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ORIGINAL ARTICLE

Structured skills training for adults with ADHD in an outpatient psychiatric context: an open feasibility trial

E. Morgensterns[1] · J. Alfredsson[2] · T. Hirvikoski[1,3]

Abstract The aim of the current study was to evaluate the feasibility, acceptability, and effectiveness of Dialectical Behavioral Therapy-based skills training groups for adults with ADHD in an outpatient psychiatric context. Furthermore, the purpose was to analyze the impact of clinical characteristics on the effect and attrition. Ninety-eight adults (out of 102) with ADHD were allocated to the treatment. Self-rating scales were administered as baseline before the first session (T1), post-treatment (T2), and at 3-month follow-up (T3). Approximately 80 % (74 individuals) attended at least two-thirds of the sessions. Treatment satisfaction was good. ADHD symptoms and ADHD-related functional impairment in every-day life were reduced. Well-being, ability to be mindful, acceptance of emotions and quality of life were increased. The results were stable at 3-month follow-up. None of the predictors, i.e., age, comorbidity, ADHD medication status, IQ-level, treatment credibility, or functional impairment at the beginning of treatment, significantly predicted treatment outcome (change in ADHD symptoms from T1 to T2). Likewise, none of the predictors, i.e., irritability/aggression, comorbidity, and functional impairment, were significantly associated with attrition. Due to the difficulties in predicting treatment outcome, as well as attrition, based on clinical characteristics, broad inclusion criteria should be applied.

Keywords Psychotherapy · Group therapy · Skills training group · ADHD · Adults · Multimodal

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a childhood-onset neurodevelopmental disorder characterized by inattention, impulsiveness, and hyperactivity (American Psychiatric Association 2000). ADHD seems to be related to a dysfunction in various domains of executive function (EF) (Willcutt et al. 2005), including emotion dysregulation (Barkley 2010). In recent years, an increasing number of adults have been diagnosed with ADHD. The prevalence of ADHD in the adult population is estimated to be 3–4 % (Fayyad et al. 2007; Kessler et al. 2006).

ADHD often co-occurs with other psychiatric disorders (Biederman 2004; Fayyad et al. 2007; Gjervan et al. 2012; Kessler et al. 2006). Furthermore, studies have shown that the adult population with ADHD experiences a wide range of psychosocial problems, as well as functional impairment (Barkley 2002; Biederman 2004; Gjervan et al. 2012), including high self-perceived stress and many stressors in everyday life (Hirvikoski et al. 2009, 2011a), increased healthcare costs, even when psychiatric treatment is controlled for (Barkley 2002), low educational attainment and poor occupational outcomes (Gjervan et al. 2012), and increased risk of criminal behavior (Biederman 2004), as well as low income, high rates of work loss and turnover, high prevalence of car accidents, and increased divorce rates (Spencer et al. 2007).

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Clinical guidelines recommend combined pharmacological and non-pharmacological treatment (CADDRA 2011; NICE 2009; The Swedish National Board of Health and Wellfare in press). Clinical trials of pharmacotherapy have demonstrated positive short-term (Castells et al. 2011; Koesters et al. 2009; Torgersen et al. 2008) and possible positive long-term (Fredriksen et al. 2013) effects on the core ADHD symptoms. However, alternative and complementary treatment methods are called for due to rather frequent problems concerning treatment discontinuation, residual symptoms, and nonresponse to medication, as well as an uncertain effect on comorbidity and functional impairment (Fredriksen et al. 2013; Knouse et al. 2008; Kolar et al. 2008; Torgersen et al. 2008).

Research on psychotherapy for adults with ADHD is still in an early stage. The number of empirical studies is small, but growing. Randomized controlled trials of individual psychotherapy (Safren et al. 2010), self-directed skills training (Stevenson et al. 2003), and group psychotherapy (Emilsson et al. 2011; Hirvikoski et al. 2011b; Solanto et al. 2010; Stevenson et al. 2002), as well as a few nonrandomized, pilot, and open studies (Bramham et al. 2009; Hesslinger et al. 2002; Philipsen et al. 2007; Rostain and Ramsay 2006; Virta et al. 2010; Zylowska et al. 2008) show promising results in reducing ADHD symptoms and/or other problems related to ADHD. All therapies have been based on behavioral psychotherapeutic approaches. So far, there is only one published RCT comparing the outcomes of psychotherapy (cognitive behavior therapy) for adults with ADHD with and without concurrent pharmacological treatment (dextroamphetamine) (Weiss et al. 2012). Both groups showed improvement and the combined treatment (pharmacological and CBT) did not further improve outcome as compared to CBT alone (ibid.). Limitations of the studies in this research area include small sample sizes, plausible atypicality of samples, and inability to discriminate between general effects of group support and the effects of specific treatment methods. Further studies in outpatient psychiatric contexts, with representative samples and higher generalizability, as well as studies on the underlying mechanisms of compliance and treatment outcome, are needed (Knouse et al. 2008).

