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Cognitive Behavioural Group Therapy for Adolescents with ADHD – Study Protocol for a Randomized Controlled Trial

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ABSTRACT

Introduction Persistence of ADHD into adolescence is a significant burden to patients. Clinical guidelines recommend non-pharmacological therapies for this age group, but the evidence to support this recommendation is sparse. This study aims to study the effect of a 12-week group treatment program for adolescents with ADHD aged 14-18, who still have impairing symptoms after treatment with medication. The primary outcome is change in ADHD symptoms. The secondary outcomes are changes in scores on instruments measuring executive functions, anxiety, depression, sleep problems, self-esteem, self-efficacy and global functioning. We also aim to examine moderators and mediators of the effect of CBT group therapy on ADHD.

Methods and analysis We conduct an RCT of group therapy in adolescents with ADHD recruited from child psychiatric outpatient units in Mid-Norway. Those who meet inclusion criteria and consent to participation are randomised to a 12-week group intervention or to a limited clinical follow-up. Assessments are made at intake (T1), prior to the intervention (T2), after the intervention (T3) and one year after intake to the study (T4) obtaining adolescent, parent and teacher reports at T2 and T3, and adolescent reports at T4. Clinicians blinded to group participation rate all participants as to their functioning at T2, T3 and T4.

Ethics and dissemination The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115). Findings will be disseminated in peer-reviewed scientific journals, and be presented at scientific conferences, to user organisations and at courses attended by families and professionals. Two PhD students will publish and defend dissertations relating to the study. Planned publications include primary and secondary outcomes and fidelity to the intervention. Furthermore, we plan to publish a manual of CBT group therapy in adolescent ADHD to benefit treatment of patients in Norway and elsewhere.

Trial registration Clinical Trials NCT02937142

Strengths and limitations of this study

- A study of CBT group therapy which may yield findings relevant to the population of adolescents with ADHD who still have impairing symptoms after treatment with medication.
- A strength of the present study is its delivery in a real world setting using practising clinical staff and covering a total catchment area.
- A further strength of the study is the use of multiple informants including teacher assessments.
- The findings will not fully answer which psychosocial interventions are beneficial for adolescents with ADHD who for various reasons are not included in the study, decline to participate or are excluded from the study at intake.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder, which starts in childhood and is characterised by inattention, impulsivity, and hyperactivity that impair functioning.[1] ADHD persists across the lifespan in a majority of patients, and causes significant impairment across multiple domains of daily functioning. A majority of children with ADHD continue to have symptoms and impairment during adolescence. [2 3] The core symptoms contribute to impairment in executive functioning, inhibitory control, working memory and motivation. These deficits prevent the acquisition and implementation of compensatory skills such as organizing and planning, leading to difficulties in handling everyday challenges. During adolescence, ADHD is associated with low academic achievement, interpersonal difficulties, substance use disorders, mood disorders and anxiety disorders continuing into adult life. [3 4] A recent study of comorbidity in a large sample of Norwegian adults with ADHD, shows that both men and women had a 4-9 times higher prevalence of anxiety, depression, bipolar and personality disorders, schizophrenia and substance use disorder (SUD) than the remaining adult population [5], indicating the potential

for introducing preventive measures in young people with ADHD.

Pharmacotherapy with stimulants, atomoxetine or guanfacine is effective in reducing core symptoms of ADHD in most adolescents with moderate to severe ADHD. Medication may also improve processing speed, work productivity and perseverance.[6] However, pharmacotherapy alone may not be sufficient to remediate ADHD and its comorbid symptoms and disorders. National and international guidelines for ADHD recommend non-pharmacological therapies as the first-line or add-on treatment for young people with ADHD, [7 8] even though there is inadequate evidence to support this recommendation. Specifically, there is limited evidence to support psychological treatments in adolescents with ADHD. which have been less studied than psychological treatments in children.[9]

Cognitive behavioural therapy (CBT) is a well-known psychological treatment for mental disorders across disorders and age groups. Meta analyses have documented significant treatment effects on disorders such as OCD, anxiety, and depression across age groups and in ADHD in adults. [10 11] There are currently only three published studies on CBT with adolescents with ADHD, and thus little knowledge exists about short term and long-term treatment effects of CBT on ADHD in this age group. [12-14] Vidal and colleagues [14] found significant improvement in adaptive functioning as well as ADHD symptoms in the treatment group in their RCT of adolescents aged 15-21. Patients with emotional disorders were excluded from the study. It is therefore unknown to what extent CBT treatment could help ADHD patients with comorbid emotional disorders, which are frequent in a teenage population with ADHD. [15]

Previous studies on CBT in other conditions than ADHD have found that different moderators and mediators have implications for treatment effects. For example in the treatment of Obsessive Compulsive Disorder, comorbidity, age, sex, and lower quality of life were found to be important moderators and predictive of treatment effect. [16] Age, symptom severity, comorbidity rate and adaptive functioning seem to moderate the effect of CBT in patients with depression.[17] Since research on adolescents with ADHD is scarce, we have very limited knowledge of which moderators make the most impact in this patient group. Of note, the Vidal and colleagues [14] did not reveal any moderating effect of demographic variables in their

study of CBT group therapy outcome.

To date, there is little knowledge about the short-term outcome psychological treatment programs in adolescents with ADHD, and even less knowledge about long-term outcomes. The present study will therefore fill a gap in the treatment literature. It is crucial to know if clinically relevant changes in psychiatric symptoms and functioning is associated with the applied treatment program and particularly whether the observed changes last over time. The project will include unique longitudinal data and will provide results that can help fill knowledge gaps and promote improved quality and efficacy of services for adolescents with ADHD both nationally and internationally.

Aims

The study Cognitive Behaviour Group Therapy in Adolescents with Attention Deficit Hyperactivity Disorder *(Clinical Trials,* NCT02937142), aims to improve the quality and effectiveness of treatment and care of adolescents with ADHD. We aim to obtain new knowledge related to Cognitive Behavioural Group Therapy in adolescents with ADHD 14-18 years of age referred to assessment and treatment at the Child & Adolescent Psychiatric (CAP) Clinic, St. Olav University Hospital, Trondheim, Norway. The primary outcome investigated will be treatment effect on ADHD symptoms, measured on the ADHD rating scale[18], in adolescents in a 12-week manual based CBT group treatment program. We will study the effect after the intervention and at a 12 months follow-up. The secondary outcomes will be characteristics of functional impairment in adolescents with ADHD and the study of possible moderators and mediators of treatment effects. Furthermore, we wish to study the feasibility of the intervention, patient satisfaction and treatment fidelity, and identify therapist factors associated with positive outcomes. The long-term goal of the study group is to publish a Norwegian evidence based treatment manual for the benefit of patients locally and elsewhere.

METHODS AND ANALYSIS

Study design

The design is a randomised, controlled, rater blinded study to evaluate the effectiveness of group therapy for adolescents aged 14 to18 with ADHD. We recruit adolescent patients, who receive medical treatment but still have impairing symptoms into the study. The patients are randomly assigned to the intervention group or a control group. The two groups are followed prospectively to assess the effectiveness of the CBT group program. See Table 1 for the completed SPIRIT (Standard Protocol Items; Recommendations for Intervention Trials) check-list of recommended items to address in a clinical trial process. We make assessments before and after the intervention, and at a one-year follow-up.

Study Recruitment

Patients 14 to 18 years of age with a diagnosis of ADHD according to ICD-10[19] are recruited to the study from two Child & Adolescent Psychiatric outpatient units at the St. Olav University Hospital with a catchment area of around 230.000 inhabitants (city of Trondheim and a few surrounding municipalities). Very few private practitioners do assessments and treatment of suspected ADHD adolescents in the area. The number of adolescents with ADHD as the main diagnosis or comorbid diagnosis in the age group 14-18 years in the outpatient clinics was 330 as per February 2019. Most adolescent patients with ADHD are prescribed medication. We assess and recruit a few additional participants in the study from general practitioners responsible for patients discharged from the clinic on stable medication, through user organisations, and through advertisements in media and the local newspaper.

Participants

The diagnostic process at the clinic includes information from multiple informants (patients, parents and teachers), including developmental history, somatic status and school functioning. The routine assessment includes interviews with the adolescent and parents, and the administration of various questionnaires. These include an assessment of emotional and behaviour problems with the ASEBA Checklists[20] and ADHD-symptoms by the ADHD-

Rating Scale.[18] IQ scores are obtained using Wechsler Intelligence Scales for Children - WISC-IV. [21] Adaptive functioning is scored using the Children's Global Assessment Scale (CGAS).[22] Patients receive education about ADHD, and patients with moderate to severe ADHD symptoms are offered medical treatment (T1).

We evaluate the patients in relation to the inclusion criteria after at least two months of stable medical treatment. Thereafter the adolescent (and parents) are asked to participate in the study through an open invitation brochure providing information about the aim of the project, the randomization process and the intervention. We invite adolescents who consent to participate into the study. At intake, two clinicians, a clinical neuropsychologist and a child and adolescent psychiatrist, interview the adolescents using a semi-structured psychiatric interview, the Kiddie-SADS PL.[23] We also assess executive functions, general adaptive functioning, anxiety and depression, sleep patterns, self-esteem and self-efficacy.

Inclusion criteria. A diagnosis of ADHD and a Clinical Global Impression Severity (CGI-S) [24] score ≥ 3 (mildly ill, some impairment in one setting). Participants should receive medical treatment for ADHD, but patients may be included in the study if they have tried medication with little effect or experienced intolerable side effects. Participants with comorbid diagnoses (mild to moderate depressive disorders, anxiety disorders, bipolar disorders and mild degree of autism spectrum disorders) are included in the study. *Exclusion criteria* are psychoses, mental retardation (IQ < 70), ongoing substance use disorder, severe conduct disorder, suicidal behaviour and severe depression.

Procedure

The recruitment period lasts two years and nine months starting in winter 2017 and ongoing until mid- September 2019. After the initial diagnostic procedures, follow up evaluations are performed immediately after the CBT group program and at 12 months follow up. The participants fill in questionnaires at two time points, before the intervention (T2) and after the

intervention (T3). An interviewer administers three questionnaires during a telephone interview with the adolescents at the 12 months follow-up 9 months after the intervention (T4) (Figure 1). Clinicians blinded to patient assignment complete pre- and post- evaluations.

At a one-year assessment (T4) a telephone interview is performed with the adolescent examining general and adaptive functioning (a score on the CGI and CGAS are obtained), school functioning, emotional and behaviour problems, ADHD symptoms and self-efficacy. All participants medicated for ADHD are asked if they use their medication as prescribed on a weekly basis during the study period. At post-treatment (T3) the participants in the intervention group fill out a questionnaire about satisfaction with the group therapy. In addition, the subjects report on current and past treatment during the past 9 months and their impression of the treatment in a longer perspective. Flowcharts for inclusion of patients, treatment and evaluation, are made according to Consolidated Standard of Reporting Trials [25] (see Table 1).

Control group

Patients in the control group continue their medical treatment as usual and get one routine medical follow-up during the treatment intervention. They are not supposed to get any psychosocial treatment at the clinic in the study period. However, a crisis with considerable worsening of psychiatric problems might necessitate intervention.

Randomization

Eligible participants who have provided written consent are randomly assigned to a CBT group or a control group in a 1:1 ratio. The randomisation is performed using of a computer program supplied by the Unit for Applied Clinical Research, a centre of expertise in the Central Norway Health Region.

Table 1 SPIRIT table for evaluation of the **Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomized Controlled Study**

	STUDY PERIOD						
	Enrolment[1]	**Allocation**[2]	**Post-allocation**				**Close-out**
		Q1 2017 ***Q2 2017*** ***Q3 2018*** ***Q4 2018*** ***Q5 2019***	***Pre-***	***Mid-***	***Post-***	***Post+9 months***	
Coh1: Q1 2017	***Coh1: Q1 2017***		***Coh1: Q1 -2017***	***Coh1: Q1 -2017***	***Coh1: Q2 -2017***	***Coh1: Q2 2018***	
Coh2: Q3 2017	***Coh2: Q3 2017***		***Coh2: Q3 -2017***	***Coh2: Q3 -2017***	***Coh2: Q4 -2017***	***Coh2: Q4 2018***	
Coh3: Q1 2018	***Coh3: Q1 2018***		***Coh3: Q1 -2018***	***Coh3: Q1 -2018***	***Coh3: Q2 -2018***	***Coh3: Q2 2019***	
Coh4: Q3 2018	***Coh4: Q3 2018***		***Coh4: Q3 -2018***	***Coh4: Q3 -2018***	***Coh4: Q4 -2018***	***Coh4: Q4 2019***	
Coh5: Q1 2019	***Coh5: Q1 2019***		***Coh5: Q1 -2019***	***Coh5: Q1 -2019***	***Coh5: Q2 -2019***	***Coh5:Q2 2020***	
Coh6: Q3 2019	***Coh6: Q3 2019***	***Q6 2019***	***Coh6: Q3-2019***	***Coh6: Q3-2019***	***Coh6: Q4-2019***	***Coh6: Q4 2020***	***Coh6: Q4 2020***
ENROLMENT:							
Eligibility screen[3]			X				
Informed consent	X						
Allocation		X					
INTERVENTIONS:							
Int.: CBT + medic.			←	—	→		
Ctr.: Medication			←	—	→		
ASSESSMENT:							
Diagnostic evaluation			X				
CGI			X		X	X	
CGAS			X		X	X	
PRIM. OUTCOME:							
ADHD symptoms			X[3]		X	X	
SEC. OUTCOMES:							
Behaviour problems	X					X	
Emotional problems	X					X	
Funct. impairment			X		X		
Anxiety			X		X		

Depression			X		X		
Sleep			X		X		
Self-esteem			X		X		
Self-efficacy			X		X	X	
Executive functioning			X		X		
Treatm. satisfaction					X	X	
Treatment fidelity							X

[1]Enrollment occurs in the semester of the delivery of the intervention. Each cohort represents a group of adolescents recruited during the semester. [2]Allocation (randomization) is conducted at the individual level. [3]Study eligibility for individual adolescents is based on ADHD diagnosis and being stable on medication (primary outcome measure).

