

Doctoral thesis

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Ann Christin Andersen

# Adolescents with ADHD

Follow-up of a Group CBT Intervention:  
Satisfaction, Feasibility, and Long-Term  
Efficacy

**NTNU**  
Norwegian University of Science and Technology  
Thesis for the Degree of  
Philosophiae Doctor  
Faculty of Medicine and Health Sciences  
Department of Mental Health



Norwegian University of  
Science and Technology



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Trondheim, May 2023

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## **Norsk sammendrag**

### **Ungdom med ADHD: Oppfølgingsstudie av en gruppebehandling basert på kognitiv atferdsterapi**

ADHD (Attention Deficit/Hyperactivity Disorder) kjennetegnes av utfordringer med oppmerksomhet, uro og impuls kontroll av et slikt omfang at det gir problemer med å fungere på flere områder i livet. Ungdom med ADHD har en høy risiko for å utvikle andre psykiske vansker og opplever ofte utfordringer i forhold til både skole, fritid, venner og familie.

Anbefalt behandling for ADHD er opplæring/kunnskap, tilrettelegging, og medisiner. Dette er for mange ikke tilstrekkelig for å oppnå normalisering av symptom eller funksjon.

Kognitiv atferdsterapi (KAT) er en anbefalt tilleggsbehandling, men vi har enda manglende kunnskap om KAT for ungdom med ADHD.

Deltagerne i denne studien var ungdom i alderen 14 til 18 år som alle hadde fått diagnose ADHD i BUP og fremdeles opplevde funksjonsnedsettende symptomer etter standard behandling inkludert minst 2 måneder med stabil medisiner. Deltagerne ble tilfeldig fordelt mellom en kontrollgruppe og en behandlingsgruppe som fikk KAT som gruppebehandling gjennom 12 ukentlige timer. KAT-programmet besto av 6 timer om kjernesymptomer ADHD, 4 timer om samtidige vansker, og 2 timer med fokus på forberedelse til fremtiden.

Vi samlet inn data ved hjelp av spørreskjema og klinisk vurdering ved inntak i studien og rett etter behandlingsperioden, og ved telefonintervju ett år etter inntak. Vi fant at KAT-programmet var veldig godt likt og velegnet for gjennomføring i klinikken. Det var også godt oppmøte til gruppetimene og få som sluttet underveis. Vi fant imidlertid ikke at programmet ga bedring i ADHD-symptomer eller funksjon ved oppfølging etter ett år sammenlignet med kontrollgruppen. Mange av deltagerne i studien hadde også sluttet med medisinene sine og hadde lite eller ingen oppfølging til tross for at de fortsatt hadde betydelig grad av

symptomer. Våre resultater viser at disse ungdommene med ADHD som fortsatt har symptomer etter behandling er en sammensatt gruppe der mange har tilleggsvansker. Mange har også betydelige utfordringer med eksekutive funksjoner, som viser seg blant annet i evnen til å få oversikt og organisere oppgaver, komme i gang, holde orden, og regulere oppmerksomhet, følelser og atferd.

Det er behov for å forbedre programmet gitt i denne studien. Mulighet for individuell tilpasning og moduler spesielt rettet mot eksekutive funksjonsvansker vil kunne gi bedre effekt. Fremtidige studier bør også utforske om kombinasjon av individuelle timer og gruppetimer er hensiktsmessig. Mer vekt på gjennomføring av hjemmeoppgaver og involvering av foreldre og/eller lærere vil sannsynligvis være fornuftig. Når vi fortsetter arbeidet med å gi bedre oppfølging for ungdom med ADHD bør vi også ta hensyn til utfordringer med selv-innsikt, motivasjon, og motstand mot behandling som vi ofte møter hos denne gruppen.

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## Abstract

Adolescents with attention deficit/hyperactivity disorder (ADHD) have a high risk of adverse outcomes and a negative life trajectory into adulthood. First line treatment, including medication, has well-documented effects on core symptoms but is often not enough to normalise function. Resistance to treatment and discontinuation of medication are also common issues in this population. Cognitive behavioural treatment (CBT) is a recommended treatment option for adolescents with ADHD. However, evidence regarding CBT for this population is limited.

The overall aim of this thesis was to improve treatment and care for adolescents with ADHD by evaluating satisfaction, feasibility, and long-term efficacy of a group CBT intervention. We further aimed to improve our knowledge of the challenges for this group of patients in a manner that could improve future interventions.

The studies in this thesis are part of a randomised controlled trial (RCT) comparing a group CBT intervention as addition to standard clinical treatment, including medication, to no additional treatment. Participants were adolescents diagnosed with ADHD who still experienced impairing symptoms after standard treatment, including at least 2 months on stable medication. Participants were randomised to either a group CBT intervention or a control group. The intervention was delivered in 12 weekly sessions focused on core symptoms of ADHD (6 sessions), associated difficulties (4 sessions), and preparation for the future (2 sessions).

In Study I, we found that the programme was feasible and very well-liked by the targeted population, with high attendance rates and few dropouts. In Study II, we found, contrary to our hypothesis, that the treatment programme delivered in this trial failed to prove efficacy on core symptoms and functional impairment at one-year follow-up when compared

to control conditions. We also found that despite reporting overall symptom levels above or just below the clinical threshold, many of the adolescents in both the intervention and control group stopped taking their medication and had little or no contact with health care providers at follow-up. In Study III, we found that participants in this trial had considerable executive functional deficits as measured by *the Behavior Rating Inventory of Executive Function* (BRIEF) at the time of inclusion. Correlation and agreement between parents', teachers', and self-reported scores on BRIEF varied, and whereas teachers generally reported the highest problem scores on all scales and indexes, adolescents generally self-reported the lowest problem scores.

In conclusion, the population of adolescents with ADHD still impaired after standard treatment, including medication, represents a heterogeneous group in which comorbidities and executive functional deficits are frequently present. The group CBT intervention delivered in the RCT failed to show a treatment effect on symptom level when added to standard care. The program was, however, feasible and well-liked, with few dropouts and high rates of attendance. Future improvements might include more individual tailoring and targeting of specific problem domains and/or comorbid conditions and difficulties. As the group aspect of treatment seems to be highly appreciated by these adolescents, future studies should explore whether a combination of group and individual modules could be helpful. Furthermore, including more practice on skills and involving parents and/or teachers to some extent might improve outcomes. An emphasis on adherence and competence in the delivery of treatment is also warranted. In future follow-up studies, a broader range of outcome measures related to functional outcomes should be included, preferably evaluated by multiple informants. Lastly, as we continue to strive towards improving treatment and care for these adolescents, the challenge remains that self-awareness, motivation, and treatment resistance are issues we need to address to facilitate change.

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## List of Papers

- Paper I: Ann Christin Andersen, Anne Mari Sund, Per Hove Thomsen, Stian Lydersen, Susan Young & Torunn Stene Nøvik (2022). Cognitive behavioural group therapy for adolescents with ADHD: A study of satisfaction and feasibility. *Nordic Journal of Psychiatry*, 76:4, 280-286, DOI: [10.1080/08039488.2021.1965212](https://doi.org/10.1080/08039488.2021.1965212)
- Paper II: Ann Christin Andersen, Anne Mari Sund, Per Hove Thomsen, Stian Lydersen, Susan Young & Torunn Stene Nøvik (2022): One year follow-up of Participants in a Randomized Controlled Trial of a CBT-based Group Therapy Program for Adolescents Diagnosed with ADHD. *In review*
- Paper III: Ann Christin Andersen, Anne Mari Sund, Per Hove Thomsen, Stian Lydersen, Anne-Lise Juul Haugan & Torunn Stene Nøvik (2022): Executive Function Measured by BRIEF in Adolescents Diagnosed and Treated for ADHD: Problem Profiles and Agreement Between Informants. *In review (revised manuscript submitted)*





## Abbreviations

ADHD	Attention Deficit/Hyperactivity Disorder
ODD	Oppositional Defiant Disorder
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5 <sup>th</sup> edition
ICD-10	International Classification of Diseases, 10 <sup>th</sup> edition
ASD	Autism Spectrum Disorder
EF	Executive Function
EDF	Executive Functional Deficit
CAP	Child and Adolescent Psychiatry
CBT	Cognitive Behavioural Therapy
DBT	Dialectical Behavioural Therapy
YBP	The Young-Bramham Programme
RCT	Randomised Controlled Trial
STAND	Support Teenage Autonomy Daily (Treatment Programme)
CAS-CBT	Competence and Adherence Scale for Cognitive Behavioral Therapy
BRIEF	Behavior Rating Inventory of Executive Functions
ADHD-RS-IV	ADHD Rating Scale, 4 <sup>th</sup> edition
K-SADS-PL	Schedule for Affective Disorders and Schizophrenia for School Aged Children -Present and Lifetime version
CGI-S	Clinical Global Impression Scale for Severity
C-GAS	Children's Global Assessment Scale
BPM-YSR	Brief Problem Monitor -Youth Self Report
GSE	General Perceived Self-Efficacy Scale



## Introduction

### Attention Deficit/Hyperactivity Disorder (ADHD)

#### Symptoms and Diagnosis

The conceptualisation and diagnostic criteria used to describe attention deficit/hyperactivity disorder (ADHD) have changed over time, but the concept of the disorder has a long history dating back to the 19<sup>th</sup> century (Lange et al., 2010). The core features of ADHD include developmentally inappropriate symptoms of inattention, impulsivity, and hyperactivity, causing functional impairment across multiple life domains (American Psychiatric Association, 2013; Helsedirektoratet, 2016; World Health Organization, 1992). The diagnosis is based on a thorough investigation performed by licenced clinicians and includes information from multiple informants, cognitive testing, and observations.

*The International Classification of Diseases, 10<sup>th</sup> edition* (ICD-10; World Health Organization, 1992) is the formal diagnostic classification used in Norway. However, the national guidelines for diagnosing ADHD revised in 2022 recommend the use of diagnostic criteria from the *Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition*, (DSM-5; American Psychiatric Association, 2013) in the diagnostic evaluation of ADHD in clinical practice (Helsedirektoratet, 2016). The DSM-5 lists three different presentations of ADHD: predominantly inattentive, predominantly hyperactive-impulsive, and combined presentation. The diagnostic criteria of hyperkinetic disorder in ICD-10 are slightly narrower than the criteria of ADHD in DSM-5, especially for those with predominantly inattentive symptoms. Although not part of the diagnostic criteria and not disorder specific, most individuals with ADHD also have problems related to cognition and executive function, emotional regulation, peer relationships, and social skills (Nigg, 2017). This is especially relevant to the recognition

of ADHD in adolescence, as the core features of the disorder might be less obvious (Mick et al., 2004).

## **Prevalence**

The estimated childhood prevalence of ADHD is 3%-7% and stable over time across Western countries (Polanczyk et al., 2014). The estimate for prevalence in the adult population is 2-3%, but this estimate is uncertain, as epidemiological studies focused on the adult population are scarce (Cortese et al., 2022; Simon et al., 2009). There has been an increase in diagnosed cases of ADHD worldwide over the past few decades (Sayal et al., 2018). However, the prevalence of clinically diagnosed or recorded cases is still lower than the estimated prevalence from epidemiological studies; this is most likely due to increased awareness and recognition of cases rather than an actual increase in prevalence (Sayal et al., 2018). ADHD is more commonly diagnosed in males, with a 2:1 male/female ratio in childhood and youth (Willcutt, 2012), but the gender distribution is more equal later in adulthood (Simon et al., 2009). It has been argued that the gender difference in childhood ADHD is, at least partly, due to lack of recognition and/or referral biases as symptom expression in females with ADHD is often somewhat different than in males (S. Young et al., 2020). The disorder is still believed to be under-recognised and under-diagnosed, especially in girls and adolescents (Sayal et al., 2018).

## **Aetiology**

ADHD is a complex and heterogeneous neurodevelopmental disorder for which there is no single cause. Both genetic and environmental risk factors seem to play important roles in the causal pathway towards ADHD, and for most patients, there is an accumulation of risk factors (Faraone et al., 2015; Faraone et al., 2021; Sonuga-Barke, Becker, et al., 2022). It has long been acknowledged that there is a substantial hereditary risk of ADHD, with a mean

heritability of 74% across several twin studies (Faraone & Larsson, 2019). With advances in genetic medicine, a variety of genes have now been identified as important risk factors for the disorder, but most of these are shared with other mental disorders and are not specific to ADHD (Thapar et al., 2013). In particular, there is important genetic overlap between ADHD and other neurodevelopmental disorders, such as autism spectrum disorder (ASD) and tic disorders (Thapar, 2018). Research supports a common psychopathological pathway shared between a range of disorders, proposedly termed *the general psychopathology dimension*, or *p-factor* (Caspi et al., 2014). This view is supported by the fact that there is a high rate of comorbidity and common features shared by different psychiatric disorders, which could also explain some of the challenges we face when trying to identify the aetiology of specific conditions.

There is evidence to support an association between ADHD and environmental risk factors, such as exposure to lead, artificial food dyes, and second-hand smoking, but as with genetic risk factors, very few have been proposed to have a direct causal pathway (Faraone et al., 2021; Sonuga-Barke, Becker, et al., 2022). The pre- and perinatal risk factors identified are not unique to ADHD but include maternal distress, maternal smoking or alcohol use, pre-term birth and/or low birth weight, social disadvantage, and high levels of some environmental toxins (Nigg et al., 2020). Identifying post-natal risk factors is challenging, partly due to methodological challenges in designing such studies. There is, however, evidence to suggest that both parental style and stressful or traumatic life events are associated with the development of ADHD. Nevertheless, the studied associations are most likely to have a moderating rather than a causal effect, underlining the complex gene environment interaction that are most likely at play (Thapar & Rutter, 2019). This complex and multifactorial pathway is consistent with the heterogeneity of ADHD, both in terms of morbidity and comorbidity. A better understanding of the factors involved will guide the field

towards earlier intervention, but knowledge is still limited (Nigg et al., 2020; Sonuga-Barke, Becker, et al., 2022).

## **Executive Function**

Executive function (EF) is an overarching term used to describe the processes involved in planning, directing, and managing cognitive, emotional, and behavioural functions, especially in active problem solving (Gioia et al., 2002). EFs are thus multidimensional and include several components, such as working memory, sustained attention, cognitive flexibility, inhibition, self-regulation, impulse control, and the ability to plan and organise. Reasoning and problem solving are components of EF that will also be influenced by fluid intelligence, defined as the ability to reason, problem solve, and see relations or patterns among items (Diamond, 2013). EFs may be divided into “hot” and “cold” executive skills. The “hot” EFs are related to emotional regulation and affective decision making, while the “cold” EFs include those related to organisation, problem solving, and cognitive flexibility (Zelazo & Carlson, 2012). The hot and cold EFs are, however, closely connected and most often used in combination (De Luca & Leventer, 2010). Executive functional deficits (EFDs) are present in many psychiatric disorders, but there is evidence to suggest distinct patterns of EFDs related to specific disorders, especially autism and ADHD (Bloemen et al., 2018; Craig et al., 2016). Although not part of the diagnostic criteria, there is thus an increasing recognition of EFDs as an important part of ADHD, especially in relation to functional outcomes (Barkley, 1997; Biederman et al., 2004; Willcutt et al., 2005).

Higher cognitive functions continue to develop through childhood and adolescence into adulthood: this also involves EFs, which is often not fully developed until mid- to late twenties (De Luca & Leventer, 2010). There have been discussions on whether EFDs in children with ADHD represent a delay in maturation or a persistent deficit. Studies have

shown that although EFDs present in childhood may improve as a child grows older, they tend to persist into adolescence and adulthood in the ADHD population (Fossum et al., 2021; Martel et al., 2007; Zelazo & Carlson, 2012). Several studies have also shown an important relationship between functional impairments and EFDs in adults with ADHD, further supporting the theory that EFDs are an important underlying deficit in ADHD (Biederman et al., 2006; Halleland et al., 2019).

Measures of EFs may be based on neuropsychological testing or behavioural ratings (observed or self-rated). The correlation between these measures, however, varies considerably, and it is argued that they, in fact, represent different underlying mental constructs (McAuley et al., 2010; Toplak et al., 2008). The behavioural ratings of EFs are found to better correlate with everyday function and hence have higher ecologic validity in clinical assessments than formal testing conducted under controlled conditions (Barkley & Fischer, 2011; Toplak et al., 2008). As the environment, demands, and frame of reference for the observer will vary between different settings (i.e., home, and school), the results from behavioural ratings may also vary between informants, reflecting these differences (De Los Reyes & Kazdin, 2005).

## **Comorbidity**

There is a considerable overlap between ADHD and other neurodevelopmental disorders, such as ASD, intellectual disability, tic disorders, and communication and learning disorders (Gnanavel et al., 2019; Visser et al., 2016). In a recent literature review, the comorbidity rate of ADHD and ASD was found to be as high as 59% (Gnanavel et al., 2019). Children and adolescents diagnosed with ADHD also have a significantly elevated risk for a range of comorbid psychiatric and somatic disorders, with the presence of one or more comorbid disorders estimated between 60%–100% (Faraone et al., 2021; Gillberg et al., 2004;

Gnanavel et al., 2019; Yoshimasu et al., 2012). The high rate of comorbidity might be explained by both shared genetic and environmental risk factors and common developmental trajectories (Nigg et al., 2020). Among adolescents with ADHD learning disorders, oppositional defiant disorder and conduct disorders are most frequently observed, followed by anxiety and mood disorders, and adjustment disorder (Gnanavel et al., 2019; Jensen & Steinhausen, 2015; Yoshimasu et al., 2012). Among adults with ADHD, as many as 80% have at least one coexisting psychiatric disorder, most frequently mood and anxiety disorders, personality disorders and substance use disorder (Katzman et al., 2017; Torgersen et al., 2006). There has been increased awareness of somatic comorbidities and health problems related to ADHD in recent years, with evidence of a considerably elevated risk for obesity, asthma, allergies, and diabetes mellitus in individuals diagnosed with ADHD (Faraone et al., 2021). Sleep disorders are also very common, with a strong correlation between ADHD symptom score and the severity of sleep problems (Yin et al., 2022). This high rate of comorbidity and overlap between disorders challenges both diagnostic recognition and treatment of ADHD, especially in adolescence.

### **Developmental Trajectories**

ADHD was previously considered primarily a childhood diagnosis. Although symptoms may change as a child grows older, there is growing evidence that the disorder both presents and persists later in life for many patients (Franke et al., 2018). Prevalence rates for symptom persistence from childhood into adolescence and adulthood vary between 4% and 77%, reflecting methodological challenges related to the definition of symptom persistence, sample, measures, and informants (Caye, Swanson, et al., 2016; Shaw & Sudre, 2021). Symptoms of hyperactivity and impulsivity are more predominant in early childhood but have a tendency to decrease with age, while symptoms of inattention seem to be more stable



over time (Faraone et al., 2006). As the core symptoms of the disorder improve with maturity, many fail to meet the full diagnostic criteria as adults, and thus present with a subsyndromal phenotype (Faraone et al., 2006). Although many children diagnosed with ADHD will have positive outcomes and benefit from treatment, most patients diagnosed in childhood continue to experience symptoms and/or functional impairment to some degree into adolescence and adulthood (Biederman et al., 2010; Mick et al., 2004). Longitudinal studies of children diagnosed with ADHD also suggest that symptoms and impairment fluctuate over the course of time (Biederman et al., 2010; Sibley, Arnold, et al., 2022). The identified predictors of ADHD persistence are symptom severity, comorbid conduct disorder, and major depressive disorder (Caye, Spadini, et al., 2016). When EFDs are present, there is a higher risk of functional impairment with increasing age, as demands on EFs in family, social, and academic settings increase (Dvorsky & Langberg, 2019). Contextual factors are also likely to play an important part in symptom persistence, and changes in these factors might influence an individual's developmental trajectory (Roy et al., 2016).

Adolescents with ADHD are at increased risk of adverse outcomes and a negative life trajectory into adulthood (Erskine et al., 2016; Franke et al., 2018; Torgersen et al., 2006). ADHD is also shown to have negative impacts on adolescents' health-related quality of life as compared to normally developed peers (Lee et al., 2016) and they often struggle with peer relationships (Barkley et al., 2006). Adolescents with ADHD have substantially lower school performance compared to their normally developed peers, resulting in lower educational achievements and poorer occupational outcomes (Barkley et al., 2006; Jangmo et al., 2019; Sunde et al., 2022). Among other highly prevalent negative long-term outcomes are physical injuries, crime and delinquencies, substance use, and teenage pregnancies (Faraone et al., 2021). The lifetime cost of ADHD is thus considerable on a personal, societal, and economic

level, emphasising the need for recognition and intervention to facilitate better outcomes (Du Rietz et al., 2020; Sciberras et al., 2020).

## **Treatment of ADHD**

### **Treatment Outcomes**

The choice of outcome measures in treatment studies is of great importance to conclusions about the effect; however, which outcomes to measure in a treatment study for ADHD is not always obvious (Stein, 2007; Weiss, 2022). As previously described, ADHD is a heterogeneous disorder with a high prevalence of comorbidities and an increased risk of many negative outcomes. The natural course of the disorder also changes over time, related to development and maturation, as well as to expectations and changes in the environment. Short-term outcomes related to core symptoms and symptom severity are most often chosen in comparable treatment studies of ADHD. It could be argued that functional outcomes are equally important in the evaluation of treatment outcome (Weiss, 2022). Longer-term outcomes, such as better relationships, educational, and occupational outcomes, or physical and mental wellbeing, are also important from both an individual and societal perspective (Coghill et al., 2009; Stein, 2007). The choice of informant or evaluator will potentially affect outcomes, as self-reported symptoms and impairment might differ from those observed or experienced by parents, teachers, or a clinician, due to differences in both perception and context (Coghill et al., 2009; Hoza et al., 2001).