The aim of the current study was to evaluate feasibility, acceptability, and preliminary efficacy of a Dialectical Behavioral Therapy (DBT)-based skills training program for adults with ADHD (Hesslinger et al. 2002; Hirvikoski et al. 2011b; Philipsen et al. 2007) in an outpatient psychiatric context in an open multicenter feasibility trial. Furthermore, the purpose was to analyze the impact of clinical characteristics on treatment outcome, as well as attrition.

Methods

The clinical part of the study was conducted as part of the clinical work at six outpatient psychiatric clinics in Stockholm: Neuropsychiatric Unit Karolinska, Psychiatric Outpatient Clinic Kronan, Sigtuna/Upplands Väsby Psychiatric Outpatient Clinic, Huddinge Psychiatric Outpatient Clinic, and Märsta Psychiatric Outpatient Clinic, and PRIMA Neuropsychiatriatric unit. The study was approved by the Regional Ethics Committee of Stockholm.

Participants

All participants ($n = 102$) had contact with one of the six participating clinics and were diagnosed with ADHD. In order to include a sample reflecting the natural heterogeneity of the adult ADHD population presenting in an outpatient psychiatric context, the *inclusion criteria* of the study were broad: ADHD as the main neurodevelopmental diagnosis; age of 18 years or older; if the patient was on psychoactive drug treatment, the treatment should have been stable for at least 1 month with regard to ADHD medication and 3 months with regard to other medications. Thus, the baseline data refers to on medication status for individuals who had on-going psychoactive drug treatment (88 % of the sample, Table 1). The participants were asked to try to stay on stable medication during the skills training, but participants who changed their medication status during the program were not excluded from the study. 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 conditions that would greatly interfere with adherence to the treatment, such as being homeless or having severe depression, psychosis, or bipolar disorder not under stable pharmacological treatment (as judged by a clinical psychologist and a psychiatrist); as well as recent participation in DBT-based skills training for adults with ADHD.

Enrollment

The participants were recruited from the above-mentioned clinics by the clinical staff. They were invited to an individual interview with one of the group leaders. After giving their informed consent, the participants' case files were studied in order to further assess their eligibility.

Treatment method

The treatment method used was based on an adaptation of Marsha Linehan's dialectical behavior therapy (DBT) for

Table 1 Clinical characteristics of the allocated participants at baseline (pre-treatment)

	Skills training group, $n = 98$
Age	$M = 37.4$ (SD $= 10.4$); range 19–63 years
Gender	31 males (31.6 %)
Pharmacological treatment of ADHD	68 (out of $n = 91$, 74.7 %; missing $= 7$): 4 had atomoxetine and 64 central stimulants
Any psychoactive drugs	82 (out of $n = 93$, 88.2 %; missing $= 5$)
ADHD subtype[a]	ADHD-C: 84 (out of $n = 97$; 86.6 %; missing $= 1$)
	ADHD-A: 13 (out of $n = 97$, 13.4 %; missing $= 1$)
At least one comorbid DSM-IV diagnosis	69 (out of $n = 97$, 71.1 %; missing $= 1$)
Employment	Full-time work or studying, parental leave:
	39 (out of $n = 95$, 39.8 %; missing $= 3$)
	Part-time work or studying, short-term sick leave (2 weeks–2 months), or vocational training:
	13 (out of $n = 95$, 13.3 %; missing $= 3$)
	Unemployed, long-term sick leave, or disability pension:
	43 (out of $n = 95$, 43.9 %; missing $= 3$)
Education	Academic: 19 (out of $n = 95$, 19.4 %; missing $= 3$)
	Upper secondary: 41 (out of $n = 95$, 41.8 %; missing $= 3$)
	Nine-year compulsory school or less: 35 (out of $n = 95$, 35.7 %; missing $= 3$)
Barkley current ADHD symptom scale	$M = 29.74$ (SD $= 9.41$), missing $= 7$

[a] *ADHD-C* ADHD combined type, *ADHD-A* predominantly inattentive type

borderline personality disorder (BPD) into a group-based skills training program for adults with ADHD (Hesslinger et al. 2002; Philipsen et al. 2007). The treatment uses core DBT elements such as acceptance, mindfulness, functional behavioral analysis and psychoeducation to target problem areas common in ADHD, with the overall treatment goal that patients will "control ADHD rather than to be controlled by ADHD." The treatment was based on the Swedish version of the ADHD skills training manual/workbook (Hesslinger et al. 2010; Hirvikoski et al. 2011b).