The Intervention

The research group has developed a manual based on the work of Susan Young and Jessica Bramham.[26] These authors have developed a cognitive behaviour therapy program for adults and adolescents with ADHD, which has been modified for adolescents in the present study (see Table 2). The treatment includes group therapy modules addressing core symptoms of ADHD and associated problems. In making a Norwegian adaptation of the Young-Bramham Program, we have collaborated with one of the authors, Professor Susan Young. We tested our manual in a pilot-study at one of the clinics before the study period and made necessary modifications. We found the choice of modules appropriate for the Norwegian clinical population of adolescents with ADHD, however made some language modifications to better suit our young age group of 14-18 year olds. In addition, we removed some details in the material judged less important to our age group to arrive at a slightly simpler format.

Table 2 Core treatment modules in the project research manual

MODULES	
Core symptom modules	What is ADHD?
	Attention
	Memory
	Organization and time management

	Impulsivity
Comorbid disorders and difficulties	Problem solving
	Communication
	Anxiety
	Anger and frustration
	Sadness and depression
	Sleep
The future	Preparing for the future

The intervention consists of 12 weekly cognitive behaviour therapy sessions addressing core difficulties and concerns of the adolescent population with ADHD, each session lasting 90 minutes. The manual is structured and includes methods and key points to be worked through in each session. The key points are visualised in a power point presentation. Each group consists of 6-8 participants. Two clinicians conduct the sessions (usually a psychologist working together with either another psychologist, a psychiatrically trained special education teacher or a physician). The group leaders receive manual training and supervision by an experienced adolescent psychiatrist and CBT supervisor. Between sessions, the participants get a weekly phone call by a coach to follow up on home assignments.

Treatment Fidelity

Treatment fidelity in this project has the overall goal of increasing confidence that changes in the dependent variable are attributable to the independent variables. Analysis of treatment fidelity may help to explain study findings, revise interventions for future testing, and increase statistical power and effect size by reducing random and unintended variability. [27] All sessions (except session 1 and 12) are videotaped and adherence to the manual and to CBT core principles relevant for this study will be assessed through observation by independent raters of a random selection of around 20% of the sessions. The Competence and Adherence Scale for Cognitive Behavioural Therapy (CAS-CBT) [28] covers basic CBT components as well as specific session goals. The user can specify the goals for the particular treatment. The scale was originally developed for the treatment of anxiety disorders, and has shown good to

excellent reliability. Additional items on group dynamics are included. In addition, each group leader will fill in a self-rating scale after each session to evaluate goal achievement in the session and to provide an overall rating of their own work.

Adherence and dropouts

Treatment adherence is assessed by recording the number of completed CBT sessions. In the case of dropouts, the participants are asked to let the questionnaires filled in before the intervention at T2, remain in the study to be included in the data analysis.

Outcome measures

Well-established and validated instruments are used to assess psychiatric morbidity and cognitive and over-all functioning at four time-points. When adequate, adolescent, parent and teacher reports are acquired. The study time-points are T1, intake into the CAP-clinic; T2, study baseline assessment; T3, 3-month follow-up and T4, 12-month follow-up after baseline. The following instruments are used to collect data on adolescent psychiatric morbidity including diagnoses, diagnostic classification, symptom load assessment, and psychosocial functioning at one or more time-points T1, T2, T3 and T4 (Table 3).

ADHD Rating Scale (ADHD-RS)[20] is a questionnaire to be completed by parents (home version) or teachers (school version) to detect ADHD symptoms in children and adolescents. The questionnaire contains 18 questions regarding a child's or an adolescent's behaviour during a specified timeframe rated on a 4-point Likert scale. A self-report version (ADHD-SRS) has been used successfully with adolescents, including treatment studies.[29]

K-SADS – PL Schedule for Affective Disorders and Schizophrenia for School-Age Children present- Life version [23] is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents. Diagnoses of interest to the

present study include attention deficit/hyperactivity disorder (AD/HD), anxiety disorders, mood disorders, tic disorders, conduct disorders and sleep disorders.

Children's Global Assessment Scale (CGAS) [22] is a numeric scale (1 through 100) used to rate the general psychosocial functioning of children under the age of 18. A score above 70 denotes good functioning.

Clinical Global Impression Severity (CGI-S)[24], is used to rate the severity of a patient's illness at the time of assessment. It is a 7-point scale ranging from 1="Normal, not at all ill" to 7="Among the most extremely ill patients", with 0="Not assessed".

Weiss Functional Impairment Rating Scale for parents and adolescents (WFIRS-P, WFIRS-S), [30] are questionnaires appropriate for parent report and adolescent and adult self-report of functional impairment typically affected in ADHD. The questions assess to what degree an individual's behaviour or emotional problems have affected various clinically relevant domains of functioning.

Screen for Child Anxiety Related Emotional Disorders (SCARED) [31] is a 41 items self-report screening questionnaire for anxiety symptoms in youth.

Mood & Feelings Questionnaire (MFQ) [32] is a 34 items inventory self-report tool that measures depressive symptoms in children and adolescents. One question is from the MFQ parent version.[33]

General Perceived Self Efficacy Scale [34] is a 10-items scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life.

Rosenberg Self-Esteem Scale [35] is a 10 items scale widely used self-report instrument for evaluating individual self-esteem in adolescents and adults.

Behaviour Rating Inventory of Executive Function (BRIEF) [36] parent form (BRIEF-P) is an 86 items assessment of executive function behaviours at home and at school for children and adolescents ages 5–18. The BRIEF self-report (BRIEF-SR) provides an adolescent's or an adult's own view of his or her executive functioning behaviours.

Table 3 Instruments used with participants in the project

	T1:	T2:	T3:	T4*:

Instruments used in project (informant)	Admission to CAP	Project intake	Outcome at 3 months	Outcome at 12 months
Kiddie-SADS psychiatric interview (S)		x (S)		
ADHD-RS (ADHD-symptoms) (P/T/S)	x (P,T)	x (P,T,S)	x (P,T,S)	x (S)
Children's Global Assessment Scale (CGAS)	x	x	x	x
ASEBA CBCL/YSR/TRF and BP-Monitor(P/T/S)	x (P,T)			x (BP-M, S)
Clinical Global Impression (CGI)		x	x	x
SCARED (Anxiety)(S)		x	x	
Mood & Feelings Questionnaire (MFQ)(S)		x	x	
BRIEF (Executive Functioning) P/T/S	x P,T,S	x (P,T,S)	x (P,T,S)	
Weiss Functional Impairment Rating Scale (P/S)		x	x	
Adolescent Sleep Wake Scale (S)		x	x	
Rosenberg Self-Esteem Scale (S)		x	x	
General Perceived Self-Efficacy Scale (S)		x	x	X (S)
User satisfaction and usefulness of coaching (S)			x	X (S)

S=Self Report P=Parent report T=Teacher Report *TI=Telephone Interview

ASEBA school-age assessment forms [20] are the CBCL/6-18, completed by parents (120 problem items); the TRF/6-18 (120 problem items), completed by teachers; and the YSR/11-18 (106 problem items and 17 positive qualities items) completed by youths. All three forms include questions related to school, hobbies, chores and inter-personal relations. The forms generate ratings of behavioural and emotional problems and competencies.

ASEBA-YSR Brief Problem Monitor (YSR-BPM) [20] is a short version of the YSR school-age form used for monitoring and follow-up in research and clinical assessment.

Adolescent Sleep-Wake Scale [37] is a 28 items scale and widely used measure of sleep quality in adolescents.

Adolescent Interview at one-year follow-up (T4). The telephone interview includes questions about present school situation or other daytime activity, ADHD medication, and furthermore health assessment and treatment in CAP or adult psychiatry, private psychologists or psychiatrists, or primary care during the past nine months. The interviewer administers the ADHD Rating Scale, ASEBA Brief Problem Monitor and General Perceived Self-Efficacy

Scale during the interview. The interviewer scores the CGAS and CGI blinded to information about group participation.

Medical history and sociodemographic information

In addition to data collection via validated instruments at T1, T2, T3 and T4, we extract data from medical records, including information about parents SES. Treatment history from T3 to T4 is registered at T4 by type (cognitive, neurobiological, psychodynamic, psycho-educational, social-relational, medication), participant (individual, group, parent, family), number of sessions, length of treatment, in-patient or outpatient, indirect patient work, and counselling from community services. Socioeconomic status will be defined as follows: the highest level of parental education will determine parent SES, divided into four categories (≤2 years of high school, completed high school + 1 year, ≤ 4 years academy/university, ≥ 5 years four years academy/university).

Statistics

Outcome measures at T3 contain ADHD symptom scores, clinician rated functioning, self- and parent reported functioning, self-, parent- and teacher reported executive functioning, and self-reported anxiety, depression, sleep, self-esteem and self-efficacy. Outcome measures at T4 contain ADHD symptom scores, clinician rated functioning, and self-reported functioning, anxiety and depression, and self-efficacy. Data will be analysed using mixed-effect models for longitudinal data. Variables included in the assessment of possible interactions with treatment effect will be age, gender, SES, IQ, type of ADHD, and comorbidity. Clinical and demographic variables will be included in the mixed-effect model to explore these effects. Unless the participants withdraw the consent to participate, we will use all available data in an intention to treat analyses.

Sample size

Sample size was calculated for a two samples student's t-test, for a 6 points difference assuming a standard deviation of 9 on the ADHD Rating Scale.[18] With significance level 5%, we need 37 participants in each group to obtain 80% power. To allow for drop-outs, we aim at including 50 participants in each group, in total 100.

Ethics and dissemination

All participating parents and adolescents 16 years or older are required to provide informed consent. The recruitment process explains that participation is voluntary and that participants can withdraw from the study at any time without consequences regarding their treatment in the clinic. The data obtained by questionnaires and clinical assessment is recorded in electronic files that are password protected. Participants receive anonymous study IDs that are stored with the collected data. Identifying information is not stored alongside the parent-, self- or teacher-report data. Only the main investigator and researchers directly involved in data analysis will have access to de-identified data.

The results will be disseminated in peer-reviewed international scientific journals. Furthermore, the study group will present the results of the study at regional, national, and international scientific conferences, in reports to funders, reports to patient advocacy organisations and press releases to news media. Two PhD students will publish and publicly defend dissertations relating to the study. Planned publications include primary and secondary outcomes, feasibility and patient satisfaction with the treatment, and fidelity to the intervention. The CAP clinic and RKBU cooperate extensively with user and patient advocacy organizations, and the research results will be presented to the public during educational seminars arranged by the St. Olav Hospital Learning Centre.

PATIENT AND PUBLIC INVOLVEMENT

We consulted the user committee in the Clinic of Psychiatry at St. Olav University Hospital,

during the planning state of the study in order to receive feedback to the principal investigator. The ADHD association, Mid-Norway, was informed about the project at its planning stage and recommended it to funding authorities and to members. The CAP clinic has an active co-operative network with user organisations and arranges "learning and mastery" course days where patients with ADHD and family members share their experiences. During the course, clinicians give lectures to patients, families and health care providers. Information about the project has been conveyed on such occasions. We will set up a reference group of adolescents from the Norwegian ADHD association as recently suggested by user organizations. The reference group will aid the project with respect to discussion and dissemination of the results.

DISCUSSION

The results from the project will address key gaps in the literature on the treatment of adolescents with ADHD. The project will provide answers to essential research and clinical questions about the long-term outcome of treating ADHD and co-existing psychiatric symptoms in young people.