High dropout rates and resistance to treatment in general are common issues in the adolescent psychiatric population (Park & Kim, 2020). Ambivalence, motivational issues, and treatment compliance are especially challenging in the population of adolescents with ADHD. Thus, the challenge we face in clinical care is developing effective treatment options

that are feasible and acceptable. Patient perspectives in the evaluation of treatment for this group of patients are therefore considered especially important, as even the most effective treatment has little value if it is not accepted by the targeted population (Black, 2013; Bukstein, 2004). Patient-centred health care is considered important in general, and patient autonomy and a focus on individual treatment preferences are increasingly acknowledged (Phelan et al., 2020). Treatment evaluation beyond efficacy measures is therefore of importance, as acceptability and patient's preferences will guide clinicians in their effort to improve the treatment offered. The value of experiences for participants in a psychotherapeutic treatment programme is not easily captured using a quantitative approach; adding qualitative measures will potentially add valuable perspectives.

In the evaluation of a treatment intervention, it is considered important to include an assessment of treatment integrity, also known as treatment fidelity, ensuring that the treatment is delivered as intended by the programme developer (Breitenstein et al., 2010; Cox et al., 2019; Perepletchikova & Kazdin, 2005). As most psychotherapeutic interventions by nature are dynamic, flexible, and, to some extent, individualized, this is not always a straightforward task (Carroll et al., 2000). The structural component of treatment integrity, most often referred to as treatment adherence, reflects whether the specified procedures and key components of the treatment manual are utilized (Perepletchikova & Kazdin, 2005). Although partly overlapping, therapist competence in the delivery of the programme is considered another key component, referring to the level of skills shown by the therapist in treatment delivery (Perepletchikova & Kazdin, 2005). Other aspects considered part of treatment integrity are dosage of intervention received, differentiation of treatment delivery, and treatment engagement (Breitenstein et al., 2010; Dane & Schneider, 1998; Perepletchikova & Kazdin, 2005). There are different approaches to the evaluation of treatment integrity in psychotherapy research (Schoenwald & Garland, 2013). Assessments

can be made by self-reports from therapists delivering the treatment, by observation of treatment sessions (directly or by video recordings), or a combination of both. Observational assessment by an independent evaluator with knowledge of both the method and the programme delivered is recommended (Perepletchikova, 2014).

### **Treatment Recommendations**

National and international guidelines recommend a multimodal approach to ADHD treatment (Helsedirektoratet, 2016; NICE, 2018). Psychoeducational interventions for adolescents and their families are recommended as a first line treatment, followed by environmental modifications at home and school. There is little or no consensus regarding the content or dosage of psychoeducation, and the evidence regarding the clinical outcomes and potential adverse effects of psychoeducational interventions are limited (Coghill et al., 2021; Montoya et al., 2011). Findings, however, support the positive role of psychoeducation and other educational interventions targeting children and adolescents with ADHD (Ferrin et al., 2020; Lovett & Nelson, 2021; Montoya et al., 2011).

### **Pharmacological Treatment**

For adolescents, pharmacotherapy is recommended as a second line treatment. Normally, this involves a trial period with titration of dosage, monitoring of effects and potential side effects, and, when needed, testing of different drugs. Based on evidence that takes both efficacy and safety into account, methylphenidate is recommended as the first drug of choice for the treatment of ADHD in children and adolescents (Cortese et al., 2018). There is, however, an increasing number of alternative drugs available, both stimulants (e.g. amphetamines) and non-stimulants (e.g. atomoxetine, guanfacine, and clonidine), with different profiles regarding effects and side effects (Cortese, 2020). Pharmacotherapy has well-documented short-term effects on reducing inattention, hyperactivity, and impulsivity

across ages in ADHD (Cortese, 2020). The long-term effects of medication on ADHD are less studied, partly due to methodological challenges. In a randomised controlled trial (RCT) that included participants stable on long-term treatment with methylphenidate, the authors found that continuation of medication was beneficial on core symptoms as compared to discontinuation or switch to placebo, but effect sizes were smaller than those reported from short-term studies (Matthijssen et al., 2019).

There is evidence to suggest that those adherent to medication over time show a decrease in negative long-term outcomes, such as accidents, criminal acts, and substance use disorders, as well as an improvement in academic functioning (Boland et al., 2020; Craig et al., 2015; Jangmo et al., 2019). The effects of methylphenidate on cognition and EF, such as response inhibition, sustained attention, and working memory, are found to be small to moderate (David R. Coghill et al., 2014; Tamminga et al., 2016). Although medication may improve core symptoms and facilitate the acquisition of skills, evidence suggests that medication alone is not sufficient to normalise function for many patients (Jangmo et al., 2019; Posner et al., 2020). Despite recommendations for long-term treatment, discontinuation of medication is also a frequent problem, especially in the adolescent ADHD population (Biederman et al., 2019; Gajria et al., 2014). Reasons for discontinuation are most commonly adverse effects, followed by perceived lack of effectiveness, dosing inconvenience, stigmatisation, and a negative attitude towards pharmacological treatment (Gajria et al., 2014).

## **Psychosocial Treatment**

Psychosocial interventions are recommended for patients still experiencing symptoms and/or impairment after previous steps of treatment (Helsedirektoratet, 2016; NICE; 2018). The literature on psychosocial interventions has been steadily increasing over the past few years,

and a range of programmes have been studied. Most programmes developed for adolescents with ADHD are multimodal, incorporating behavioural, cognitive behavioural, motivational, and skills training techniques in treatment delivery (Sibley, 2019). A comparison of the different programmes is challenging due to the heterogeneity of programmes and participants between studies. In a systematic review Chan et al. (2016) summarised current knowledge on psychosocial interventions for adolescents with ADHD, concluding overall with inconsistent effects on core symptoms but greater benefits on academic outcomes and organisational skills. In an updated systematic review and meta-analysis, the Canadian ADHD Resource Alliance (CADDRA) Guidelines Group concluded that there is evidence to support a recommendation of cognitive behavioural therapy (CBT) for adults and caregiver interventions for children but not enough data to provide recommendations for any psychosocial intervention in the treatment of ADHD in adolescence (Tourjman et al., 2022). A limitation of this study was, however, the exclusion of ADHD with comorbidities and the isolated focus on core ADHD symptoms as outcomes. In another recent meta-analysis using individual participant data (IPDMA) Groenman et al. (2022) found strong evidence that behavioural interventions reduce core symptoms as well as associated behavioural problems and global impairment in both children and adolescents with ADHD, as perceived by teachers and/or parents. The heterogeneity regarding both the participants and the interventions included in this study was, however, a limitation. Overall, knowledge about what works for whom and on what outcome is still limited, and more knowledge on psychosocial interventions for adolescents with ADHD is warranted.

### **Cognitive Behavioural Therapy**

CBT is recommended as a treatment option for adolescents and adults with ADHD. CBT is a structured psychotherapeutic approach shown to be effective in the treatment of a range of

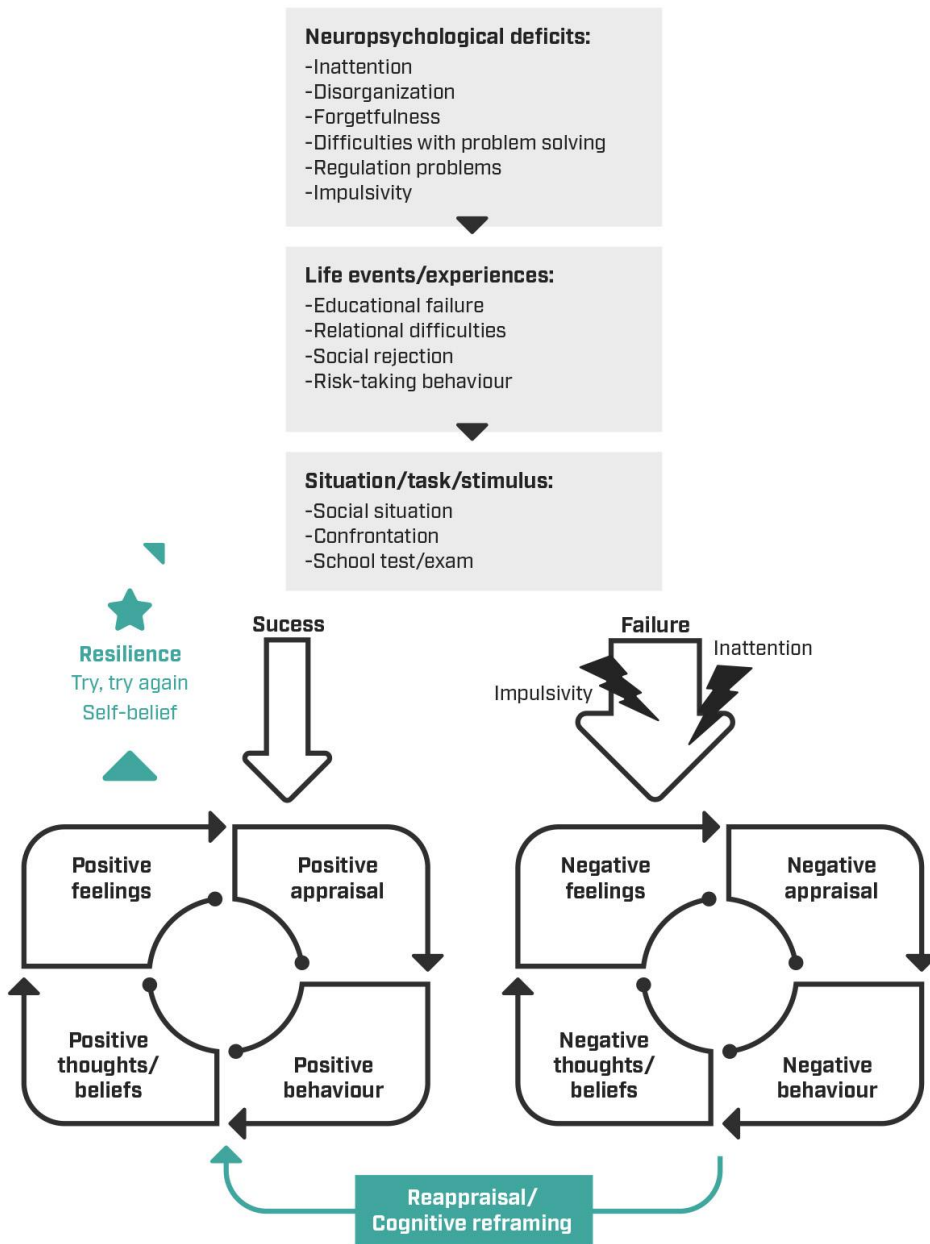
conditions in children, adolescents, and adults. Different CBT programmes for children and adolescents are adapted for delivery in individual, group, and family formats across different levels of healthcare (Halder & Mahato, 2019). At the core of CBT is a cognitive model of interaction between thoughts, feelings, and behaviour in different situations (Beck, 2011). Understanding and modifying how these components interact and affect each individual in order to produce emotional, behavioural, and cognitive change are essential to CBT treatment (Beck, 2011). Psychoeducation is included to some extent in most psychosocial interventions and is considered an important part of CBT, with appropriate adaptations to recipient, age, and condition (Beck, 2011; Luman et al., 2010; Montoya et al., 2011).

Different approaches have been developed to adapt the CBT model to different conditions and age groups, but they all share common features. This normally includes a structured, goal-focused approach based on an individual case formulation. Another common feature is the focus on change through experience; this involves teaching skills and conducting behavioural experiments both in and between sessions. In the delivery of CBT, specific techniques to facilitate cognitive and behavioural change are emphasised, for example Socratic questioning, positive reinforcement, and rewards. Some of these techniques are shared with other behavioural interventions aimed at increasing desired behaviours and decreasing undesired behaviour (De Meyer et al., 2019). Model learning, stimulus control, and consequence techniques are examples of commonly used behavioural intervention principles shared between different programmes (De Meyer et al., 2019). Inattention, problems with self-regulation, and altered reinforcement sensitivity are common in individuals with ADHD, and behavioural modification strategies often need to be adopted in interventions targeting this group of patients (Luman et al., 2010).

## **CBT Model of ADHD**

A CBT model of ADHD was developed by Safren, Sprich, Chulvick, and Otto (2004). In this model, the core neuropsychiatric impairments of ADHD are understood as the cause of repeated failures and underachievement that over time results in negative patterns affecting thoughts, feelings, and behaviour. This, in turn, results in an increased likelihood of future impairments. In this model, the negative cognitions and patterns of behaviour, thoughts, and feelings continue to cause impairment even if core symptoms of the disorder improve. Young and Bramham (2012) presented a similar cognitive behavioural model of ADHD in their psychological guide to CBT for ADHD in adolescents and adults. This model also emphasises the importance of the negative life events many patients with ADHD have experienced due to their neuropsychological impairments, such as inattention, forgetfulness, problem-solving difficulties, and impulsivity. Due to these impairments and a previous history of failure, these individuals are prone to negative appraisals in new situations, which affects their behaviour and coping strategies. Negative behaviour and consequences are likely to result in negative thoughts and feelings, and this again likely affects how this person reacts in a subsequent situation, and a negative cycle may form. Through cognitive reframing and new attempts to overcome past failures, these negative cycles may be broken. An adapted version of the Young–Bramham cognitive behavioural model of ADHD is presented in Figure 1.





**Figure 1:** CBT model of ADHD, adapted from the Young-Bramham Programme (2012)

## **CBT Interventions for ADHD**

Existing CBT interventions for individuals with ADHD are diverse in terms of targeted symptoms, dosage, and method of delivery. The heterogeneity of the targeted population makes comparison between them even more challenging. A recent systematic review and meta-analysis supports the efficacy of CBT in the treatment of ADHD in adult patients (Z. Young et al., 2020). Several programmes based on CBT have been developed for adolescents with ADHD, but the overall effect of these programmes is inconclusive (Chan et al., 2016). A distinction between school-based and clinic-based programmes is useful in comparison between programmes. School-based programmes are primarily based on behavioural change through the acquisition and practice of skills, such as the Challenging Horizon Program (CHP) and the Homework, Organization, and Planning Skills (HOPS) interventions, and these are found to be promising for several ADHD-related outcomes (Evans et al., 2014; Langberg et al., 2012; Langberg et al., 2016). These programmes will not be further described in this thesis, as opposed to the clinic-based programmes, which were found to be more relevant, as they share common features with the programme used in our study. Summarised below are the relevant studies of clinic-based CBT interventions targeting core symptoms and related impairments in adolescents with ADHD, limited to the programmes that explicitly include the core elements of CBT, delivered directly to the patients in an individual or group format, with, or without parental involvement.

Antshel et al. (2014) published one of the first well-documented studies of CBT for adolescents with ADHD. In this study, the authors modified the Safren-programme (2004), a manualised CBT programme found to be efficacious in the treatment of adult patients with ADHD still experiencing symptoms after medication for use in an adolescent population. The programme was delivered in 12 individual treatment sessions; parents were included at the

end of each session as well as in two of the full sessions. Parents were also offered two optional sessions. Initial findings from an uncontrolled study found that the programme had positive effects on several ADHD-related outcomes (Antshel et al., 2014). These findings were later confirmed in a crossover RCT with a waitlist control including 46 medicated adolescents aged 14-18 years (Sprich et al., 2016). The limitations of these studies include a small sample-size and a lack of follow-up data. The authors also noted that the studied sample may not be representative of the general adolescent ADHD population due to the exclusion of comorbid conduct disorders and self-referred patients from predominantly high-resource families.

Vidal et al. (2015) developed a CBT programme for delivery in a group format to medicated adolescents and young adults with ADHD (15-21 years of age). They found this programme to be highly effective in reducing core symptoms and functional impairment in an RCT comparing the group therapy to a waitlist control. The manual consisted of 12 weekly sessions and included components of motivational interviewing. Parents were not involved in the programme. Although adolescents 15 years of age and older were included, many of the participants in this study were older than in comparable studies. The limitations of this study further include the exclusion of participants with anxiety and mood disorders, common to this population, as well as the lack of follow-up data.

Boyer et al. (2015) compared two novel CBT programmes with integrated motivational components developed for adolescents with ADHD. They found both to be efficacious, marginally favouring a programme aimed at improving planning skills over a programme with solution-focused treatment. In a follow-up study, they found that initial improvement was sustained or continued to improve one year post-treatment, but no differences were found between the groups (Boyer et al., 2016). The limitations of this study

include the lack of a no-treatment comparison group and blinded outcome measures. The authors also discussed the possibility of the sample being non-representative of the general ADHD-population (Boyer et al., 2015, 2016).

Sibley et al. (2016) developed a programme for parents and teens with a blended approach, including behavioural therapy enhanced with motivational interviewing techniques, *Supporting Teenage Autonomy Daily* (STAND). The STAND programme is focused on teaching skills and primarily targets EF and motivational deficits in adolescents with ADHD. The programme has proven efficacy on several ADHD-related outcome measures. When comparing individual teen-parent sessions with delivery in a group setting, the results did not differ on a group level, but there were indications that an individual approach might be more favourable for some adolescents (Sibley et al., 2020). STAND delivered in a community setting did not outperform usual care in a randomised community-based study (Sibley, Graziano, et al., 2021). The authors proposed that enhancing implementation fidelity might improve future outcomes (Sibley, Bickman, et al., 2021).

Meyer et al. (2021) developed a skills-training programme based on dialectical behavioural therapy (DBT) delivered in a group format for Swedish adolescents with ADHD. DBT is based on CBT but with more emphasis on strategies for emotional regulation and relational problems. This programme did not prove to be effective on ADHD symptoms or other ADHD-related outcomes when compared to a psychoeducational intervention, but participants appreciated the group format of treatment delivery (Meyer et al., 2020).

Young and Bramham (2006) developed a CBT programme for adults with ADHD, which was later revised to include strategies for both adults and adolescents (2012). The Young-Bramham programme (YBP) is based on the CBT model presented in the section “CBT model of ADHD”, and treatment delivery is enhanced with elements of motivational

interviewing. The programme includes modules for comorbid and associated problems and is flexible for use at different levels of health care in both individual and group settings. The programme was studied in a short group intervention for adult patients and found to significantly improve knowledge on ADHD, self-efficacy, and self-esteem as compared to a waitlist control (Bramham et al., 2009).

### **The “ADHD in Adolescence” Study**

The studies presented and discussed in this thesis are part of a larger, randomised, controlled, rater-blinded study of a group CBT programme as addition to psychoeducation and medication for adolescents with ADHD. A detailed account of the study protocol for this trial is presented in a previous publication by Nøvik and colleagues (2020). When planning this treatment study, there was no CBT programme for the adolescent population available in the Scandinavian language. In collaboration with one of the authors, SY, Nøvik and colleagues developed a Norwegian research manual based on selected modules from the YBP. Modules thought to fit the population of Norwegian adolescents with ADHD were translated, adapted, and tested in a pilot study before the RCT was planned and conducted. The treatment was delivered in a group format, as this provided an opportunity to share experiences and practice with peers, as well as the potential to normalise and reduce stigma. Previous studies have indicated that the group format of treatment delivery is highly appreciated in both adolescents and adults with ADHD (Bramham et al., 2009; Meyer et al., 2020; Nordby et al., 2021).

CBT is recommended as an additional treatment for adolescents still experiencing impairing symptoms after standard clinical intervention (Helsedirektoratet, 2016). Standard intervention at the child and adolescent psychiatry (CAP) clinics normally includes information about the diagnostic assessment, and one or a few non-standardised psychoeducational session(s) focused on symptoms, causes, and treatment options. A

collaborative meeting is also normally held between the CAP clinician, parents, and a schoolteacher. The focus of these meetings is typically information about the diagnosis and, if applicable, co-existing problems, and advice on supportive measures related to school, learning, and homework. A full-day lecture on ADHD is offered to parents and schoolteachers. Patients still experiencing impairing symptoms of their ADHD after these psychoeducational and supportive measures are offered psychopharmacological treatment. Normally, this involves a trial period with dose titration and the evaluation of effects and side effects. In Norway, a long-acting methylphenidate is normally the first drug of choice followed by atomoxetine, amphetamines and/or guanfacine. If comorbidity is present, treatment is adjusted accordingly. A more detailed account of previous interventions for the studied population in this trial is presented by Haugan et al (2022).

The present RCT had two study arms, comparing the group CBT intervention to a control group that received no additional treatment. The study was conducted at two CAP outpatient clinics at St. Olav University Hospital in Norway. Initial findings from our research group did not find significant treatment efficacy of the delivered intervention on any of the outcome measures as compared to a passive control-group (Haugan et al., 2022). Previous studies suggest that interventions focused on skills training have the potential for continuous improvement post-intervention as skills are implemented and practised (Kodal et al., 2018), but knowledge on the long-term outcomes of CBT interventions for ADHD is limited. To evaluate the long-term efficacy of the group CBT intervention for adolescents with ADHD delivered in the RCT, a follow-up study was planned, as well as an evaluation of feasibility and participant satisfaction with the programme.

## **Aims of the Thesis**

The overall aim of this thesis was to improve treatment and care for adolescents with ADHD by evaluating the satisfaction, feasibility, and long-term efficacy of a group CBT intervention. We further aimed to improve our understanding of the challenges for this group of patients in a manner that could improve future interventions. More specifically, the aims of the three included studies were:

### **Study I**

- To investigate treatment satisfaction with a CBT group treatment programme for adolescents with ADHD.
- To identify any baseline characteristics that predict satisfaction.
- To explore whether the treatment was considered feasible in the setting of a CAP clinic by measuring attendance, dropouts, medication adherence, and group leaders' perspectives on treatment adherence.

### **Study II**

- To evaluate the long-term treatment efficacy of a CBT-based group intervention on ADHD symptoms, self-efficacy, and global functioning.
- To evaluate changes in ADHD medication from baseline to one-year follow-up among all participants.
- To explore how adolescents experienced participating in the trial and the group-based treatment programme.