The treatment comprises of 14 weekly group sessions. The usual group sizes were 8–10 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. Most of the group leaders were either experienced from previous study phases (Hirvikoski et al. 2011b) or had clinical supervision from an experienced group leader. 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 with exercises and homework for the following week were introduced. Session themes and contents have been described in detail previously (Hirvikoski et al. 2011b; Philipsen et al. 2007). A treatment contract was signed during the first session (Hesslinger et al. 2010), defining the rules for participation and attendance.

Based on the feedback from the participants in our previous RCT (Hirvikoski et al. 2011b), a few modifications were made. Each participant was offered 10–30 min of individual homework coaching every week (in most cases by group leaders or other psychologists), either by phone or in the clinic. This addition to the original treatment method was made to make it easier for participants to adhere to the homework regimen. Moreover, the groups were allowed to stay on for 45–60 min after each group session for optional, non-structured group discussions, without therapist involvement. This was to allow for group discussions that were important to the participants, but fell outside of the treatment protocol.

Measures

Major study assessments were made at baseline (T1), post-treatment (T2), and 3 months after completed treatment (T3). The demographic and background information, as well as information on psychiatric comorbidity, was obtained from the participants' case files. Moreover, they completed a questionnaire covering demographic information and current stressors within different life activities (Hirvikoski et al. 2009).

Outcome measures

Feasibility was evaluated using two criteria for good feasibility: (1) a dropout rate of <25 % (i.e., a clear majority finishing the treatment); (2) the participants should attend a clear majority (at least two-thirds) of the sessions. Attendance to two-thirds of the session (9 out of 14 sessions)

would ensure that the participants learn the most important treatment components or skills, such as mindfulness meditation and functional behavior analysis, which is the focus in the beginning of the skills training program (Hirvikoski et al. 2011b; Philipsen et al. 2007).

Treatment acceptability was evaluated using the patient evaluation form from the manual. 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").

Efficacy-related measures 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 and Murphy 1998), a self-report scale containing three parts: (1) the 18 symptom items for ADHD from the DSM-IV, (2) functional impairment in major life areas (e.g., work, family life, economy, social interaction etc.; in total 10 items), as well as (3) 8 items covering symptoms of irritability and aggressiveness (all items in all three parts scored 0–3 from never/seldom to very often). Moreover, the participants completed self-rating questionnaires for assessing symptoms of psychiatric comorbidity: the Beck Depression Inventory (BDI) (Beck et al. 1961, 1988b) and the Beck Anxiety Inventory (BAI) (Beck et al. 1988a), both containing 21 items and scored 0–3; and the Karolinska Sleep Questionnaire (Kecklund and Åkerstedt 1992) for the assessment of sleep problems; as well as the Swedish version of the Perceived Stress Scale (PSS) (Cohen et al. 1983; Eskin and Parr 1996), which is based on the original 14-item scale (scored 0–4) measuring the degree to which situations in one's life are perceived as stressful. The subjective appraisal of functional impairment or disability as related to familial, social, and vocational aspects of life was made using the Sheehan Disability Scale (Sheehan 1983), scored as a visual analog scale ranging from 0 (not at all) to 10 (very much). To assess the core characteristic of dispositional mindfulness, the 15-item (scored 1–6) Mindful Attention Awareness Scale (MAAS) (Brown and Ryan 2003) was used. To measure experiential avoidance, the Acceptance & Action Questionnaire, 9-item version (AAQ-9) (Hayes et al. 2004) was used. As a diagnosis-specific quality-of-life instrument, the Adult Attention-deficit/hyperactivity disorder Quality of Life scale (AAQoL) (Brod et al. 2006) was used. The AAQoL consists of 29 items scored 1–5 (ibid.).

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 efficacy-related measures were analyzed using a series of repeated measures ANOVAs (rmANOVAs), with a baseline score (T1) and post-intervention score (T2) as a within-subjects repeated measure factor. In a separate series of analyses, the data were analyzed with the inclusion of all three time points, T1, T2, and T3 (3-month follow-up). When indicated by the Mauchly's test, the rmANOVAs were corrected for violence against an assumption of sphericity using the Huyn–Feldt correction. The effect size was expressed as partial eta-squared (η^2) for efficacy-related measures and was interpreted using the guidelines proposed by Cohen: 0.01 = small effect size, 0.06 = moderate effect size, and 0.14 = large effect size (Cohen 1988). The prediction analyses were performed using standard multiple regression analysis with predictors entered simultaneously as independent variables and treatment effect and premature discontinuation of therapy, respectively, as dependent variables. The alpha levels were set at $p \leq 0.05$ for significance.