A weakness of the present study might be the attrition before study start. The study will not fully answer which psychosocial interventions are beneficial for adolescents with ADHD who for various reasons decline to participate in the study or are excluded from the study at intake. A strength of the study, however, is its delivery in a real world setting using practising clinical staff and covering a total catchment are. Furthermore, compared to the previous RCT of CBT group therapy in adolescent ADHD using waiting list control as the comparison condition, [14] the present study employs a different type of control condition with a defined limited clinical follow-up. This is less likely to result in exaggerated short-term effects of the intervention compared to the use of waiting list control.[38]

A second strength of the present study is the use of multiple informants including teacher assessments in the evaluation of the short-term outcome. Teachers may be as accurate as parents are when evaluating ADHD symptoms[39], and provide an important additional

perspective in the assessment of the adolescents. Vidal and colleagues[14] conducted their study in a somewhat older age group than ours and used information from parents and adolescents only. It will be unknown, however, if the teachers in the present study are completely blinded to the assignment of treatment group. At the one-year follow-up, some of our findings may be limited by the fact that the adolescents are the only informants. Self-ratings may be less valid than parent ratings in the prediction of ADHD persistence.[40]

A third strength of our study will be the proposed work related to treatment fidelity. Fidelity, or treatment integrity, as proposed by Dane and Schneider[41] refers to the therapists' ability to follow predefined key components in the program (adherence), as well as the quality of delivery (competence). In addition, dosage, responsiveness from the participants, and program differentiation, meaning avoiding use of central elements from other treatment methods, are relevant factors when measuring fidelity. Fidelity promotes treatment outcome, but still studies including fidelity seem to be lacking.[42] Enhancing treatment fidelity increases internal validity as well as external validity, and a high degree of treatment fidelity is needed for study replication and for generalisation of the treatment to other treatment facilities.

The results of the present study will generate new knowledge and will potentially improve the quality and effectiveness of treatment for adolescents with ADHD. We will communicate the newly generated knowledge directly to local authorities responsible for healthcare services. Because of this project, clinicians receive training in the delivery of CBT and gain expertise in a new treatment method with the potential to benefit patients with ADHD and facilitate further implementation in daily clinical practice.

Results from this study may be generalised to the regional and national populations. Results will have reduced bias using validated instruments in a clinical population with baseline and follow-up data. To our best knowledge, there is no other study at present, which aims to test the effectiveness of CBT group therapy of adolescents with ADHD, with a program uniquely tailored to the needs of the adolescents and in addition tests for patient satisfaction and treatment fidelity.

Collaboration

The study is an active collaboration between the Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare, Norwegian University of Science and Technology, Trondheim, Norway. The core research team make up an international, interdisciplinary research group.

TRIAL STATUS

The study has so far recruited 89 patients, will continue to recruit patients through September 2019 and will gather data until December 2020. One PhD-student has been appointed in the project and one more will be appointed in August 2019.

Trial Registration Clinical Trials NCT02937142

Primary Sponsor Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare (RKBU), The Norwegian University of Science and Technology.

Protocol version February 2019

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Contributors TSN conceived of the study and wrote the applications for funding. The main research team/steering group undertook the research design: TSN, AMS, PHT and SL. ALJH, the first PhD student in the study, contributed to the CBT treatment manual and participates in the gathering of data. AMS supervises the therapists in the study, while TSN, PHT and SL supervise the PhD students. All authors read and provided substantial contribution to the final version of the study protocol and approved of the final version of the manuscript.

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Competing interests PHT has received speaker's fees from MEDICE and Shire within the last three years. AMS has received travel support and congress fee from MEDICE during the last year. The other authors declare no conflicts of interest.

Patient consent Not required.

Ethics approval The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115).

Provenance and peer review Not commissioned; peer reviewed for ethical and funding approval prior to submission.

Open access

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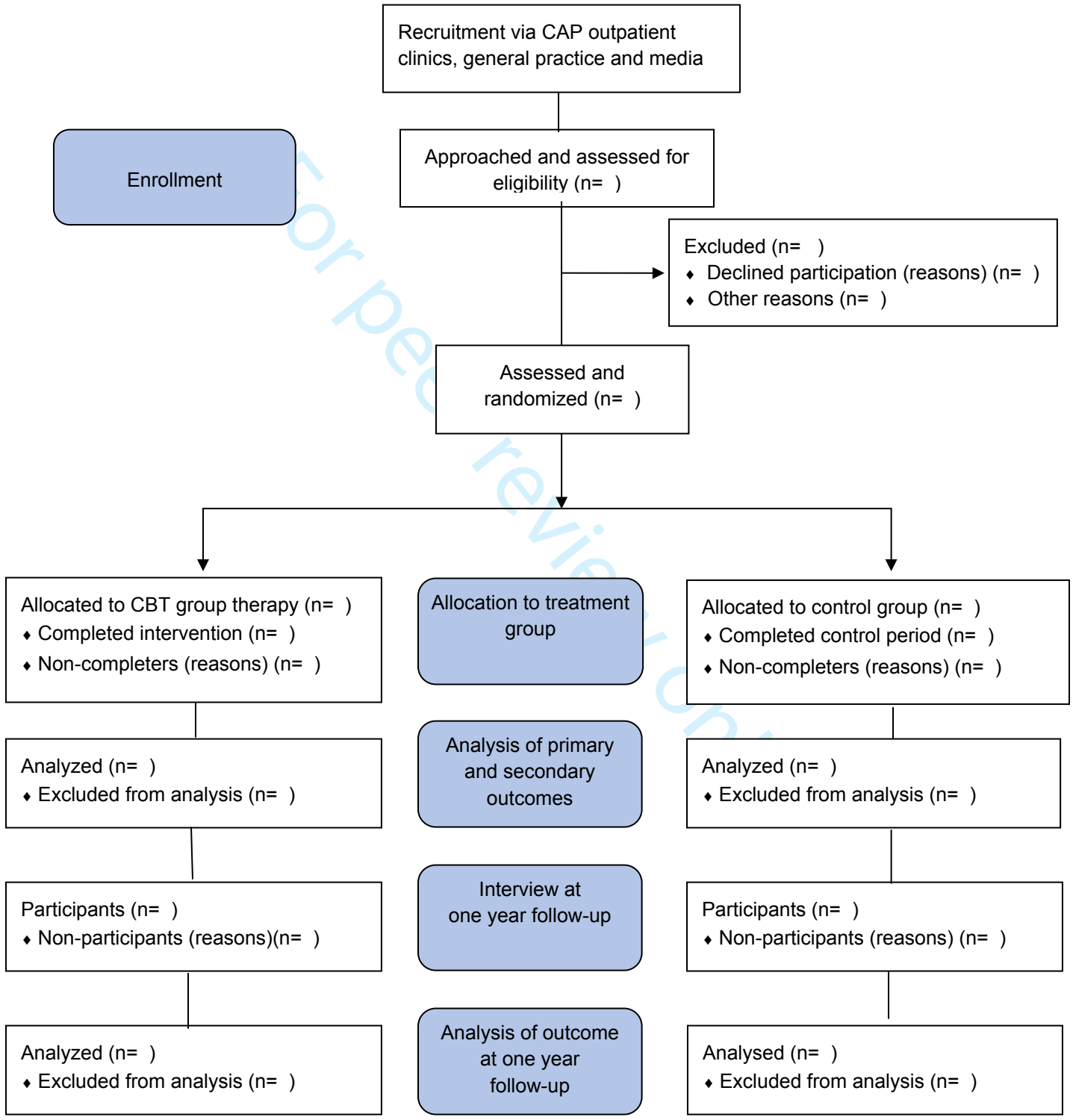
Figure 1 Flow chart diagram of participants in **Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomized Controlled Study**



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Cognitive Behavioural Group Therapy for Adolescents with ADHD – Study Protocol for a Randomised Controlled Trial

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ABSTRACT

Introduction Persistence of Attention Deficit Hyperactivity Disorder (ADHD) into adolescence is a significant burden to patients. Clinical guidelines recommend non-pharmacological therapies, but the evidence to support this recommendation is sparse. This study aims to study the effect of a 12-week group cognitive behaviour therapy (CBT) program for adolescents with ADHD aged 14-18, who still have impairing symptoms after treatment with medication. We will study the effect of the treatment on ADHD symptoms and examine moderators and mediators of the effect of the treatment on ADHD.

Methods and analysis We conduct a Randomised Controlled Trial (RCT) of CBT group therapy in 96 adolescents with ADHD recruited from child psychiatric outpatient units in Mid-Norway. Those who meet inclusion criteria and consent to participation are randomised to a 12-week group intervention or to a control group receiving treatment as usual. Assessments are made at admission to the clinic, pre-intervention, post-intervention and at post-intervention plus nine months, obtaining adolescent, parent and teacher reports. Clinicians blinded to group participation rate all participants as to their functioning pre-intervention and at the two post-intervention assessment points. The primary outcome is change in symptom scores on the ADHD Rating Scale-IV.

Ethics and dissemination The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115). Findings will be disseminated in peer-reviewed publications and conference presentations, to user organisations and at courses attended by families and professionals. Two PhD students will publish and defend dissertations relating to the study. Planned publications include primary and secondary outcomes and patient satisfaction with the treatment. Furthermore, we plan to publish a manual of CBT group therapy in adolescent ADHD to benefit treatment of patients in Norway and elsewhere.

Trial registration Clinical Trials NCT02937142

Strengths and limitations of this study

- An RCT delivered in a real world setting using practising clinical staff and covering a total catchment area.
- Outcome data collected from multiple informants including parents, adolescents and teachers, and blinded clinician assessment.
- Adequate statistical power to detect a clinically meaningful effect in the primary outcome variable.
- Randomization does not control for therapy moderators and process variables such as comorbidities, level of engagement, readiness for change and family support.
- Bias may be introduced by patients refusing to enter the study or by patients who are not randomised to their treatment of choice.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder, which starts in childhood and is characterised by inattention, impulsivity, and hyperactivity that impair functioning.[1] ADHD persists across the lifespan in a majority of patients, and causes significant impairment across multiple domains of daily functioning. A majority of children with ADHD continue to have symptoms and impairment during adolescence. [2 3] The core symptoms contribute to impairment in executive functioning, inhibitory control, working memory and motivation. These deficits prevent the acquisition and implementation of compensatory skills such as organizing and planning, leading to difficulties in handling everyday challenges. During adolescence, ADHD is associated with low academic achievement, interpersonal difficulties, substance use disorders, mood disorders and anxiety disorders continuing into adult life. [3 4] A recent study of comorbidity in a large sample of Norwegian adults with ADHD, shows that both men and women had a 4-9 times higher prevalence of anxiety, depression, bipolar and personality disorders, schizophrenia and substance use disorder than the remaining adult population [5], indicating the potential for introducing preventive measures in young people with ADHD.

Pharmacotherapy with stimulants, atomoxetine or guanfacine is effective in reducing core symptoms of ADHD in most adolescents with moderate to severe ADHD. Medication

may also improve processing speed, work productivity and perseverance.[6] However, pharmacotherapy alone may not be sufficient to remediate ADHD and its comorbid symptoms and disorders. National and international guidelines for ADHD recommend non-pharmacological therapies as the first-line or add-on treatment for young people with ADHD, [7 8] even though there is inadequate evidence to support this recommendation. Specifically, there is limited evidence to support psychological treatments in adolescents with ADHD which have been less studied than psychological treatments in children.[9]

Cognitive behavioural therapy (CBT) is a well-known psychological treatment for mental disorders across disorders and age groups. Meta analyses have documented significant treatment effects on disorders such as Obsessive Compulsive Disorder (OCD), anxiety, and depression across age groups and in ADHD in adults. [10 11] There are currently only three published studies on CBT with adolescents with ADHD, and thus little knowledge exists about short term and long-term treatment effects of CBT on ADHD in this age group. [12-14] Vidal and colleagues [14] found significant improvement in adaptive functioning as well as ADHD symptoms in the treatment group in their RCT of adolescents aged 15-21. Patients with emotional disorders were excluded from the study. It is therefore unknown to what extent CBT treatment could help ADHD patients with comorbid emotional disorders, which are frequent in a teenage population with ADHD.[15]

Previous studies on CBT in other conditions than ADHD have found that different moderators and mediators have implications for treatment effects. For example in the treatment of OCD, comorbidity, age, sex, and lower quality of life were found to be important moderators and predictive of treatment effect. [16] Age, symptom severity, comorbidity rate and adaptive functioning seem to moderate the effect of CBT in patients with depression.[17] Since research on adolescents with ADHD is scarce, we have very limited knowledge of which moderators make the most impact in this patient group. Of note, Vidal and colleagues [14] did not reveal any moderating effect of demographic variables in their study of CBT group therapy outcome.

As there is little knowledge about the short-term outcome psychological treatment programs in adolescents with ADHD, and even less knowledge about long-term outcomes, a study of CBT group therapy would fill a gap in the treatment literature. It would be crucial to know if clinically relevant changes in psychiatric symptoms and functioning were associated with the applied treatment program and particularly whether the observed changes last over time. Such a project would have the potential to provide results that could help fill knowledge gaps and promote improved quality and efficacy of services for adolescents with ADHD.

