacological status. Participants were recruited from a psychiatric outpatient clinic and the treatment was conducted as part of the clinical work at the same clinic. Both groups were satisfied with the treatment, but the skills training group scored higher on-treatment credibility. Treatment credibility scores were not correlated with treatment efficacy, i.e. not associated with reduced ADHD symptoms. The feasibility was good in both groups. No reduction of comorbidity was observed in either one of the groups.

An explicit goal of the project was to include as many patients as possible; the treatment should be suitable for a clear majority of the adults with ADHD presenting at psychiatric outpatient clinics.

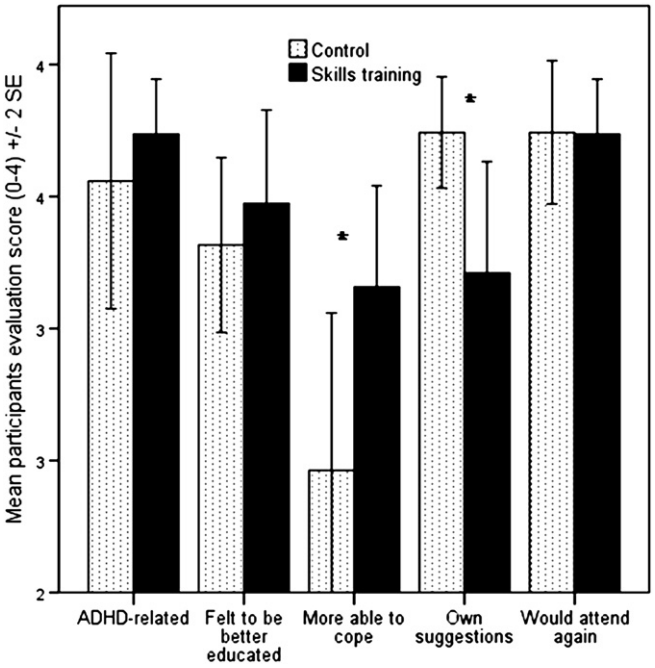

Fig. 2. Participants in both groups were satisfied with the treatment. Participants in the skills training group reported significantly more often that their ability to cope with ADHD- related problems had increased, while the controls scored higher on the item regarding the possibility of making their own suggestions concerning the discussions during the sessions. Note: $^{*}p \leq 0.05$.

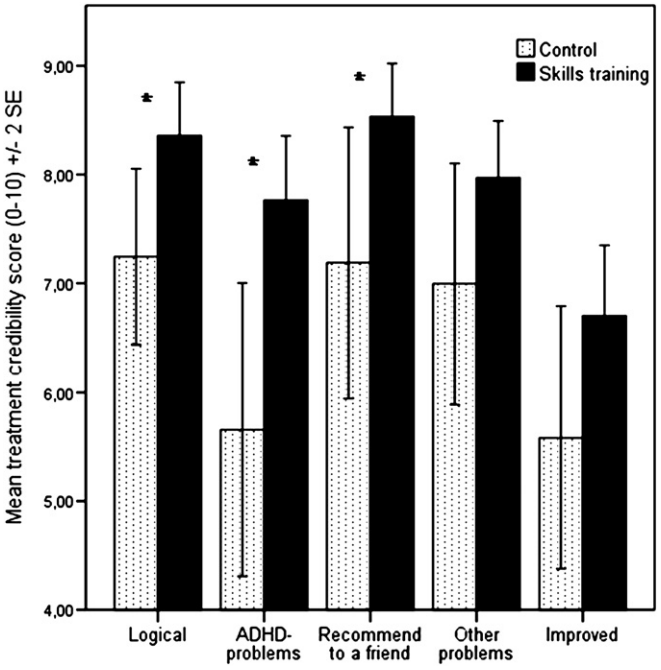

Fig. 3. On the Treatment Credibility Scale, the skills training group scored higher on three items out of five after treatment. Note: $^{*}p \leq 0.05$; The item wordings after adjustment to the current study were (1) How logical does this type of group seem to you?; (2) How confident are you that this kind of group will be successful in reducing your ADHD-related problems?; (3) How confident would you be in recommending this type of group to a friend with ADHD?; (4) How successful do you feel this type of group would be in treatments of other kinds of problems?; (5) How much improved do you expect that you will be from participation in this kind of group?.

