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ADHD in adolescence

Evaluation of a structured skills training group and associated predictors of functional impairment

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Abstract
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Attention-deficit/hyperactivity disorder (ADHD) is related to difficulties with self-control and functional impairment across several life domains. Cognitive behavioral therapy has been recommended for adolescents with ADHD, but evidence of its effectiveness remains scarce. Associated predictors of daily impairment for this age group also need further investigation. The overall aim of this thesis was to evaluate the effectiveness, acceptability, and experience of a structured skills training group (SSTG) for adolescents with ADHD, and to explore associated predictors of functional impairment in this group of patients. Study I was a randomized controlled trial where the SSTG, which was based on dialectical behavioral therapy, was compared to an active control group of psychoeducation (164 participants were included in the main analyses). In Study II (n = 128), potential treatment moderators were explored in order to investigate if certain subgroup(s) might have an effect from the SSTG. In Study III, the experience of participating in the SSTG was investigated in a qualitative interview study (n = 20). Study IV was a cross-sectional study including adolescents with (n = 164) and without (n = 106) ADHD, where associated predictors of impairment were explored. The findings from Study I suggested that the SSTG was not more effective than the control intervention. A majority did report benefits from the SSTG, indicating that the treatment was acceptable for the adolescents. In Study II, three moderators were identified (hyperactivity/impulsivity, conduct problems, and impairment of emotional dysregulation); participants with elevated symptoms of these moderators had a better effect from the SSTG than from the control intervention. In Study III, the participants expressed appreciation of meeting peers with ADHD and described a feeling of togetherness. Adaptations of the treatment were suggested, such as more practicing and discussions. In Study IV, inattention was identified as the strongest associated predictor of impairment in school and symptoms of psychiatric comorbidity contributed to the explained variance of daily impairment. In conclusion, the group format of the SSTG seemed to provide added value for adolescents with ADHD, but further adaptations of the treatment (e.g., more extensive practicing of skills) are warranted to enable improvements in daily functioning. More research is needed to establish the potential effectiveness of the SSTG for certain subgroups. School-based interventions more tailored for attentional deficits might be needed to improve academic functioning, and comorbid symptoms should be routinely assessed and treated in adolescents with ADHD.

Keywords: ADHD, Adolescents, CBT, DBT, Group treatment, Functional impairment

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“There is a crack in everything. That’s how the light gets in.” /Leonard Cohen

To my family

List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

I. Meyer J, Ramklint M, Hallerbäck MU, Lööf M, Isaksson J. Evaluation of a structured skills training group for adolescents with attention-deficit/hyperactivity disorder: a randomised controlled trial. Eur Child Adolesc Psychiatry. 2021:1-13.

II. Meyer J, Zetterqvist V, Hallerbäck MU, Ramklint M, Isaksson J. Moderators of long-term treatment outcome when comparing two group interventions for adolescents with ADHD: Who benefits more from DBT-based skills training? (Under review).

III. Meyer J, Öster C, Ramklint M, Isaksson J. You are not alone–adolescents' experiences of participation in a structured skills training group for ADHD. Scand J of Psychol. 2020;61:671-8.

IV. Meyer J, Alaie I, Ramklint M, Isaksson J. Associated predictors of functional impairment among adolescents with ADHD–a cross-sectional study. Child Adolesc Psychiatry Ment Health. 2022;16.

Appendix. Meyer J, Ramklint M, Hallerbäck MU, Lööf M, Isaksson J. Evaluation of a structured skills training group for adolescents with attention deficit/hyperactivity disorder (ADHD)–study protocol of a randomised controlled trial. BMC Psychiatry. 2019;19.

Scientific papers not included in the thesis

1. Öster C, Ramklint M, Meyer J, Isaksson J. How do adolescents with ADHD perceive and experience stress? An interview study. Nord J Psychiatry. 2020;74(2):123–30.

2. Frick MA, Meyer J, Isaksson J. The role of comorbid symptoms in perceived stress and sleep problems in adolescent ADHD. Child Psychiatry Hum Dev. 2022:1–11.

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Abbreviations

ADHD	Attention-Deficit/Hyperactivity Disorder
ADHD-C	ADHD Combined Presentation
ADHD-I	ADHD Predominantly Inattentive Presentation
ASRS-A	Adult ADHD Self-Report Scale for Adolescents
ADHD UNS	Unspecified ADHD
CAP	Child and Adolescent Psychiatry
CBT	Cognitive Behavioral Therapy
CD	Conduct Disorder
CSDS	Child Sheehan Disability Scale
DBT	Dialectical Behavioral Therapy
DSM	Diagnostic Statistical Manual of Mental Disorders
ED	Emotional Dysregulation
EF	Executive Functioning
FFMQ	Five Facet Mindfulness Questionnaire
GQL	Global Quality of Life
HADS	Hospital Anxiety and Depression Scale
IAS	Impact of ADHD Symptoms
KSQ	Karolinska Sleep Questionnaire
MINI-KID	Mini International Neuropsychiatric Interview for Children and Adolescents
ODD	Oppositional Defiant Disorder
PAS	Pressure Activation Stress Scale
RCT	Randomized Controlled Trial
SDQ	Strengths and Difficulties Questionnaire
SSTG	Structured Skills Training Group
T1	Time Point 1 (pre-treatment assessment)
T2	Time Point 2 (post-treatment assessment)
T3	Time Point 3 (follow-up assessment)

Introduction

ADHD

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental condition characterized by age-inappropriate symptoms of inattention, hyperactivity, and impulsivity, resulting in functional impairment across several life domains (1). The diagnostic criteria for ADHD were formalized in the later part of the 20th century, but descriptions of children displaying the core symptoms of ADHD have been found in the literature for more than two centuries (2).