When planning a study of CBT group therapy in adolescents with ADHD, we found no manual in a Scandinavian language suited to the purpose. Two of the authors (TSN and ALH) therefore developed a manual in Norwegian based on the work of Susan Young and Jessica Bramham[18]. The Young-Bramham program includes group therapy modules addressing core symptoms of ADHD and associated problems. In making the Norwegian adaptation for adolescents, we collaborated with one of the authors, Professor Susan Young, and tested the manual and the feasibility of the treatment in a small pilot-study. We chose modules appropriate for a Norwegian clinical population of adolescents with ADHD, and included the core symptom modules and modules addressing, anxiety, depression, sleep problems and communication. We made some language modifications to better suit a young age group of 14-18 year olds. Based on the findings from the pilot study (see Methods) we concluded that it would be feasible to undertake a study examining the effect of CBT group treatment in adolescents with ADHD.

Aims

The study Cognitive Behaviour Group Therapy in Adolescents with Attention Deficit Hyperactivity Disorder *(Clinical Trials,* NCT02937142), aims to improve the quality and effectiveness of treatment and care of adolescents with ADHD. We aim to obtain new knowledge related to group CBT in adolescents with ADHD 14-18 years of age referred to assessment and treatment at the Child & Adolescent Psychiatric (CAP) Clinic, St. Olav University Hospital, Trondheim, Norway. The primary outcome investigated will be treatment effect on ADHD symptoms in a 12-week manual based group CBT treatment program. We will study the effect post treatment and at post treatment plus nine months follow-up. The secondary outcomes will be characteristics of functional impairment and psychiatric symptoms and the study of possible moderators and mediators of treatment effects. Furthermore, we wish to study the feasibility of the intervention, patient satisfaction and treatment fidelity, and identify therapist factors associated with positive outcomes. The long-term goal of the study group is to publish a Norwegian evidence based treatment manual for the benefit of patients locally and elsewhere.

METHODS AND ANALYSIS

Pilot study

We conducted an 11-week group CBT treatment in eight adolescents with ADHD 15-17 years of age in 2015, based on the first version of the manual. A special education specialist and a psychologist experienced with ADHD conducted the therapy. The participants received a phone call between sessions to remind them about homework assignments as recommended by Lily Hechtman (American Academy of Child & Adolescent Psychiatry, Annual Meeting, San Diego, USA, 2014). Six of the eight adolescents finished the program and filled out a questionnaire about their experience with the therapy. Parents responded to a short telephone interview. The adolescents reported that the program had increased their knowledge of ADHD, that the material presented was useful and that the program was well adapted to personal challenges. They found the proposed techniques understandable. Further, they reported that the group experience was enjoyable and that hearing about other participants' experience was helpful. They were uncertain about planning to use the newly acquired techniques in the future. The parents were generally positive towards the treatment. The majority of the adolescents had made comments at home about the group learning experience and some had started to use new strategies in their schoolwork. Half of the adolescents appeared more self-confident after completing the program. Doing the homework in between sessions and making use of the new strategies in real life was a challenge to the adolescents, as reported by the parents. Based on these findings we concluded that it would be feasible to undertake a study examining the effect of CBT group treatment in adolescents with ADHD. To finalize the study manual we made further language modifications to better suit a young age group of 14-18 year olds. In addition, we removed some details in the material judged less important to this age group. We decided to use telephone coaching in-between sessions to encourage adolescents to extend new strategies into real life situations.

The main study design

The design is a randomised, controlled, rater-blinded study to evaluate the effectiveness of CBT group therapy for adolescents aged 14 to18 with ADHD. We recruit adolescent patients, who receive medical treatment but still have impairing symptoms into the study. The patients are randomly assigned to the intervention group or a control group who receive treatment as

usual. Eligible participants who provide written consent are randomly assigned to the intervention and control groups in a 1:1 ratio. The randomisation is performed using a computer program supplied by the Unit for Applied Clinical Research, a centre of expertise in the Central Norway Health Region. The two groups are followed prospectively to assess the effectiveness of the CBT group program. We completed the Standard Protocol Items; Recommendations for Intervention Trials (SPIRIT) [19] checklist of recommended items to address in a clinical trial process. A flow chart for the timeline for recruitment, follow-up assessments and undertaking analyses is shown in Figure 1.

Insert Figure 1 about here

Study Recruitment

Patients 14 to 18 years of age with a diagnosis of ADHD according to ICD-10[20] are recruited to the study from two Child & Adolescent Psychiatric outpatient units at the St. Olav University Hospital with a catchment area of around 230.000 inhabitants (city of Trondheim and a few surrounding municipalities). The recruitment period lasts two years and nine months starting in winter 2017 and ongoing until mid- September 2019. Very few private practitioners do assessments and treatment of suspected ADHD adolescents in the area. The number of adolescents with ADHD as the main diagnosis or comorbid diagnosis in the age group 14-18 years in the outpatient clinics was 330 as per February 2019. Most adolescent patients with ADHD are prescribed medication. We assess and recruit a few additional participants in the study from general practitioners responsible for patients discharged from the clinic on stable medication, through user organisations, and through advertisements in media and the local newspaper.

Participants and procedure

The diagnostic process at the admission to the clinic (T1) includes information from multiple informants (patients, parents and teachers), including developmental history, somatic status and school functioning. The routine assessment includes interviews with the adolescent and

parents, and the administration of various questionnaires. These include an assessment of emotional and behaviour problems with the ASEBA Checklists[21] and ADHD symptoms by the ADHD Rating Scale-IV (ADHD-RS-IV).[22] IQ scores are obtained using Wechsler Intelligence Scales for Children-WISC-IV. [23] Adaptive functioning is scored using the Children's Global Assessment Scale (CGAS).[24] Routine clinical treatment include adolescent and parent education about ADHD. Patients with moderate to severe ADHD symptoms are offered medical treatment. A brief intervention for emotional problems may be given before starting medical treatment if indicated. We evaluate the patients in relation to the inclusion criteria after at least one month of stable medical treatment with the same medication and dosage.

Inclusion criteria. A diagnosis of ADHD and a Clinical Global Impression Severity (CGI-S) [25] score ≥ 3 (mildly ill, some impairment in one setting). Participants should receive medical treatment for ADHD, but patients may be included in the study if they have tried medication with little effect or experienced intolerable side effects. Participants with comorbid diagnoses (mild to moderate depressive disorders, anxiety disorders, bipolar disorders, behavioural disorders, tic disorders and mild degree of autism spectrum disorders) are included in the study. *Exclusion criteria* are psychosis, mental retardation (IQ < 70), ongoing substance use disorder, severe conduct disorder, suicidal behaviour and severe depression.

The adolescent (and parents) are asked to participate in the study through an open invitation brochure providing information about the aim of the project, the randomization process and the intervention. We invite adolescents who consent to participate into the study.

Assessment procedures

Two clinicians, a clinical neuropsychologist and a child and adolescent psychiatrist, interview the adolescents using a semi-structured psychiatric interview, the Kiddie-SADS PL.[26] We also assess executive functions, general adaptive functioning, anxiety and depression, sleep patterns, self-esteem and self-efficacy. After the pre-intervention assessments (T2), follow up evaluations are performed post-intervention (T3) and at post-intervention plus 9 months (T4). All participants fill in questionnaires at T2 and T3. Participants in the intervention group fill out an additional questionnaire about patient satisfaction with the therapy, at T3. Clinicians blinded to patient assignment complete pre- and post-evaluations. All participants medicated for ADHD are asked during a weekly telephone call if they use their medication as prescribed

and further if they have started psychotherapy or other treatment. During the interview at T4, the participants report on ADHD symptoms, emotional and behavioural problems, school functioning and self-efficacy. The interviewers score general and adaptive functioning. In addition, the subjects are asked about current and past treatment during the past 9 months and their impression of the CBT group therapy in a longer perspective. See Table 1 for a SPIRIT[19] table for the evaluation of the study.

Table 1 SPIRIT table for evaluation of the **Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomised Controlled Trial**

	STUDY PERIOD						
	Enrolment[1]	**Allocation[2]**	**Post-allocation**				**Close-out**
			Pre-T2	***Mid-***	***Post-T2***	***Post-+9 months T4***	
Coh1: Q1 2017	***Coh1: Q1 2017***	***Q1 2017***	***Coh1: Q1 -2017***	***Coh1: Q1 -2017***	***Coh1: Q2 -2017***	***Coh1: Q2 2018***	
Coh2: Q3 2017	***Coh2: Q3 2017***	***Q2 2017***	***Coh2: Q3 -2017***	***Coh2: Q3 -2017***	***Coh2: Q4 -2017***	***Coh2: Q4 2018***	
Coh3: Q1 2018	***Coh3: Q1 2018***	***Q3 2018***	***Coh3: Q1 -2018***	***Coh3: Q1 -2018***	***Coh3: Q2 -2018***	***Coh3: Q2 2019***	
Coh4: Q3 2018	***Coh4: Q3 2018***	***Q4 2018***	***Coh4: Q3 -2018***	***Coh4: Q3 -2018***	***Coh4: Q4 -2018***	***Coh4: Q4 2019***	
Coh5: Q1 2019	***Coh5: Q1 2019***	***Q5 2019***	***Coh5: Q1 -2019***	***Coh5: Q1 -2019***	***Coh5: Q2 -2019***	***Coh5:Q2 2020***	
Coh6: Q3 2019	***Coh6: Q3 2019***	***Q6 2019***	***Coh6: Q3-2019***	***Coh6: Q3-2019***	***Coh6: Q4-2019***	***Coh6: Q4-2020***	***Coh6: Q4-2020***
ENROLMENT:							
Eligibility screen[3]			X				
Informed consent	X						
Allocation		X					
INTERVENTIONS:							
Int.: CBT + medic.			←	—	→		
Ctr.: Medication			←	—	→		
ASSESSMENT:							
Psychiatric diagnosis[4]			X				
Illness severity[5]			X		X	X	
Psychosocial Funct.[6]			X		X	X	
PRIMARY OUTCOME							
ADHD symptoms[7]			X[3]		X	X	
SECOND OUTCOMES							
Behaviour problems[8]						X	
Emotional problems[8]						X	
Functional Impairment[9]			X		X		
Anxiety[10]			X		X		
Depression[11]			X		X		
Sleep[12]			X		X		
Self-esteem[13]			X		X		
Self-efficacy[14]			X		X	X	
Executive functioning[15]			X		X		
Treatment satisfaction					X	X	
Treatment fidelity							X

[1]Enrollment occurs in the semester of the delivery of the intervention. Each cohort represents a group of adolescents recruited during the semester. [2]Allocation (randomization) is conducted at the individual level. [3]Study eligibility for individual adolescents is based on ADHD diagnosis and being stable on medication (primary outcome measure). [4]Kiddie-SADS-PL, [5]Clinical Global Impression Severity, [6]Children's Global Assessment Scale, [7]ADHD-Rating Scale-IV, [8]ASEBA Brief Problem-Monitor, [9]Weiss Functional Impairment Rating Scale, [10]SCARED, [11]Mood & Feelings Questionnaire, [12]Adolescents' Sleep-Wake Scale, [13]Rosenberg Self-Esteem Scale, [14]General

Perceived Self-Efficacy Scale.

Interventions

Table 2 Core treatment modules in the research manual

MODULES		SESSION
Core symptom modules	What is ADHD?	1
	Attention	2
	Memory	3
	Organization and time management	4
	Impulsivity	5
Comorbid disorders and difficulties	Problem solving	6
	Anxiety	7
	Sadness and depression	8
	Sleep	8
	Communication	9
	Frustration and anger	10
The future	Preparing for the future	11, 12

CBT group. The intervention consists of 12 weekly cognitive behaviour therapy sessions addressing core difficulties and concerns of the adolescent population with ADHD, each session lasting 90 minutes. The last two sessions consists of a review of the contents and planning for the future (Table 2). Parents are not involved in the treatment sessions. The manual is structured and includes methods and key points, which are used in each session. The key points are visualised in a power point presentation. Each group consists of 6-8 participants. Two clinicians conduct the sessions (usually a psychologist working together with either another psychologist, a psychiatrically trained special education teacher or a physician). The group leaders receive manual training and supervision by an experienced adolescent psychiatrist and CBT supervisor. Between sessions, the participants get a weekly phone call by a coach to motivate the adolescents and follow up on home assignments. Participants do not receive any other treatment than CBT group therapy and medication in the 12-week period. One routine medical follow-up is performed during the intervention period, with registration of blood pressure, weight and side effects of medication according to standard clinical follow-up in the CAP clinic.

Control group. Participants in the control group continue with medical treatment and receive one routine medical follow-up according to standard clinical follow-up in the same way as the intervention group. This is in accordance with treatment-as-usual, as only medical treatment is offered routinely in the clinic at this stage. Participants who do not use medication receive one session with a clinician to monitor their clinical status. After the post-treatment assessments (at T3), there is no offering to enter a CBT group, but patients may have other treatments according to their clinical needs.