Results

Demographic and background information

Demographic and background information is presented in Table 1.

Feasibility

Ninety-eight of the 102 adults with ADHD were allocated to the intervention. Four did not show up for the first session. A total of 94 individuals underwent the allocated intervention. Approximately 80 % (74 individuals) attended at least two-thirds of the sessions and thus completed the program (the mean attendance among completers was 11.48 session out of 14), while approximately 60 % (55 individuals) attended at least 75 % of the sessions (Fig. 1).

Treatment acceptability

Five items on the patient evaluation form were rated above 3 out of max. 4, which indicates good acceptability of the treatment among those who completed the program (Fig. 2).

Efficacy-related measures

Descriptive statistics on the efficacy-related measures, as well as the results of the rmANOVAs, are depicted in
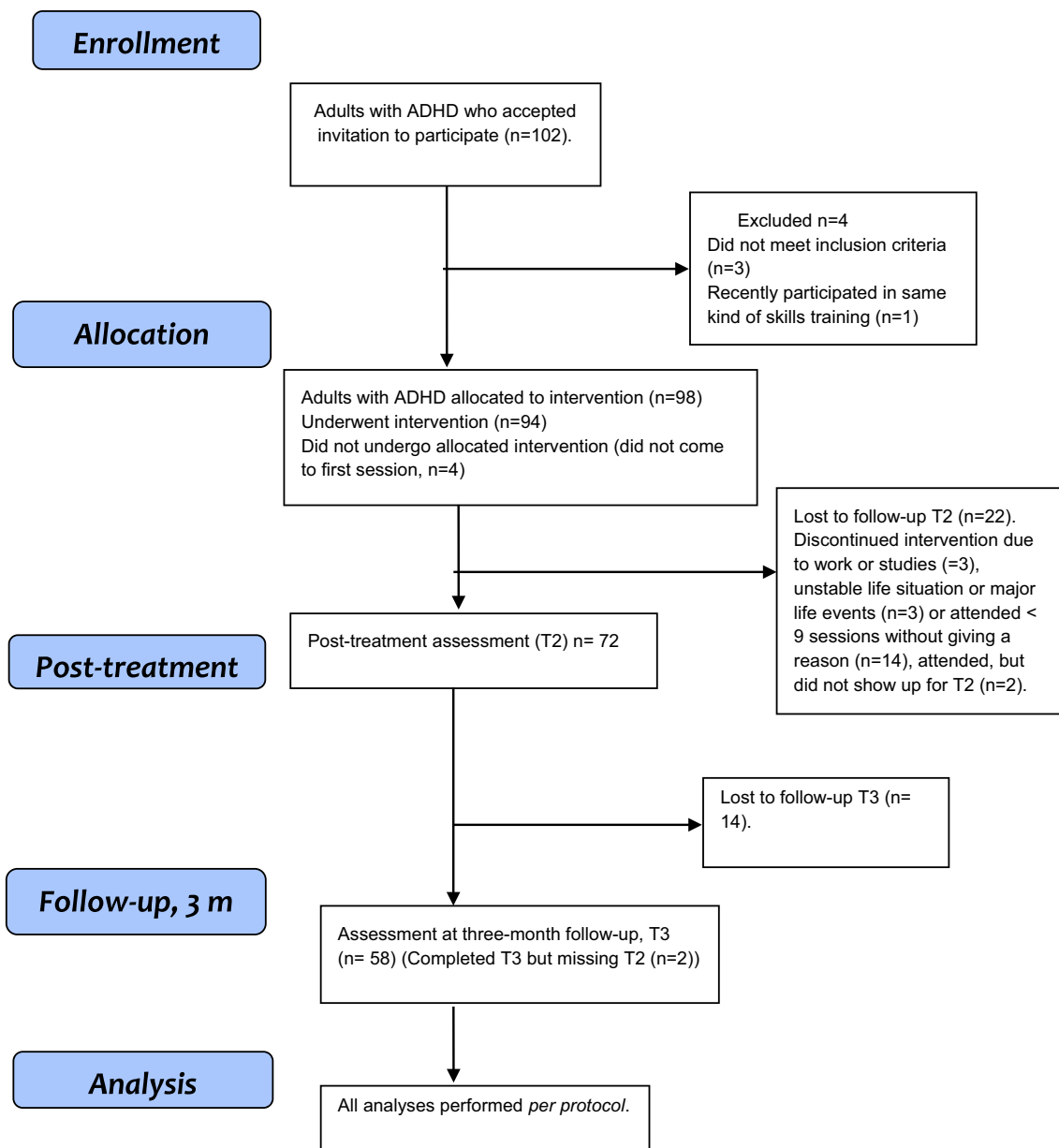
Fig. 1 Flowchart for the study participants