Diagnostic criteria

According to the latest edition of the Diagnostic Statistical Manual of Mental Disorders (DSM-5) (1), the diagnostic criteria for ADHD consist of nine symptoms in the domain of inattention (e.g., difficulties to sustain attention and to organize tasks and activities) and nine symptoms in the domain of hyperactivity/impulsivity (e.g., difficulties being still for extended time and waiting for one's turn). To get a diagnosis of ADHD, six or more symptoms within one of these domains should have been present for at least six months (only five symptoms are required from the age 17 years and above) and the symptoms should be apparent in at least two different settings and have a negative impact on daily functioning. In addition, the symptoms should have debuted before the age of 12 years (1). In DSM-5, the ADHD diagnosis is categorized as the combined presentation (ADHD-C), which is marked by symptoms within both domains, the predominantly inattentive presentation (ADHD-I), or the predominantly hyperactive-impulsive presentation. The severity of the diagnosis is specified (mild, moderate or severe) based on current symptoms and degree of functional impairment (1).

Heterogeneity and variability over time

ADHD is a heterogenous condition where the symptom profile and degree and type of functional impairment varies across individuals (3-5). Many patients with ADHD also suffer from psychiatric comorbidities (6-8), which may affect symptoms and impairment further. Heterogeneity is seen both between and within the ADHD presentations (9, 10). For example, within

ADHD-I, some individuals do not present any symptoms of hyperactivity/impulsivity and struggle with inattentive symptoms that may be linked to deficits in arousal and sluggish cognitive tempo. In contrast, others could have impairing subthreshold symptoms of hyperactivity/impulsivity in addition to their attentional deficits (10). Studies have also found that individuals diagnosed with one presentation often meet criteria for another presentation at a later assessment (11, 12). The shift between presentations over time may partly be explained by the decline and/or altered expression in overt symptoms of hyperactivity/impulsivity that is often seen as a child gets older (1, 5, 12). Symptoms of hyperactivity and impulsivity are often more subtle in adolescents and adults (e.g., inner restlessness, drumming with fingers, becoming overwhelmed by impulsive thoughts and emotions) (5, 13). Symptoms of inattention more often persist into adolescence and adulthood (1, 13). Recent findings also indicate that ADHD symptoms tend to fluctuate over repeated assessments (14), suggesting that remission of symptoms may not be preserved over time. In addition, although symptom levels may decrease below the diagnostic threshold, functional impairment often remains (14).

A dimensional perspective on ADHD

The diagnostic procedure treats ADHD as a categorical condition, i.e., you either have or do not have the diagnosis (10), but the instability of the ADHD presentations has led researchers to question the validity of this categorization (9). Recent research suggests that ADHD should rather be viewed as the extreme end of one or several dimension(s) of symptoms with a continuous distribution in the population (10, 15 16). Corroborating this, the dimensional perspective (e.g., the number of ADHD symptoms within each symptom domain) seems to have better predictive value of functional impairment than the categorical diagnoses (12, 17).

Prevalence

The prevalence of ADHD during childhood ranges from around 5% to 7.2%, (18, 19), with variations in prevalence estimates mainly being due to methodological differences between studies (20). While the prevalence of clinical levels of ADHD symptoms in population-based samples has been stable over several decades (20, 21), the incidence of cases diagnosed with ADHD has increased greatly (21, 22). Possible reasons for this increase may be greater awareness and destigmatization of the diagnosis, leading to increased help-seeking, or changes in medical practices, administrative alterations, and/or overdiagnosis (21). In Sweden, both clinicians and scientists have stated that a diagnosis often seems to be a prerequisite to

receiving further support and adjustment from society (21, 23), which might affect the incentives for referral among both teachers and parents.

A recent meta-analysis found that the prevalence of ADHD in adulthood was 2.6%, with estimates ranging between 5.0% in young adults (19–24 years old) to 0.8% in those aged 60 years and above (24). When ignoring the criterion of a childhood onset, about 6.8% showed symptomatic adult ADHD, with a clear decline with increasing age, from 9.0% in young adults to 4.5% at ≥ 60 years (24). ADHD has previously been conceptualized as a childhood disorder, but since a substantial proportion of those with childhood ADHD still struggle with symptoms and impairment as adults (25-28), it is now regarded as a lifelong condition for many patients (29).

Moreover, the prevalence of ADHD is higher among boys, with a male-to-female ratio ranging from around 2:1 to 9:1 in samples of children and adolescents (1, 30-32). The sex difference in ADHD prevalence is higher in clinical samples than in population-based samples (32), and adult samples have displayed close to similar prevalence across the sexes (24). While boys more often display hyperactive-impulsive symptoms, girls are more likely to present predominately inattentive symptoms and less disruptive behaviors than boys (5). Symptoms of hyperactivity and disruptive behaviors have been identified as strong predictors of a clinical diagnosis of ADHD (33), meaning that some of the observed sex difference might be explained by an under-identification and underdiagnosis of girls (5, 33, 34). Corroborating this, recent findings showed that girls were older than boys when receiving their ADHD diagnosis (35).

Etiology of ADHD

Current evidence indicates that several genetic and environmental risk factors are involved in the development of ADHD (36, 37). Although more research is needed, interactions between genetic and environmental factors have been suggested as a potential pathway to ADHD (15, 36).