Treatment Fidelity

Treatment fidelity in this project has the overall goal of increasing confidence that changes in the dependent variable are attributable to the independent variables. Analysis of treatment fidelity may help to explain study findings, revise interventions for future testing, and increase statistical power and effect size by reducing random and unintended variability. [27] All sessions (except session 1 and 12) are videotaped and adherence to the manual and to CBT core principles relevant for this study will be assessed through observations by independent raters from a random selection of around 20% of the sessions. The Competence and Adherence Scale for Cognitive Behavioural Therapy (CAS-CBT) [28] covers basic CBT components as well as specific session goals. The user can specify the goals for the particular treatment. The scale was originally developed for the treatment of anxiety disorders. It has shown good to excellent reliability. Additional items on group dynamics are included. In addition, each group leader will fill in a self-rating scale after each session to evaluate goal achievement in the session and to provide an overall rating of their own work.

Adherence and dropouts

Treatment adherence is assessed by recording the number of completed CBT sessions. In the case of dropouts, the participants are asked to let the questionnaires filled in before the intervention at T2, remain in the study to be included in the data analysis.

Outcome measures

Well-established and validated instruments are used to assess psychiatric morbidity and cognitive and over-all functioning at four time-points. When adequate, adolescent, parent and teacher reports are acquired. The following instruments are used to collect data from various informants on adolescent psychiatric morbidity including diagnoses, diagnostic classification, symptom load assessment, and psychosocial functioning at one or more time-points from T1-T4 (Table 3).

ADHD Rating Scale IV (ADHD-RS-IV) [22] is a questionnaire completed by parents (home version) or teachers (school version) to detect ADHD symptoms in children and adolescents. The questionnaire contains 18 questions regarding a child's or an adolescent's behaviour during a specified timeframe rated on a 4-point Likert scale.

K-SADS – PL Schedule for Affective Disorders and Schizophrenia for School-Age Children present- Life version [26] is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents. Diagnoses of interest to the present study include ADHD, anxiety disorders, mood disorders, tic disorders, conduct disorders and sleep disorders.

Children's Global Assessment Scale (CGAS) [24] is a numeric scale (1 through 100) used to rate the general psychosocial functioning of children under the age of 18. A score above 70 denotes good functioning.

Clinical Global Impression Severity (CGI-S) [25], is used to rate the severity of a patient's illness at the time of assessment. It is a 7-point scale ranging from 1="Normal, not at all ill" to 7="Among the most extremely ill patients", with 0="Not assessed".

Weiss Functional Impairment Rating Scale for parents and adolescents (WFIRS-P, WFIRS-S) [29] are questionnaires appropriate for parent report and adolescent and adult self-report of functional impairment typically affected in ADHD. The questions assess to what degree an individual's behaviour or emotional problems have affected various clinically relevant domains of functioning.

Screen for Child Anxiety Related Emotional Disorders (SCARED) [30] is a 41 items self-report screening questionnaire for anxiety symptoms in youth.

Mood & Feelings Questionnaire (MFQ) [31] is a 33 items inventory self-report tool that measures depressive symptoms in children and adolescents. The last question in the 34 item

Norwegian version, "I wasn't as happy as usual even when praised and rewarded", is from the MFQ parent version.[32]

General Perceived Self Efficacy Scale [33] is a 10-items scale designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life.

Rosenberg Self-Esteem Scale [34] is a 10 items scale widely used self-report instrument for evaluating individual self-esteem in adolescents and adults.

Behaviour Rating Inventory of Executive Function (BRIEF) [35] parent form (BRIEF-P) is an 86 items assessment of executive function behaviours at home and at school for children and adolescents ages 5–18. The BRIEF self-report (BRIEF-SR) provides an adolescent's or an adult's own view of his or her executive functioning behaviours.

Table 3 Instruments used with various informants at admission to the CAP clinic and during time points in the study

Instruments used in study (informant)	T1: Admission to CAP	T2: Pre-	T3: Post-	T4*: Post- + 9 months
Kiddie-SADS psychiatric interview (S)		x		
ADHD-RS (ADHD-symptoms) (P,T,S)	X(P,T)	X (P,T,S)	X (P,T,S)	X(S)
Children's Global Assessment Scale (CGAS)(C)	x	x	x	x
ASEBA YSR Brief Problem-Monitor (S)				x
Clinical Global Impression (CGI) (C)		x	x	x
SCARED (Anxiety)(S)		x	x	
Mood & Feelings Questionnaire (MFQ)(S)		x	x	
BRIEF (Executive Functioning) P,T,S	X (P,T)	X (P,T,S)	X (P,T,S)	
Weiss Functional Impairment Rating Scale (P,S)		x	x	
Adolescent Sleep Wake Scale (S)		x	x	
Rosenberg Self-Esteem Scale (S)		x	x	
General Perceived Self-Efficacy Scale (S)		x	x	x
User satisfaction, usefulness of coaching (S)			x	x

S=Self Report P=Parent report T=Teacher Report C=Clinician evaluation *Telephone Interview

ASEBA-YSR Brief Problem Monitor (YSR-BPM) [21] is a short version of the Youth Self Report school-age form. It includes questions about behavioural and emotional problems and is used for monitoring and follow-up in research and clinical assessment.

Adolescent Sleep-Wake Scale [36] is a 28 items scale and widely used measure of sleep quality in adolescents.

Adolescent Interview at one-year follow-up (T4). The telephone interview includes questions about present school situation or other daytime activity, ADHD medication, and furthermore health assessment and treatment in CAP or adult psychiatry, private psychologists or psychiatrists, or primary care during the past nine months. The interviewer administers the ADHD-RS-IV, YSR-BPM and the General Perceived Self-Efficacy Scale during the interview. The interviewer scores the CGAS and CGI blinded to information about group participation.

Medical history and sociodemographic information

In addition to data collection via validated instruments at T1, T2, T3 and T4, we extract data from medical records, including information about parent Socioeconomic Status (SES). Treatment history from T3 to T4 is registered at T4 by type (cognitive, neurobiological, psychodynamic, psycho-educational, social-relational, medication), participant (individual, group, parent, family), number of sessions, length of treatment, in-patient or outpatient, indirect patient work, and counselling from community services. SES will be defined as follows: the highest level of parental education will determine parent SES, divided into four categories (≤2 years of high school, completed high school + 1 year, ≤ 4 years academy/university, ≥ 5 years four years academy/university).

Statistics

Outcome measures at T3 contain ADHD symptom scores, clinician rated functioning, self- and parent reported functioning, self-, parent- and teacher reported executive functioning, and self-reported anxiety, depression, sleep, self-esteem and self-efficacy. Outcome measures at T4 contain self-reported ADHD symptom scores, clinician rated functioning, self-reported functioning, anxiety and depression, and self-efficacy. Data will be analysed using mixed-

effect models for longitudinal data. Variables included in the assessment of possible interactions with treatment effect will be age, gender, SES, IQ, type of ADHD, and comorbidity. Clinical and demographic variables will be included in the mixed-effect model to explore these effects. Unless the participants withdraw the consent to participate, we will use all available data from participants with relevant outcome data in an intention-to-treat analysis.

Sample size

Sample size was calculated for a two samples student's t-test, for a 6 points difference assuming a standard deviation of 9 on the ADHD-RS-IV. [22] The rationale for the use of a 6 points difference is supported by the work of Coghill and Seth[37] who provide a guide for clinical interpretation of scores from the ADHD-RS-IV. They interpret total scores of 19-26 after a medication trial as partial response, and 26 % reduction in scores as a good response. The two previous RCTs of CBT in adolescent ADHD used a 6 points difference in ADHD-RS scores[14] or a 30 % reduction in ADHD-RS scores[13], respectively. With significance level 5 %, we need 37 participants in each group to obtain 80 % power. To allow for dropouts, we aim at including 48 participants in each group, in total 96.

Ethics and dissemination

All participating parents and adolescents 16 years or older are required to provide informed consent. The recruitment process explains that participation is voluntary and that participants can withdraw from the study at any time without consequences regarding their treatment in the clinic. All participants receive documents explaining the purpose and procedures in the study. We record the data obtained by questionnaires and clinical assessment in electronic files that are password protected. Participants receive anonymous study IDs that are stored with the collected data. Identifying information is not stored alongside the parent-, self- or teacher-report data. Only the main investigator and researchers directly involved in data analysis will have access to de-identified data.

We will disseminate the results in peer-reviewed international scientific journals. Furthermore, the study group will present the results of the study at regional, national, and international scientific conferences, in reports to funders, reports to patient advocacy

organisations and press releases to news media. Two PhD students will publish and publicly defend dissertations relating to the study. Planned publications include primary and secondary outcomes, feasibility and patient satisfaction with the treatment, and fidelity to the intervention. The CAP clinic and Regional Centre for Child and Youth Mental Health and Child Welfare (RKBU) cooperate extensively with user and patient advocacy organizations, and the research results will be presented to the public during educational seminars arranged by the St. Olav Hospital Learning Centre.

PATIENT AND PUBLIC INVOLVEMENT

We consulted the user committee in the Clinic of Psychiatry at St. Olav University Hospital, during the planning state of the study in order to receive feedback to the principal investigator. The ADHD association, Mid-Norway, was informed about the project at its planning stage and recommended it to funding authorities and to members. The CAP clinic has an active co-operative network with user organisations and arranges "learning and mastery" course days where patients with ADHD and family members share their experiences. During the course, clinicians give lectures to patients, families and health care providers. Information about the project has been conveyed on such occasions. We will set up a reference group of adolescents from the Norwegian ADHD association as recently suggested by user organizations. The reference group will aid the project with respect to discussion and dissemination of the results.

DISCUSSION

To date there are few RCT studies of CBT in adolescent ADHD. We have designed an RCT that aims to test the effectiveness of CBT group therapy, with a program uniquely tailored to the needs of the adolescents. In addition, we will test for patient satisfaction and treatment fidelity. We test the effectiveness of CBT group therapy in a younger age group than a previous RCT of CBT group therapy in adolescents and young adults with ADHD[14].

The present study offers an advantage in its delivery of group CBT in a real world setting using practising clinical staff and covering a total catchment area. The study employs a different type of control condition than previous studies[14] with a defined limited clinical follow-up. This is less likely to result in exaggerated short-term effects of the intervention

compared to the use of waiting list controls.[38] Another advantage is the use of multiple informants in the assessment of the outcome. Teachers may be as accurate as parents are when evaluating ADHD symptoms[39] and provide an important additional perspective to parents and adolescents.

At the follow-up at 9 months post treatment, some findings may be limited by the fact that the adolescents are the only informants. Self-ratings may be less valid than parent ratings in the prediction of ADHD persistence. [40] The sample recruitment may be biased in ways that are difficult to measure. For example, participants may be those who are more engaged and ready for change or have better family support. Further, randomization does not control for therapy moderators such as psychiatric comorbidities and personality factors associated with these comorbidities. In addition, bias may be introduced by adolescents who refuse to enter the study, or by adolescents who do not get their treatment of choice after randomization.

If the group CBT is shown to be significantly more effective compared to treatment-as-usual, this may encourage the wider dissemination and utilization of the treatment in the care of adolescents with ADHD. Such initiatives have the potential to increase the number of adolescents who receive effective care to benefit patients in Norway and elsewhere. When designing the study we decided to examine the effect of group CBT as an add-on to medication, as this seems a reasonable first step before studying the effect of the treatment in adolescents who do not receive medication. Steps might be taken to study the feasibility and treatment effects in adolescents who do not use medication in the future.

Collaboration

The study is an active collaboration between the Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare, Norwegian University of Science and Technology, Trondheim, Norway. The core research team make up an international, interdisciplinary research group.

TRIAL STATUS

The study has so far recruited 89 patients, will continue to recruit patients through September 2019 and will gather data until December 2020. One PhD-student has been appointed in the project and one more will be appointed in August 2019.

Trial Registration Clinical Trials NCT02937142

Primary Sponsor Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare (RKBU), The Norwegian University of Science and Technology.

Protocol version February 2019

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Contributors TSN conceived of the study and wrote the applications for funding. The main research team/steering group undertook the research design: TSN, AMS, PHT and SL. ALJH, the first PhD student in the study, contributed to the CBT treatment manual and participates in the gathering of data. AMS supervises the therapists in the study, while TSN, PHT and SL supervise the PhD students. All authors read and provided substantial contribution to the final version of the study protocol and approved of the final version of the manuscript.

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Competing interests PHT has received speaker's fees from MEDICE and Shire within the last three years. AMS has received travel support and congress fee from MEDICE during the last year. The other authors declare no conflicts of interest.

Patient consent Not required.

Ethics approval The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115).

Provenance and peer review Not commissioned; peer reviewed for ethical and funding approval prior to submission.