Table 2. The rmANOVAS of the efficacy-related measures showed significant improvement in all parameters with the exception of anxiety from baseline (T1) to post-intervention (T2). These improvements were maintained at the 3-month follow-up, with the exception of perceived stress. The effect sizes (partial eta-squared), ranging between 0.08 and 0.22, indicated medium-large to large effects. The attention-deficit *versus* hyperactivity/impulsivity subscales of the Current ADHD Symptom Scale were further analyzed separately, and the pattern of improvement on each subscale was similar to the total score (i.e., both dimensions improved and the results were maintained at the 3-month follow-up).

Prediction of treatment outcome and completion

The overall model predicting treatment outcome (change score in ADHD symptoms from T1 to T2) was non-significant. Moreover, none of the predictors (age, comorbidity, ADHD medication status, treatment credibility, or functional impairment at the beginning of the treatment) significantly predicted treatment outcome. However, a statistical trend ($p = 0.065$) for functional impairment (Current ADHD Symptom Rating Scale) as a predictor in the regression model was observed. As a single predictor (Pearson correlation), the association between functional impairment at T1 was significantly and negatively
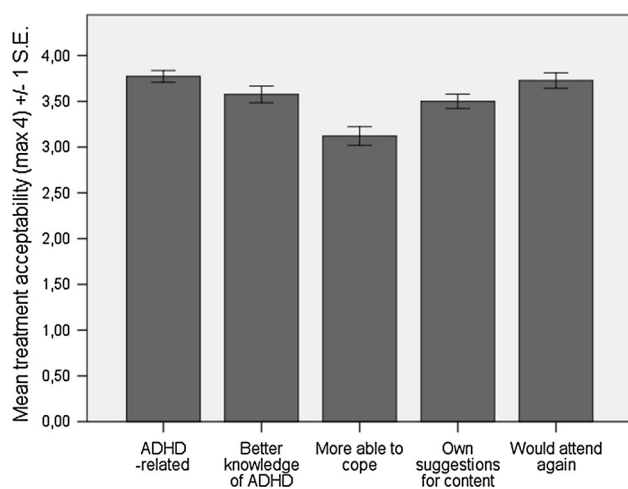
Fig. 2 Treatment acceptability was good as measured by the patient evaluation form. Note: The item wordings: (1) Has the group training been adequate/clearly focused on ADHD; (2) Are you better educated in ADHD; (3) Are you more able to cope with your ADHD-related deficits; (4) Did you have opportunities to make own suggestions at the sessions; and (5) Are you willing to attend to a similar group again?

correlated with treatment outcome (change score), $r = -0.30$, $p = 0.01$, indicating that individuals with more severe functional impairment benefitted less from the treatment.

For the participants with data on FSIQ ($n = 48$), the mean IQ was $M = 98$, SD $= 12.74$, range 70–120. There was no significant association between FSIQ and treatment outcome (change score from T1 to T2).

The overall model predicting completion of the treatment program was nonsignificant. Thus, none of the predictors in the model (irritability/aggression, comorbidity, or functional disability) were significantly associated with premature treatment discontinuation (all p values >0.10).

Adverse events and serious adverse events

Four individuals (out of 74 who completed the treatment) reported adverse events (AEs) at T2/post-treatment assessments. One participant reported anxiety related to the finishing of the treatment. This participant was worried about what kind of support, if any, would be offered after the skills training. Another participant reported increased symptoms of anxiety and depression, as well as more frequent alcohol consumption. This participant had changed the ADHD medication dose, although it was not possible to discern whether the reported symptoms were associated with these changes and/or finishing the skills training group. One participant reported anxiety related to new insights into ADHD-related difficulties, including the fact that ADHD is a lifelong condition. The same participant

also reported anxiety in conjunction with the finishing of the treatment, but also reported better coping strategies after participating in the skills training. One participant reported a serious adverse event (SAE): inpatient hospitalization due to depression. No patient reported AE or SAE at the 3-month follow-up.

Discussion

In this open trial of DBT-based skills training groups consisting of adults with ADHD, we observed good feasibility in an outpatient psychiatric context, high treatment acceptability among completers, and positive changes over time on efficacy-related measures. The results were stable at the 3-month follow-up. It was neither possible to predict the effect of treatment on ADHD symptoms nor attrition based on clinical characteristics in the group.