Genetic factors

The amount of explained variation in a trait that is attributable to genetic factors is called heritability. ADHD has an estimated heritability of about 70–80% (15). The strong heritability of ADHD is supported by family, twin and adoption studies, showing that ADHD clusters in families (15, 38-41), with the familial factors of ADHD seeming to be attributable to genetic factors rather than shared rearing environment (39, 40). Furthermore, a strong genetic link has been found for both clinical levels of ADHD symptoms and subthreshold symptoms (15, 16).

Except in rare cases where ADHD symptoms may result from single genetic abnormalities, recent findings support a polygenic influence on the condition (15, 37, 42). Specifically, a combination of several genes, which each has very small effect, has been found to increase the risk for ADHD (15, 37, 42). Genome-wide association studies have identified 12 genome-wide significant loci associated with ADHD, which have been estimated to account for approximately 22% of the disorder's heritability (42). It should be noted that many genetic risk factors associated with ADHD are also related to other psychiatric conditions (37).

Environmental factors

In regard to environmental risk factors, most seems to exert their effect during the prenatal or early postnatal period (3, 36, 37). Examples of such factors are maternal obesity during pregnancy (43), maternal preeclampsia during pregnancy (44), intrauterine exposure to tobacco (45) or acetaminophen (46), and prematurity and low birth weight (47-49). While several environmental risk factors have been associated with an increased risk of developing ADHD, the evidence of causal effect varies and some associations (e.g., maternal smoking during pregnancy), could be confounded by genetic or familial factors (37, 50).

Regarding psychosocial factors, exposure to severe institutional deprivation early in life has been associated with an increased risk of developing ADHD (51). Moreover, childhood adversities such as sexual abuse, physical neglect (52), parental substance abuse, parental psychiatric disorders, parental criminality (53), or low family income (54) have all been related to ADHD. Findings also suggest that combined exposure to several childhood adversities seems to result in an increased cumulative risk for ADHD (53, 55). It should be noted that the design and methods used in studies examining psychosocial risk factors for ADHD often preclude inference of causal effects and many of these risk factors are not specific to ADHD (36). Nevertheless, environmental conditions may influence the expression of ADHD symptoms, comorbidities, and long-term outcomes for the affected individuals (36). For example, an overcontrolled parenting style where the parent directs a lot of criticism at the child may partly contribute to the persistence of oppositional behaviors (36), while exposure to high family cohesion and community support have been associated with a decreased risk of moderate to severe ADHD (56).

Self-control in ADHD

Cognitive and behavioral self-control

Executive functioning (EF) is an umbrella term for a construct that includes several cognitive abilities involved in impulse control, strategic planning, cognitive flexibility, and goal-directed behaviors (57). ADHD has been described as a condition of deficits in EF (58), but this conceptualization may need to be nuanced.

Regarding psychometric tests of EF, group comparisons between individuals with and without ADHD suggest that ADHD is related to deficits in several EF domains, e.g., response inhibition, working memory, planning, and set-shifting (57, 59, 60). However, a substantial proportion of individuals with ADHD do not display significant deficits in EF (57, 59, 60). On the other hand, correlations between neuropsychological tests and EF ratings are often weak (57, 61), and when EF is measured with a rating scale, a majority of patients with ADHD seem to struggle with such deficits (57, 62). Hence, the estimated prevalence of EF in ADHD seems to depend partly on how it is measured. Rating scales for EF have been suggested to be superior in predicting functional impairment in daily life (57, 62), and deficits in EF have been associated with impairment in school and occupational work (57, 62-64).

In relation to EF and cognitive functioning, neuroimaging studies have identified subtle but significant differences in several cortical and subcortical areas between children with and without ADHD (65, 66). However, most such differences have not been observed in adolescents or adults (65, 66). Corroborating this, findings have indicated that children with ADHD may have a delayed maturation of the cerebrum, including the prefrontal cortex (67), an area involved in EF (3). It has also been suggested that individuals with ADHD may have a reduced connectivity and atypical interaction between different functional brain areas, which may impact the ability for sustained attention (3).

Furthermore, individuals with ADHD can have difficulties in adapting their level of arousal (i.e., preparedness for action) in response to changing circumstances and external demands (3, 58). ADHD is also associated with altered patterns of motivation, resulting in difficulties in waiting for important outcomes and delaying gratification (3), which may result from deficits in response inhibition and/or an aversion to delay (3, 60). Corroborating this, ADHD has been associated with abnormalities within the dopaminergic mesolimbic system, a neural circuit related to anticipated outcomes, motivated behaviors, and reinforced learning (3).

The prevalence, type and degree of deficits in cognitive domains varies not only between individuals with ADHD, but also in relation to different tasks and settings (3, 58). For example, lengthy and repetitive tasks seem to elicit more ADHD symptoms and associated cognitive deficits, while stimulating

and varied tasks are often managed more easily (3, 58). Taken together, many (but not all) individuals with ADHD display deficits in EF and other cognitive abilities that are related to cognitive and behavioral self-control. A closely related construct that is often seen in patients with ADHD is emotional dysregulation (ED).

Emotional dysregulation

ED can be described as a reduced ability to modify emotional states, which can prevent an individual from using adaptive, goal-oriented behaviors (68). Patients with ADHD often experience high emotional lability and reactivity, with rapid shifts of emotions that are context-inappropriate and excessive in relation to social norms (68-72). Difficulties in controlling these emotions (e.g., a lack of self-soothing behaviors and an incapacity to refocus attention toward adaptive behaviors) are also common among individuals with ADHD (68-72).