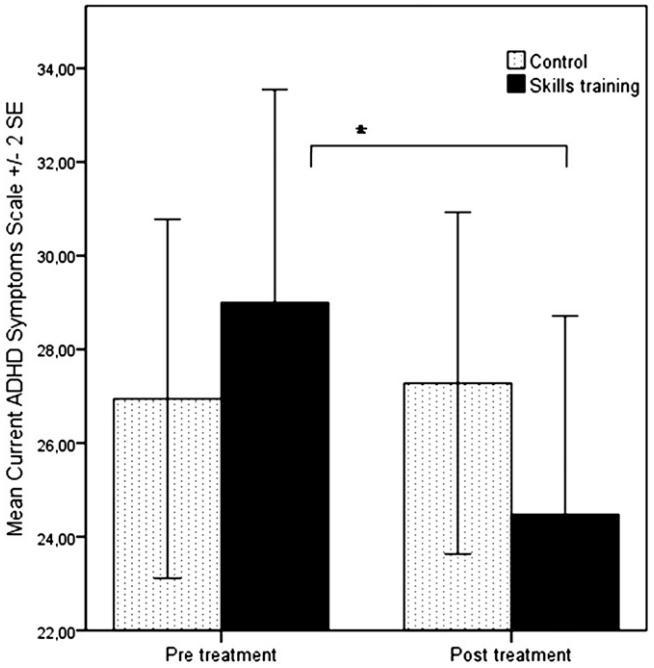

Fig. 4. The participants in the skills training group reported significantly larger reductions in ADHD symptoms after treatment. Note: $^{*}p \leq 0.05$.

Moreover, the group treatment should be appealing and motivating to enable a clear majority of those who start the treatment to participate in most of the sessions and complete the program. These goals were attained. However, it should also be observed that the treatment feasibility was as good in the controls as in the skills training group, i.e. the specific rules for attendance/exclusion and other DBT-based interventions did not further improve the feasibility in this sense. The group setting as such appeared to have a motivating effect on the adults with ADHD.

Treatment acceptability was good in both groups, and the results from the patient evaluation forms (Hesslinger et al., 2004) were comparable to the previously published results from the open trial in Germany (Philipsen et al., 2007). The only differences between the two groups were that the control group reported, as expected, better opportunities to influence the contents of the sessions, and the skills training group reported better ability to cope with their ADHD-related problems after finishing the treatment. As for treatment credibility, however, the skills training group scored higher on three out of five items at both the beginning and end of the treatment. The skills training group was experienced to be more logical and suitable for ADHD-related problems. Consequently, the participants in the skills training group would recommend the group more often to a friend with ADHD than the controls. Thus, the skills training group was successful in engendering expectations for positive

Table 3
Results on the ADHD Current Symptom Scale categorized to responders according to different cut-off criteria.

	DBT –based skills training group	Control (discussion group)	χ^2	p	Cramer's v
30% reduction of ADHD symptoms	6/19 (32%)	0/18 (0%)	6.784	.009	.43
21% reduction of ADHD symptoms	8/19 (42%)	0/18 (0%)	9.67	.002	.51
15% reduction of ADHD symptoms	11/19 (58%)	2/18 (11%)	8.877	.003	.49

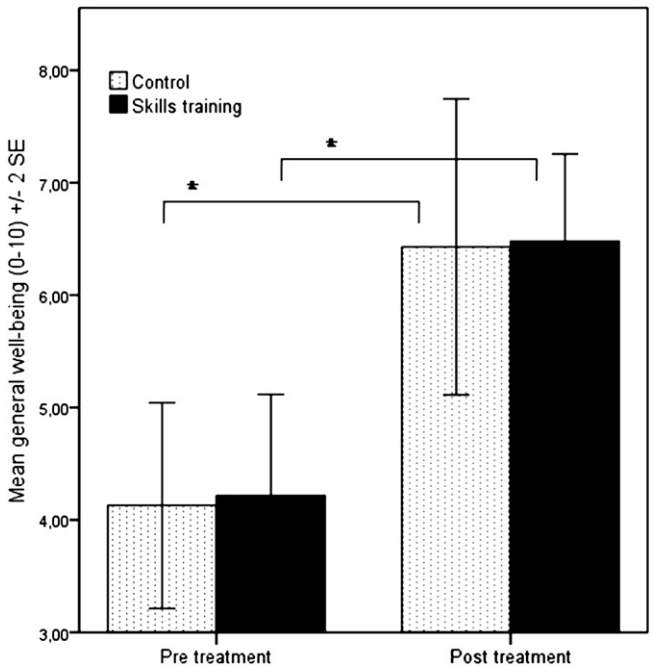

Fig. 5. The participants in both groups reported that their general well-being increased after they participated in the group. Note: $^{*}p \leq 0.05$.

change (Hesslinger et al., 2004). Contrary to the original theory of Borkovec and Nau (1972), treatment credibility was not correlated with treatment efficacy, i.e. the reduction in the ADHD symptoms.