An explicit goal of the project was to investigate feasibility in an outpatient psychiatric context. The skills training group programs were conducted as part of the clinical practice of different psychiatric outpatient clinics with clinical psychologists as group leaders. Wide inclusion criteria were applied in order to study feasibility for a clear majority of the adult population with ADHD presenting at psychiatric outpatient clinics. Compared to many of the previous studies, the present study group had a lower educational level, as well as employment status (Philipsen et al. 2013; Solanto et al. 2010), a higher level of comorbidity (Philipsen et al. 2013; Virta et al. 2010) and included persons with lower IQ levels, i.e., individuals with marginal mental retardation who are usually excluded from psychotherapy trials (Philipsen et al. 2013; Solanto et al. 2010). Our results indicated that the structured skills training was a feasible treatment method also for a majority of the present rather clinically impaired group of adults with ADHD in an outpatient psychiatric setting, as well as a usable treatment method for clinical practice. Based on participant feedback from previous study (Hirvikoski et al. 2011b), some modifications were made to the treatment program: weekly individual homework coaching and optional, non-structured group discussions in conjunction with therapy sessions. While individual homework coaching was perceived as helpful (e.g., regarding homework and individual goals), the role of non-structured group discussion was unclear and the involved clinics have not maintained this component after the study phase.

Treatment completion was acceptable (80 % attended at least two-thirds of the sessions; the mean attendance among completers was 11.48 session out of 14). However, on applying a more rigorous rule for treatment completion (attendance at 75 % of the sessions) (Hirvikoski et al. 2011b), the completion rate dropped to 60 %. Thus, quite a

Table 2 Results in self-rating questionnaires from baseline to post-intervention, as well as from baseline to 3-month follow-up

	Baseline/T1 M (SD) n	Post-intervention/T2 M (SD)	3-month follow-up/T3 M (SD)	rmANOVA T1–T2	rmANOVA T1–T2–T3
Barkley current ADHD symptom scale: ADHD symptoms	29.12 (9.30) $n = 66$	24.52 (10.40) $n = 66$	24.41 (9.72) $n = 51$	$F = 16.51_{(1,65)}$ **$p < 0.001$, $\eta_p^2 = 0.20$**	$F = 13.98_{(1.77,88.59)}$ **$p < 0.001$, $\eta_p^2 = 0.22$**
Barkley current ADHD symptom scale: functional impairment	15.23 (5.80) $n = 66$	12.56 (6.10) $n = 66$	12.86 (6.78) $n = 51$	$F = 15.39_{(1,65)}$ **$p < 0.001$, $\eta_p^2 = 0.19$**	$F = 8.88_{(2,100)}$ **$p < 0.001$, $\eta_p^2 = 0.15$**
Barkley current ADHD symptom scale: aggression and irritability	6.40[a] (4.70) $n = 65$	4.80 (4.02) $n = 65$	5.43 (4.90) $n = 51$	$F = 12.46_{(1,64)}$ **$p = 0.001$, $\eta_p^2 = 0.16$**	$F = 3.04_{(2,100)}$ $p = 0.05$, $\eta_p^2 = 0.06$
Beck depression inventory (BDI)	19.04 (11.89) $n = 72$	14.79 (12.49) $n = 72$	16.54 (12.64) $n = 50$	$F = 11.32_{(1,71)}$ **$p = 0.001$, $\eta_p^2 = 0.14$**	$F = 4.46_{(2,98)}$ **$p = 0.014$, $\eta_p^2 = 0.08$**
Beck anxiety inventory (BAI)	16.03 (11.16) $n = 72$	14.75 (11.47) $n = 72$	15.56 (11.35) $n = 48$	$F = 1.64_{(1,71)}$ $p = 0.204$, $\eta_p^2 = 0.23$	$F = 1.55_{(2,94)}$ $p = 0.217$, $\eta_p^2 = 0.032$
Perceived stress scale (PSS)	33.07 (8.37) $n = 62$	30.10 (10.21) $n = 62$	32.05 (11.13) $n = 38$	$F = 5.6_{(1,61)}$ **$p = 0.021$, $\eta_p^2 = 0.08$**	$F = 1.66_{(1.62,60.1)}$ $p = 0.203$, $\eta_p^2 = 0.043$
Karolinska sleep questionnaire (KSQ)	37.10 (15.74) $n = 69$	33.23 (16.7) $n = 69$	33.22 (16.07) $n = 46$	$F = 7.4_{(1,68)}$ **$p = 0.008$, $\eta_p^2 = 0.10$**	$F = 6.1_{(2,90)}$ **$p = 0.003$, $\eta_p^2 = 0.12$**
Sheehan disability scale	6.44 (2.00) $n = 70$	5.72 (2.23) $n = 70$	5.94 (2.16) $n = 48$	$F = 11.72_{(1,69)}$ **$p = 0.001$, $\eta_p^2 = 0.15$**	$F = 5.61_{(1.7,80.61)}$ **$p = 0.008$, $\eta_p^2 = 0.11$**
Mindful attention awareness scale (MAAS)	45.45 (14.5) $n = 51$	49.92 (15.17) $n = 51$	48.51 (14.53) $n = 41$	$F = 6.96_{(1,50)}$ **$p = 0.011$, $\eta_p^2 = 0.12$**	$F = 6.44_{(1.51,60.42)}$ **$p = 0.006$, $\eta_p^2 = 0.14$**
Acceptance & action questionnaire (AAQ)	42.09 (7.58) $n = 43$	40.26 (8.14) $n = 43$	39.06 (9.25) $n = 32$	$F = 3.32_{(1,42)}$ $p = 0.076$, $\eta_p^2 = 0.73$	$F = 5.33_{(1.64,50.91)}$ **$p = 0.012$, $\eta_p^2 = 0.15$**
Adult attention-deficit/hyperactivity disorder quality-of-life scale (AAQoL)	80.84 (17.50) $n = 44$	85.57 (17.76) $n = 44$	87.03 (18.85) $n = 35$	$F = 4.61_{(1,43)}$ **$p = 0.038$, $\eta_p^2 = 0.97$**	$F = 6.87_{(2,68)}$ **$p = 0.002$, $\eta_p^2 = 0.17$**