### Study III

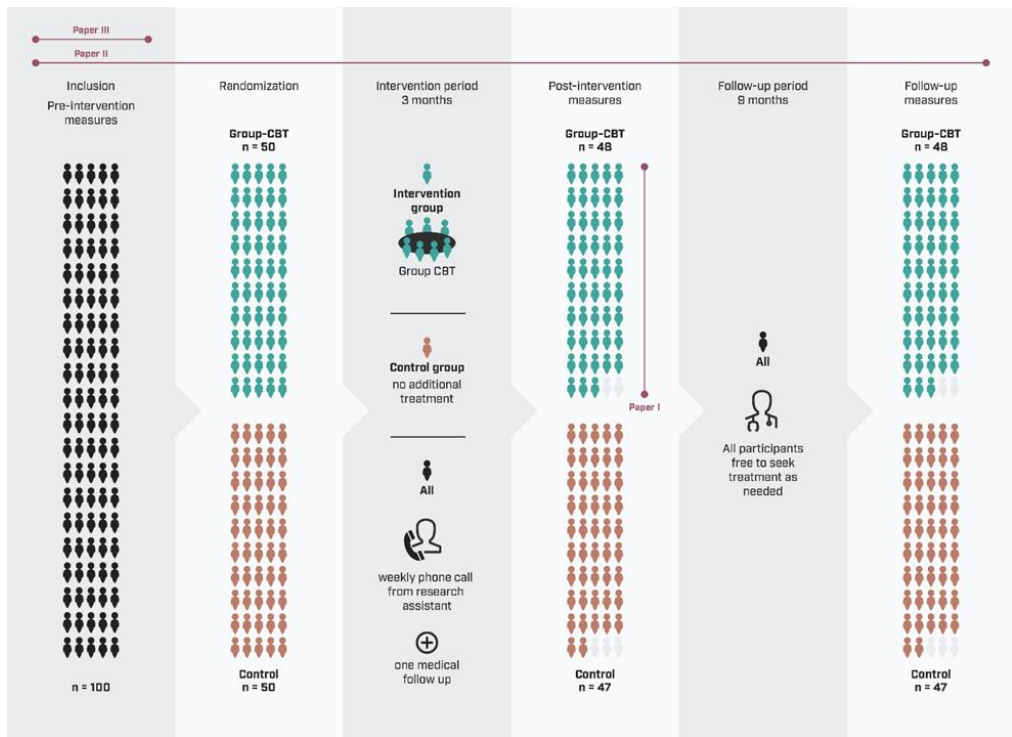
- To use teacher, parent, and self-reported data *on the Behavior Rating Inventory for Executive Functions* (BRIEF) obtained at inclusion to describe the problem profiles of executive functioning for adolescents with ADHD who, despite previous standard intervention and medication, still experience impairing symptoms.
- To evaluate correlations and agreement between informers on behavioural executive function measured by the BRIEF.
- To gain more knowledge on clinical profiles for this group of patients to improve interventions and guide clinicians towards more tailored treatment advice.



# Methods

## Study Design

All participants included in the three studies were adolescents recruited for the RCT previously described. A 12-week group-CBT intervention, as addition to standard clinical CAP treatment, including medication, was compared to no additional treatment. The participant flow and data collection for the three papers are illustrated in Figure 2.



**Figure 2** Participant flow and data used for Papers I, II, and III

## Procedures

**Recruitment:** Patients were recruited between 2017 and 2019, and the last follow-up data were collected in October 2020. Participants were screened for eligibility and recruited by the project leader in cooperation with clinicians from the CAP clinics. Most participants were recruited from the CAP clinics, but a few were recruited through local media, social media, and primary physicians. They all underwent the same procedures prior to inclusion. For details on recruitment and participants flow, see *Figure 1: Participant flow* in Paper II.

**Pre-intervention:** Demographic information was obtained from the patients' medical records at the time of inclusion. A clinical psychologist or child and adolescent psychiatrist assessed diagnosis, comorbidity, and functional impairment pre-randomisation. In the case of uncertainty, the patients' medical records were used to assess the presence of comorbidity. Pre-intervention measures were obtained from patients, parents, and teachers 2-4 weeks prior to the start of intervention. Patients and their parents completed questionnaires at the clinic under the presence of a research assistant, while teachers completed questionnaires at their respective schools before returning them by mail. Randomisation was performed using a computer programme delivered by the Unit of Applied Clinical Research in the Central Norway Health Region.

**Post-intervention:** Clinical assessment of symptom severity and global functioning was performed by a clinician blinded to randomisation in an interview at the clinic 2 weeks post intervention. Participants and their parents completed post-intervention measures at the same visit to the clinic under the presence of a research assistant. Participants in the intervention group completed an evaluation questionnaire at the end of the last group session. Group leaders were present and collected the questionnaires that were assigned a project number not

known to the group leaders. A group leader checklist was completed after all group sessions by one or both group leaders.

**Follow-up:** All participants completing the intervention period were interviewed by telephone 9 months post-intervention. The interviewer was an experienced clinician blinded to randomisation. The measures were completed by reading the questions for the participants and presenting the answer options. If needed, these were repeated, but no further explanation was given unless there was specific wording not understood by the adolescents. In such cases, a short explanation was provided. The same clinician assessed symptom severity and global functioning based on the information in the interviews. After this assessment and completion of all questionnaires, the participants were invited to reveal treatment allocation and answer some open questions on their experience of participation in the trial and, if applicable, their experience of participating in the group therapy.

## **Participants**

The participants were adolescents aged 14–18 (mean age: 15.8, SD: 1.3) at the time of inclusion. Demographic characteristics are presented in Table 1. All participants were previously diagnosed with ADHD after a comprehensive diagnostic assessment at the CAP clinic, following national guidelines (Helsedirektoratet, 2016). The initial diagnostic evaluation followed the ICD-10 (World Health Organization, 1992). Prior to inclusion, diagnosis and comorbidity were re-assessed using a semi-structured diagnostic interview *The Schedule for Affective Disorders and Schizophrenia for School Aged Children -Present and Lifetime Version* (Kiddie-SADS-PL; Kaufman et al., 1997). The diagnosis of ADHD was then classified according to DSM-5 criteria (American Psychiatric Association, 2013) into either predominantly inattentive, predominantly hyperactive-impulsive or combined presentation. Participants with impairing symptoms of ADHD but symptom levels below the

threshold for DSM-5 diagnosis when medicated were diagnostically classified as subthreshold ADHD. All participants had previously received standard treatment for their ADHD according to the recommendations stated in the Norwegian national guidelines, as previously described (Helsedirektoratet, 2016). Adolescents still experiencing impairing symptoms of their ADHD after standard treatment, including at least two months on stable medication, were invited into the study.

Thus, the inclusion criteria were:

- A previous full diagnosis of ADHD according to the diagnostic criteria of the ICD-10.
- A confirmed present diagnosis of ADHD or subthreshold ADHD according to the diagnostic criteria of the DSM-5.
- Previous standard treatment, including stable medication for ADHD (2 months or longer). Patients who tried medication but stopped due to intolerable side effects or minimal effects were also included (for ethical reasons).
- Evidence of still clinically impairing symptoms of ADHD with a score of 3 (mildly ill, some impairment in one setting) or above on the *Clinical Global Impression Scale for Severity* (CGI-S)(Guy, 1976).

Exclusion criteria were as follows:

- Severe depression
- Suicidal behaviour
- Psychosis
- Intellectual disability (IQ<70)
- Ongoing substance use
- Severe behavioural problems or conduct disorders

- Moderate to severe pervasive developmental disorder
- Bipolar disorder without stable medication
- Previous CBT interventions targeting the core symptoms of ADHD
- Ongoing psychotherapeutic interventions
- Declining psychopharmacological treatment

**Table 1:** Clinical characteristics of the study sample included in the thesis

Characteristics	All participants (n = 100)	CBT-group (n = 50)	Control group (n = 50)
Female, n (%)	57 (57)	29 (58.0)	28 (56.0)
Mean age, years (SD)	15.8 (1.3)	15.9 (1.3)	15.8 (1.3)
Full Scale IQ <sup>1</sup> , n (mean [SD])	86 (93.9 [12.9])	44 (94.3 [12.8])	42 (93.4 [13.2])
ADHD presentation <sup>2</sup> , n (%)			
Combined	31 (31)	18 (36.0)	13 (26.0)
Predominantly inattentive	35 (35)	17 (34.0)	18 (36.0)
Subthreshold ADHD	34 (34)	15 (30.0)	19 (38.0)
ADHD RS-IV SR <sup>3</sup> total score, n (mean [SD])	91 (21.52 [9.90])	44 (21.55 [9.75])	47 (21.49 [10.15])
C-GAS <sup>4</sup> , n (mean [SD])	100 (62.15 [6.87])	50 (62.18 [6.98])	50 (62.12 [6.82])
CGI-S <sup>5</sup> , n (mean [SD])	100 (3.94 [ .60])	50 (3.96 [ .53])	50 (3.92 [ .67])
Psychiatric comorbidities present <sup>6</sup> , n (%)	53 (53)	28 (56)	25 (50)
Anxiety disorders	37 (37)	19 (38.0)	18 (36.0)
Depressive disorder NOS/dysthymic disorder	11 (11)	8 (16.0)	3 (6.0)
Tics disorder or Tourette syndrome	9 (9)	4 (8.0)	5 (10.0)
Obsessive compulsive disorder	3 (3)	1 (2.0)	2 (4.0)
Posttraumatic stress disorder	1 (1)	0 (0.0)	1 (2.0)
ODD <sup>7</sup> /disruptive behavioural disorder NOS	11 (11)	6 (12.0)	5 (10.0)
Autism spectrum disorder (mild symptoms)	4 (4)	2 (4.0)	2 (4.0)
Learning disorders, reading disorders or mixed, n (%)	18 (18)	8 (16.0)	10 (20.0)
Medication, n (%)			
ADHD Medication	91 (91)	44 (87)	47 (94)
Methylphenidates	59 (59)	29 (58)	30 (60)
Lisdexamphetamine	19 (19)	8 (16)	11 (22)
Atomoxetine	8 (8)	6 (12)	2 (4)
Guanfacine	4 (4)	1 (2)	3 (6)
Sleep medication <sup>8</sup>	8 (8)	6 (12)	2 (4)
Other psychopharmacological treatment <sup>9</sup>	7 (7)	5 (10)	2 (4)

*Note:* SD: standard deviation, NOS: Not otherwise specified <sup>1</sup>Full scale IQ Wechsler Intelligence

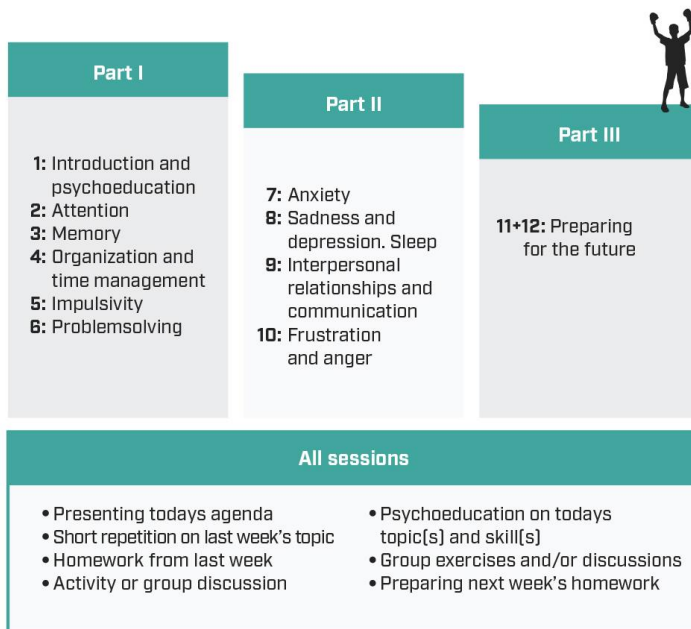
Scale for Children or Adults (WISC-IV, WAIS-IV), <sup>2</sup> Based on the Kiddie-SADS-PL interviews with the adolescents, <sup>3</sup>ADHD-RS-IV SR ADHD: Rating Scale IV Self-Report, <sup>4</sup>C-GAS: Children's Global Assessment Scale, <sup>5</sup>CGI-S'' Clinical Global Impression Scale for Severity,

<sup>6</sup>Psychiatric comorbidities are based on the Kiddie-SADS-PL interviews with the adolescents, <sup>7</sup>ODD:

Oppositional Defiant Disorder, <sup>8</sup>Sleep medication: melatonin, <sup>9</sup> other psychopharmacological treatment includes neuroleptic medication: risperidone, quetiapine, and antiepileptic medication: valproate, lamotrigine

## The Intervention

The CBT programme delivered in the intervention arm of the study was organised and delivered in a group format of 12 weekly sessions. At the core of the programme are three psychological techniques: CBT, psychoeducation, and motivational interviewing. Using these techniques throughout the programme, the intention is to teach the participants about ADHD and to provide psychological strategies for coping with their symptoms and associated problems. All sessions were structured over the same stem and presented visually at the start of every session (see Figure 3). The modules are divided into three parts: Part I contains six sessions focused on the core symptoms of ADHD, Part II includes four sessions focused on associated problems, and Part III includes two sessions focused on preparing for the future. Details are presented in Figure 3.



**Figure 3:** Main outline of the CBT programme used in the present study

To facilitate learning and aid in keeping focus shifting between teaching techniques using visual aids, discussions, role play, and activities are incorporated throughout the programme. CBT techniques including positive reinforcement, rewards, cognitive restructuring including challenging negative automatic thoughts, modelling, and role-play are all emphasised in delivering the program. Between sessions, participants are expected to practice on skills individually defined together with a group leader. There was no parental involvement in the programme.

## **Coaching**

Between sessions, all participants were contacted by a research assistant by phone following up on homework, asking about medication adherence, verifying that they did not receive any other form of psychological treatment, and reminding them of the next treatment session. One routine medical follow-up was performed during the intervention period.

## **Control Conditions**

The participants in the control group continued their medication and normally had one routine medical follow-up at the CAP clinic. As in the intervention group, the participants in the control group also received a weekly phone call from a research assistant, asking about medical adherence and verifying that they did not receive any other psychological treatment. After the post-intervention assessment, all participants were free to seek treatment as needed.

## **Group Leaders**

All groups had two group leaders responsible for delivering the programme. These group leaders were recruited from the CAP clinic, and were either child and adolescent psychiatrists in training, clinical psychologists, or clinical education specialists. They all had clinical



experience and substantial knowledge of ADHD symptomatology and treatment. The group leaders had some knowledge and experience of CBT treatment prior to the trial, but only one had formal CBT training. All group leaders were trained prior to delivering the intervention and received supervision during the intervention period. A more comprehensive description of the competence and training of the group leaders is presented in Paper I.

## **Measures**

An overview of the outcome measures and informants used in this thesis is shown in Table 2. Each measure is presented briefly below. For a more comprehensive description, including psychometric properties, see the respective papers and appendix I.

*ADHD Rating Scale IV* (ADHD-RS IV; DuPaul et al., 1998) is a questionnaire measuring the severity of ADHD symptoms. Symptoms are rated on 18 different items on a 4-point Likert scale. The questionnaire is available in different versions, including home (parental), school (teacher), and self-rated. ADHD-RS-IV is widely used in both clinical and research settings, both to investigate the presence of ADHD symptoms and to evaluate change and/or treatment effects. The instrument has shown acceptable psychometric properties for the adolescent population (Döpfner et al., 2006).

*The Children Global Assessment Scale* (C-GAS; Shaffer et al., 1983) is a measure of overall psychosocial function rated on a scale from 0–100, with higher values representing better function. The C-GAS is widely used in the CAP clinic in Norway and is rated by a clinician based on observations and information about the child's or adolescents' psychosocial function in the last month prior to assessment.

**Table 2:** Outcome measures

Measure	Pre-intervention	Post-intervention	Follow-up	Paper
ADHD-RS-IV	X (S, P, T)	X (S)	X (S)	I, II
CGI-S	X (C)	X (C)	X (C)	I, II
C-GAS	X (C)	X (C)	X (C)	I, II
GSE	X (S)	X (S)	X (S)	II
BPM-YSR			X (S)	II
BRIEF	X (S, P, T)			III
Evaluation Questionnaire		X (S)		I
Group Leaders Checklist		X (GL)		I
Medication Use	X (S, P)	X (S, P)	X (S)	I, II

*Note:* S: self-reported, P: parent reported, T: teacher reported, C: clinical assessment, GL: group leaders, *ADHD-RS*: ADHD Rating Scale IV, *CGI-S*: Clinical Global Impression - Severity Scale, *C-GAS*: Children's Global Assessment Scale, *BPM-YSR*: Brief Problem Monitor - Youth Self Report, *GSE*: General Perceived Self-Efficacy Scale, *BRIEF*: Behavior Rating Inventory of Executive Functions

*The Clinical Global Impression -Severity Scale (CGI-S; Guy, 1976)* is a measure of illness severity rated on a scale from 1 = *normal/not at all ill*, to 7 = *among the most extremely ill patients*. CGI-S is rated by a clinician based on observed and reported symptoms, behaviour, and function in the last seven days. The scale was developed for monitoring treatment effects in clinical trials (Busner & Targum, 2007).

*The General Perceived Self-Efficacy Scale* (GSE; Schwarzer & Jerusalem, 1995) is a measure of self-beliefs regarding one's own abilities to cope with different challenges and demands. The questionnaire contains 10 statements rated on a 4-point scale from 1 = *not at all true* to 4 = *exactly true*, with higher scores indicating more self-efficacy.

*The ASEBA-Youth Self Report, Brief Problem Monitor* (BPM-YSR; Achenbach, 2009) is a short version of the ASEBA Youth Self Report (YSR), an instrument for assessing and monitoring function in children and adolescents. The measure includes 19 statements rated by the adolescent as 0 = *not true*, 1 = *somewhat or sometimes true*, or 2 = *very true or often true*. BMP provides problem scales with age- and gender-adjusted T-scores for internalising, externalising, and attention problems, as well as a total problem score.

*The Behavior Rating Inventory of Executive Functioning* (BRIEF; Gioia et al., 2000) contains different observer and self-rated scales measuring the cognitive, emotional, and behavioural manifestations of executive functioning. We used the parent, teacher, and self-report versions of BRIEF in the present study. Each version contains 80 (self) to 86 (parent and teacher) statements regarding different behaviours rated on a 3-point scale as *never*, *sometimes*, or *often* present. The BRIEF summarises eight scales within two main indexes, as well as an overall score. A more detailed account of BRIEF is presented in Paper III.

The post-intervention evaluation questionnaire, *Treatment Satisfaction and Value of Coaching*, was developed for the present study by the project leader and inspired by an evaluation questionnaire used in a study of CBT for adults with ADHD (Bramham et al., 2009). The questionnaire is presented in full in Paper I. Seven items regarding the experience of participation in the trial were rated on a scale from 1 = *not much/not good* to 4 = *very much/very good* and one question regarding total satisfaction with the CBT programme was

rated on a scale from 1 = *dissatisfied* to 5 = *very satisfied*. The questionnaire also had two open-ended questions regarding the phone calls received between sessions.

The project group developed the *Group Leaders Checklist* for the present study to evaluate fidelity and feasibility from the group-leaders perspective. The checklist included 10 items rated on a 3-point scale (*yes, partly, no*), and 1 item regarding adherence to treatment manual rated on a visual analogue scale from 0–100. The checklist is presented in more detail in Paper I.

Information about *medication use* was retrieved from the parents and the adolescents themselves. This was done during the assessments at the clinic pre- and post-intervention, and in the telephone interview at follow-up. The information was confirmed by comparison to the CAP medical record pre-intervention only.

*The experience* of participating in the trial and the group therapy programme was explored in the telephone interview at the one-year follow-up by asking the adolescents to respond to a few questions, after revealing their group allocation to the interviewer. The procedure and questions asked are presented in Paper II. *Attendance* was registered by the group leaders after every session.

## **Treatment Integrity**

For assessment of competence and adherence in the delivery of the programme, all group sessions except the first and last were videotaped. 6 sessions were randomly selected for training purposes and IRR assessments. From the remaining videos, 22% were randomly selected for rating of competence and adherence, stratified in early (2-6) and late (7-11) sessions. For this purpose, we used the CAS-CBT (Bjaastad et al., 2016). The psychometric documentation for CAS-CBT is limited (Harstad et al., 2021; Rasmussen, 2019), but previous

studies have suggested that CAS-CBT is a reliable instrument for measuring fidelity in a clinical CBT trial (Bjaastad et al., 2016; Harstad et al., 2021). CAS-CBT is an 11-item measure based on observation of therapists in a treatment setting. Competence and adherence are measured in three different dimensions: cognitive therapy structure, process, and relational skills, and achievement of session-specific goals. We made minor revisions to the instrument by removing items regarding parental involvement and adding manual-specific session goals and scoring instructions. Adherence was rated on a scale from 0 = *none* to 6 = *thorough*, and competence was rated on a scale from 0 = *poor skills* to 6 = *excellent skills*. Based on previous studies using CAS-CBT in manualised CBT treatment for adolescents, a predetermined score of 3.0 was set as the minimum threshold for adequate therapist adherence and competence (Kodal et al., 2018; Wergeland et al., 2014). The fidelity ratings were made by the author, an experienced CBT therapist and trained CBT supervisor, after an initial training period assuring adequate agreement with one of the programme developers (Anne-Lise Juul Haugan) and the project CBT-supervisor (Anne Mari Sund). To prevent drifting, video 9 was also assessed by all three raters. The mean CAS-CBT score in the present study ranged from 2.42 to 4.50 (mean: 3.38, SD: .75). Adherence ranged from a mean score of 2.43 to 4.57 (mean: 3.47, SD: .69) and competence ranged from a mean score of 2.20 to 4.60 (mean: 3.25, SD: .87).