The main outcome measure for the current study was ADHD symptoms as measured on a self-rating scale (Barkley & Murphy, 1998). We observed a significant symptom reduction in the skills training group in the per protocol analysis of subjects who were stable regarding medication status, but no effect in the control group. The effect size of .57 indicated half a standard deviation decrease in the ADHD symptoms in the skills training group. The analyses of responders versus non-responders showed clear differences between the skills training group and the controls. In previous studies of individual psychotherapy for adults with ADHD higher responder rate have been reported for both 30% cut-off (Safren et al., 2010) and 21% cut-off (Rostain & Ramsay, 2006). However, the studies are not fully comparable due to differences in sample selection. In the current study, we applied broad inclusion criteria and recruited all participants from a psychiatric clinic. This may result in different study population as compared to studies that recruited participants using for example radio advertisements and excluded individuals with anxiety disorders and learning disabilities (Safren et al., 2010) or having inclusionary criteria for a participant "to have completed high school or GED, be enrolled in either college or graduate school, or be otherwise employed" (Rostain & Ramsay, 2006). This can be compared with the study population in the current study; 45% of the participants were not employed (unemployed/in vocational training or on long-term sick leave/disability pension); over 70% of the participants in the current study had at least one (many of them several) comorbid psychiatric diagnosis; 45% had documented (lifetime) substance abuse; and participants with full scale IQ between 70 and 85 as well as participants with learning disabilities were included.

In the measures of comorbid psychiatric symptoms, however, no symptom reduction was observed in either one of the groups. The reasons for this may be related to low statistical power and relatively low baseline scores – and of course the treatment focus on ADHD. Moreover, additional effects may be observed in the long-term follow-ups that are currently being conducted (3-month and 1-year follow-up). Also, there might be effects that we did not measure in any structured manner, for example, on medication management. The evidence from pharmacological treatment studies indicate that the majority of adults with ADHD choose to discontinue medication after some months, also in cases of good initial treatment effects; for a review, see (Kolar et al., 2008; Torgersen et al., 2008). The reason for this has not been fully explored, but practical difficulties with medication management due to the executive dysfunctions may be a contributing factor. Most participants in the current study remained on stable medication during the entire treatment (with pre- and posttreatment measurements at approximately four months), and we think that the support of the group and the group leaders may facilitate medication management for adults with ADHD.

We had however two individuals in both groups that were not able to stay on stable medication/without medication. These individuals reported very high self-perceived stress as well as separation anxiety post treatment. We cannot exclude that the group treatment (regardless of group) causes stress in individuals who are already burdened and therefore we recommended careful follow-up of individuals with psychiatric instability.

Limitations

The major limitation was the small sample sizes and low statistical power, which also limited possible analyses: for example, we could not analyze whether the background variables (such as IQ, gender, age, medication status) had an effect on the treatment outcome. We are currently conducting the next phase of the project in an open trial design, including larger groups with the aim of analyzing the impact of these kinds of background variables. Moreover, performing additional statistical analysis on small groups (ITT-analyses and responder/non-responder analyses) not planned for a priori may increase risk of random results. An additional limitation was that only self-rating scales were used and not clinician-reported pre- and posttreatment ratings. In pharmacological studies, larger effect sizes were related to clinician ratings as compared to self-ratings by the patients (Faraone, Spencer, Aleardi, Pagano, & Biederman, 2004). Finally, no drug screenings were performed after randomization and given the high rate of documented lifetime overconsumption of alcohol, or documented abuse/dependency of alcohol or illegal drugs among the participants (Table 1), some individuals may have had ongoing substance abuse during the group treatment. If so, this should have had a negative effect for their ability to benefit from the group treatment.

Conclusions

In summary, the DBT-based skills training group program appears to be a treatment that is feasible in an outpatient psychiatric context, well tolerated, and effective for on treatment individuals with regard to the ADHD symptoms.

Declaration of interest

All authors declare that they have no conflicts of interest related to this work.

Role of the funding sources

The clinical part of the study was conducted as part of the clinical work at Neuropsychiatric Unit Karolinska, Psychiatry Northwest, Stockholm County Council. The scientific parts of the

projects were supported by the foundations Psykiatrifonden and Bror Gadelius Minnesfond. The funding sources had no role in study design, in the collection, analysis or interpretation of data, in the writing of the report, or in the decision to submit the paper for publication.

Contribution

TH designed the study, performed the statistical analysis, and wrote the first draft; EW, JA, AH, CH, AJ, JR, CW, and PB conducted the treatment and the pre- and posttreatment measurements; A-LN supervised TH; all authors read and commented on the manuscript.

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Appendix. Supplementary material

Supplementary material related to this article can be found online at doi:10.1016/j.brat.2011.01.001

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