While most studies of ED are based on observations and questionnaires (73), some studies have indicated neural and physiological correlates of emotional reactivity and dysregulation in individuals with ADHD (66, 74-76). For example, a neuroimaging study by Posner et al. (74) showed that adolescents with ADHD had an increased activity in amygdala, as well as atypical connectivity with the lateral prefrontal cortex during processing of fearful stimuli.

Although ED have been reported in both children and adults with ADHD (70), it has been suggested that emotional lability may become more pronounced during adolescence and early adulthood (5). Accordingly, ED has been included in the Wender Utah criteria of adult ADHD (77). While ED has been suggested to be an important part of the conceptualization of ADHD (73), not all patients with ADHD experience difficulties with emotional regulation (69, 70). ED has predominately been associated with the hyperactive/impulsive and combined presentations of ADHD, and is also related to comorbid conditions such as oppositional defiant disorder (ODD) and affective disorders (73, 78). However, a study of adolescents with ADHD revealed that self-rated ED did not differ across the different presentations of the disorder or between those with and without comorbid ODD (79). In addition, ED have been associated with additional functional impairment for individuals with ADHD (79, 80), which underlines the importance of assessing and treating such difficulties.

Psychiatric comorbidity

Psychiatric comorbidity is common among patients with ADHD, with about two thirds having at least one psychiatric comorbidity (6-8). The most

prevalent psychiatric comorbidities are ODD, conduct disorder (CD), learning disorders, anxiety disorders, depression, bipolar disorder, obsessive compulsive disorder, autism spectrum disorders, tic disorder, and Tourette syndrome (6, 7). The type of comorbidities often changes across the lifespan, with symptoms of ODD and CD being common among children with ADHD, whereas substance use disorders, and affective disorders become more prevalent in adolescence and adulthood (5, 8). Moreover, ADHD is related to increased stress (81, 82), sleep problems (83), and lower ratings of quality of life (84). In addition, feelings of being different, shame at the diagnosis, and experiencing low self-esteem have been described by adolescents with ADHD (85).

The risk rate of psychiatric comorbidities in ADHD has been found to be comparable across females and males (86, 87). However, some findings suggest that the type of comorbidities may vary by sex (31, 33, 86-88). For example, in a study of adolescents, girls with ADHD were more likely to have internalizing disorders, while boys with ADHD were more often diagnosed with externalizing disorders (87). Corroborating this, recent findings showed that girls with ADHD were more often referred to a child and adolescent psychiatry (CAP) unit due to emotional problems, while neurodevelopmental problems were the most common reason for referral of boys with ADHD (35). However, the influence of sex on psychiatric comorbidity in ADHD has been inconsistent across studies (31, 86-90). In summary, a majority of individuals with ADHD display coexistent psychiatric symptoms and these symptoms are likely to exacerbate functional impairment in daily life.

Functional impairment in ADHD

Functional impairment of a disorder has been described as the real-world consequence of the symptoms (91). ADHD is associated with impairment in several life domains such as school/occupational work, social relationships, and family life (1), and the daily impairment is often the main reason for referral to health care (92, 93).

As regards impairment in school, youths with ADHD have an increased risk of academic failure, including poor schoolwork completion, lower grades, absenteeism, and school dropout (94-96). Since academic demands often increase in higher grades (e.g., more writing assignments, homework, exams, and lectures), it has been suggested that the magnitude of academic impairment may become more pronounced in adolescence (96). Regarding occupational work, ADHD have been related to a higher risk of long-term work disability and unemployment (97, 98).

Interpersonal problems are also common among individuals with ADHD (99, 100), appearing as an impaired ability to effectively participate in social exchanges (e.g., have difficulties in communication and turn taking, and more

frequently expressing anger) (100, 101). As a result, youths with ADHD are more often rejected by peers, have fewer close friends, and quarrel more with both peers and adults (102). Moreover, ADHD is associated with strained family life involving conflicts and stress (103, 104) and adults with ADHD report higher rates of marital problems and divorce (104).

ADHD has also been associated with an increased risk for several negative outcomes such as criminality, substance misuse, vehicle accidents, and mortality (98, 105, 106). In addition, ADHD is related to an economic burden, at both the individual and the societal level (37, 107, 108). For example, in a Swedish cohort study of young adults, the annual health care costs were found to be three times higher for individuals with persistent ADHD than for individuals without ADHD (107). In summary, ADHD is associated with functional impairment and adverse outcomes over the whole lifespan (5, 29, 105). In order to minimize functional impairment in individuals with ADHD, factors that contribute to impairment in different life domains need to be mapped.

Associated predictors of impairment in ADHD

The influence of ADHD on functional impairment has been explored at a categorical and dimensional level. As regards ADHD presentation, ADHD-C has been related to the highest degree of overall impairment, whereas ADHD-I and ADHD-C have been associated with comparable levels of academic impairment (12). When the symptom loads on each ADHD domain have been explored as predictors, inattention has repeatedly been found to be the strongest associated predictor of parent- and teacher- rated impairment of academic functioning (9, 12, 109), whereas both domains have been related to social impairment (12, 109).