## **Data Analysis**

Analyses were performed according to the intention-to-treat principles in Paper II, and analyses were performed on all available cases in Papers I and III. All analyses were performed using SPSS, versions 26.0 (Paper I), 27.0 (Paper II) and 28.0 (Paper III). We report a 95% confidence interval when relevant, and  $p < 0.05$  (two tailed) was considered statistically significant. Pearson's correlation coefficients were categorised as small ( $r = .10$  to

.29), medium ( $r=.30$  to  $.49$ ) or large ( $r=.50$  to  $1.0$ ), following Cohen's guidelines (Cohen, 1992).

### **Study I**

Satisfaction was quantified by calculating the mean scores for all single items in the evaluation questionnaire. An overall satisfaction score was also calculated as the mean from items 1-7, as these were considered the most relevant. The overall satisfaction mean score was used as the dependent variable in the linear regression analysis. Relevant predictors were analysed one at a time, and included age, gender, ADHD presentation, symptom severity, global functioning, comorbidity, and number of sessions attended. Missing data were handled using available case analyses. Qualitative data from the evaluation questionnaire were analysed by grouping comments and reporting on frequencies.

### **Study II**

Primary and secondary outcome measures included self-reported symptom scores and clinician-rated function scores assessed pre-intervention, post-intervention, and at follow-up. If answers were missing on 30% or less of the items on any scale, this was handled by single imputation using the mean score on the respective scale. If more than 30% of the items were unanswered on any scale, they were treated as missing data. Data on all quantitative measures were analysed using linear mixed-effects models for longitudinal data. The outcome variable was defined as the dependent variable, with separate analyses for each outcome. Time and the interaction between group allocation and time were defined as fixed effects, and patient as random effect. This procedure ensures that the baseline value of the outcome variable is handled as recommended by Twisk et al (2018). Qualitative data from the follow-up interviews were analysed using the principles of thematic analysis (Braun & Clarke, 2006).

### **Study III**

Agreement between teacher, parent, and self-rated scores on behavioural executive function measured by BRIEF was assessed using Pearson correlations. Informant discrepancies were analysed using paired samples t-tests. Missing data were handled using available case analyses.

### **Ethical Considerations**

The study was approved by the Regional Committee for Medical and Health Research Ethics in Southeast Norway (2015/2115). All participants and their parents were given oral and written information about the study, randomisation, and treatment conditions prior to inclusion. Written informed consent was obtained from all participants, or their parents, when the participants were under the age of 16. All participants could withdraw their consent at any time.

Although participation was voluntary, there was always the risk that patients felt obliged to participate. They might feel that parents or therapist expected them to volunteer or be afraid that other treatments will be lacking if they do not accept the offer to enrol in the trial. As the group intervention involved meeting other adolescents, there was also the risk of someone sharing personal information outside the group. To minimise such risk, information and discussion of group rules and mutual respect were addressed in all groups. The risk of stigma related to participation in a treatment programme was minimised by organising the groups at the CAP clinics after school hours.

Another ethical dilemma in this population is the control condition. Although all patients were on stable medication and had one medical follow-up, the study conditions of no other treatment during the intervention period could have been difficult for some. Participants

were also encouraged to stay on a stable dosage of their medication throughout the intervention period; this might have been suboptimal for some.

Participants in the intervention group were offered food at the start of every group session, as they came directly from school. All participants also received a universal gift card of NOK 500 upon completion of the last follow-up interview. Although these were motivational incentives to minimize dropouts, there is always a risk of such efforts causing bias, as participants might be more inclined to be more positive towards the programme when compensation is provided.



## Results

All studies included in this thesis are based on a clinical sample of adolescents with ADHD still impaired after standard treatment, including psychoeducation and medication. The CBT-based group treatment delivered in the RCT was considered feasible and was very well liked by the participants but did not improve core symptoms or functional impairment at follow-up as compared to a control group. Our findings underline that the participants in this study represent a heterogeneous group of patients in whom comorbidities and executive functional deficits are frequently present. A short summary of the results from each study follows.

Please refer to the respective papers for a more detailed account.

### Paper I

#### *Cognitive Behavioural Group Therapy for Adolescents with ADHD: A Study of Satisfaction and Feasibility*

Of the 50 participants randomised to the intervention group 48, (96%) completed the intervention and attended a mean of 10.7 (SD 1.4) of the 12 group sessions. Results from the evaluation questionnaire showed overall high satisfaction with the group therapy, with a mean score of 4.21 (SD: .77) on item 10 regarding total satisfaction (rated 1–5). For items 1–7 regarding more specific elements of the programme (rated 1–4) participants rated a mean of 3.14 (SD: .45). The highest ratings were found on items related to the group format of treatment: item 5: *Did you like being in a group with other adolescents* (mean: 3.35, SD: .73) and item 6: *Did you find it useful to learn about the experiences and coping strategies of others* (mean: 3.37, SD: .73). The lowest ratings were found on item 7: *Did you find coaching between sessions helpful* (mean: 2.98, SD: .94), and item 4: *Will you be using any of the skills you have learned* (mean 2.96, SD .83). On the open-ended questions regarding the benefit of

coaching, 71% had positive comments, most frequently about the usefulness of reminders and an added learning effect from being contacted between sessions.

Linear regression analysis showed a significant positive effect of age (.13 per year,  $p=.007$ ) on mean satisfaction (items 1-7). Higher function, as measured by C-GAS, also had a small but statistically significant effect (.021 per unit increase,  $p=.035$ ) on mean satisfaction. Neither gender, ADHD presentation, symptom severity, comorbidity, nor sessions attended were found to predict satisfaction, either overall or on any single item from the evaluation questionnaire.

Group leaders completed a checklist after 97% of the sessions. They generally rated their own adherence to the treatment manual as high. On all items regarding self-rated adherence, the answer was *yes* in 90% or more of all sessions, except for one item regarding addressing resistance towards homework, rated *yes* after 72% of sessions. Group leaders also reported that they found time to make necessary preparations prior to group therapy in 89% of the sessions.

## **Paper II**

### ***One year Follow-up of Participants in a Randomised Controlled Trial of a CBT-based Group Therapy Programme for Adolescents Diagnosed with ADHD***

Of the 100 participants included in the study, 95 completed the interview at the one-year follow up, 48 (96%) in the intervention group, and 47 (94%) in the control group. There were no differences between the groups regarding daytime activities or engagement in health care services. 28.4% reported having been in contact with specialist health care facilities (CAP or adult services) during the follow-up period, while 46.3% were in contact with primary health care providers (most frequently general practitioners monitoring pharmacological treatment).

The primary outcome measure was self-reported symptoms of ADHD as measured by the ADHD-RS-IV. We found an improvement from pre-intervention assessment to follow-up in both groups, but no statistically significant differences were found between the intervention group and the control group either on total score or on any subscales of the ADHD-RS-IV. We did not find any statistically significant differences between the intervention group and the control group in the secondary outcome measures of functional impairment, symptom severity, or self-efficacy at any study point. We found no significant difference between the intervention group and the control group on either total score or any subscales of the YSR-BPM obtained at the one-year follow up.

Of participants using ADHD-medication at inclusion, 32 of the 44 (64%, 4% missing) in the intervention group and 35 of 47 (70%, 8% missing) in the control group were still on stable medication at the one-year follow-up. Among those not using ADHD-medication at the one-year follow-up, 75% were female, and the mean age was 17.3 years (SD: 1.28).

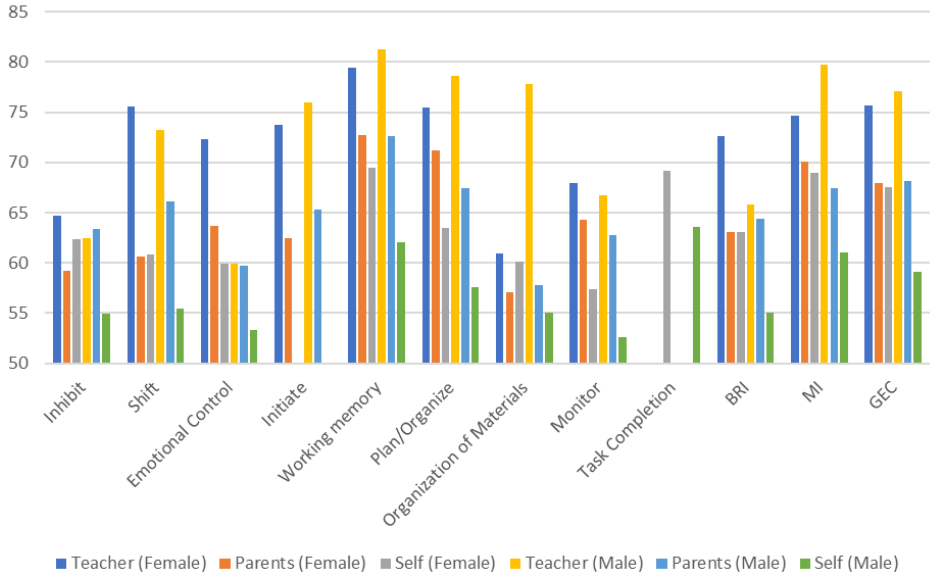
Qualitative data from the follow-up interviews showed an overall positive experience from participating in the trial and in the intervention. Participants in the intervention group highlighted the social aspect of the programme, felt they learned about ADHD and useful strategies, and overall found the programme helpful.

### **Paper III**

#### ***Executive Function Measured by BRIEF in Adolescents Diagnosed and Treated for ADHD: Problem Profiles and Agreement Between Informers***

BRIEF mean T-scores on parent, teacher, and self-reported scales and indexes from all 100 participants in the study, measured at inclusion, are presented in Figure 4. Correlations varied between informants on different scales and indexes. Overall correlations were medium between teacher and parent ratings on all scales and indexes. Correlations were small on most

scales between teacher and self-ratings, but medium on the *Behavior Regulation Index* ( $r = .48, p < .01$ ) and the *Global Executive Function* ( $r = .31, p < .05$ ). Correlations were highest between parents and self-reports, with large correlations on all indexes (mean  $r = 0.55$ ). Overall, the teachers reported the highest problem scores on all scales and indexes. Adolescents self-reported the lowest problem scores on most scales and indexes, but generally, agreement was higher between parents and self-reports, especially among female participants.



**Figure 4:** BRIEF T-score on teacher, parent, and self-reported scales and indexes

**Note:** BRI: Behavior Regulation Index, MI: Metacognition Index, GEC: Global Executive Function

## **Discussion**

### **Main findings**

With the overall aim of improving treatment and care for adolescents with ADHD, this thesis includes three studies all parts of a larger RCT on group CBT for adolescents still impaired after standard treatment, including psychoeducation and medication. In Study I, we found that the programme was feasible and well-liked by the targeted population, with high attendance rates and few dropouts. In Study II, we found, contrary to our hypothesis, that the treatment programme delivered in this trial failed to prove efficacy in reducing core symptoms and functional impairment at the one-year follow-up compared to a control group. We also found that despite reporting overall symptom levels above or just below the clinical threshold, many of these adolescents stopped taking their medication and had little or no contact with health care providers at follow-up. In Study III, we found that the participants in this trial had considerable executive functional deficits as measured by BRIEF at the time of inclusion. Correlation and agreement between parent, teacher, and self-reports on the BRIEF, however, varied, and whereas teachers generally reported the highest problem scores on all scales and indexes, adolescents generally self-reported the lowest problem scores.

### **General Discussion**

#### **Long-term Efficacy of CBT Treatment**

The CBT-programme used in our study was an adaption of the Young-Bramham programme, developed for adolescents and adults with ADHD (2012). This programme has proven to be useful in the treatment of adult patients (Bramham et al., 2009). In a recent publication by our research group Haugan et al. (2022) found that the programme did not prove to be superior to control conditions post-treatment in a population of adolescents still impaired after previous

treatment, including psychoeducation and medication. Only a few studies of CBT for adolescents with ADHD have included follow-up measures, and knowledge on long-term effects is thus limited. Boyer et al. (2016) found that initial improvement from the CBT interventions offered in their trial was sustained or continued to improve at the one-year follow up. A recent qualitative study by Sibley et al. (2022) also found positive outcomes 4 years after participation in a behavioural intervention for adolescents with ADHD. Another recent study found long-term effectiveness from a trans-diagnostic CBT treatment programme for adolescents with emotional problems (Lorentzen et al., 2022). Thus, there are indications of the long-term benefits of CBT treatments. We hypothesised that given the time to implement and practice the skills introduced in the CBT programme, there would be an increased improvement in the intervention group compared to the control group in our trial. However, we still found no significant differences between the groups on any of the outcome measures at the one-year follow-up. There was improvement in ADHD symptoms and self-efficacy in both groups from post-treatment to follow-up. Possible explanations for this include the continuous effect of previous treatment given, regression to the mean, or a general effect of increasing maturity (Biederman et al., 2000).

### **The Intervention**

The original Young-Bramham programme (2012) consists of several modules addressing both the core symptoms of ADHD and associated problems and was designed for flexible use in a group or an individual therapeutic setting. When translating and adopting this programme for Norwegian adolescents, the project group selected the modules thought to be most relevant for our target population of Norwegian adolescents with ADHD still experiencing residual impairment after standard care. As this population is known to have a high degree of comorbidity and associated problems (Schei et al., 2016), it was considered relevant to

include modules addressing these issues in the programme, in addition to modules addressing core symptoms. This resulted in an extensive programme that might have been too ambitious. With many treatment components delivered over a relatively short amount of time, it is possible that the dosage of each component was too low for the successful implementation of new knowledge and skills. This would most likely also affect the implementation of skills and the likelihood of continuous practice after the intervention period. A narrower focus with more time to practice and implement skills in everyday life are potential adaptations to the programme that might improve long-term efficacy. A more tailored intervention, for example, by addressing each participant's specific problems using a case formulation, might also benefit the outcome.

The adolescent population is unique in several ways, and one of the important characteristics of this age is the increasing need for independence and autonomy (Silverberg & Gondoli, 1996). The choice of delivering the treatment programme without parental involvement was partly driven by this knowledge, and partly inspired by the positive results of the Vidal study (2015) targeting adolescents directly without parental involvement. There are, however, also positive findings from other psychosocial treatments for adolescents with strong parental involvement, as in the STAND-programme (Sibley et al., 2016). It could, however, be argued that these programmes are primarily behavioural interventions, with fewer of the cognitive restructuring components known to be important in CBT. Most CBT-programmes targeting children and adolescents have some form of parental involvement in and/or between sessions. Our results from Studies I and II imply that practicing skills between sessions was suboptimal, and although the weekly phone call from a research assistant was intended to increase homework adherence, this might not have been enough. The involvement of parents and/or teachers in CBT for adolescents with ADHD is probably warranted to implement new knowledge and practice new skills; which is consistent with

recent findings in other studies (Meyer et al., 2021; Meyer et al., 2020; Sprich et al., 2016). There is also the question of age and maturity to consider, as it is possible that a more individualised approach is better suited for the eldest and more mature adolescents. The results from Study I suggest that the oldest participants were most satisfied with the intervention, but the results from study II did not reveal any moderating effect of age in our follow-up study.

The population of adolescents with ADHD has a high risk of peer problems, and many have difficulty finding and keeping friends (Barkley et al., 2006). The group format of treatment delivery offers some advantages in relation to this. Of the most important is the possibility of meeting and exchanging experiences with peers, practice skills in a safe environment, and reducing stigma. The findings of Study I indicate that the participants valued the group aspect of the treatment programme and especially highlighted the social element of meeting and sharing experiences with peers as positive. This is consistent with the findings by Meyer et al. (2020) on DBT delivered in a group format in a similar population. Sibley et al. (2020) compared a parent-teen group programme to an individual parent-teen programme and found these to be comparable regarding overall efficacy on treatment outcomes. The results, however, indicated that families with parental psychopathology and high parent–teen conflicts benefitted more from an individual treatment approach. Although our findings indicate that our participants valued the group format, this treatment also offered some challenges that might have affected the treatment outcome. Notably, delivery in a group format limits the ability to focus on an individual case formulation for each participant. As the group leaders delivering the treatment in our programme did not know the participants in advance, the possibility of tailoring the approach to individual needs was even less. The process of randomisation gives no opportunity to compose compatible groups, further limiting the possibility of tailoring the treatment approach to a group. Knowing that



adolescents with ADHD are a heterogeneous group, the manualised approach offered in this programme might not have been a good enough fit for all participants. A combination of individual and group sessions may be a way forward to keep both positive aspects of group treatment while increasing individually tailored intervention.

### **The Heterogeneity of Adolescent ADHD**

The study sample included in this thesis was recruited from a clinical context. The sample was heterogeneous regarding symptom severity, functional impairment, and comorbidities. The inclusion criteria were somewhat broader than in comparable studies (Boyer et al., 2015; Sprich et al., 2016; Vidal et al., 2015). This increases the ecological validity of our sample, as it is close to a natural setting but might have made it more difficult to find treatment effects in our intervention study. The inclusion of participants with sub-threshold ADHD might, for the same reason, have influenced our results, as there was less room for improvement.

Despite the improvement in ADHD symptoms in both groups during the follow-up period, presented in Paper II, there were only minor, non-significant improvements in the measures of overall functioning. This is consistent with previous findings implying that many individuals with ADHD still experience clinical impairment despite improvements in core symptoms from adolescence into adulthood (Barkley et al., 2002, 2006; Biederman et al., 2010). Also consistent with this finding is the conceptualisation that executive dysfunction plays a major part in functional outcomes for this population (Biederman et al., 2004; Craig et al., 2016; Miller et al., 2012; Willcutt et al., 2005). The findings in Paper III support these assumptions, as the participants in our study had considerable EFDs despite previous treatment.

The participants in our study had a high rate of comorbidity, especially for internalising disorders. This is consistent with findings in the general population of

adolescents with ADHD (Schei et al., 2016; Steinhausen et al., 2006; Yoshimasu et al., 2012). The choice of integrating treatment modules directed towards anxiety, depression, and sleep problems was motivated by this knowledge, but the dosage of these modules was low as compared to CBT programmes primarily targeting comorbid conditions. A CBT programme has recently been developed for the treatment of anxiety in patients with ADHD (Sciberras et al., 2019). In a pilot study, the authors found that this programme seems to improve not only anxiety but secondarily both functional outcomes and ADHD symptom severity (Sciberras et al., 2018). More knowledge is needed, but an approach to treatment directly targeting comorbid emotional problems might be a way forward to improving functional impairment for adolescents with ADHD.

Taken together, our findings thus support previous research on ADHD as a heterogeneous condition (D. R. Coghill et al., 2014; Sonuga-Barke, Becker, et al., 2022). Some patients respond well to first-line treatments and medication and have a “benign” developmental course with positive outcomes, but many patients have a more complex condition with more pronounced EFDs, comorbid conditions, and less optimal responses to treatment (Buitelaar et al., 2022; Cortese & Coghill, 2018; Nigg et al., 2020). Previous studies have found that adolescents with ADHD demonstrate varied phenotypes, suggesting that identifying these different profiles of ADHD might be useful in treatment matching (Coxe et al., 2021; Reale et al., 2017). There is growing recognition for the need to integrate these perspectives in treatment development and better tailor treatment to the individual needs of the patient (Sonuga-Barke, Becker, et al., 2022; Sonuga-Barke, Zubedat, et al., 2022). The European ADHD Guidelines Group (EAAG; Coghill et al., 2021) elaborate on these perspectives in a recent publication where they guide practitioners towards an individualised and family-centred evidence-based practice to treatment, taking strengths and impairments as well as the individual treatment targets into consideration. Buitelaar et al.

(2022) also argue in a recent publication that the way forward is towards a more personalised approach to treatment of ADHD, with integration of knowledge on genetics and biological markers, predictors, mediators, and moderators on clinical course, treatment response, and long-term outcome across different ages.

### **Motivation and Self-awareness**

Adolescence is a time for increased independence and autonomy, but for many, there is a lack of maturity for risk assessment and thinking ahead (Silverberg & Gondoli, 1996). For the adolescent psychiatric population in general, resistance and non-compliance to treatment are well-known issues (Park & Kim, 2020). In adolescents with ADHD, ambivalence, the ability to plan and organise, rational decision making, and motivational issues are also common (Sibley, 2019). Our findings in Paper III underline that the population included in our studies had a high prevalence of EFDs, most dominantly on the metacognitive index of the BRIEF, likely to affect these issues. Despite recommendations for long-term treatment, discontinuation of pharmacological treatment is also very common in adolescents with ADHD (Biederman et al., 2019; Gajria et al., 2014). In Study II, we found that many of the participants stopped taking their medication, and many had no contact with any health care system, in line with these previous findings. The reason for discontinuation of treatment is, however, unclear. Medical adherence was satisfactory overall during the intervention period, in which all participants were reminded and asked about medication each week in a telephone call from a research assistant (Haugan et al., 2022). Thus, our first impression was a positive effect on medical adherence, also described in Paper I. However, these results are not sustained over time, as presented in Paper II.

There are indications of a positive illusory bias in adolescents with ADHD (Chan & Martinussen, 2015; Steward et al., 2017). A lack of insight related to functional impairment is

likely to affect treatment choices and might partly explain the problems of treatment compliance. We found considerable differences between EFDs, as reported by teachers, parents, and adolescents themselves, as presented in Paper III, supporting a theory of self-illusory bias. It is possible that negative expectations contribute to the high ratings of EFDs as reported by teachers, but considering that our studied sample had few participants with conduct disorders and fewer reported problems on the behaviour regulatory index of the BRIEF, this is less likely to explain the considerable differences between self- and teacher ratings. Informant discrepancies have previously been found to predict poorer treatment response (Hennig et al., 2018). Thus, this is an important issue to be aware of when planning a treatment approach, as self-awareness of competences and impairment are considered important for behavioural change (Volz-Sidiropoulou et al., 2016).