The repeated measures ANOVAs were performed *per protocol* using pairwise exclusion of individuals with missing data

p values printed in bold indicate a statistically significant difference

[a] One extreme outlier excluded from analyses of the Current ADHD Symptom Scale section aggression and irritability

few participants did not complete the entire treatment or attended only a few sessions (a majority of non-completers discontinued after only 1–4 session at the beginning of the program). This indicates that the skills training program may be too demanding for some adults with ADHD. Furthermore, several participants reported that their most important problem area was that of organizing their daily life, which is a problem area that the skills training does not

focus much attention on. These patients may benefit more from other treatment programs, such as psychoeducational groups for adults with ADHD and their significant others (Hirvikoski et al. 2014), or treatment focusing on organization skills (Safren et al. 2010). The order in which patients take part in different psychological treatment programs, such as psychoeducational groups and skills training groups, in combination with pharmacotherapy,

may help to motivate participants to take part in and persist through a stepped care treatment model. However, in the current data, we did not observe any effect of medication status on the therapeutic effect of behavioral skills training, a result in line with the finding of Weiss et al. (2012). In line with previous studies (Hirvikoski et al. 2011b; Philipsen et al. 2007), treatment satisfaction was good and the participants highlighted the strength of the group format and the importance of meeting other adults with ADHD. However, our clinical experience is that some individuals with ADHD perceive the group format and certain treatment components (such as psychoeducation and homework) as school like which may have a negative connotation based on their experiences from school. Also, group treatments include interventions and discussions that do not apply to each individual's current life situation. For some individuals, individual cognitive therapy may be a better treatment option (Safren et al. 2010; Rostain and Ramsay 2006). Development of individualized care pathways in stepped care treatment models is an important area for future research.

The present study used broad outcome measures, to better capture the complex set of problems that is usually associated with ADHD-diagnosis in adults; ADHD symptoms, functional disability, quality of life, depression, anxiety, perceived stress, sleep, mindful attention and acceptance. The efficacy-related measures showed significant improvement in all parameters with the exception of anxiety from baseline (T1) to post-intervention (T2). These improvements were maintained at the 3-month follow-up (T3), with the exception of perceived stress. Thus, the obtained results were in general stable 3 months after finished skills training program, which is in line with previous follow-ups on psychological interventions (Stevenson et al. 2002, 2003). The effect sizes indicated medium-large to large effects. In ADHD—symptoms we observed a symptom reduction corresponding to 16 % of baseline symptoms. This corresponded to our previous findings (Hirvikoski et al. 2011b) and was regarded as an acceptable result in current group in which a majority had pharmacological treatment but unsatisfactory treatment response with rest symptoms and functional impairments.