Since coexistence of psychiatric symptoms and disorders is common in individuals with ADHD, it is reasonable to believe that these comorbidities may have an additive effect on functional impairment. In line with this, a Swedish registry-based study of children with ADHD found that those with psychiatric comorbidity displayed lower clinician-rated global functioning than those without comorbidity (110). In some life domains, the impairment may be primarily driven by comorbid symptoms. For example, Gardner et al. found that the influence of ADHD symptoms on interpersonal functioning was minimal after accounting for parent-rated oppositional symptoms, which was the strongest predictor of social impairment (9). In line with this, parent-rated conduct problems were identified as a risk factor of social impairment in young adolescents with ADHD (111). Furthermore, the manifestation of coexistent emotional problems in youths with ADHD has been associated with social impairment (111, 112) as well as academic impairment (113).

Regarding predictors of long-term outcomes of childhood ADHD, studies have identified that both persistence of ADHD symptoms and psychiatric comorbidities predict several negative outcomes in adulthood (97, 105), including an increased economic burden (107, 114). These findings emphasize the importance of identifying and providing support not only for ADHD, but also for psychiatric comorbidities.

As regards the influence of sex on functional impairment, there are inconsistent findings. Studies on children with ADHD, which are mostly based on parental or teacher reports, have generally indicated comparable levels of impairment across the sexes (115-117), or higher impairment in boys (109, 116). In contrast, some studies on young adults with ADHD, which were based on self-reports, have indicated higher levels of impairment in females (118-120). Accordingly, the occurrence of sex differences in impairment may partly be related to who you ask.

The association between clinical symptoms and functional impairment in youths with ADHD has predominantly been studied in younger children, usually based on other informants than the patients themselves (9, 12, 109, 110, 113). Self-reports are more frequently used in adult populations (12, 118-121), but should probably be included in studies of adolescents as well. In adolescence, the individual generally becomes more independent from their parents, spends more time outside the family context, and may entrust some of their issues to friends rather than parents (100, 122). In addition, overt symptoms of ADHD tend to decrease in this age (1, 10, 12) and impairing symptoms might not be as observable for others as in childhood (111). Hence, in order to improve daily functioning in adolescents with ADHD, associated predictors of self-reported impairment need to be identified and then considered when developing treatments for this age group.

Treatment for ADHD

Both national and international guidelines (123, 124) recommend a stepwise and multimodal treatment approach for managing ADHD, where several aspects of a patient's mental health, behaviors, and daily functioning should be taken into account. The importance of the patient's and their family's involvement in the treatment plan is emphasized. As a first step, the patient and their family should receive proper information (i.e., psychoeducation) about the diagnosis and related aspects. For youth, school staff should be informed about the results of the assessment and collaboration between the family and school should be established. Environmental modifications that could reduce the impact of ADHD symptoms (e.g., in the school setting) should be implemented (123, 124). In addition, psychiatric comorbidities need to be assessed in an early stage to prioritize the type and sequence of interventions (29, 123).

Pharmacological treatment has been recommended for patients over five years of age, for whom impairment persists after adjustments in the environment (123, 124). Parent-training programs are recommended as a second step for young patients, three to six years of age, and could also be considered for patients up to twelve years old (123). Psychological interventions have been suggested for adolescents and adults who have declined medication, have low adherence, or suffer from impairment despite medication (123, 124). Cognitive behavioral therapy (CBT) that addresses relevant aspects such as social skills, self-control, managing emotions, problem-solving, and acceptance, has been recommended for adolescents with ADHD (123, 124). In addition, national guidelines state that group interventions could be a cost-effective treatment option which may reduce feelings of exclusion and stigma (123), in particular for adolescents who may have difficulties accepting their diagnosis (125).

Pharmacological treatment

Pharmacological treatment has been shown to be effective in reducing ADHD symptoms (13, 37, 126). Medications that are supported as ADHD treatment are classified as stimulants (e.g., methylphenidate and lisdexamfetamine) or non-stimulants (e.g., atomoxetine and guanfacine) (37). Methylphenidate has been recommended as the first choice of pharmacological treatment for children and adolescents (123, 124, 126), whereas methylphenidate or lisdexamfetamine are recommended for adults with ADHD (124, 126). In addition, lisdexamfetamine, atomoxetine, or guanfacine can be offered to those who do not tolerate or respond well to the first choice of treatment (124, 126).

In addition to improvements in ADHD symptoms, medication for ADHD has been associated with improvement in global clinical functioning (126) and academic functioning (127), and a decreased risk for criminality (128), injury (129), and transport accidents (130). At the same time, a need for more research on the long-term effects of ADHD medication has been mentioned (126, 131), and the persistence of effects on daily functioning have been questioned (3). For example, in both the 3-year and 8-year follow-up studies of the Multimodal Treatment of ADHD, the previously identified advantages of medication management were not preserved (132, 133). Moreover, not all patients respond well to medication (134), and side effects such as appetite suppression, nausea, stomach aches, and sleep problems are common (3, 13, 135). In addition, adherence to pharmacological treatment for ADHD is rather low, particularly among adolescents (136).

Psychosocial treatment

In a systematic review of non-pharmacological treatment for children and adolescents with ADHD (93), the authors concluded that behavioral management training, including parent training, could be regarded as effective interventions for children with ADHD. However, the generalizability of treatment effects outside the training setting has been questioned and the evidence for these intervention for adolescents is not well-established (93).

For younger adolescents with ADHD, school-based interventions, including extensive practicing of academic and organizational skills, have been evaluated in randomized controlled trials (RCTs). The effectiveness of these interventions was supported with regard to parent-rated academic outcomes such as planning skills and homework completion, but not in regard to teacher rated outcomes (137, 138). Moreover, Sibley et al. evaluated a skills-based therapy for young adolescents and their parents. The treatment offered several optional skills (e.g., organization, planning, time-management, homework), from which a family could select a few skills to be practiced during the treatment. In addition, the parents provided behavioral contingencies based on the adolescents' use of the targeted skills, in order to encourage such use. When evaluated in an RCT, treatment effects were found for parent-rated academic problems and ADHD symptoms, but not for teacher- or self-rated outcomes (139).