In addition to the aforementioned problems related to EFDs and self-awareness, issues related to intrinsic motivation and engagement in learning are common in the population of adolescents with ADHD (Morsink et al., 2017; Plamondon & Martinussen, 2019). Treatments that are well-liked and that engage the participation of adolescents with ADHD are hence more likely to succeed. Our findings indicate that the format of treatment delivery giving opportunity to meet and share experiences with peers was considered positive, and many participants reported subjective positive outcomes after the intervention. Although attendance was high, and dropouts were few, there were indications of low adherence to homework and practice of skills between sessions in the intervention period, as shown in Study I and a previous publication by our research group (Haugan et al., 2022). These are issues that need to be addressed in future revisions, as practice and behavioural experiments are considered important for accomplishing behavioural change in CBT treatment (Beck, 2011). Although elements from motivational interviewing were integrated into the programme partly to address these issues, the degree of adherence to this method of delivery was not measured

and therefore uncertain. Regardless, a more individual focus on goals and motivation for change might be warranted. More emphasis on use of immediate rewards to facilitate change might also be useful. However, it should also be noted that the results from Study II suggest that some participants in the treatment intervention experienced participation as stressful. A consideration of the total burden on adolescents, who are often engaged in education and after-school activities in addition to treatment, should also be integrated into treatment planning.

### **Choice of Outcome Measures and Informants**

As previously described, ADHD is a heterogeneous condition that often presents with a complex clinical picture. There is a high rate of comorbidities and a risk of negative outcomes, and functional impairments tend to persist despite a decrease in core symptoms in young adulthood (Faraone et al., 2021; Franke et al., 2018). The choice of outcome measures in treatments targeting ADHD is therefore not always straight forward (Stein, 2007; Weiss, 2022; Wong et al., 2019). The choice of core symptoms of ADHD as a primary outcome for the study of treatment efficacy in our trial was motivated both by the choices made in comparable studies, such as the Vidal study (Vidal et al., 2015), and by the fact that better management of deficits related to core symptoms was the main target of the delivered intervention. One could, however, argue that changes in outcomes related to functional impairment, quality of life, or educational outcomes could be even more relevant in a follow-up study (Stein, 2007; Weiss, 2022). We included measures on functional impairment and symptom severity rated by a clinician in the follow-up study (Study II), but as ratings were based on the sole information from the adolescents themselves in the telephone interview, the reliability of these measures may be less than ideal.

The choice of informer(s) and evaluator(s) also has implications for outcomes. As we had limited resources for follow-up, we chose to obtain measures in Study II through a telephone interview with the adolescents themselves as informants. Mean age at the time of follow-up was 16.8 years, SD 1.3 (Paper II); they were thus close to adulthood, where self-reports are most common in the clinical context. However, there is evidence to support the idea that parent reports are more diagnostically sensitive than self-reports in young adults (Sibley et al., 2012). From our findings in Paper III, we know that the participants in our study reported considerably fewer EFDs than their teachers and parents. Haugan et al. (2022) also found that adolescents reported fewer symptoms on the primary outcome measure, ADHD-RS-IV, pre- and post-intervention, compared to their parents and teachers. Thus, it is possible that the inclusion of self-reports only in Study II might have affected our results, as multiple informants might have provided more differentiated results.

### **Study Setting and Treatment Integrity**

The group leaders delivering the intervention were recruited from local CAP clinics. As detailed in Study I, they all had clinical experience and substantial knowledge of ADHD. However, they had varied experiences with CBT treatment delivery; only one of the group leaders had formal CBT training. Based on the checklist completed by the group leaders after all sessions, they generally self-rated adherence to the manual as very high, except for addressing homework, as previously discussed. Assessments based on observations of video recordings from the treatment sessions, however, indicate less-than-optimal treatment fidelity. Overall competence and adherence were found to be acceptable based on a pre-determined mean score of 3.0 as adequate on the CAS-CBT (details are presented in Paper II), but it could be argued that the threshold for adequacy should be set higher in an efficacy study. The mean scores of both competence and adherence in our intervention were, in fact,

considerably lower than those for other intervention studies where CAS-CBT has been used to assess fidelity (Bjaastad et al., 2016; Bjaastad et al., 2018; Harstad et al., 2021). A substantial variation in the fidelity measures in the sessions assessed in our study should also be noted, as several of the observed sessions did not reach an acceptable level of competence and adherence.

Although the results are not consistent, previous research has linked therapist adherence and competence to treatment outcome (Bjaastad et al., 2018; Sibley, Bickman, et al., 2021). Diminished integrity has also been proposed as a plausible explanation for why effectiveness studies tend to produce lower effect sizes than efficacy studies (Breitenstein et al., 2010). Bjaastad et al. (2018) investigated whether clinical experience, formal CBT training, adherence, and competence predicted outcomes in a manualised CBT programme for anxiety disorders in a Norwegian community setting, using the CAS-CBT. Their findings suggest that results are better when treatment is delivered by therapists with formal CBT training who exhibit high competence. Although all therapists had the same training in the specific manual used for the intervention trial, those with a previous formal 2-year CBT training obtained better outcomes. Sibley et al. (2021) found similar results in the process of implementation of the STAND programme and concluded that diminished fidelity might in part explain the lack of treatment effect of the programme in a community setting as compared to previous results from efficacy studies.

The measure of competence in CAS-CBT is primarily related to the use of CBT-specific treatment strategies, although there is some overlap between the constructs (Rasmussen, 2019). In the sessions assessed for fidelity in our study, the competence measure varied from 2.2 to 4.6, with a mean score just above the pre-determined acceptable level of 3.0. This would indicate that the use of CBT techniques in treatment delivery was also less

than optimal. The less-than-optimal adherence and competence in the delivery of the CBT intervention in our efficacy trial challenges our interpretation of the treatment results. The lack of a positive outcome might be a result of several factors, as previously discussed, related to the conceptualisation of the treatment and the targeted population. There is, however, also the possibility that the lack of treatment efficacy is affected by the programme not being delivered as intended by the programme developers. Efforts to increase treatment integrity should be made in future studies, and the use of therapists formally trained in CBT is most likely warranted.

## **Methodological Considerations**

### **Design**

When studying the potential effects of an intervention, validity can be described in two dimensions: internal validity and external validity (Godwin et al., 2003). High internal validity represents a high degree of confidence that any differences in outcomes are due to the intervention, not by chance. External validity refers to the generalisability of the study; in other words, whether the results obtained can be applied to a real-life setting. Internal and external validity may be further described as being related to the studied population or the study setting; the latter also termed ecological validity. A high degree of internal validity often comes at the expense of external validity, and the choice of study reflects the conclusions that you can be drawn from the results (Godwin et al., 2003).

The randomised controlled design has long been the preferable design of experimental studies, ideally with the double blinding of both participants and evaluators (Machin & Fayers, 2010). This design offers a high degree of internal validity, as the participants were randomly assigned to the intervention or control groups, minimising any systematic



differences between the groups. Randomisation and blinded evaluators increased the internal validity of our trial. However, the treatment offered was not blinded to the participants, as this is challenging in psychotherapeutic studies, adding to the risk of information bias.

Possible measures to avoid such bias would be to compare the CBT intervention to another intervention or compare two different CBT-interventions (Nair, 2019). The low dropout rate of our study also increased internal validity, as there was a lower likelihood of missing data related to the intervention itself.

All participants in our intervention trial were free to seek help or other interventions between the post-intervention and follow-up assessments. There is the possibility that any treatment received during this period diminished the differences between the groups related to the intervention. In Study II, we did not find any differences between the groups regarding received health care from the CAP clinic or contact with the health care system in the follow-up period, but this information was obtained from the adolescents themselves based on what they could remember from the past 9 months. The validity of these measures could therefore be questioned, and more systematic information on both received health care and the type of treatment received would have provided additional information useful to our evaluation. Thus, there is the possibility of differences between the groups in the type and dosage of treatment received during the follow-up period.

### **Study Sample**

There were more female than male participants in our studies, as opposed to the general clinical population of adolescents with ADHD, where there is an overweight of males. This reflects selection bias, which is a common problem within clinical research. It is well known that it is easier to recruit female participants in psychotherapy research, potentially affecting the generalisability of the study results to the general population. The gender distribution also

affects the comorbidities of the studied population, especially the low number of participants with comorbid behavioural disorders, which are more common in boys than girls. The general inclusion of participants with common comorbidities did, on the other hand, increase the external validity of our study.

The choice to include participants with a subthreshold symptom level when medicated also increased the external validity of our studies and is reasonable from a clinical perspective, as these patients, as previously discussed, often still experience functional impairment. This lower pre-intervention symptom level may, however, have affected the possibility of further improvement in primary outcomes. The sample size of our trial was calculated based on a 6-point difference in ADHD-RS-IV post intervention; the rationale for this is thoroughly described in Haugan et al (2022). As the pre-intervention symptom level was lower in participants of our study, a 6-point reduction may possibly be too optimistic. Our study was thus not powered to prove smaller differences, neither was the sample large enough for comparison of subgroups within our sample.

The study sample in Study III was recruited for the clinical trial of a treatment intervention and did not represent a random sample of the population of adolescents with ADHD. Neither was there a comparison group from the general population. This limits the generalisability of our findings.

### **Measures and Informants**

Limitations related to the choice of outcome measures and informants in Paper II have been previously discussed. The limited resources available for the follow-up assessments in this study informed some of these choices, which might have influenced the results and conclusions we may draw. However, there are potential pitfalls related to the inclusion of many outcome measures, as this will increase the risk of statistical errors and reporting bias.

There is also a risk of more dropouts if the assessments are too time-consuming for the participants. Therefore, selecting the outcomes thought to be most relevant is of great importance in treatment evaluation and should be given priority in future studies of adolescents with ADHD (Stein, 2007; Weiss, 2022).

The evaluation questionnaire used in Study I was designed specifically for this trial and inspired by an evaluation questionnaire from a CBT group intervention for adults with ADHD (Bramham et al., 2009). It has not been formally evaluated, and we have limited knowledge regarding the psychometric properties of the questionnaire. This limits the external validity of the findings. The questionnaire did not differentiate well between different aspects of the treatment programme, and some items were not clearly defined. As an example, total satisfaction might therefore include elements not directly related to the treatment delivered, such as the pizza served at the beginning of each session. The questionnaire was delivered only once after the last treatment session, further limiting the generalisability. Study I also included participants only in the evaluation of treatment satisfaction. The addition of parental information might have provided additional information about the perceived usefulness and satisfaction of the intervention from their perspective.

The follow-up measures in Study II were obtained through telephone interviews. Although the same questionnaire was used for the primary outcome at the different assessments, there is the possibility that the different modes of delivery affected the answers given. As this population has a high risk of learning disabilities and known EFDs, their writing and oral processing abilities might differ, affecting how they answered a written as opposed to an orally distributed questionnaire.

Adding qualitative outcome measures to a quantitative efficacy study potentially provides more depth of understanding and gives the participants the opportunity to elaborate

on their experiences beyond the ratings of given statements in questionnaires (Palinkas, 2014). In Paper II, the addition of a short semi-structured interview after the completion of the quantitative measures filled this purpose with the intention of providing an opportunity for the participants to elaborate on their experiences. However, the interview was limited by only a few questions, and only a few of the participants chose to elaborate beyond a few comments. This resulted in limited data for further analysis, and a rigorous qualitative analysis was therefore not possible. Nevertheless, the results from this interview provided some indications of participants' experiences that were not captured by the quantitative outcome measures obtained. For future studies, a mixed method approach with a larger-scale collection of qualitative data would provide useful complementary insight into the experiences of participants. This would be especially useful in the evaluation of interventions targeting a population in which treatment resistance is common.

## **Conclusions and Clinical Implications**

The overall aim of this thesis was to improve treatment and care for adolescents with ADHD. The studies included are all part of a larger RCT on a group CBT intervention for adolescents diagnosed with ADHD and still impaired after standard treatment, including psychoeducation and medication. The work of this thesis contributes to the limited knowledge on this group of patients by reporting on clinical profiles as well as the satisfaction, feasibility, and long-term efficacy of a group-CBT intervention targeting core symptoms and associated problems. The conclusions and clinical implications of this work are presented below.

Findings from Study II indicate that the treatment programme delivered in this trial did not show efficacy in reducing core symptoms and functional impairment at the one-year follow-up as compared to a control group receiving medical follow-up only in the intervention period. In Study I, however, we found that the programme was feasible and very well-liked by the targeted population, with high attendance rates and few dropouts. The group aspect of the programme, meeting, and sharing experiences with peers, was most highly valued. The results from both Studies I and II indicate the need for future improvements related to both the programme and the delivery of the intervention to improve efficacy. At the one-year follow-up, many of the participants still reported positive gains and felt that they had learned a lot from the group intervention. These are important perspectives, as resistance to healthcare and discontinuation of treatment are common issues in this population. The group aspect does, however, limit the possibility of individualising treatment, and a combination of these approaches might be a better way forward. Our results also indicate the need to address motivation and compliance for practicing skills between treatment sessions; this might be improved by involving parents in the programme.

The results from our studies suggest that the group of adolescents still impaired after standard treatment, including psychoeducation and medication, represents a heterogeneous group with a complex clinical phenotype. Findings from Study III suggest that the participants in this trial had considerable executive functional deficits as measured by BRIEF at the time of inclusion. Correlation and agreement varied between teachers, parents, and self-reports of the BRIEF, and we suggest that including multiple informants in evaluation and treatment planning for adolescents with ADHD is useful in a clinical context. Motivational issues and low self-awareness are also likely to affect the choices made by this population regarding treatment. Findings of Study II underline this, as despite recommendations for long-term treatment, and reporting of overall symptom level above or just below clinical threshold at the time of follow-up assessment, many of the adolescents had stopped taking their medication and had little or no contact with health care providers.

The group of adolescents with ADHD still impaired after standard treatment, including medication, represents a heterogeneous group with considerable EFDs and comorbidities. There is a need to develop better treatment options for this group of patients with a complex clinical picture and a high risk of adverse outcomes and negative life trajectories. The knowledge of the short- and long-term efficacy and effectiveness of CBT interventions for adolescents with ADHD is still limited and inconclusive, and more research is needed to determine which patients will benefit from a CBT approach. Considering the heterogeneity of this group, future directions might include more individual tailoring and targeting of specific problem domains and/or comorbid conditions. As the group aspect of treatment seems to be highly appreciated by these adolescents', future studies should explore whether a combination of group and individual modules could be a way forward. Furthermore, future improvements of treatment programmes should consider including more practice on skills and including parents and/or teachers to some extent. An emphasis on

adherence and competence in the delivery of treatment is also warranted. In future follow-up studies, a broader range of outcome measures related to functional outcomes should be included, preferably evaluated by multiple informants. Lastly, as we continue to strive towards improving treatment and care for these adolescents, the challenge remains that self-awareness, motivation, and treatment resistance are issues we need to address to facilitate change.





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# Paper I





## Cognitive behavioural group therapy for adolescents with ADHD: a study of satisfaction and feasibility

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## Cognitive behavioural group therapy for adolescents with ADHD: a study of satisfaction and feasibility

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### ABSTRACT

**Background:** Adolescents with ADHD are at increased risk of adverse outcomes and a negative life trajectory into adulthood. Evidence regarding treatment specifically tailored for the needs of this age group are still limited. High dropout rates, discontinuation of medication and treatment resistance are common issues in this population, and the patient perspective on new treatment options is therefore important. In this study, we aimed to investigate treatment satisfaction and feasibility of a group CBT program for adolescents with ADHD. We further aimed to identify any baseline characteristics predicting satisfaction.

**Materials and methods:** This study was part of a larger RCT of group CBT as add-on treatment for adolescents aged 14–18 years (Mean age 15.9 years, SD 1.3) with ADHD in Norway. Satisfaction and feasibility in the treatment group ( $n=48$ ) were measured by completion of an evaluation questionnaire, attendance of group sessions and a group-leaders checklist. Predictors of satisfaction were analysed using linear regression.

**Results:** Overall satisfaction was very high with a significant age effect, the eldest participants being most satisfied. Attendance rate was high with few dropouts and medical adherence during the treatment period was good. Group-leaders generally self-evaluated adherence to treatment manual positively but addressing resistance towards homework as challenging.

**Conclusions:** The participants were very satisfied with the group CBT treatment. Treatment options that are accepted and well-liked by the targeted population have the potential of reducing resistance towards treatment, improving future health and adherence to medication. The program is considered suitable for a clinical setting and may represent a feasible treatment supplement for adolescent ADHD.

### ARTICLE HISTORY

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ADHD; group therapy; CBT; adolescence; treatment satisfaction

### Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder affecting 3–5% of the general population during childhood [1]. The disorder is characterized by pervasive symptoms of inattention, impulsivity and hyperactivity that affects daily functioning across multiple domains. Although the presenting clinical features and impairment may change as the child grows older, the majority continue to meet diagnostic criteria as adolescents and adults [2]. Adolescents with ADHD are at increased risk of many adverse outcomes and a negative life trajectory into adulthood [3,4]. Appropriate treatment and care for this group will potentially reduce the risk of harmful outcomes and hence be cost-effective on many levels for individuals, families and society [5,6].

National and international guidelines recommend multimodal treatment programs for ADHD [7,8]. Pharmacotherapy has well documented effects on reducing core symptoms [9].

Still, medication does not necessarily contribute to developing skills or function, and is often insufficient to control symptoms and comorbidity [10,11]. Although there is evidence of long-term effect discontinuation of treatment is also a frequent problem [12]. Evidence regarding non-pharmacological treatment options specifically tailored for the needs of adolescents with ADHD are still limited [13].

Cognitive behavioral therapy (CBT) is a well-known and well-documented psychological treatment delivered in both individual and group format and treatment effect has been shown across age groups in a range of psychiatric disorders [14–16]. There is growing evidence on the effect of CBT in reducing core symptoms of ADHD in adults [17], but knowledge on effect of CBT-based programs for adolescent ADHD is still limited. Results from previous studies are promising but not conclusive [18–21]. Hopefully we will gain more knowledge from ongoing studies expected to publish their results in the near future [22,23].

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Patient centred health care plays an important role in psychiatric care. As high dropout rates, discontinuation of medication and treatment resistance are common issues in an adolescent psychiatric population in general [24], the patient perspective is especially important when evaluating new treatment programs for this group [25,26]. For adolescents with ADHD ambivalence, motivational issues and resistance towards treatment are especially challenging and treatment options able to overcome these issues are potentially more likely to succeed.

As part of efforts to improve the quality and efficacy of treatment for adolescents with ADHD, we designed a CBT group treatment tailored to this patient group. When designing the study, we considered an evaluation of satisfaction and feasibility to be an important part of the trial. Thus, the primary aim of the present study was to investigate treatment satisfaction with a CBT group treatment program for adolescents with ADHD. We also aimed to identify any baseline characteristics predicting satisfaction. Furthermore, we aimed to explore if the treatment was considered feasible in a clinical setting of a Child and Adolescent Psychiatric (CAP) clinic by measuring attendance, dropouts, medication adherence, and group-leaders perspective on treatment adherence.

## Materials and methods

### Study design

The present study was part of a larger rater-blinded randomized controlled trial (RCT) with the primary aim to evaluate efficacy of a CBT group therapy program as add-on to standard treatment for adolescents with ADHD. A more detailed account of diagnostic procedures and recruitment process are presented elsewhere [23]. After diagnosis all patients received standard clinical management, including a short psychoeducational intervention and a trial period of medical treatment. After at least one month on stable medical treatment patients still experiencing symptoms and impairment were recruited.

After inclusion patients were randomly assigned to attend CBT-group treatment or a control group. The treatment took place at two CAP outpatient units at St. Olav's University Hospital with the catchment area comprising the city of Trondheim and surrounding areas in Norway.

### Participants and procedure

The study was approved by the Regional Committee for Medical and Health Research Ethics in South East Norway (2015/2115). A total of 100 adolescents aged 14-18 years (Mean age 15.8 years, SD 1.3) were included in the RCT. Randomization into the two treatment arms were done in a 1:1 ratio by a computer program supplied by the Unit for Applied Clinical Research. 50 participants were randomized to the intervention group, 48 of these (96%) completed the intervention and were included in the present study (demographics, Table 1). The diagnosis of ADHD and comorbidity,

Table 1. Demographics, clinical characteristics, and medication use at pre-intervention assessment for participants completing the CBT intervention.

Variable	Total (n = 48)
Gender, n (%)	
Female	28 (58%)
Male	20 (42%)
Age, years (mean, SD)	15.9 (1.3)
ADHD presentation, n (%)	48 (100%)
ADHD-predominantly inattentive	26 (54%)
ADHD-predominately combined	22 (46%)
Medication, n (%)	45 (94%)
Methylphenidate	30 (63%)
Lisdexamphetamine	8 (17%)
Atomoxetine	6 (13%)
Guanfacine	1 (2%)
Comorbidity, n (%)	27 (56%)
Anxiety disorder NOS	7 (15%)
Generalized anxiety disorder/social phobia/specific phobia	10 (21%)
Depression disorder, NOS	6 (13%)
Obsessive compulsive disorder	1 (2%)
Tic disorders and Tourette syndrome	4 (8%)
Behavioural disorder, ODD	5 (10%)
Learning disorder, dyslexia, mixed	8 (17%)
ADHD-RS (mean, SD)	
Self-reported (n = 42)	21.5 (9.9)
Parent-reported (n = 46)	24.2 (9.7)
Teacher-reported (n = 27)	19.6 (10.1)
Functional assessment, C-GAS (mean, SD)	62.8 (6.4)
Severity of illness, CGI-S, n (%)	
Mildly ill	8 (17%)
Moderately ill	36 (75%)
Markedly ill	4 (8%)

Note: C-GAS: Children's Global Assessment Scale; CGI-S: Clinical Global Impression-Severity Scale.

as well as assessment of overall psychosocial function and illness severity, were reassessed after recruitment before inclusion. Inclusion criteria included a verified diagnosis of ADHD according to the International Statistical Classification of Disease and Related Health Problems (ICD-10) [27] and a Clinical Global Impression Severity (CGI-S) [28] score  $\geq 3$  (mildly ill, impairment in one setting). Exclusion criteria were intellectual disability (IQ < 70), autism spectrum disorder, psychosis, substance use disorder, severe conduct disorder, suicidal behaviour, or severe depression. Adolescents with comorbid anxiety disorders, mood disorders, behavioural disorders and tic disorders were included in the study.