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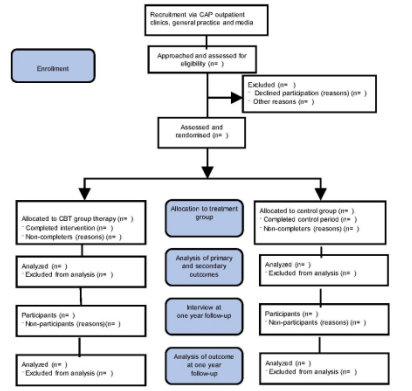
Legend Table 1

[1]Enrollment occurs in the semester of the delivery of the intervention. Each cohort represents a group of adolescents recruited during the semester. [2]Allocation (randomization) is conducted at the individual level. [3]Study eligibility for individual adolescents is based on ADHD diagnosis and being stable on medication (primary outcome measure). [4]Kiddie-SADS-PL, [5]Clinical Global Impression Severity, [6]Children's Global Assessment Scale, [7]ADHD-Rating Scale-IV, [8]ASEBA Brief Problem-Monitor, [9]Weiss Functional Impairment Rating Scale, [10]SCARED, [11]Mood & Feelings Questionnaire, [12]Adolescents' Sleep-Wake Scale, [13]Rosenberg Self-Esteem Scale, [14]General Perceived Self-Efficacy Scale.

Legend Table 3

S=Self Report P=Parent report T=Teacher Report C=Clinician evaluation *Telephone Interview

Figure 1 Flow chart diagram of participants in Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomised Controlled Study



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SPIRIT

STANDARD PROTOCOL ITEMS: RECOMMENDATIONS FOR INTERVENTIONAL TRIALS

SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	Item No	Description
Administrative information		
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym. Pages 1 and 2.
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry. Page 2.
	2b	All items from the World Health Organization Trial Registration Data Set. N/a
Protocol version	3	Date and version identifier. Page 18.
Funding	4	Sources and types of financial, material, and other support. Page 19.
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors. Page 19.
	5b	Name and contact information for the trial sponsor. N/a.
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities. N/a
	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee). Page 19
Introduction		
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention. Page 4-5
	6b	Explanation for choice of comparators. Page 17-18
Objectives	7	Specific objectives or hypotheses. Page 5

Trial design	8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, noninferiority, exploratory). Page 6.
Methods: Participants, interventions, and outcomes		
Study setting	9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained. Page 7
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists). Page 8.
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered. Page 11
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving/worsening disease). N/a.
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return, laboratory tests). Pages 8
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial. Page 11
Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended. Pages 12-15
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure) Table 1, page 10
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations. Page 16
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size. Page 8
Methods: Assignment of interventions (for controlled trials)		
Allocation:		Page 10

Sequence generation	16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions. Page 7
Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned. N/a
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions. Pages 8 and 15
Blinding (masking)	17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how. Page 8.
	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial. n/a
Methods: Data collection, management, and analysis		
Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol. Pages 8, 12-16
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols. Page 12.
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol. Page 16.
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol. Page 15
	20b	Methods for any additional analyses (eg, subgroup and adjusted analyses). N/a
	20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation) Page 16

Methods: Monitoring

Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed. N/a
	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial. n/a
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct. N/a
Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor. n/a

Ethics and dissemination

Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval. n/a (study approved 2015)
Protocol amendments	25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC/IRBs, trial participants, trial registries, journals, regulators). N/a
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32). Page 16
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable. n/a
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial. Page 16.
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site. Page 19
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators. Page 16
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation. Page 12

Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions. Page 16
	31b	Authorship eligibility guidelines and any intended use of professional writers. Page 16.
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code. N/a.
Appendices		
Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates. Page 16.
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable. N/a

*It is strongly recommended that this checklist be read in conjunction with the SPIRIT 2013 Explanation & Elaboration for important clarification on the items. Amendments to the protocol should be tracked and dated. The SPIRIT checklist is copyrighted by the SPIRIT Group under the Creative Commons "Attribution-NonCommercial-NoDerivs 3.0 Unported" license.

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Cognitive Behavioural Group Therapy for Adolescents with ADHD – Study Protocol for a Randomised Controlled Trial

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ABSTRACT

Introduction Persistence of Attention Deficit/Hyperactivity Disorder (ADHD) into adolescence is a significant burden to patients. Clinical guidelines recommend non-pharmacological therapies, but the evidence to support this recommendation is sparse. This study aims to evaluate the effect of a 12-week group cognitive behaviour therapy (CBT) program for adolescents with ADHD aged 14-18, who still have impairing symptoms after treatment with medication. We will study the effect of the treatment on ADHD symptoms and examine moderators and mediators of the effect of the treatment on ADHD.

Methods and analysis We conduct a Randomised Controlled Trial (RCT) of CBT group therapy in adolescents with ADHD recruited from child psychiatric outpatient units in Mid-Norway. 99 adolescents who met inclusion criteria and consented to participation have been randomised to a 12-week group intervention or to a control group receiving treatment as usual. Assessments are made at admission to the clinic, pre-intervention, post-intervention and at a nine-month follow-up, obtaining adolescent, parent and teacher reports. Clinicians blinded to group allocation rate all participants as to their functioning pre-intervention and at the two post-intervention assessment points. The primary outcome is change in symptom scores on the ADHD Rating Scale-IV.

Ethics and dissemination The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115). We will disseminate the findings in peer-reviewed publications and conference presentations, to user organisations and at courses attended by families and professionals. Two PhD students will publish and defend dissertations relating to the study. Planned publications include primary and secondary outcomes and patient satisfaction with the treatment. Furthermore, we plan to publish a manual of CBT group therapy in adolescent ADHD to benefit treatment of patients in Norway and elsewhere.

Trial registration Clinical Trials NCT02937142

Strengths and limitations of this study

- An RCT delivered in a real world setting using practising clinical staff and covering a total catchment area.
- Outcome data collected from multiple informants including parents, adolescents and teachers, and blinded clinician assessment.
- Adequate statistical power to detect a clinically meaningful effect in the primary outcome variable.
- Randomisation does not control for therapy moderators and process variables such as comorbidities, level of engagement, readiness for change and family support.
- Bias may be introduced by patients refusing to enter the study or by patients who are not randomised to their treatment of choice.

INTRODUCTION

Attention Deficit/Hyperactivity disorder (ADHD) is a neurodevelopmental disorder, which starts in childhood and is characterised by inattention, impulsivity, and hyperactivity that impair functioning.[1] ADHD persists across the lifespan in a majority of patients, and causes significant impairment across multiple domains of daily functioning. A majority of children with ADHD continue to have symptoms and impairment during adolescence. [2 3] The core symptoms contribute to impairment in executive functioning, inhibitory control, working memory and motivation. These deficits prevent the acquisition and implementation of compensatory skills such as organizing and planning, leading to difficulties in handling everyday challenges. During adolescence, ADHD is associated with low academic achievement, interpersonal difficulties, substance use disorders, mood disorders and anxiety disorders continuing into adult life. [3 4] A recent study of comorbidity in a large sample of Norwegian adults with ADHD, shows that both men and women had a 4-9 times higher prevalence of anxiety, depression, bipolar and personality disorders, schizophrenia and substance use disorder than the remaining adult population [5], indicating the potential for introducing preventive measures in young people with ADHD.

Pharmacotherapy with stimulants, atomoxetine or guanfacine is effective in reducing core symptoms of ADHD in most adolescents with moderate to severe ADHD. [6] Medication

may also improve processing speed, work productivity and perseverance.[7] However, pharmacotherapy alone may not be sufficient to remediate ADHD and its comorbid symptoms and disorders. National and international guidelines for ADHD recommend non-pharmacological therapies as the first-line or add-on treatment for young people with ADHD, [8 9] even though there is inadequate evidence to support this recommendation. Specifically, there is limited evidence to support psychological treatments in adolescents with ADHD, which have been less studied than psychological treatments in children.[10]

Cognitive behavioural therapy (CBT) is a well-known psychological treatment for mental disorders across disorders and age groups. Meta analyses have documented significant treatment effects on disorders such as Obsessive Compulsive Disorder (OCD), anxiety, and depression across age groups and in ADHD in adults. [11 12] There are currently only three published studies on CBT with adolescents with ADHD, and thus little knowledge exists about short term and long-term treatment effects of CBT on ADHD in this age group. [13 14] Vidal and colleagues [15] found significant improvement in adaptive functioning as well as ADHD symptoms in the treatment group in their RCT of adolescents aged 15-21. Patients with emotional disorders were excluded from the study. It is therefore unknown to what extent CBT treatment could help ADHD patients with comorbid emotional disorders, which are frequent in a teenage population with ADHD.[16]

Previous studies on CBT in other conditions than ADHD have found that different moderators and mediators have implications for treatment effects. For example in the treatment of OCD in children and adolescents, comorbidity, age, sex, and lower quality of life were found to be important moderators and predictive of treatment effect. [17] Age, symptom severity, comorbidity rate and adaptive functioning seem to moderate the effect of CBT in adolescents with depression.[18] Since research on adolescents with ADHD is scarce, we have very limited knowledge of which moderators make the most impact in this patient group. Of note, Vidal and colleagues [15] did not reveal any moderating effect of demographic variables in their study of CBT group therapy outcome.

As there is little knowledge about the short-term outcome psychological treatment programs in adolescents with ADHD, and even less knowledge about long-term outcomes, a study of CBT group therapy would fill a gap in the treatment literature. It would be crucial to know if clinically relevant changes in psychiatric symptoms and functioning were associated with the applied treatment program and particularly whether the observed changes last over time. Such a project would have the potential to provide results that could help fill knowledge gaps and promote improved quality and efficacy of services for adolescents with ADHD.

When planning a study of CBT group therapy in adolescents with ADHD, we found no manual in a Scandinavian language suited to the purpose. We therefore developed a research manual in Norwegian based on previous work by one of the authors, Susan Young. [19]. The CBT program developed by Susan Young and her colleague Jessica Bramham for use with adolescents and adults includes group therapy modules addressing core symptoms of ADHD and associated problems. After making the Norwegian translation, we tested the manual and the feasibility and acceptability of the treatment in an 11-week pilot study with eight adolescents aged 15-18 from a child and adolescent outpatient clinic. We found the weekly manual-based program both feasible and well accepted by both adolescents and parents. When planning a large Randomised Controlled Trial (RCT) to evaluate the effects of the treatment, we made some further adaptations in language, materials and activities to improve the fit to the adolescent age group. We decided to use telephone coaching in-between sessions to encourage the adolescents to extend new strategies into real life situations. We expected this to be important in working with adolescents with ADHD who may have planning and organisation difficulties.

Aims

The study Cognitive Behaviour Group Therapy in Adolescents with Attention Deficit Hyperactivity Disorder *(Clinical Trials,* NCT02937142), aims to improve the quality and effectiveness of treatment and care of adolescents with ADHD. We aim to obtain new knowledge related to group CBT in adolescents with ADHD 14-18 years of age referred to assessment and treatment at the Child & Adolescent Psychiatric (CAP) Clinic, St. Olav University Hospital, Trondheim, Norway. The primary outcome investigated will be treatment effect on ADHD symptoms in a 12-week manual based group CBT treatment program. We will study the effect post treatment and at a nine-month follow-up. The secondary outcomes will be characteristics of functional impairment and psychiatric symptoms and the study of moderators and possible mediators of treatment effects. Furthermore, we wish to study the feasibility of the intervention, patient satisfaction and treatment fidelity, and identify therapist factors associated with positive outcomes. We hypothesise that the CBT group will have fewer ADHD symptoms, less severe ADHD, fewer comorbid problems, higher self-efficacy and better functioning at the end of the treatment and at the 9-month follow-up, than the

control group. We expect adolescents who are older, who have a higher IQ, come from a higher SES background, and have comorbid emotional problems to have a more favourable treatment outcome. We hypothesise that change in anxiety problems during treatment could be a mediator of the primary outcome, as the intervention has a focus on reducing anxiety and coping with the challenges associated with ADHD. We expect adolescents with more ADHD symptoms at intake, a higher degree of ADHD severity, more executive dysfunction problems, lower adaptive functioning and comorbid behaviour disorder to have a less favourable outcome.

METHODS AND ANALYSIS

The main study design

The design is a randomised, controlled, rater-blinded study to evaluate the effectiveness of CBT group therapy for adolescents aged 14 to18 with ADHD. We recruited adolescent patients, who received medical treatment but still had impairing symptoms into the study. The patients were randomly assigned to the intervention group or a control group who received treatment as usual. Eligible participants who provided written consent were randomly assigned to the intervention and control groups in a 1:1 ratio. The randomisation was performed using a computer program supplied by the Unit for Applied Clinical Research, a centre of expertise in the Central Norway Health Region. The two groups are followed prospectively to assess the effectiveness of the CBT group program. We completed the Standard Protocol Items; Recommendations for Intervention Trials (SPIRIT) [20] checklist of recommended items to address in a clinical trial process. A flow chart for the timeline for recruitment, follow-up assessments and undertaking analyses is shown in Figure 1.

Insert Figure 1 about here

Study Recruitment

Patients 14 to 18 years of age with a diagnosis of ADHD according to ICD-10 [21] were recruited to the study from two Child & Adolescent Psychiatric outpatient units at the St. Olav University Hospital with a catchment area of around 230.000 inhabitants (city of Trondheim and a few surrounding municipalities). The recruitment period lasted two years and nine months starting in winter 2017 and ending in September 2019. Very few private practitioners do assessments and treatment of suspected ADHD adolescents in the area. The number of adolescents with ADHD as the main diagnosis or comorbid diagnosis in the age group 14-18 years in the outpatient clinics was 330 as per February 2019. Most adolescent patients with ADHD are prescribed medication. We assessed and recruited a few additional participants in the study from general practitioners responsible for patients discharged from the clinic on stable medication, through user organisations, and through advertisements in media and the local newspaper.