Among older adolescents with ADHD, a few RCTs have found promising results regarding the benefits of using CBT for this age group (140-142). Although these studies used different CBT programs, they all included psychoeducation and practice of skills targeting difficulties with organization, planning, distractibility, and procrastination (140-142). In a study by Sprich et al., the short-term efficacy of an individualized CBT, also including parent-teen sessions, was evaluated among medicated adolescents. The CBT was shown to be superior to the wait list control in regard to clinician-assessed ADHD symptoms and global functioning (140). In a study by Boyer et al., two novel CBT-based treatments were compared (planning-focused versus problem-solving). Both interventions included individualized sessions and parental sessions. Improvements were found in both groups in regard to several outcomes, such as ADHD symptoms, planning, emotional symptoms, and impairment. However, the lack of group differences precluded firm conclusions about the actual treatment effects (141). In contrast to the above studies using individualized CBT and the involvement of parents, Vidal et al. evaluated a group-based CBT directed at adolescents only (142). In addition to the common treatment content described above, this treatment also included strategies to improve management of impulsive behaviors and emotions, as well as social skills. The treatment was compared to a wait list control and was found to be efficacious in regard to clinician- and parent-rated outcomes of ADHD symptoms and impairment, but not in regard to self-rated

impairment. This study also included young adults (up to 21 years old), and most psychiatric comorbidities were excluded (140), which compromised the generalizability to clinical populations of adolescents with ADHD.

For adult patients with ADHD, group-based psychoeducation for the patients and their significant others has shown to increase knowledge about ADHD and general life satisfaction (143). Moreover, CBT has been associated with reduction of ADHD symptoms, psychiatric comorbidity, and functional impairment (29, 144). However, the outcomes of CBT have varied across studies and findings have generally been more positive in studies that used non-active control groups (144). The current evidence of CBT for adults with ADHD primarily supports a multimodal approach, combining CBT and pharmacological treatment (29).

While several studies have found promising results of psychosocial treatments for youths with ADHD, the long-term benefits of these interventions and the effects on functional impairment in different life domains are more uncertain (93). Furthermore, the evidence of psychosocial interventions for older adolescents is scarce (93) and the observed treatment effects for youths with ADHD are often based on informants other than the patients themselves (137-140, 142). Overall, the adolescents' perspective could be emphasized more in evaluating new treatments for this age group. Aside from including self-reported outcomes in RCTs, the addition of qualitative data based on interviews with adolescents could increase understanding of how a treatment in perceived by the targeted patients. Moreover, trials conducted under authentic conditions (i.e., treatment provided by clinical staff to clinically representative patients) have been requested (145). Given the common difficulties with relationships and emotional and behavioral self-control, these areas should be in focus in psychosocial treatments for adolescents with ADHD (69, 123, 124, 146).

Dialectical behavioral therapy for patients with ADHD

Dialectical behavioral therapy (DBT) is a CBT method which explicitly targets ED, impulsive behaviors, and relational problems. DBT was originally developed for patients with borderline personality disorder (BPD) (147). Due to some overlap in symptoms between ADHD and BPD (148), the method has been suggested as potentially beneficial for patients with ADHD. A structured skills training group (SSTG), which combines traditional CBT and DBT, has been developed for adults with ADHD (149-151). The SSTG aims to increase self-control by working with both the core symptoms of ADHD and closely associated difficulties, such as ED and interpersonal problems (149-151). In its original form, the SSTG consisted of 13–14 weekly group sessions including psychoeducation, strategies to improve planning, and organization, and practicing of DBT techniques, such as mindfulness, behavioral chain analysis, acceptance, and social skills (149-151).

Previous uncontrolled studies with adults with ADHD have shown significant within-group reduction in symptoms of ADHD, psychiatric comorbidity, and functional impairment after receiving the SSTG (149, 152, 153). In an open feasibility trial, the treatment was concluded to be feasible (80% completed at least two thirds of the sessions) and acceptable (the treatment was associated with increased knowledge of ADHD and improved ability to cope with ADHD-related deficits) (153). When comparing the SSTG to an active control group, the findings have been mixed. Specifically, the 14-session SSTG was found to be superior to a loosely structured discussion group regarding effects on self-rated ADHD symptoms and the participants' perceived ability to cope with deficits, but not regarding symptoms of comorbidity (154). To enable more practicing of the learned skills, an extended form of the SSTG was developed, consisting of 12 weekly sessions followed by 10 monthly sessions. When compared to individual clinical management, the extended SSTG did not outperform the control group regarding its effect on clinician-rated ADHD symptoms or self-rated depression. In contrast, the clinical global impression ratings and the patients' retrospective ratings of perceived effectiveness in regard to their ADHD supported the superiority of the SSTG (155, 156). In summary, these studies indicate that the SSTG might be an effective treatment for some adult patients with ADHD.

In regard to younger age groups, a small pilot study (n = 7) has been conducted on adolescents with ADHD within a clinical context in Sweden. The author concluded that the SSTG was feasible and appreciated by the participants, but that age adaptions were needed (157). The effectiveness and acceptability of an age-adapted SSTG has hitherto not been evaluated for adolescents with ADHD and in-depth knowledge of how patients with ADHD experience the SSTG is lacking. This calls for clinical trials evaluating the SSTG for younger populations as well as qualitative studies enabling exploration of the patients' own experiences of this treatment.