All participants who completed the intervention (n = 48) were asked to fill out an evaluation questionnaire at the end of the last group-treatment session. Only the participant number was added to the questionnaire and the participants were ensured that the information would be treated confidentially. The forms were collected by the group leaders, who were blinded to the project number assigned to each participant.

Participants were strongly encouraged to comply with their current medication during the intervention period. During this period one routine medical follow-up was offered by a doctor at the CAP clinic. Medication use was recorded at inclusion and post treatment.

Each CBT-group was led by two group leaders recruited from the CAP clinic. There were in total 11 group leaders in eight different pairs. Seven of the group leaders were psychologists, three were clinical pedagogues, and one was a child and adolescent psychiatrist in training. All group leaders had clinical experience from diagnosing and treating

ADHD in adolescents. The group leaders had varied experience with CBT treatment, only one was certified as a CBT therapist. Group leaders were given a copy of the Young-Bramham textbook describing treatment strategies in CBT for ADHD [29]. They also participated in a full day course on CBT and delivering of the research treatment manual. Supervision was given regularly to all group leaders by an experienced CBT supervisor (AMS) who also attended some sessions as an observer.

### The intervention

The CBT group treatment manual used in this study was an adaption of the CBT program developed by Susan Young and Jessica Bramham [29]. Material from the program was translated to Norwegian by an agency and adjusted to suit a Norwegian population of adolescents. The objectives of the programme were to provide information about ADHD, and psychological strategies and techniques for coping with both ADHD-symptoms and commonly associated problems. By addressing these issues, the treatment aims to reduce core symptoms and improve functioning. The program is delivered in a group format. Cognitive behavioural therapy was the core psychological technique used in delivering this program closely followed by psychoeducation and motivational interviewing.

The manualised intervention was delivered in 12 weekly sessions of 90 min, including a break. Each group usually consisted of six participants. The sessions were organized after school hours, transport aid was provided when needed and food was served upon arrival. The program was delivered using different teaching techniques including visual aids (on-screen presentation), modelling, exercises, group activities and role-play. Handouts with all the presentations and exercises were provided and used for repetition and individual notes. Between sessions all participants received a phone call from a research assistant who followed up on homework and reminded participants about the next session. We used the term 'coach' to describe this role to the participants and on the evaluation questionnaire.

The content of the manualized sessions focused on core symptoms of ADHD, comorbid disorders and difficulties,

and preparation for the future (Table 2). All sessions followed the same structure: (1) presenting today's agenda, (2) reminding about highlights from last week's session, (3) going through homework, (4) starting activity or group discussion, (5) psychoeducation, (6) skills training, (7) exercise or activity, and (8) defining and preparing homework for the following week. Homework was pre-defined based on each session's main subject, presented on a PowerPoint and individualized for each participant with the aid of the group leaders. Cognitive behavioural techniques such as structure, agenda, feedback, rewards and focus on exercises in and between sessions were emphasized in delivering the program. Parents did not participate in this program.

### Measures, pre-intervention

To verify the diagnosis of ADHD and assess comorbidity an experienced clinician interviewed the adolescents before inclusion using a semi-structured diagnostic interview, *The Schedule for Affective Disorders and Schizophrenia for school age children-Present and Lifetime version* (Kiddie-SADS-PL) [30].

*ADHD-Rating Scale-IV* (ADHD-RS-IV) [31] is a questionnaire measuring the severity of ADHD-symptoms on 18 items rated on a 4-point Likert scale. ADHD-RS-IV has shown acceptable psychometric properties in children and adolescents [32]. The questionnaire was completed by participants (self-version), parents (home-version) and teachers (school-version) at inclusion.

*The Children's Global Assessment Scale* (C-GAS) [33] is a measure of global psychosocial function, rated on a scale from 0-100. Higher values indicate better function. The Norwegian version of C-GAS has shown acceptable validity and interrater reliability [34].

*The Clinical Global Impression -Severity Scale* (CGI-S) [28] was used for assessing the severity of the adolescents ADHD. CGI-S was rated on a scale ranging from 1, *normal/not at all ill* to 7, *among the most extremely ill patients*.

An experienced clinician blinded to randomization assessed both CGAS and CGI-S.

Table 2. Overview of the group therapy program.

Modules	Homework assignment
Core symptoms of ADHD	
1. Introduction. What is ADHD	Reflect and make notes about expectations and goals
2. Attention	Awareness of when and where attention is disrupted
3. Memory	Awareness of aids and inner strategies to improve memory
4. Organization and time management	Practice skills to organize, plan and reward effort
5. Impulsivity	Practice skills to reduce impulsive behaviour
Comorbid disorders and difficulties	
6. Problem solving	Practice skills on problem solving
7. Anxiety	Awareness of avoidance, practice skills on exposure and relaxation
8a. Sadness and depression	Reflect and make notes on past episodes of sadness/depression or practice skills to improve your mood
8b. Sleep	Awareness of sleeping pattern and what improves sleep
9. Social interaction and communication	Practice skills on communication and listening
10. Frustration and anger	Practice skills on anger management
The future	
11. and 12. Preparing for the future	Reflect and make notes on future goals and how to achieve them

Table 3. Results from the evaluation questionnaire 'user satisfaction and value of coaching'.

#	Item	n	Mean item score (SD)
1	Have you learned more about ADD and ADHD from participating in this group?	48	3.06 (0.67)*
2	Was the content suitable for your needs?	48	3.04 (0.62)*
3	How well did you understand the suggested skills?	48	3.23 (0.59)*
4	Will you be using any of the skills you have learned?	47	2.96 (0.83)*
5	Did you like being in a group with other adolescents?	48	3.35 (0.73)*
6	Did you find it useful to learn about the experiences and coping strategies of others?	48	3.37 (0.73)*
7	Did you find coaching between group sessions helpful?	47	2.98 (0.94)*
8	How did you benefit from coaching? <sup>a</sup>		
9	Did you have other experiences with coaching? <sup>a</sup>		
10	In total: How satisfied are you with the cognitive behavioural group therapy?	48	4.21 (0.77)**

Notes: \*Participants rated question 1–7 on a scale from 1 *not much/not good* to 4 *very much/very good*. <sup>a</sup>Questions 8 and 9 were open questions.

\*\*Participants rated question 10 on a scale from 1 *dissatisfied* to 5 *very satisfied*.

### Measures, satisfaction and feasibility

Satisfaction and feasibility were measured in the intervention group only. Satisfaction was measured by completion of an evaluation questionnaire by the participants at the end of the last session. Feasibility was measured by recording attendance at all group sessions and by completion of a checklist by group leaders after every session. Current medication use was recorded at inclusion and post-intervention.

*The Treatment Satisfaction and Value of Coaching Questionnaire* (Table 3) was developed for the present study by the last author. The questionnaire was an adaption of the evaluation questionnaire used previously in a study of CBT in adults with ADHD [35]. A reliability analysis was carried out on the evaluation questionnaire items 1–7. Cronbach's alpha showed the questionnaire to reach acceptable reliability,  $\alpha = 0.72$ . Only the deletion of item 3 increased alpha by 0.05. As the difference was small, we chose to keep all items in further analysis.

*The Group-leaders checklist* (Table 4) was developed for this project and included one item regarding preparations before the session and nine items regarding adherence to specified elements of the treatment manual. Each item was rated on a 3-point scale (yes, partly, no) after each session by one or both group-leaders.

### Statistical analyses

All analysis of satisfaction, attendance and medical adherence included all patients who completed the intervention ( $n = 48$ ). We calculated mean scores of satisfactions on both single items and groups of items on the evaluation questionnaire. Analysis of satisfaction were done using the mean score on item 1–7 as well as single item scores. The mean score on item 1–7 were considered most relevant for evaluation of overall satisfaction with the treatment program and was used as dependent variable in linear regression with age, gender, ADHD-presentation, symptom severity, global functioning, comorbidity, and number of sessions attended as predictors, one at a time. Normality of residuals were checked by visual inspection of Q–Q plots.

Qualitative data from open questions in the evaluation questionnaire were analysed by grouping comments and reporting on frequencies. Items on the group-leader's checklists are reported as mean scores and frequencies. All analyses were carried out using SPSS 26.

Table 4. Items on the group-leader checklist.

#	Item
1	Made necessary preparations before the session
2	Repeated main objectives from last session
3	Went through homework from last session
4	Addressed resistance towards homework, identified challenges and planned strategies
5	Starting activity/sustaining interest
6	Psychoeducation
7	Completed exercises
8	Active use of rewards
9	Other issues (open)
10	Defined homework for the following week
11	Adherence to treatment manual for current session (Visual Analogue Scale 0–100)

## Results

### Sample characteristics

There were 50 adolescents randomized to the intervention group and 48 of these (96%) completed the intervention and was included in the analyses. Reasons for dropout was low motivation ( $n = 1$ ) and difficulties attending due to illness severity ( $n = 1$ ). Among the 48 participants there were 28 girls (58%) and 20 boys (42%), with a mean age of 15.9 years (SD 1.3). Clinical characteristics are presented in Table 1.

### Satisfaction and feasibility

Overall satisfaction with the CBT group therapy was high (Table 3). 79.2% rated that they were *somewhat satisfied* or *very satisfied*, 20.8% rated *neutral*, no one rated that they were *somewhat dissatisfied* or *dissatisfied*. The mean score on item 10 total satisfaction (rated 1–5) was 4.21 (SD 0.77) and the mean score on items 1–7 (rated 1–4) was 3.14 (SD 0.45). The highest scores on individual items of satisfaction were reported on items *being in a group with other adolescents* (mean 3.35, SD 0.73) and *usefulness of learning from peers* (mean 3.37, SD 0.73). The mean score of satisfaction was higher for the older participants (0.13 per year,  $p = .007$ ) (Table 5). Also, higher score on the Clinical Global Assessment Scale at intake predicted higher score of mean satisfaction (0.021 per unit increase,  $p = .035$ ). We found no other predictors of satisfaction neither on mean score nor single items on the evaluation questionnaire.

On the open questions about benefit of coaching 71% had positive comments, 8% described coaching as neutral/did not need, one participant described coaching as a

Table 5. Baseline predictors of satisfaction with group-CBT ( $n = 48$ ).

Predictive factor	Coefficient (95% CI)	p-Value
Male gender	0.098 (-0.165, 0.362)	.46
Age in years	0.132 (0.038, 0.226)	.007
ADHD-presentation predominantly inattentive	0.061 (-0.201, 0.322)	.64
Children's Global Assessment Scale (C-GAS)	0.021 (0.002, 0.041)	.035
Clinical Global Impression, Severity (CGI-S)	-0.172 (-0.432, 0.089)	.19
No comorbidity	0.132 (-0.128, 0.393)	.13
Sessions attended	-0.035 (-0.127, 0.056)	.44

Results from linear regression analyses with mean satisfaction (item 1–7) as dependent variable.

negative experience and 18% had no comments. Among the comments were positive remarks about reminders of home assignments and next session and an added learning effect from being contacted between sessions.

Attendance rate was high among those completing the treatment (mean attendance 10.7 sessions, SD 1.4). We found no significant association between satisfaction and attendance (Table 5). 45 of the 48 participants (93.8%) used regular ADHD-medication at baseline, 42 of the 48 participants (87.5%) were still using regular ADHD-medication post-intervention. Reasons for discontinuation for the three participants were side effects ( $n = 1$ ), change to mood stabilizing medication ( $n = 1$ ) and unknown ( $n = 1$ ). Of the 42 patients still using regular ADHD-medication nine (21.4%) had minor changes in dosage during this period.

The *group-leaders checklist* was completed after 97% of sessions by one or both group-leaders. Item 1 on the checklist regarding necessary preparations before the session was rated *yes* after 89% of sessions. On items 2–10 regarding adherence to specified elements of the treatment manual they were all rated *yes* on 90% or more of all sessions with one exception: Item 4, *addressed resistance towards homework*, was rated *yes* after 72% of sessions.

## Discussion

This study aimed to evaluate satisfaction and feasibility of a group CBT program as add-on treatment for adolescents with ADHD. Overall, the participants in the intervention group reported being highly satisfied with the treatment. Drop-out rate was low and attendance rate high, all indicating that the program was well liked and feasible within this population. Furthermore, adherence to medication was good with only three participants discontinuing their medication during the intervention period. The study represents a contribution to the research field of psychosocial interventions in adolescent ADHD. More specifically it provides knowledge to the limited evidence-base of CBT for this group [13]. As resistance towards treatment, dropouts and discontinuation of medication is common among adolescents receiving psychiatric care we have argued that treatment satisfaction is an important measure in addition to treatment efficacy [25].

The group format has the potential of adding a positive dimension of peer support and a safe environment for practicing skills. Meeting others in a similar situation might also reduce stigma and provide normalization. This is especially important in this population as adolescents with ADHD might feel socially isolated and misunderstood by others [36]. Items regarding group format and learning from others

were rated high on the evaluation questionnaire, suggesting that the participants valued the group aspect of the treatment. Previous studies have shown similar results, Meyer and colleagues found in their evaluation of a structured skills training group that the participants emphasized the value of meeting other adolescents with ADHD and exchanging experiences and strategies [37]. Still, the group format comes with some limitations. It is more challenging to tailor the treatment to the individual needs in a group, and some participants might feel that the issues addressed are not relevant for them. In the research setting we were not able to consider age, gender, strengths, and difficulties when putting a group together as the participants were randomly assigned to treatment groups. This is considered important in real life settings.

The perceived usefulness of a phone-call between sessions was ranked lowest among the single items on the evaluation questionnaire. Still, most participants responded positively towards this element of the treatment program. The intention was to remind participants of their next treatment session and aid with homework, as homework compliance is considered an important part of CBT [38]. The phone-call might have had an impact on the good attendance rate, but a few participants also found the call excessive. This part of the intervention might have been considered more useful if one of the group leaders had made the phone-call instead of a research assistant, as they would know the participants and their individual homework assignment better.

As a secondary aim we wanted to analyse predictors of satisfaction. Although overall satisfaction was high, we found that higher age predicted even higher satisfaction in both females and males. This might indicate that the program is more suitable for the eldest participants. This could be due to motivational factors, e.g. related to school performance and skills for everyday functioning. Other possible explanation might be that the content and skills taught in this program is a better fit to the more mature participants. Higher rating on the Clinical Global Assessment Scale at baseline also predicted higher mean satisfaction. Although statistically significant the difference in CGAS is small and probably of limited clinical relevance. We did not find any other baseline predictors significantly associated with degree of satisfaction, neither on total satisfaction nor on single items.

This study was organized in a manner that facilitated attendance by organizing groups after school hours, aiding with transport if needed, serving food upon arrival, and contacting participants by phone between sessions. The high overall satisfaction might be, at least partly, influenced by these elements not directly related to the therapy. All these

elements may also have contributed positively through motivating and reinforcing adherence to therapy and medication. Although it will require some extra resources, we consider these elements feasible in a natural clinical setting of a CAP clinic.

Group leaders overall evaluated adherence to treatment manual positively but addressing resistance towards homework was reported as challenging. This occurred despite the added element of a phone call between sessions, following up on homework. As previously mentioned, the added phone-call between sessions might have had a greater impact on homework if one of the group leaders made this call instead of a research assistant. Homework is considered an important aspect of CBT [38] and the adolescents will benefit from learning to take responsibility and rehearse learned skills in a natural setting. The evaluation on item 'will be using skills' in the evaluation questionnaire is rated lower than mean satisfaction and strengthens the impression that the issue of practicing skills between sessions needs to be addressed in future revisions of the program.

### Strengths and limitations

The present study has several strengths. The treatment was delivered close to a normal clinical setting with clinicians from the local CAP clinics. By including participants with common comorbid disorders the participants of this study are considered a representative selection of Norwegian adolescents with ADHD [39]. The results should therefore be clinically relevant for a CAP clinic. The study also has some weaknesses. Our evaluation questionnaire was developed for this study, which limits the ability to generalize and draw conclusions about the findings. Also, it was administered only once at the end of the last session and does not differentiate well between different aspects of the program. Only the participants number were added to the evaluation form, but even though participants were informed that their information would be treated confidentially there is a risk that this number might have caused uncertainty regarding anonymity and hence a potential information bias. For this study, we only used self-report to evaluate treatment satisfaction. An additional parent evaluation might have added a useful supplemental perspective.

### Conclusions

The group CBT treatment program delivered in this study was well-liked by a population of Norwegian adolescents with ADHD. Attendance was high, drop-outs were few, and medical adherence during the intervention period was good. All participants were satisfied, but the oldest participants reported even higher satisfaction with the intervention. This might indicate that this program is better suited for the more mature adolescents, but further research is needed to address this issue. Treatment options that are accepted and well-liked by the targeted population have the potential of reducing resistance towards treatment, improving future health and adherence to medication. This might in turn improve the future prognosis for

a group of patients with a high risk of adverse outcomes. The available competence on CBT treatment is increasing in the CAP clinics, adding to the argument that this program represents a feasible treatment suitable for a clinical setting. In conclusion, we consider this program to offer a promising treatment supplement for adolescents with ADHD.

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AMS has received travel support and congress fee from MEDICE in the last 3 years. PHT has received speaker's fee from MEDICE and Shire in the last 3 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 the author of "ADHD Child Evaluation (ACE) and ACE+ (for adults), and lead author of "R&R2 for ADHD Youths and Adults". TSN has received a speaker's fee from MEDICE in the last 3 years.

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## Paper II

Andersen, Ann Christin; Sund, Anne Mari; Thomsen, Per Hove; Lydersen, Stian; Young, Susan; Nøvik, Torunn Stene. One year follow-up of Participants in a Randomized Controlled Trial of a CBT-based Group Therapy Program for Adolescents Diagnosed with ADHD (2022).

This paper is under review for publication and is therefore not included.





## Paper III

**Executive Function Measured by BRIEF in Adolescents Diagnosed and Treated for ADHD: Problem Profiles and Agreement Between Informants**

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## **Abstract**

Executive functional deficits (EFDs) play an important role in functional impairment in adolescents with attention deficit/hyperactivity disorder (ADHD). More knowledge of executive function (EF) profiles and informant discrepancies will guide clinicians and provide tailored treatment advice. The objectives of this study were to use teacher, parent, and self-reported EF ratings to describe (a) problem profiles and (b) the correlation and agreement between informants. This study included 100 adolescents aged 14-18 years with ADHD still experiencing clinically impairing symptoms despite standard treatment including medication. EFs were measured using *the Behavior Rating Inventory of Executive Functioning* (BRIEF). Agreement between informants was quantified using Pearson correlation and informant discrepancies were analysed using paired samples t-test. Overall, the results indicated considerable EFDs in the study population. Correlation and agreement varied between the informants. Agreement was highest between adolescents and their parents, especially for female participants, and lowest between male participants and their teachers. Teachers reported the highest level of EFDs, whereas adolescents generally self-reported EFDs at a lower level than both parents and teachers. Identifying and tailoring treatment for EFDs might improve future prognosis for adolescents with ADHD, however, self-awareness of these difficulties is a challenge that needs to be considered when planning interventions.

**Keywords** ADHD, Adolescents, Executive Function

## **Introduction**

Attention deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterised by impaired symptoms of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013). Although often diagnosed in childhood, there are high persistence rates in adolescence and adulthood (Barkley et al., 2002; Sibley et al., 2017). Adolescents with ADHD often struggle in many areas of their lives, psychiatric comorbidity is common, and there is a high risk of adverse outcomes (Arnold et al., 2020; Franke et al., 2018; Jensen & Steinhausen, 2015). There is increased awareness of the complexity of developmental trajectories for these patients, and different phenotypes might warrant different treatment approaches (Coxe et al., 2021). Current treatment recommendations include psychoeducational and supportive measures and medication, but these are often insufficient to normalise function (Posner et al., 2020). A broad range of psychosocial treatments has been developed in recent years, but the overall effect of non-pharmacological treatment for ADHD is inconclusive (Chan et al., 2016).

Executive functions (EFs) are collectively described as processes involved in planning, directing, and managing cognitive, emotional, and behavioural functions, especially during active problem solving (Gioia, Isquith, Retzlaff, et al., 2002). Although not part of the diagnostic criteria and not disorder-specific, there is a growing consensus that executive functional deficits (EFDs) are an important part of ADHD (Willcutt et al., 2005). EFDs have been shown to cause a high degree of impairment and are associated with poor academic and occupational outcomes (Biederman et al., 2004; Dvorsky & Langberg, 2019). EFs also play an important role in self-appraisal and the ability to regulate emotions (Lantrip et al., 2016). Previous studies have indicated that EFDs persist into adolescence and young adulthood (Fossum et al., 2021; Zelazo & Carlson, 2012). With increasing age, there is an increased need for more complex metacognitive aspects of EF in both academic and social settings,

with a higher risk of functional impairment when EFDs are present (Dvorsky & Langberg, 2019; Jacobson et al., 2011). Several studies have highlighted the important relationship between EFDs and functional impairment in adults (Biederman et al., 2006; Hallelund et al., 2019). These findings underline the importance of identifying these difficulties early in life and the need to develop better interventions targeting EFDs in children and adolescents.

Previous studies have shown that the combined use of performance-based tests and rating scales provide complementary information useful for the assessment of children and adolescents with neurodevelopmental disorders (Halvorsen et al., 2019; Krieger & Amador-Campos, 2018). Studies have also shown that the behavioural ratings of EFs correlate better with functional outcomes and have higher ecological validity than formal neuropsychological tests (Barkley & Fischer, 2011; Toplak et al., 2008). However, evidence suggests considerable differences between informants when rating executive functions in children and adolescents (Mares et al., 2007; Soriano-Ferrer et al., 2014). EFs are dynamic, and observed deficiencies may vary across settings depending on both contextual and individual factors (De Los Reyes & Kazdin, 2005). Self-ratings of EFs might also differ from observer ratings owing to a positive illusory bias in adolescents with ADHD, as they tend to overestimate their own abilities (Chan & Martinussen, 2015; Steward et al., 2017).