The reason why there seemed to be improvements in depression, sleep and perceived stress measures, but not anxiety is unclear. One reason may be that the manual focuses explicitly on depression and stress management and prevention, but not on anxiety. The treatment in itself poses a form of behavioral activation, including an arena for social interaction, which may alleviate depressive symptoms, whereas the treatment contains less clear interventions for alleviation of anxiety (e.g., exposure exercises). Mindfulness and acceptance strategies, as used in this manual, are not expected to result in anxiety

reduction, but rather awareness, tolerance and acceptance of anxiety symptoms. According to this, the participants also reported greater psychological flexibility and tolerance of distress post-treatment on AAQ-9 questionnaire. Generally, a greater ability cope with ordinary life (including emotional experiences) may be more important than symptom reduction (Kazdin 2008). Finally, the choice of BAI for measurement of anxiety may not capture all aspects of anxiety (e.g., worry and other cognitive aspects of anxiety) due to the questionnaire's focus on somatic symptoms of anxiety (e.g., heart racing, dizziness). Previous studies on behavior therapy for adults with ADHD have shown mixed results on comorbidity, especially regarding anxiety. Some studies have shown effects on anxiety (Rostain and Ramsay 2006; Safren et al. 2005), while others have not (Emilsson et al. 2011; Hirvikoski et al. 2010a; Solanto et al. 2010).

There is no session or part of the program with direct focus on sleep problems. Nevertheless, it is our clinical experience that many participants report improved sleep, which was also observed in current study. It is possible that the parts of the manual focusing on stress, depression, relationships and mindfulness also have a positive effect on the participants' sleep.

In line with our previous study (Hirvikoski et al. 2011b), four individuals (4 out of 74 who completed the treatment) reported adverse events (AEs). Our experience is that some individuals experience the separation from the group as stressful and therefore may need individual support in conjunction with finishing the treatment. Careful monitoring for symptoms of anxiety and depression is warranted before treatment and directly after completion of treatment.

None of the clinical characteristics (ADHD symptoms, age, comorbidity, ADHD medication status, treatment credibility, functional impairment at the beginning of the treatment or FSIQ) significantly predicted treatment outcome (change in ADHD symptoms). Likewise, none of the predictors (irritability/aggression, comorbidity, or functional disability) were significantly associated with attrition. Thus, the clinical characteristics hypothesized to be associated with treatment effect and completion were not useful predictors of treatment feasibility and effectiveness. This would prompt careful consideration before excluding individuals with ADHD from skills training based on their clinical characteristics. Moreover, further studies including other possible predictors (e.g., motivation, type of comorbidity and substance abuse) are warranted.

There are several limitations of the current study. The most challenging limitation is the open study design. It is difficult to conclude that the treatment alone was the cause of changes in the efficacy-related measures. Regression toward the mean, as well as other unmeasured factors,

could also contribute to the results. Also, changes in concurrent treatments (e.g., medication status) were not systematically assessed. However, the open study design was the only possible option in the clinical context in which the study was conducted. Moreover, in our previous study we did not observe changes in the ADHD—symptoms over time in the control group (loosely structured discussion group) (Hirvikoski et al. 2011b). Therefore, we would not expect large changes to occur spontaneously in the relatively impaired group of adults with ADHD in an outpatient psychiatric context. We would rather expect that changes in ADHD symptomatology can be observed in individuals who complete the skills training program (Hirvikoski et al. 2011b). Another limitation was that outcome measures were based solely on self-report scales and did not include clinician observations. Self-report measurements may be associated with exaggeration or under-reporting of symptoms due to difficulties in analyzing own behavior. However, some of the scales used in this study have previously shown high correlations between investigator-reported and self-reported ADHD symptoms, as well as between symptom ratings and functional ratings (Ginsberg et al. 2012). Moreover, the experience of the therapists varied, while treatment fidelity was not systematically measured. However, most of the group leaders were either experienced from previous study phases (Hirvikoski et al. 2011b) or had clinical supervision from an experienced group leader.

Unfortunately, we had little information about the reasons for attrition. A further analysis of those who discontinued treatment may have given valuable information for modification of the treatment for those who may need additional support to persist through the skills training program.

Bearing these limitations in mind, this study still supports previous findings (Hirvikoski et al. 2011b; Philipsen et al. 2007, 2013) indicating good feasibility for behavioral group treatment/skills training for adults with ADHD. We also performed a 3-month follow-up that gave preliminary indications of maintained treatment benefit. In the present study, the treatment was evaluated in an outpatient psychiatric context, applying wide inclusion criteria. The findings are likely to be generalizable to other outpatient psychiatric contexts due to the relatively large number of participants from six different outpatient clinics, serving different regions in the Stockholm area. There was a substantial variety in the range of functioning among the participants, representative of the adult population with ADHD in an outpatient setting. However, we were not able to predict treatment outcome or completion based on the participants' clinical characteristics. This indicates that wide inclusion criteria may be appropriate in an outpatient clinical context.

Compliance with ethical standards

Conflict of interest Two of the authors are also authors of the Swedish version of the treatment manual.

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