While earlier findings suggest that some adult patients have an effect of the SSTG (149, 152-156), no previous studies have identified which subgroup(s) of patients these might be. The heterogeneity among patients with ADHD makes it unlikely that there is one treatment that fits all (4). Thus, the exploration of treatment moderators could aid identification of which subgroups of patients actually benefit from a treatment and for whom other interventions may be more appropriate (158-160).

Moderators of treatment effects

When evaluating the effect of a treatment, the randomized controlled design is regarded as the gold standard (158). The main analyses of an RCT generally investigate the overall effectiveness of a treatment, with the results interpreted at the group level (158). In order to identify under what circumstances and for

whom a treatment is effective (or not), moderator analyses can be added (158-160). The moderator analyses can decrease the risk of overgeneralization of both positive and negative findings observed in the main analyses (158). A moderating effect is present when the treatment effect (i.e., a significant difference in outcome between the groups) differs depending on the baseline value of an additional variable (i.e., a moderator) (158-160). The concept of moderation is illustrated in Figure 1. Pretreatment variables that predict change in the outcome in an uncontrolled design or regardless of treatment condition in an RCT are called predictors and unspecific predictors, respectively (158).

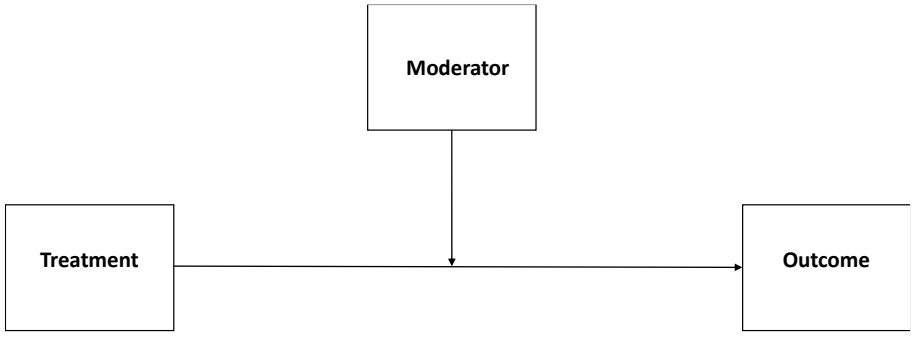


Figure 1. The concept of moderation.

Research on moderators in psychosocial trials for adolescents with ADHD is scarce (4, 142). Therefore, studies on other age groups as well as studies performing predictor analyses are also included in the below summary of previous research.

Prior studies on youths with ADHD have indicated that neither sex nor age (4, 142, 161) seems to affect treatment outcome of psychological treatments. In contrast, when mindfulness training was compared to an active control group of psychoeducation for adults with ADHD, sex was identified as both an unspecific predictor and a moderator in regard to treatment outcomes (e.g., ADHD symptoms). Specifically, females responded better than males to both interventions, whereas males responded better to mindfulness than psychoeducation (162).

Mixed findings have been observed in regard to the impact of ADHD symptoms, which might be related to the different methods and outcomes used in these studies. In a recent study comparing a sleep intervention to treatment as usual for children with ADHD, a high severity of ADHD symptoms at baseline was related to a larger reduction of ADHD symptoms after the sleep intervention (161). In the Multimodal Treatment study of children with ADHD, those with high levels of ADHD symptoms at baseline where less

likely to show normalized (or near to normalized) levels in symptoms of ADHD and ODD after receiving medication management or combined treatment, while initial symptom severity did not affect the outcome of behavioral treatment or community care (163). Moreover, in studies evaluating CBT for adolescents with ADHD, neither severity of ADHD symptoms nor ADHD presentation were found to moderate the treatment effect (4, 142).

As regards comorbid psychiatric symptoms, previous studies have suggested that coexistent anxiety could have a positive impact on treatment outcome (e.g., ADHD symptoms and symptoms of anxiety) of psychosocial treatments for youths with ADHD (4, 164-166). It has been suggested that some of the anxiety in individuals with ADHD might be related to stress over ADHD-related problems and that psychosocial treatment for ADHD may reduce some of this stress (165). However, patients with elevated symptoms of ODD/CD have shown poorer treatment outcomes from psychosocial interventions (164, 167). In addition, findings have suggested that children with multiple comorbidities (anxiety and ODD/CD) benefit most from a combination of medication and behavioral treatment (166).

Regarding the impact of ADHD medication, children with medication were found to respond better to a sleep intervention than those without medication (161). In contrast, medication did not affect treatment effect when comparing two CBT interventions for adolescents with ADHD (4).

Taken together, the above findings indicate that factors such as severity of ADHD symptoms, symptoms of psychiatric comorbidity, sex, and medication status can influence treatment response among patients with ADHD. Nevertheless, moderators and predictors of treatment outcome may vary in different study populations and must be considered in relation to the specific interventions and outcomes used in each study. In regard to the DBT-based SSTG described above, this intervention specifically targets ED, impulsive behavior, and interpersonal problems. Hence, the treatment might be most effective for the patients with ADHD who display such difficulties.

Aims

The overall aim of this thesis was to investigate the effectiveness, acceptability, and experience of an age-adapted SSTG for adolescents with ADHD, and to explore associated predictors of functional impairment within this group of patients.