Behavioural EF measures are frequently obtained as part of the diagnostic assessment in child and adolescent psychiatry (CAP). Informant discrepancies are weighed and interpreted differently, and might impact diagnostic assessment, classification, and treatment strategies (De Los Reyes & Kazdin, 2005). The reporting of EFDs in various settings will provide important information about functional impairment; however, few studies have compared the EFs reported by multiple informants in adolescents with ADHD. Self-reported measures of ADHD symptoms and impairments in general have shown limited agreement with the observed ratings (Du Rietz et al., 2016). However, findings on self-reported

behavioural ratings of EF have shown a moderate correlation with parent ratings, although a lower correlation with teacher ratings (Guy et al., 2004; Walker & D'Amato, 2006). More knowledge would improve the understanding of clinical profiles and informant discrepancies and guide clinicians towards more tailored treatment advice.

Thus, the primary objectives of the present study were to use teacher, parent, and self-reported data on behavioural EFs in a sample of adolescents diagnosed with ADHD who still experience clinically impairing symptoms after standard treatment to (a) describe problem profiles of executive functioning for this population and (b) evaluate the correlation and agreement between informants.

## **Materials and Methods**

### ***Participants and Procedure***

This study included 100 adolescents recruited for a clinical trial of group cognitive behavioural therapy (CBT) for adolescents diagnosed with ADHD. Baseline data obtained prior to randomisation were used in the present study. Detailed accounts of the study protocol have been published previously (Haugan et al., 2022; Nøvik et al., 2020). We conducted this study at two CAP outpatient clinics at St. Olav's University Hospital in mid-Norway. This study was approved by the Regional Committee for Medical and Health Research Ethics in Southeast Norway (2015/2115). We provided oral and written information about the study prior to inclusion and obtained written informed consent from the participants or their parents if they were under the age of 16 years. The data were collected between February 2017 and September 2019.

Sample characteristics are presented in Table 1. All participants had been previously diagnosed with ADHD according to the International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> revision (ICD-10) (World Health Organization, 1992). The

initial diagnosis was made after a comprehensive investigation at the CAP clinic following the national guidelines for the assessment and treatment of ADHD (Helsedirektoratet, 2016). A current diagnosis of ADHD and comorbidity was confirmed at inclusion using a semi-structured diagnostic interview *Kiddie-SADS-PL, Schedule for Affective Disorders and Schizophrenia for School Aged Children -Present and Lifetime version* (KSADS-PL) (Kaufman et al., 1997). Patients with a symptom score below the threshold for ADHD according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria (American Psychiatric Association, 2013) when they were both medicated and still had impaired ADHD symptoms were diagnostically classified as having subthreshold ADHD.

Prior to inclusion in the study, all participants received standard treatment at the CAP clinic. Most participants received a short psychoeducational intervention either alone or together with their parents. Collaborative meetings were held between the CAP clinician, parents, and schoolteachers, with information about the diagnosis and advice about supportive measures related to school and homework. Parents and teachers were offered a standardised full-day course on ADHD. Children and adolescents still experiencing ADHD symptoms were offered pharmacological treatment in line with current recommendations (Helsedirektoratet, 2016). Medication was titrated and evaluated during a trial period, and if needed, a second or third medication option was attempted. Long-acting methylphenidate was normally the first drug of choice, followed by atomoxetine, amphetamines, and/or guanfacine.

The inclusion criteria were a previous full diagnosis of ADHD according to ICD-10 criteria, a current diagnosis of ADHD or subthreshold ADHD according to DSM-5 criteria, and evidence of clinically impairing symptoms (Clinical Global Impression Scale for Severity (CGI-S) score  $\geq 3$ ). Participants were required to be on stable ADHD-medication

(two months or longer) before inclusion. However, nine patients who had tried medication but stopped because of minimal effect or intolerable side effects were also included. The exclusion criteria were severe depression, suicidal behaviour, psychosis, mental retardation (IQ<70), ongoing substance use, severe behavioural problems or conduct disorder, moderate to severe pervasive developmental disorder, or bipolar disorder without stable medication. A few patients undergoing psychotherapeutic interventions or previously having received CBT interventions targeting the core symptoms of ADHD were also excluded.



**Table 1.** Clinical Characteristics

<b>Characteristics</b>	
Mean age, years (SD)	15.8 (1.3)
Female Gender, n (%)	57 (57)
Full scale IQ, n (mean [SD])	86 (93.9 [12.9])
ADHD Rating Scale (ADHD-RS-V) Total Score, n (mean [SD])	
Parent-Reported	97 (24.96 [8.85])
Self-Reported	91 (21.52 [9.90])
Children's Global Assessment Scale (C-GAS), n (mean [SD])	100 (62.15 [6.87])
Clinical Global Impression Scale for Severity (CGI-S), n (mean [SD])	100 (3.94 [0.60])
ADHD presentation, n (%)	
ADHD Predominantly combined subtype	31 (31)
ADHD Predominantly inattentive subtype	35 (35)
Subthreshold ADHD	34 (34)
Medication, n (%)	
ADHD medication <sup>a</sup>	91 (91)
Other psychopharmacological treatment <sup>b</sup>	7 (7)
Psychiatric comorbidities <sup>c</sup> , n (%)	
Anxiety Disorders	37 (37)
Depressive Disorders/Dysthymic Disorder	11 (11)
ODD/Disruptive Behaviour Disorder NOS	11 (11)
Tic Disorders or Tourette's Disorder	9 (9)
Obsessive Compulsive Disorder	3 (3)
Autism Spectre Disorder (mild symptoms)	4 (4)
Posttraumatic Stress Disorder	1 (1)
Learning Disorders, Reading Disorders or mixed, n (%)	18 (18)

*Note* Full scale IQ= Wechsler Intelligence Scale for Children or Adults (WISC-IV, WAIS-IV), SD=standard deviation, ADHD=attention deficit/hyperactivity disorder

<sup>a</sup>ADHD medication includes methylphenidate, lisdexamphetamine, atomoxetine, and guanfacine <sup>b</sup>Other psychopharmacological treatment includes neuroleptic medication; risperidone, quetiapine; anti-epileptic medication: valproate, lamotrigine.

<sup>c</sup>Psychiatric comorbidities are based on Kiddie-SADS-PL interview with the adolescents and converted to DSM-5 diagnoses. ODD Oppositional Defiant Disorder

## ***Measures***

### *Executive Function:*

EFs were measured using parent, teacher, and self-report forms of the *Behavior Rating Inventory of Executive Functioning* (BRIEF) (Gioia et al., 2000a). The BRIEF package contains several rating scales developed to capture the cognitive, emotional, and behavioural manifestations of executive dysfunction across different ages and informants. For the adolescent population, the relevant versions are the BRIEF self-report for ages 11-18 years (Guy et al., 2004), and the original BRIEF for ages 5-18 years with separate teacher and parent forms (Gioia et al., 2000a). The BRIEF parent and teacher form consists of 86 statements regarding different behaviours in the last six months, answered on a 3-point scale: *never, sometimes, or often*. The BRIEF self-report contains 80 statements regarding own behaviour for the last six months, rated in the same manner.

Each version of the BRIEF summarises eight empirically derived scales within two main indices and provides an overall score. The *Behavior Regulation Index* (BRI) represents the ability to shift cognitive sets and modulate emotions and behaviour. BRI summarize the *Inhibit, Shift, and Emotional Control* scales. The *Metacognition Index* (MI) represents the ability to actively solve problems- and manage different tasks. In the parent and teacher forms, MI summarises the *Initiate, Working Memory, Plan-Organize, Organization of Materials, and Monitor* scales. In the self-report version, MI includes the *Task-Completion* scale, but not the *Initiate* scale. The *Global Executive Function* (GEC) is a summary score that includes all eight clinical scales. All BRIEF-versions are found to have strong internal consistency (Gioia, Isquith, Retzlaff, et al., 2002). We performed a reliability analysis for all items in the different versions of the BRIEF used in our study. Cronbach's alpha showed good to excellent reliability with  $\alpha = .88$  to  $.92$ , in line with the original American version

(Cronbach's  $\alpha = .80$  to  $.98$ ). Previous evidence supports the instrument's reliability and validity for measuring EF (Gioia, Isquith, Retzlaff, et al., 2002). The BRIEF differentiates well between the clinical population and control groups, and more specifically, between children with and without ADHD (Gioia et al., 2000b; Sørensen & Hysing, 2014). The Norwegian version of the BRIEF teacher and parent forms have shown good psychometric properties and are considered satisfactory for clinical use in Norway with American norms (Køhn & Halvorsen, 2020; Sørensen & Hysing, 2014). The BRIEF provides raw scores that are transformed into age- and sex-adjusted T-scores. A T-score of  $\geq 65$  is considered clinically elevated, but sub-threshold T-scores (60-65) should also be considered as these might indicate clinical impairment. Clinical studies have shown that children with ADHD are more likely to show significantly more problems across all scales and indices on the BRIEF than non-ADHD controls (Gioia et al., 2000b; Jacobson et al., 2020). Different subtypes of ADHD can also be identified by differing profiles on the BRIEF (Gioia et al., 2000b; Jacobson et al., 2020). Higher problem scores on the BRI and underlying scales were more typical in the ADHD-combined subtype than in the ADHD-predominantly inattentive subtype.

#### *ADHD-symptoms:*

*The core symptoms of ADHD were assessed using parent- and self-rated versions of the ADHD Rating Scale-IV for children and adolescents (ADHD-RS IV) (DuPaul et al., 2016). Symptoms were rated on a 4-point Likert scale, with higher scores indicating more symptoms. The severity of the adolescents ADHD-symptoms was rated on a scale from 1, normal/not at all ill, to 7, among the most extremely ill patients, by an experienced clinician using the CGI-S (Guy, 1976).*

### *Functional Impairment:*

Global psychosocial functioning was rated on a Likert-Scale from 1-100, with higher scores indicating higher function, by an experienced clinician using *The Children's Global Assessment Scale (C-GAS)* (Shaffer et al., 1983).

### *Statistical Analysis*

We quantified the agreement between informants using Pearson correlations. The correlation coefficients were categorised as small ( $r=.10-.29$ ), medium ( $r=.30-.49$ ), or large ( $r=.50-1.0$ ) following Cohen's guidelines (Cohen, 1992). The differences (informant discrepancy) between T-scores for different informants were analysed using paired sample t-tests and the corresponding 95% confidence intervals. Missing data were handled using available case analyses. All tests were two-tailed with a significance level of .05, and the analyses were conducted using SPSS 28.

### **Results**

The clinical characteristics of the participants are presented in Table 1. There were 100 participants in the study, with a mean age of 15.8 (SD 1.3) years. The BRIEF T-scores on the teacher, parent, and self-reported scales and indices are presented in Table 2 and illustrated in Figure 1. Participants generally self-reported EFDs at a lower level than their parents and teachers did. There was a pattern of sex differences throughout the self-reports, with female participants reporting more difficulties in self-reports than male participants. This contrasted with parent and teacher reports, where male participants are reported having more EFDs than female participants. The mean T-scores on teachers' ratings were clinically elevated ( $\geq 65$ ) on all indices and scales except *Inhibit*. Parents' mean T-scores were clinically elevated for the MI and GEC but subthreshold for the BRI. Parents reported most difficulties on the *Working Memory* and *Plan-Organize* scales. Self-reported mean T-scores were clinically elevated only

on the *Working Memory* and *Task Completion* scales, but subthreshold on the *Plan-Organize* scale. GEC scores were in the clinical range for all reports except male self-reports, where the level was subthreshold.

**Table 2.** BRIEF T-scores, scales and indexes by informants and gender.

BRIEF, scales and indexes	Total (n=100)		Female (n=57)		Male (n=43)	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
<b>Inhibit</b>						
Self-report	100	59.13 (14.00)	57	62.32 (14.37)	43	54.91 (12.44)
Parents	100	61.03 (13.76)	57	59.26 (11.61)	43	63.37 (16.02)
Teachers	71	63.80 (16.72)	42	64.71 (17.61)	29	62.48 (15.54)
<b>Shift</b>						
Self-report	100	58.52 (13.06)	57	60.88 (12.04)	43	55.40 (13.82)
Parents	100	62.99 (11.46)	57	60.60 (10.21)	43	66.16*(12.34)
Teachers	69	74.59*(21.34)	41	75.54*(21.42)	28	73.21*(21.54)
<b>Emotional Control</b>						
Self-reports	100	57.06 (13.47)	57	59.89 (14.05)	43	53.30 (11.80)
Parents	100	61.98 (11.65)	57	63.68 (11.30)	43	59.72 (11.87)
Teacher	70	67.21*(19.67)	41	72.37*(20.92)	29	59.93 (15.30)
<b>Initiate</b>						
Parents	100	63.73 (10.77)	57	62.51 (10.72)	43	65.35*(10.74)
Teachers	71	74.65* (14.70)	42	73.74*(14.89)	29	75.97*(14.58)
<b>Task Completion</b>						
Self-reports	100	66.76*(12.43)	57	69.16*(11.16)	43	63.58 (13.41)
<b>Working Memory</b>						
Self-reports	100	66.28*(12.06)	57	69.47*(10.67)	43	62.05 (12.62)
Parents	100	72.66*(10.35)	57	72.68*(10.51)	43	72.63*(10.25)
Teachers	70	80.21*(15.70)	41	79.46*(16.01)	29	81.28*(15.46)
<b>Plan-Organize</b>						
Self-reports	100	60.98 (12.29)	57	63.51 (11.70)	43	57.63 (12.39)
Parents	100	69.60*(10.33)	57	71.25*(10.64)	43	67.42*(9.61)
Teachers	69	76.74*(15.16)	41	75.46*(17.08)	28	78.61*(11.86)

**Organization of Materials**

Self-reports	100	57.95 (12.32)	57	60.14 (12.09)	43	55.05 (12.15)
Parents	100	57.37 (10.39)	57	57.04 (10.87)	43	57.81 (9.83)
Teachers	69	67.80*(21.44)	41	60.93 (15.55)	28	77.86*(24.95)

**Monitor**

Self-reports	100	55.34 (12.21)	57	57.40 (12.23)	43	52.60 (11.76)
Parents	100	63.62 (11.39)	57	64.28 (12.56)	43	67.74*(9.71)
Teachers	70	67.49*(14.44)	41	68.00*(16.71)	29	66.76*(10.69)

**BRI**

Self-reports	100	59.66 (14.02)	57	63.12 (13.74)	43	55.07 (13.17)
Parents	100	63.62 (11.93)	57	63.07 (10.54)	43	64.35 (13.65)
Teachers	70	69.93*(18.63)	42	72.67*(18.97)	28	65.82*(17.64)

**MI**

Self-reports	100	65.56*(12.67)	57	68.95*(11.22)	57	61.07 (13.20)
Parents	100	68.90*(10.15)	57	70.04*(10.46)	43	67.40*(9.64)
Teacher	68	76.76*(14.91)	40	74.70*(15.63)	28	79.71*(13.55)

**GEC**

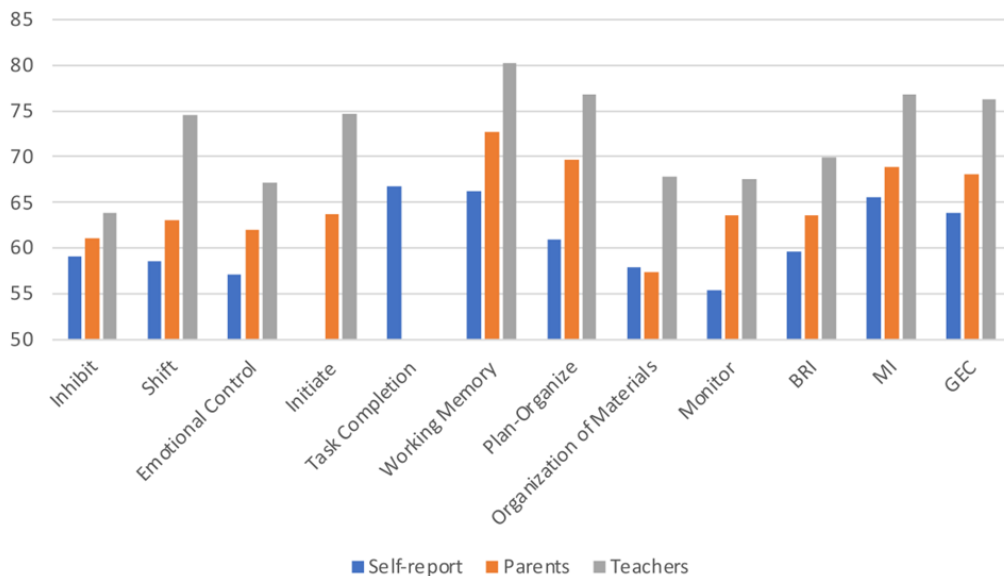
Self-reports	100	63.90 (13.15)	57	67.54*(12.07)	43	59.07 (13.10)
Parents	100	68.02*(10.43)	57	67.91*(9.98)	43	68.16*(11.12)
Teacher	68	76.26*(15.65)	40	75.65*(16.07)	28	77.14*(15.27)

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*Note* GEC=Global Executive Composite, MI= Metacognitive Index, BRI= Behavior Regulation Index

\*Means are considered clinically elevated with a defined T-score  $\geq 65$

Figure 1: BRIEF T-scores, scales and indexes by informants



The overall correlations were medium between teacher and parent ratings for all indices (overall mean  $r = .44$ ) and scales (overall mean  $r = .38$ ) (Table 3). The correlation between teachers and self-reports was large ( $r = .58, p < .01$ ) on the *Inhibit* scale, and medium ( $r = .38, p < .01$ ) on the *Emotional Control* scale, but small on all other scales. The correlation between teachers and self-reports on the main indices and GEC varied from small ( $r = .14$ , not statistically significant) on the MI to medium on the BRI ( $r = .48, p < .01$ ) and GEC ( $r = .31, p < .05$ ). The correlation between parents and self-reports was large for all indices (mean  $r = .55$ ), all statistically significant at the .01 level. The correlation was lowest on the *Monitor* scale ( $r = .41$ ) and highest on the *Emotional Control* scale ( $r = .56$ ).

Discrepancies in terms of differences in the BRIEF T-scores show that teachers rated adolescents as having greater problems than both parents and adolescents on all scales and indices (Table 3). Adolescents generally rated their problems lower than both parents and

**Table 3.** Pearson correlation coefficients and mean differences in T-scores for teacher-, parent- and self-ratings on BRIEF subscales and indexes.

<b>BRIEF scales and indexes:</b>	<b>Informants</b>	<b>n</b>	<b>r</b>	<b>95% CI</b>	<b>Difference, mean</b>	<b>95% CI</b>	<b>p-value</b>
<b>Inhibit</b>	Teacher-Parent	71	.46**	.25 to .62	1.55	-2.32 to 5.42	.43
	Parent-Self	100	.49**	.33 to .63	1.90	-.87 to 4.67	.18
<b>Shift</b>	Teacher-Self	71	.58**	.41 to .72	6.28	2.93 to 9.63	<.001**
	Teacher-Parent	69	.42**	.20 to .60	11.06	6.37 to 15.75	<.001**
	Parent-Self	100	.42**	.24 to .57	4.47	1.83 to 7.11	.001**
	Teacher-Self	69	.25*	.01 to .46	16.39	11.02 to 21.76	<.001**
<b>Emotional Control</b>	Teacher-Parent	70	.47**	.26 to .63	4.53	.33 to 8.73	.035*
	Parent-Self	100	.56**	.41 to .68	4.92	2.56 to 7.28	<.001**
	Teacher-Self	70	.38**	.16 to .56	10.73	6.13 to 15.32	<.001**
	Teacher-Parent	71	.25*	.02 to .46	9.62	5.93 to 13.31	<.001**
<b>Working memory</b>	Teacher-Parent	70	.33**	.10 to .52	6.11	2.41 to 9.82	.002**
	Parent-Self	100	.45**	.28 to .60	6.38	4.04 to 8.72	<.001**
<b>Plan-Organize</b>	Teacher-Self	70	.20	-.03 to .42	14.89	10.62 to 19.15	<.001**
	Teacher-Parent	69	.46**	.25 to .63	5.41	2.09 to 8.72	.002**
	Parent-Self	100	.53**	.37 to .65	8.62	6.41 to 10.83	<.001**
	Teacher-Self	69	.21	-.03 to .43	16.59	12.45 to 20.74	<.001**
<b>Organization of Materials</b>	Teacher-Parent	69	.14	-.10 to .36	9.33	4.01 to 14.66	<.001**
	Parent-Self	100	.52**	.36 to .65	-.58	-2.82 to 1.66	.61
	Teacher-Self	69	-.001	-.24 to .24	9.99	4.06 to 15.91	.001**



<b>Monitor</b>									
	Teacher-Parent	70	.47**	.26 to .63	1.19	-2.01 to 4.38	.46		
	Parent-Self	100	.41**	.23 to .56	8.28	5.73 to 10.83	<.001**		
	Teacher-Self	70	.48**	.27 to .64	12.91	9.63 to 16.20	<.001**		
<b>BRI</b>	Teacher-Parent	70	.49**	.29 to .65	5.37	1.44 to 9.30	.008**		
	Parent-Self	100	.57**	.42 to .69	3.96	1.54 to 6.38	.002**		
	Teacher-Self	70	.48**	.27 to .64	11.39	7.28 to 15.49	<.001**		
<b>MI</b>	Teacher-Parent	68	.38**	.16 to .57	6.0	2.55 to 9.45	<.001**		
	Parent-Self	100	.55**	.39 to .67	3.34	1.14 to 5.54	.003**		
	Teacher-Self	68	.14	-.10 to .37	12.01	7.58 to 16.45	<.001**		
<b>GEC</b>	Teacher-Parent	68	.46**	.25 to .63	6.57	3.14 to 10.00	<.001**		
	Parent-Self	100	.54**	.38 to .67	4.12	1.82 to 6.42	<.001**		
	Teacher-Self	68	.31*	.07 to .51	13.47	9.31 to 17.63	<.001**		

*Note.* BRIEF= Behavior Rating Inventory of Executive Functioning, SD= Standard Deviation, CI= Confidence Interval, BRI= Behavior

Regulation index, MI= Metacognitive index, GEC= Global Executive Composite

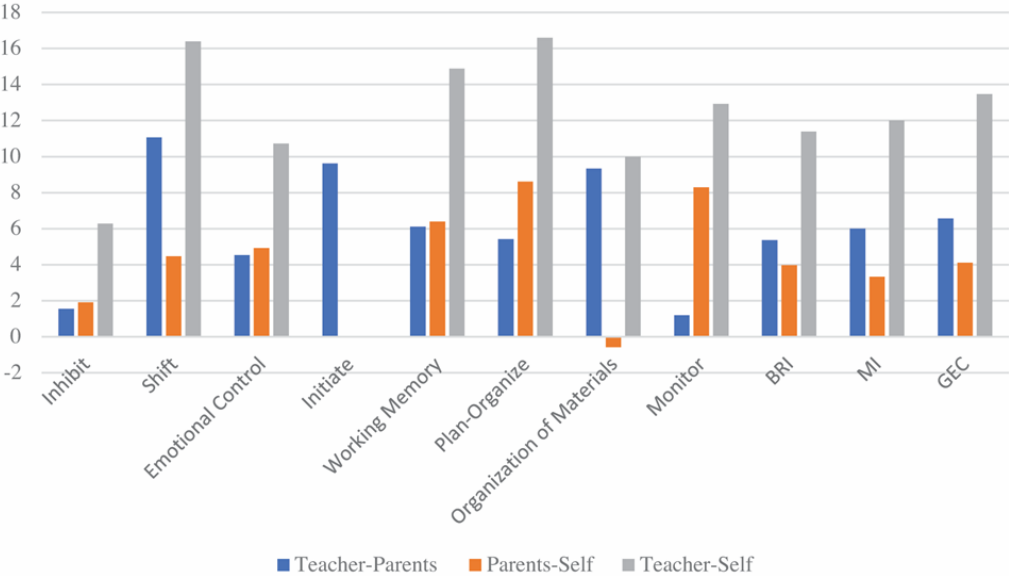
<sup>a</sup> only rated on parent and teacher forms.