Participants and procedure

The diagnostic process at the admission to the clinic (T1) includes information from multiple informants (patients, parents and teachers), including developmental history, somatic status and school functioning. The routine assessment includes interviews with the adolescent and parents, and the administration of various questionnaires. These include an assessment of emotional and behaviour problems with the ASEBA Checklists [22] and ADHD symptoms by the ADHD Rating Scale-IV (ADHD-RS-IV).[23] IQ scores are obtained using Wechsler Intelligence Scales for Children-WISC-IV. [24] Adaptive functioning is scored using the Children's Global Assessment Scale (CGAS).[25] Routine clinical treatment include adolescent and parent education about ADHD. Patients with moderate to severe ADHD symptoms are offered medical treatment. A brief intervention for emotional problems may be given before starting medical treatment if indicated. We evaluated the patients in relation to the inclusion criteria after at least one month of stable medical treatment with the same medication and dosage.

Inclusion criteria. A diagnosis of ADHD and a Clinical Global Impression Severity (CGI-S) [26] score ≥ 3 (mildly ill, some impairment in one setting). Participants should receive medical treatment for ADHD, but patients could be included in the study if they had tried

medication with little effect or experienced intolerable side effects. Participants with comorbid diagnoses (typically mild to moderate depressive disorders, anxiety disorders, bipolar disorders, behavioural disorders, tic disorders and mild degree of autism spectrum disorders) were included in the study. *Exclusion criteria* were psychosis, mental retardation (IQ < 70), ongoing substance use disorder, severe conduct disorder, suicidal behaviour and severe depression.

The adolescent (and parents) were asked to participate in the study through an open invitation brochure providing information about the aim of the project, the randomisation process and the intervention. We invited adolescents who consented to participate into the study.

Assessment procedures

Two clinicians, a clinical neuropsychologist and a child and adolescent psychiatrist, interviewed the adolescents using a semi-structured psychiatric interview, the Kiddie-SADS PL.[27] We also assessed executive functions, general adaptive functioning, anxiety and depression, sleep patterns, self-esteem and self-efficacy. After the pre-intervention assessments (T2), follow-up evaluations were performed post-intervention (T3) and at a 9-month follow-up (T4). All participants filled in questionnaires at T2 and T3. Participants in the intervention group filled in an additional questionnaire about patient satisfaction with the therapy, at T3. Clinicians blinded to patient assignment complete pre- and post-evaluations. All participants medicated for ADHD were asked during a weekly telephone call if they use their medication as prescribed and further if they had started psychotherapy or other treatment. During the interview at T4, the participants report on ADHD symptoms, emotional and behavioural problems, school functioning and self-efficacy. The interviewers score general and adaptive functioning. In addition, the interviewer ask about current and past treatment during the past 9 months and the adolescents' impression of the CBT group therapy in a longer perspective. See Table 1 for a SPIRIT [20] table for the evaluation of the study.

Table 1 SPIRIT table for evaluation of the **Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomised Controlled Trial**

	STUDY PERIOD						
	Enrolment[1]	**Allocation**[2]	**Post-allocation**				**Close-out**
			Pre-T2	***Mid-***	***Post-T2***	***9-month follow-up T4***	
Coh1: Q1 2017	***Coh1: Q1 2017***	***Q1 2017***	***Coh1: Q1 -2017***	***Coh1: Q1 -2017***	***Coh1: Q2 -2017***	***Coh1: Q2 2018***	
Coh2: Q3 2017	***Coh2: Q3 2017***	***Q2 2017***	***Coh2: Q3 -2017***	***Coh2: Q3 -2017***	***Coh2: Q4 -2017***	***Coh2: Q4 2018***	
Coh3: Q1 2018	***Coh3: Q1 2018***	***Q3 2018***	***Coh3: Q1 -2018***	***Coh3: Q1 -2018***	***Coh3: Q2 -2018***	***Coh3: Q2 2019***	
Coh4: Q3 2018	***Coh4: Q3 2018***	***Q4 2018***	***Coh4: Q3 -2018***	***Coh4: Q3 -2018***	***Coh4: Q4 -2018***	***Coh4: Q4 2019***	
Coh5: Q1 2019	***Coh5: Q1 2019***	***Q5 2019***	***Coh5: Q1 -2019***	***Coh5: Q1 -2019***	***Coh5: Q2 -2019***	***Coh5:Q2 2020***	
Coh6: Q3 2019	***Coh6: Q3 2019***	***Q6 2019***	***Coh6: Q3-2019***	***Coh6: Q3-2019***	***Coh6: Q4-2019***	***Coh6: Q4-2020***	***Coh6: Q4-2020***
ENROLMENT:							
Eligibility screen[3]			X				
Informed consent	X						
Allocation		X					
INTERVENTIONS:							
Int.: CBT + medic.			⟷		⟷		
Ctr.: Medication			⟷		⟷		
ASSESSMENT:							
Psychiatric diagnosis[4]			X				
Illness severity[5]			X		X	X	
Psychosocial Funct.[6]			X		X	X	
PRIMARY OUTCOME							
ADHD symptoms[7]			X[3]		X	X	
SECOND OUTCOMES							
Behaviour problems[8]						X	
Emotional problems[8]						X	
Functional Impairment[9]			X		X		
Anxiety[10]			X		X		
Depression[11]			X		X		
Sleep[12]			X		X		
Self-esteem[13]			X		X		
Self-efficacy[14]			X		X	X	
Executive functioning[15]			X		X		
Treatment satisfaction					X	X	
Treatment fidelity							X

[1]Enrollment occurs in the semester of the delivery of the intervention. Each cohort represents a group of adolescents recruited during the semester. [2]Allocation (randomisation) is conducted at the individual level. [3]Study eligibility for individual adolescents is based on ADHD diagnosis and being stable on medication (primary outcome measure). [4]Kiddie-SADS-PL, [5]Clinical Global Impression Severity, [6]Children's Global Assessment Scale, [7]ADHD-Rating Scale-IV, [8]ASEBA Brief Problem-Monitor, [9]Weiss Functional Impairment Rating Scale, [10]SCARED, [11]Mood & Feelings Questionnaire, [12]Adolescents' Sleep-Wake Scale, [13]Rosenberg Self-Esteem Scale, [14]General Perceived Self-Efficacy Scale, [15]Behaviour Rating Inventory of Executive Function.

Interventions

Table 2 Core treatment modules in the research manual

MODULES		SESSION
Core symptom modules	What is ADHD?	1
	Attention	2
	Memory	3
	Organisation and time management	4
	Impulsivity	5
Comorbid disorders and difficulties	Problem solving	6
	Anxiety	7
	Sadness and depression	8
	Sleep	8
	Communication	9
	Frustration and anger	10
The future	Preparing for the future	11, 12

CBT group. The intervention consists of 12 weekly cognitive behaviour therapy sessions addressing core difficulties and concerns of the adolescent population with ADHD, each session lasting 90 minutes. The last two sessions consists of a review of the contents and planning for the future (Table 2). Parents are not involved in the treatment sessions. The manual is structured and includes methods and key points, which are used in each session. The key points are visualised in a power point presentation. We included six participants in each group. Two clinicians conducted the sessions (usually a psychologist working together with either another psychologist, a psychiatrically trained special education teacher or a physician). The group leaders received manual training and supervision by an experienced adolescent psychiatrist and CBT supervisor. Between sessions, the participants got a weekly phone call by a coach to motivate them and follow up on home assignments. Participants could not receive any other treatment than CBT group therapy and medication in the 12-week period. One routine medical follow-up was performed during the intervention period, with registration of blood pressure, weight and side effects of medication according to standard clinical follow-up in the CAP clinic.

Control group. Participants in the control group continued with medical treatment and received one routine medical follow-up according to standard clinical follow-up in the same

way as the intervention group. This is in accordance with treatment-as-usual, as only medical treatment is offered routinely in the clinic at this stage. As in the CBT group, participants who did not use medication received one session with a clinician to monitor their clinical status. After the post-treatment assessments (at T3), there was no offering to enter a CBT group, but patients could start other treatments according to their clinical needs.

Treatment Fidelity

Treatment fidelity in this project has the overall goal of increasing confidence that changes in the dependent variable are attributable to the independent variables. Analysis of treatment fidelity may help to explain study findings, revise interventions for future testing, and increase statistical power and effect size by reducing random and unintended variability. [28] All sessions (except session 1 and 12) were videotaped and adherence to the manual and to CBT core principles relevant for this study will be assessed through observations by independent raters from a random selection of around 20 % of the sessions. The Competence and Adherence Scale for Cognitive Behavioural Therapy (CAS-CBT) [29] covers basic CBT components as well as specific session goals. The user can specify the goals for the particular treatment. The scale was originally developed for the treatment of anxiety disorders. It has shown good to excellent reliability. Additional items on group dynamics are included. In addition, each group leader filled in a self-rating scale after each session to evaluate goal achievement in the session and to provide an overall rating of their own work.

Adherence and dropouts

We assess treatment adherence by recording the number of completed CBT sessions. In the case of dropouts, the participants were asked to let the questionnaires filled in before the intervention at T2, remain in the study to be included in the data analysis.

Outcome measures

Well-established and validated instruments are used to assess psychiatric morbidity and cognitive and over-all functioning at four time-points. When adequate, adolescent, parent and

teacher reports are acquired. The following instruments are used to collect data from various informants on adolescent psychiatric morbidity including diagnoses, diagnostic classification, symptom load assessment, and psychosocial functioning at one or more time-points from T1-T4 (Table 3).

ADHD Rating Scale IV (ADHD-RS-IV) [23] is a questionnaire completed by parents (home version) or teachers (school version) to detect ADHD symptoms in children and adolescents. The questionnaire contains 18 questions regarding a child's or an adolescent's behaviour during a specified timeframe rated on a 4-point Likert scale.

K-SADS – PL Schedule for Affective Disorders and Schizophrenia for School-Age Children present- Life version [27] is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents. Diagnoses of interest to the present study include ADHD, anxiety disorders, mood disorders, tic disorders, conduct disorders and sleep disorders.

Children's Global Assessment Scale (CGAS) [25] is a numeric scale (1 through 100) used to rate the general psychosocial functioning of children under the age of 18. A score above 70 denotes good functioning.

Clinical Global Impression Severity (CGI-S) [26], is used to rate the severity of a patient's illness at the time of assessment. It is a 7-point scale ranging from 1="Normal, not at all ill" to 7="Among the most extremely ill patients", with 0="Not assessed".

Weiss Functional Impairment Rating Scale for parents and adolescents (WFIRS-P, WFIRS-S) [30] are questionnaires appropriate for parent report and adolescent and adult self-report of functional impairment typically affected in ADHD. The questions assess to what degree an individual's behaviour or emotional problems have affected various clinically relevant domains of functioning.

Screen for Child Anxiety Related Emotional Disorders (SCARED) [31] is a 41 items self-report screening questionnaire for anxiety symptoms in youth.

Mood & Feelings Questionnaire (MFQ) [32] is a 33 items inventory self-report tool that measures depressive symptoms in children and adolescents. The last question in the 34 item Norwegian version, "I wasn't as happy as usual even when praised and rewarded", is from the MFQ parent version.[33]

General Perceived Self Efficacy Scale [34] is a 10-items scale designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life.

Rosenberg Self-Esteem Scale [35] is a 10 items scale widely used self-report instrument for evaluating individual self-esteem in adolescents and adults.

Behaviour Rating Inventory of Executive Function (BRIEF) [36] parent form (BRIEF-P) is an 86 items assessment of executive function behaviours at home and at school for children and adolescents ages 5–18. The BRIEF self-report (BRIEF-SR) provides an adolescent's or an adult's own view of his or her executive functioning behaviours.

Table 3 Instruments used with various informants at admission to the CAP clinic and during time points in the study

Instruments used in study (informant)	T1: Admission to CAP	T2: Pre-	T3: Post-	T4*: 9-month follow-up
Kiddie-SADS psychiatric interview (S)		x		
ADHD-RS (ADHD-symptoms) (P,T,S)	X(P,T)	X (P,T,S)	X (P,T,S)	X(S)
Children's Global Assessment Scale (CGAS)(C)	x	x	x	x
ASEBA YSR Brief Problem-Monitor (S)				x
Clinical Global Impression (CGI) (C)		x	x	x
SCARED (Anxiety)(S)		x	x	
Mood & Feelings Questionnaire (MFQ)(S)		x	x	
BRIEF (Executive Functioning) P,T,S	X (P,T)	X (P,T,S)	X (P,T,S)	
Weiss Functional Impairment Rating Scale (P,S)		x	x	
Adolescent Sleep Wake Scale (S)		x	x	
Rosenberg Self-Esteem Scale (S)		x	x	
General Perceived Self-Efficacy Scale (S)		x	x	x
User satisfaction, usefulness of coaching (S)			x	x

S=Self Report P=Parent report T=Teacher Report C=Clinician evaluation *Telephone Interview

ASEBA-YSR Brief Problem Monitor (YSR-BPM) [22] is a short version of the Youth Self Report school-age form. It includes questions about behavioural and emotional problems and is used for monitoring and follow-up in research and clinical assessment.

Adolescent Sleep-Wake Scale [37] is a 28 items scale and widely used measure of sleep quality in adolescents.

Adolescent Interview at one-year follow-up (T4). The telephone interview includes questions about present school situation or other daytime activity, ADHD medication, and furthermore health assessment and treatment in CAP or adult psychiatry, private psychologists or psychiatrists, or primary care during the past nine months. The interviewer administers the ADHD-RS-IV, YSR-BPM and the General Perceived Self-Efficacy Scale during the interview. The interviewer scores the CGAS and CGI blinded to information about group participation.

Medical history and sociodemographic information

In addition to data collection via validated instruments at T1, T2, T3 and T4, we extract data from medical records, including information about parent Socioeconomic Status (SES). Treatment history from T3 to T4 is registered at T4 by type (cognitive, neurobiological, psychodynamic, psycho-educational, social-relational, medication), participant (individual, group, parent, family), number of sessions, length of treatment, in-patient or outpatient, indirect patient work, and counselling from community services. SES will be defined as follows: the highest level of parental education will determine parent SES, divided into four categories (≤2 years of high school, completed high school + 1 year, ≤ 4 years academy/university, ≥ 5 years four years academy/university).

Statistics

Outcome measures at T3 contain ADHD symptom scores, clinician rated functioning, self- and parent reported functioning, self-, parent- and teacher reported executive functioning, and self-reported anxiety, depression, sleep, self-esteem and self-efficacy. Outcome measures at T4 contain self-reported ADHD symptom scores, clinician rated functioning, self-reported functioning, anxiety and depression, and self-efficacy. Data will be analysed using mixed-effect models for longitudinal data. Variables included in the assessment of possible interactions with treatment effect will be age, gender, SES, IQ, type of ADHD, and comorbidity. Clinical and demographic variables will be included in the mixed-effect model

to explore these effects. Potential mediators will be defined before carrying out mediation analyses. We will carry out the mediation analyses following recommendations by Hayes and Rockwood.[38] Unless the participants withdraw the consent to participate, we will use all available data from participants with relevant outcome data in an intention-to-treat analysis.

Sample size

Sample size was calculated for a two samples student's t-test, for a 6 points difference assuming a standard deviation of 9 on the ADHD-RS-IV. [23] The rationale for the use of a 6 points difference is supported by the work of Coghill and Seth [39] who provide a guide for clinical interpretation of scores from the ADHD-RS-IV. They interpret total scores of 19-26 after a medication trial as partial response, and 26 % reduction in scores as a good response. The two previous RCTs of CBT in adolescent ADHD used a 6 points difference in ADHD-RS scores [15] or a 30 % reduction in ADHD-RS scores [14], respectively. With significance level 5 %, we needed 37 participants in each group to obtain 80 % power. To allow for dropouts, we aimed at including at least 48 participants in each group, in total 96.

Ethics and dissemination

All participating parents and adolescents 16 years or older were required to provide informed consent. The recruitment process explained that participation is voluntary and that participants can withdraw from the study at any time without consequences regarding their treatment in the clinic. All participants received documents explaining the purpose and procedures in the study. We record the data obtained by questionnaires and clinical assessment in electronic files that are password protected. Participants received anonymous study IDs that are stored with the collected data. Identifying information is not stored alongside the parent-, self- or teacher-report data. Only the main investigator and researchers directly involved in data analysis will have access to de-identified data.

We will disseminate the results in peer-reviewed international scientific journals. Furthermore, the study group will present the results of the study at regional, national, and international scientific conferences, in reports to funders, reports to patient advocacy organisations and press releases to news media. Two PhD students will publish and publicly defend dissertations relating to the study. Planned publications include primary and secondary

outcomes, feasibility and patient satisfaction with the treatment and fidelity to the intervention. A main goal of the study group is to publish a Norwegian evidence based manual for the benefit of patients locally and elsewhere. The CAP clinic and Regional Centre for Child and Youth Mental Health and Child Welfare (RKBU) cooperate extensively with user and patient advocacy organisations, and the research results will be presented to the public during educational seminars arranged by the St. Olav Hospital Learning Centre.

PATIENT AND PUBLIC INVOLVEMENT

We consulted the user committee in the Clinic of Psychiatry at St. Olav University Hospital, during the planning state of the study in order to receive feedback to the principal investigator. The ADHD association, Mid-Norway, was informed about the project at its planning stage and recommended it to funding authorities and to members. The CAP clinic has an active co-operative network with user organisations and arranges "learning and mastery" course days where patients with ADHD and family members share their experiences. During the course, clinicians give lectures to patients, families and health care providers. Information about the project has been conveyed on such occasions. We will set up a reference group of adolescents from the Norwegian ADHD association as recently suggested by user organisations. The reference group will aid the project with respect to discussion and dissemination of the results.

DISCUSSION

To date there are few RCT studies of CBT in adolescent ADHD. We have designed an RCT that aims to test the effectiveness of CBT group therapy, with a program uniquely tailored to the needs of the adolescents. In addition, we will test for patient satisfaction and treatment feasibility. We test the effectiveness of CBT group therapy in a younger age group than a previous RCT of CBT group therapy in adolescents and young adults with ADHD [15].

The present study offers an advantage in its delivery of group CBT in a real world setting using practising clinical staff and covering a total catchment area. The study employs a different type of control condition than previous studies [15] with a defined limited clinical follow-up. This is less likely to result in exaggerated short-term effects of the intervention compared to the use of waiting list controls.[40] Another advantage is the use of multiple

informants in the assessment of the outcome. Teachers may be as accurate as parents are when evaluating ADHD symptoms [41] and provide an important additional perspective to parents and adolescents.

At the 9-month follow-up, some findings may be limited by the fact that the adolescents are the only informants. Self-ratings may be less valid than parent ratings in the prediction of ADHD persistence. [42] The sample recruitment may be biased in ways that are difficult to measure. For example, participants may be those who are more engaged and ready for change or have better family support. Further, randomisation does not control for therapy moderators such as psychiatric comorbidities and personality factors associated with these comorbidities. In addition, bias may be introduced by adolescents who refuse to enter the study, or by adolescents who do not get their treatment of choice after randomisation.

If the group CBT is shown to be significantly more effective compared to treatment-as-usual, this may encourage the wider dissemination and utilisation of the treatment in the care of adolescents with ADHD. Such initiatives have the potential to increase the number of adolescents who receive effective care to benefit patients in Norway and elsewhere. When designing the study we decided to examine the effect of group CBT as an add-on to medication, as this seems a reasonable first step before studying the effect of the treatment in adolescents who do not receive medication. Steps might be taken to study the feasibility and treatment effects in adolescents who do not use medication in the future.

Collaboration

The study is an active collaboration between the Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare, Norwegian University of Science and Technology, Trondheim, Norway. The core research team make up an international, interdisciplinary research group.

TRIAL STATUS

The study has recruited 99 patients by the end of the recruitment period in September 2019. The treatments were finalised in January 2020. Data from the 9-month follow-up are being collected until October 2020. Two PhD-students have been appointed in the project by August 2019.

Trial Registration Clinical Trials NCT02937142

Primary Sponsor Child and Adolescent Psychiatric Clinic, St. Olav University Hospital and the Regional Competence Centre for Youth – Mental Health and Child Welfare (RKBU), The Norwegian University of Science and Technology.

Protocol version February 2019

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Contributors TSN conceived of the study and wrote the applications for funding. The main research team/steering group undertook the research design: TSN, AMS, PHT, SY and SL. ALJH, the first PhD student in the study, contributed to the CBT treatment manual in collaboration with TSN and SY and participates in the gathering of data. AMS supervises the therapists in the study, while TSN, AMS, PHT and SL supervise the PhD students. All authors read and provided substantial contribution to the final version of the study protocol and approved of the final version of the manuscript.

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Competing interests TSN has received a speaker's fee from Medice in the last year. PHT has received speaker's fees from MEDICE and Shire in the last three years. SY has received honoraria for consultation and/or educational talks in the last 5 years from Janssen, HB Pharma and/or Shire. She is author of the ADHD Child Evaluation (ACE) and ACE+ for adults and lead author of R&R2 for ADHD Youths and Adults. AMS has received travel support and congress fee from MEDICE in the last year. The other authors declare no conflicts of interest.

Patient consent Not required.

Ethics approval The Regional Committee for Medical and Health Research Ethics in South East Norway approved the study protocol (2015/2115).

Provenance and peer review Not commissioned; peer reviewed for ethical and funding approval prior to submission.

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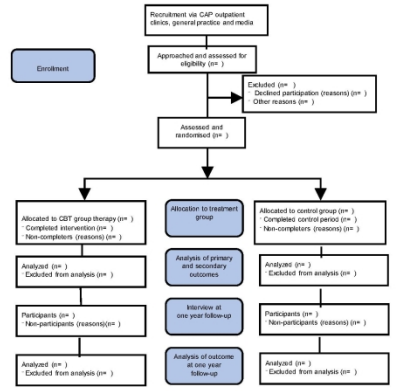
Legend Table 1

[1]Enrollment occurs in the semester of the delivery of the intervention. Each cohort represents a group of adolescents recruited during the semester. [2]Allocation (randomisation) is conducted at the individual level. [3]Study eligibility for individual adolescents is based on ADHD diagnosis and being stable on medication (primary outcome measure). [4]Kiddie-SADS-PL, [5]Clinical Global Impression Severity, [6]Children's Global Assessment Scale, [7]ADHD-Rating Scale-IV, [8]ASEBA Brief Problem-Monitor, [9]Weiss Functional Impairment Rating Scale, [10]SCARED, [11]Mood & Feelings Questionnaire, [12]Adolescents' Sleep-Wake Scale, [13]Rosenberg Self-Esteem Scale, [14]General Perceived Self-Efficacy Scale, [15]Behaviour Rating Inventory of Executive Function.

Legend Table 3

S=Self Report P=Parent report T=Teacher Report C=Clinician evaluation *Telephone Interview

Figure 1 Flow chart diagram of participants in Cognitive Behavioural Group Therapy for Adolescents with ADHD – A Randomised Controlled Study



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SPIRIT
STANDARD PROTOCOL ITEMS: RECOMMENDATIONS FOR INTERVENTIONAL TRIALS

SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	Item No	Description
Administrative information		
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym. Pages 1 and 2.
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry. Page 2.
	2b	All items from the World Health Organization Trial Registration Data Set. N/a
Protocol version	3	Date and version identifier. Page 18.
Funding	4	Sources and types of financial, material, and other support. Page 19.
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors. Page 19.
	5b	Name and contact information for the trial sponsor. N/a.
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities. N/a
	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee). Page 19
Introduction		
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention. Page 4-5
	6b	Explanation for choice of comparators. Page 17-18
Objectives	7	Specific objectives or hypotheses. Page 5

Trial design	8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, noninferiority, exploratory). Page 6.
Methods: Participants, interventions, and outcomes		
Study setting	9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained. Page 7
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists). Page 8.
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered. Page 11
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving/worsening disease). N/a.
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return, laboratory tests). Pages 8
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial. Page 11
Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended. Pages 12-15
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure) Table 1, page 10
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations. Page 16
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size. Page 8
Methods: Assignment of interventions (for controlled trials)		
Allocation:		Page 10

Sequence generation	16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions. Page 7
Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned. N/a
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions. Pages 8 and 15
Blinding (masking)	17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how. Page 8.
	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial. n/a
Methods: Data collection, management, and analysis		
Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol. Pages 8, 12-16
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols. Page 12.
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol. Page 16.
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol. Page 15
	20b	Methods for any additional analyses (eg, subgroup and adjusted analyses). N/a
	20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation) Page 16

Methods: Monitoring

Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed. N/a
	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial. n/a
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct. N/a
Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor. n/a

Ethics and dissemination

Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval. n/a (study approved 2015)
Protocol amendments	25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC/IRBs, trial participants, trial registries, journals, regulators). N/a
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32). Page 16
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable. n/a
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial. Page 16.
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site. Page 19
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators. Page 16
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation. Page 12

Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions. Page 16
	31b	Authorship eligibility guidelines and any intended use of professional writers. Page 16.
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code. N/a.
Appendices		
Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates. Page 16.
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable. N/a

*It is strongly recommended that this checklist be read in conjunction with the SPIRIT 2013 Explanation & Elaboration for important clarification on the items. Amendments to the protocol should be tracked and dated. The SPIRIT checklist is copyrighted by the SPIRIT Group under the Creative Commons "Attribution-NonCommercial-NoDerivs 3.0 Unported" license.