\*Significant at the .05 level

\*\*Significant at the .01 level

teachers, with the exception of the *Organization of Materials* scale, but agreement was generally better between adolescents and their parents compared to both adolescents and teachers and parents and teachers. Agreements were highest among female participants and their parents and lowest among male participants and their teachers (Table 2). The mean differences between the informants are shown in Figure 2.

**Figure 2** Discrepancy scores between different informants



**Discussion**

In this study, we aimed to describe problem profiles and informant discrepancies in behavioural EFs as measured by the BRIEF in 100 adolescents diagnosed with and treated for ADHD. Overall, our study shows that the study participants still experienced considerable EFDs despite standard treatment including medication. This study adds to the limited knowledge on the developmental trajectories of ADHD and supports previous findings on the

persistence of EFDs in adolescence and young adulthood for many of these patients despite treatment (Dvorsky & Langberg, 2019; Fossum et al., 2021; Zelazo & Carlson, 2012). The levels of reported EFDs were comparable and on some scales somewhat higher than those reported in previous Norwegian clinical populations (Sørensen & Hysing, 2014). This is most likely explained by our study population, which comprised adolescents still impaired after standard treatment and thus likely to represent a selection of ADHD patients with a complex phenotype (Coxe et al., 2021).

The highest levels of EFDs were reported on the scales comprising the MI. The *Working Memory*, *Initiate*, and *Plan/Organize* scales all have high ratings, which is consistent with previous findings of EF profiles in a clinical ADHD population (Jacobson et al., 2020; Skogli et al., 2013). These difficulties are likely to play an important role in daily functioning, not only academically but also socially. Interventions targeting executive dysfunction in these areas should be considered for this population. Compared to other studies reporting clinical profiles on the BRIEF subscales and indices in children with ADHD, our sample showed lower ratings on the *Inhibit* and *Shift* scales (Gioia, Isquith, Kenworthy, et al., 2002; Jacobson et al., 2020). This might be partly explained by the mean age being considerably higher in our study, and the participants might thus be more mature than those in comparable studies. The *Shift* scale, and partly the *Emotional Control* scale, were rated substantially higher in teacher reports than in adolescent and parent reports. A possible explanation for this might be that adolescents are more distressed at school than at home. Again, this might be related to the high level of comorbidity of emotional disorders in our sample, a subgroup important to be aware of when targeting interventions. The scales comprising the BRI were mostly at a subclinical level, except for teacher reports. This is also in contrast to the findings of previous studies on children with ADHD (Gioia et al., 2000b; Jacobson et al., 2020). A possible explanation for this might be that our study sample

comprised few participants with conduct disorders and no participants with primarily hyperactive-impulsive subtypes, as these clinical subtypes are likely to exhibit more emotional and behavioural regulation problems (Jacobson et al., 2020). Inattentive symptoms are more likely to persist into adolescence and adulthood, whereas hyperactive-impulsive symptoms tend to be less frequent with age (Franke et al., 2018). Inattentive subtypes with less hyperactive/impulsive symptom profiles, as well as more internalising versus externalising comorbidities are also more common in females with ADHD (Coxe et al., 2021; Hinshaw et al., 2012).

We found that both the correlations and mean T-scores varied between informants. Informant discrepancy may have several possible explanations, and there is no “true value” as these measures are subjective in nature. Differences may reflect different contexts of observation, understanding of causes of an observed behaviour and/or informants’ perspectives on symptoms that require treatment (De Los Reyes & Kazdin, 2005). Teachers reported the highest degree of EFDs with clinically elevated T-scores on almost all scales and indices. This is consistent with previous findings and might be related to differences in the context of observation with higher demands on EF, making deficits more visible in the classroom than in the home environment (Mares et al., 2007; Soriano-Ferrer et al., 2014). It is also likely that teachers have a better reference for normality as they interact with students daily, in contrast to parents, who often have limited possibilities for comparison with non-ADHD children (Soriano-Ferrer et al., 2014). These findings are in contrast to the results from a study on a normative sample referred to in the BRIEF manual, where, in general, parents rated their children as having more problems on all scales as compared to teacher ratings (Gioia et al., 2000b). These differences in findings between different samples only emphasise the challenges adolescents with ADHD face in academic settings.

Participants in our study self-reported less EFDs than their parents and teachers did. There is evidence of less self-awareness in adolescents with ADHD as they tend to overestimate their EF abilities (Steward et al., 2017). Previous findings also suggest that parents and teachers are better observers of real-life functioning than adolescents with ADHD, especially males (Hoza et al., 2002). This positive illusory bias in adolescents with ADHD might influence treatment susceptibility, both regarding compliance to medication and the effects of behavioural interventions. Informant discrepancies were also found to predict poorer treatment responses (Hennig et al., 2018). Despite positive self-perception, children with ADHD tend to perform worse and give up more easily on challenging tasks than normally developed children (Hoza et al., 2001). Awareness of one's own impairments is an important prerequisite for changing one's own behaviour, which is important to consider when planning clinical approaches and treatment interventions for this group of patients (Volz-Sidiropoulou et al., 2016).

The present study has several strengths, the most important being the assessments by multiple informants. The study population was also heterogeneous in terms of comorbidities and symptom severity, which is representative of the population of adolescents with ADHD. However, this study had several limitations. First, the selection of participants for this study was not random as they were recruited for a clinical trial. This limits the generalisability of our findings. Second, there was a lack of comparison group. Third, the study was not powered for further analysis of subgroups, such as ADHD subtype or comorbidities.

## **Conclusion**

We observed significant residual EFDs in a clinical sample of adolescents previously treated for ADHD. Our findings suggest that, in addition to parent and adolescent self-reports, it is valuable to include teacher reports in clinical evaluations to provide a broader picture of

EFDs. Although further research is needed, there are indications that EFDs play an important role in predicting functional impairment in ADHD (Biederman et al., 2006; Dvorsky & Langberg, 2019; Halleland et al., 2019). Identifying and tailoring treatments for these deficits might improve the future prognosis of this group of patients. However, the challenge remains that self-awareness and motivation for such interventions may need to be addressed to improve effectiveness.

## **Acknowledgements**

### **Ethical information:**

The Regional Committee for Medical and Health Ethics in South-East Norway approved the study protocol (2015/2115). We obtained written consent from all participants before enrollment and parental consent for participants under 16 years of age.

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### **Disclosure of interests:**

AMS has received travel support and congress fee from MEDICE in the last 3 years. PHT has received speaker's fee from MEDICE and Shire in the last 3 years. ALJH has received travel support and a speaker's fee from MEDICE the last year. TSN has received travel support from MEDICE in the last year. ACA and SL declares no conflicts of interests.

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## Appendix A. Overview of instruments used in this thesis

Instrument	Description	Target Group	Conditions	Scoring	Psychometric properties	Commentary	References
ADHD Rating Scale (ADHD-RS-IV)	Questionnaire measuring the severity of ADHD symptoms	5-18 years	Available in home (parent), school (teacher) and self-rating. Symptoms rated on 18 items regarding inattention, hyperactivity, and impulsivity.	Rated on 4-point Likert scale from 0 = not at all to 3 = very often Higher scores indicate more severity	Good validity and reliability across cultures.	Questionnaire completed by adolescents and parents at the clinic (teachers at respective schools) at pre- and post-intervention. Completed as telephone interview with the adolescents at follow-up.	<b>DuPaul, G. Power, T., Anastopoulos, A., &amp; Reid, R.</b> (1998). <i>ADHD rating scale-IV: Checklists, norms, and clinical interpretation</i> . Guilford Press. <b>Döpfner, M., Steinhausen, H. C., Coghill, D., Dalsgaard, S., Poole, L., Ralston, S. J., &amp; Rothenberger, A.</b> (2006). Cross-cultural reliability and validity of ADHD assessed by the ADHD Rating Scale in a pan-European study. <i>European Child and Adolescent Psychiatry, 15</i> (1), 146-155.
ASEBA-Youth Self Report, Brief Problem Monitor (YSR-BPM)	Questionnaire assessing and monitoring symptoms and function across several domains.	11-18 years	Short version of the Achenbach System of Empirically Based Assessment (ASEBA), Youth Self Report (YSR). Self-rated 19 items regarding internalizing, externalizing and attention difficulties.	Rated on a 3-point scale from 0 = not true to 2 = very true or often true Age and gender adjusted T-scores available.	Norwegian version of BPM found to have good reliability and validity.	Questionnaire completed as telephone interview at follow-up.	<b>Achenbach, T.</b> (2009). <i>Achenbach System of Empirically Based Assessment (ASEBA): Development, Findings, Theory and Applications</i> . University of Vermont, Research Center of Children, Youth & Families. <b>Richter, J.</b> (2015). Preliminary evidence for good psychometric properties of the Norwegian version of the Brief Problems Monitor (BPM). <i>Nordic Journal of Psychiatry, 69</i> (3), 174-178.
Behavior Rating Inventory of Executive Function (BRIEF)	Questionnaire assessing cognitive, emotional, and behavioural manifestations of executive functioning	6-18 years	86-item parent- and teacher report, and 80 item self-report. Summarizes 8 scales within two main indexes (metacognition index and behavior regulation index), as well as an overall score (global executive composite)	Rated on a 3-point scale from 0 = never to 2 = often Age and gender adjusted T-scores available.	Evidence of good psychometric properties. Cronbach's alpha in present study: good to excellent reliability ( $\alpha = .88$ to $.92$ ) in line with original American version	Questionnaire completed by parents, teachers, and adolescents at pre-intervention assessment.	<b>Gioia, G. A., Isquith, P. K., Guy, S. C., &amp; Kenworthy, L.</b> (2000). <i>Behavior rating inventory of executive function: BRIEF</i> . P. A. Resources. <b>Guy, S. C., Isquith, P. K., &amp; Gioia, G. A.</b> (2004). <i>Behavior rating inventory of executive function-self-report version professional manual</i> . Psychological Assessment Resources. <b>Gioia, G. A., Isquith, P. K., Kenworthy, L., &amp; Barton, R. M.</b> (2002). Profiles of everyday executive function in acquired and developmental disorders. <i>Child Neuropsychology, 8</i> (2), 121-137.

Instrument	Description	Target Group	Conditions	Scoring	Psychometric properties	Commentary	References
Children's Global Assessment Scale (C-GAS)	Scale for rating of overall psychosocial functioning	4-16 years	Rated by clinician based on observed and reported functioning in different settings  Lowest level for a specified time-period	Rated on scale from 0-100  Higher value indicates better function	Inter rater reliability (IRR):.84 Test-retest stability (ICC): .69-.95  Used on older age groups in several studies without reducing IRR.	C-GAS rated by experienced clinician in present study, based on observed and reported function at pre-and post-intervention assessments, and by reported function in telephone interview at follow-up.	<b>Shaffer, D., Gould, M. S., Brasic, J., Ambrosini, P., Fisher, P., Bird, H., &amp; Aluwahlia, S. (1983).</b> A children's global assessment scale (CGAS). <i>Archives of General Psychiatry</i> , <i>40</i> (11), 1228-1231.  <b>Weissman, M. M., Warner, V., &amp; Fendrich, M. (1990).</b> Applying Impairment Criteria to Children's Psychiatric Diagnosis. <i>Journal of the American Academy of Child and Adolescent Psychiatry</i> , <i>29</i> (5), 789-795.
Clinical Global Impression - Severity Scale (CGI-S)	Scale for rating the severity of a patient's illness	Children and adults	Rated by clinician based on observed and reported symptoms, behaviour, and function in the last 7 days	Rated on 7-point scale from 1 = normal/not at all ill to 7 = among the most extremely ill patients.  Higher value indicates more severe symptoms	Developed for monitoring treatment effects in clinical trials. Shown to be a reliable measure of disease severity and is sensitive to change.	CGI-S rated by experienced clinician in present study, based on observation and reported symptoms, behaviour, and function at pre- and post-intervention assessments, and on reported symptoms and function in telephone interview at follow-up.	<b>Guy, W. (1976).</b> <i>ECDEU assessment manual for psychopharmacology</i> (Vol. 76). US Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute of Mental Health, Psychopharmacology Research Branch, Division of Extramural Research Programs.  <b>Busner, J., &amp; Targum, S. D. (2007).</b> The clinical global impressions scale: applying a research tool in clinical practice. <i>Psychiatry (Edgmont)</i> , <i>4</i> (7), 28-37.
Competence and Adherence Scale for Cognitive Behavioral Therapy (CAS-CBT)	Semi-structured assessment of treatment integrity	Expert rater	Ratings based on observation of treatment sessions. An 11-item measure on three dimensions: cognitive structure, process and relational skills, and achievement of specified session goals	Adherence rated on a scale from 0 = none to 6 = thorough, and competence on a scale from 0 = poor skills to 6 = excellent skills	Limited documentation, but studies suggest that the instrument is reliable for measuring fidelity in clinical CBT trials.	In present study rated by clinician with competence in CBT and the manual after observation of videotaped treatment sessions.  Minor adjustments to the instrument were made, by removing items on parental involvement and adding program specific goals.	<b>Bjaastad, J. F., Haugland, B. S., Fjermestad, K. W., Torshelm, T., Havik, O. E., Hetervang, E. R., &amp; Ost, L. G. (2016).</b> Competence and Adherence Scale for Cognitive Behavioral Therapy (CAS-CBT) for anxiety disorders in youth: Psychometric properties. <i>Psychological Assessment</i> , <i>28</i> (8), 908-916.  <b>Harstad, S., Bjaastad, J. F., Hjemdal, O., Compton, S., Waaktaar, T., &amp; Aalberg, M. (2021).</b> Competence and Adherence Scale for Cognitive Behavioural Therapy (CAS-CBT) for anxiety disorders in youth: reliability and factor structure. <i>Behavioural and Cognitive Psychotherapy</i> , <i>49</i> (6), 745-757.  <b>Rasmussen, L.-M. P. (2019).</b> Måleegenskaper ved den norske versjonen av Competence and Adherence Scale for Cognitive Behavioral Therapy (CBT) for Anxiety Disorders in Youth (CAS-CBT). <i>psykiestbarnt</i> (1).

Instrument	Description	Target Group	Conditions	Scoring	Psychometric properties	Commentary	References
Evaluation Questionnaire: <b>Treatment Satisfaction and Value of Coaching</b>	Evaluation questionnaire	Adolescents	Rated by participants in the intervention	Seven items rated on a scale from 1=not much/not good to 4=very much/very good. Total satisfaction rated on a scale from 1= dissatisfied to 5=very satisfied. Two open-ended questions.	Analysis of reliability was carried out on items 1-7. Cronbach's alpha showed acceptable reliability $\alpha=.72$	Developed for the present study by the project leader and presented in full in Paper I. Completed by participants in the intervention group after the last treatment session.	<b>Andersen, A. C., Sund, A. M., Thomsen, P. H., Lydersen, S., Young, S., &amp; Nøvik, T. S. (2022).</b> Cognitive behavioural group therapy for adolescents with ADHD: a study of satisfaction and feasibility. <i>Nord J Psychiatry, 76</i> (4), 280-286.
General Perceived Self-Efficacy Scale ( <b>GSE</b> )	Questionnaire measuring belief in one's own ability to cope with a broad range of challenges and demands.	Children and adults	Self-rated 10-item one-dimensional scale	Items range from 1= all wrong to 4= completely right Higher scores represent positive self-efficacy.	Convergent validity with other similar constructs has been moderate to low.	Questionnaire completed by adolescents at pre- and post-intervention assessments. Completed in telephone interview with the adolescents at follow-up.	<b>Schwarzer, R., &amp; Jerusalem, M. (1995).</b> <i>Generalized self-efficacy scale</i> In: <i>Weinman, J., Wright S, Johnston M, editors.</i> Windsor, UK: NFER-NELSON. <b>Scholz, U., Doña, B. G., Sud, S., &amp; Schwarzer, R. (2002).</b> Is general self-efficacy a universal construct? Psychometric findings from 25 countries. <i>European Journal of Psychological Assessment, 18</i> (3), 242-251.
Group Leaders Checklist	Questionnaire measuring treatment integrity and feasibility	Group Leaders	Checklist completed by one or both group leaders	10 items rated on a 3-point scale (yes, partly, no). Adherence rated on scale from 0-100	No information on psychometric properties available.	Developed for the present study and presented in full in Paper I. Completed by group leaders shortly after each treatment session.	<b>Andersen, A. C., Sund, A. M., Thomsen, P. H., Lydersen, S., Young, S., &amp; Nøvik, T. S. (2022).</b> Cognitive behavioural group therapy for adolescents with ADHD: a study of satisfaction and feasibility. <i>Nord J Psychiatry, 76</i> (4), 280-286.
Schedule for Affective Disorders and Schizophrenia for School-Age Children ( <b>K-SADS-PL</b> ) (present and Revised version 2009)	Psychiatric diagnosis based on the Diagnostic and Statistical Manual of mental Disorders (DSM-IV) (present and lifetime)	6-18 years	Semi-structured psychiatric interview of child/adolescent and parents performed and scored by trained clinician	Diagnoses are scored as: -definite -probable ( $\geq 75\%$ of criteria), or -not present	Inter-rater reliability 98% (93-100 %) agreement. Validity: high concurrent validity when compared with questionnaires on ADHD, behavioural problems, depression, and anxiety	All participants were interviewed by an experienced clinician at inclusion (psychologist or child and adolescent psychiatrist)	<b>Kaufman, J., Birmaher, B., Brent, D., Rao, U., Flynn, C., Moreci, P., Williamson, D., &amp; Ryan, N. (1997).</b> Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL): initial reliability and validity data. <i>Journal of the American Academy of Child and Adolescent Psychiatry, 36</i> (7), 980-988.

<b>Instrument</b>	<b>Description</b>	<b>Target Group</b>	<b>Conditions</b>	<b>Scoring</b>	<b>Psychometric properties</b>	<b>Commentary</b>	<b>References</b>
Wechsler Adult Intelligence Scale, fourth edition (WAIS-IV)	Intelligence test for adults	16-89 years	Cognitive tests of verbal ability, perceptual reasoning, working memory and processing speed	0-100 percentiles, T-scores, and IQ scores. Higher scores equal higher IQ	Evidence of good psychometric properties.	Performed by a licenced clinician as part of initial assessment at the CAP clinic.	<b>Wechsler, D.</b> (2008). <i>Wechsler Adult Intelligence Scale--Fourth Edition (WAIS-IV)</i> [Database record]. APA PsycTests. <b>Wechsler D.</b> Psychological Corporation & PsychCorp (Firm). (2008). <i>Wais-iv technical and interpretive manual</i> (4th ed.). Pearson <b>David, W.</b> (2003). <i>Wechsler Intelligence Scale for Children / Fourth Edition (WISC-IV)</i> . Pearson's Clinical Assessment Group. <b>Canivez, G.</b> (2013). Construct Validity of the WISC-IV With a Referred Sample: Direct Versus Indirect Hierarchical Structures. <i>School psychology quarterly : the official journal of the Division of School Psychology, American Psychological Association</i> , 29.
Wechsler Intelligence scale for children, fourth edition (WISC-IV)	Intelligence test for children	6-18 years	Cognitive tests of verbal ability, perceptual reasoning, working memory and processing speed	Cognitive tests of verbal ability, perceptual reasoning, working memory and processing speed	Evidence of good psychometric properties.	Performed by a licenced clinician as part of initial assessment at the CAP clinic.	

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