The specific aims of the respective studies were to:

I Investigate the effectiveness and acceptability of an age-adapted SSTG based on DBT, for adolescents with ADHD in a clinical setting.

II Identify which adolescents with ADHD might have an effect from the SSTG, by exploring pre-treatment characteristics as potential moderators of long-term treatment outcome.

III Explore how adolescents with ADHD experienced participating in the SSTG.

IV Investigate the associations between ADHD and functional impairment, if they varied by sex, and the potential impact of comorbid psychiatric symptoms on the associations.

Methods

Design

An overview of the design, participants and measures of the four studies is displayed in Table 1. Study I was a RCT and Study II was an explorative study conducted within the context of an RCT. In Study III, a qualitative descriptive study design was used. Study IV was a cross-sectional study.

Settings

The data in Studies I–III, as well as for the clinical sample in Study IV, were collected at CAP outpatient units in seven regions of Sweden (for Study III, only two CAP units were involved). The recruitment started in 2015, the data collection for Study III ended in 2017, and the last follow-up measurements for Studies I–II were collected in the spring of 2019. In Study IV, data were also collected from a community-based sample, recruited at high schools in Region Uppsala in 2019.

Table 1. Overview of the studies in this thesis.

Study	Design	Participants	Assessment
I	Experimental design RCT	Patients with ADHD age 15–18 years (n = 184)	**Outcomes:** ADHD symptoms (ASRS-A), functional impairment (CSDS), quality of life (GQL), impact of ADHD symptoms (IAS), mindfulness (FFMQ), symptoms of psychiatric comorbidity (SDQ, HADS), sleep problems (KSQ), stress (PAS), acceptability
II	Explorative design within an RCT	Patients with ADHD age 15–18 years (n = 128)	**Potential moderators:** sex, age, inattention and hyperactivity/impulsivity (ASRS-A), conduct problems (SDQ), depression and anxiety (HADS), functional impairment (CSDS), impact of ED (IAS). **Outcomes:** Long-term change in ADHD symptoms (ASRS-A) and functional impairment (CSDS).
III	Qualitative descriptive design	Patients with ADHD age 15–18 years (n = 20)	Semi-structured interviews
IV	Cross-sectional design	Patients with ADHD age 15–18 years (n = 164) Adolescents without ADHD aged 14–19 years (n = 106)	**Potential associated predictors:** ADHD diagnosis, ADHD presentation (MINI-KID), inattention and hyperactivity/impulsivity (ASRS-A), conduct problems and emotional problems (SDQ), sex, medication. **Outcomes:** functional impairment (overall, school, friends, home) (CSDS)

ADHD, attention-deficit/hyperactivity disorder*, ASRS-A* Adult ADHD Self-Report Scale for Adolescents*, CSDS* Child Sheehan Disability Scale, *FFMQ* Five Facet Mindfulness Questionnaire, *GQL* Global Quality of Life*, HADS* Hospital Anxiety and Depression Scale, *IAS* Impact of ADHD Symptoms, KSQ Karolinska Sleep Questionnaire, *MINI-KID* Mini International Neuropsychiatric Interview for Children and Adolescents, *PAS* Pressure Activation Stress Scale, *RCT* Randomized Controlled Trial, *SDQ* Strengths and Difficulties Questionnaire.
Note. The clinical samples in Studies II–IV stemmed from Study I.

Participants and procedures

As the study populations of Studies II–III, as well as the clinical sample in Study IV, stemmed from Study I, the first step of the procedure was the same for these participants.

Recruitment of the clinical study populations was conducted using written information on posters in waiting rooms at the CAP units, as well as verbal and written information delivered by the clinical staff. Inclusion criteria were being aged 15–18 years, having a registered diagnosis of ADHD (retrieved from the patients' medical records), and having an ongoing contact with a CAP unit. All interested patients who met the above criteria were invited to a meeting together with their parents, where they underwent further assessment of eligibility and got more information about the study.

Assessment of eligibility was conducted by clinical psychologists who interviewed each adolescent and their parents about the adolescent's current health and diagnoses. Exclusion criteria were severe depression, suicidality, psychosis, or bipolar disorder without stable medication, diagnosed intellectual disability, organic brain injury, autism spectrum disorder, or current substance abuse. In case of uncertainty, psychiatric comorbidities were checked in the patient's medical record. In addition, the participants were requested to keep any ongoing pharmacological treatment for ADHD stable and not to participate in any other psychological treatment during the study period. The adolescents and their parents received information about the study and had the opportunity to ask questions. If a patient was eligible for the study, written informed consent was collected from both the adolescent and their parents.

In Study I, all included participants (n = 184) were randomly assigned (at a 1:1 ratio) to either the SSTG or to an active control group based on psychoeducation. The principal investigator, who was blinded to the participants, performed the randomization using a computer-generated allocation sequence (https://www.randomizer.org) with a separate sequence list for each treatment center. Subsequently, questionnaires (self-ratings and parental-ratings) were completed from home, on a digital platform, about two weeks before (T1), two weeks after (T2), and six months after treatment (T3). In a minority of cases, these questionnaires were completed by pen and paper due to technical issues or preference. Those who didn't completed T1 was considered external drop-outs (n = 20) and were not included in the analyses. Those who completed T1 but none of the follow-up measures (T2 and T3) were defined as internal drop-outs (n = 25). The 164 participants that completed T1 (159 self-reports and 162 parental reports) were included in the

statistical analyses of Study I. Participant flow for Study I is illustrated in Figure 2.

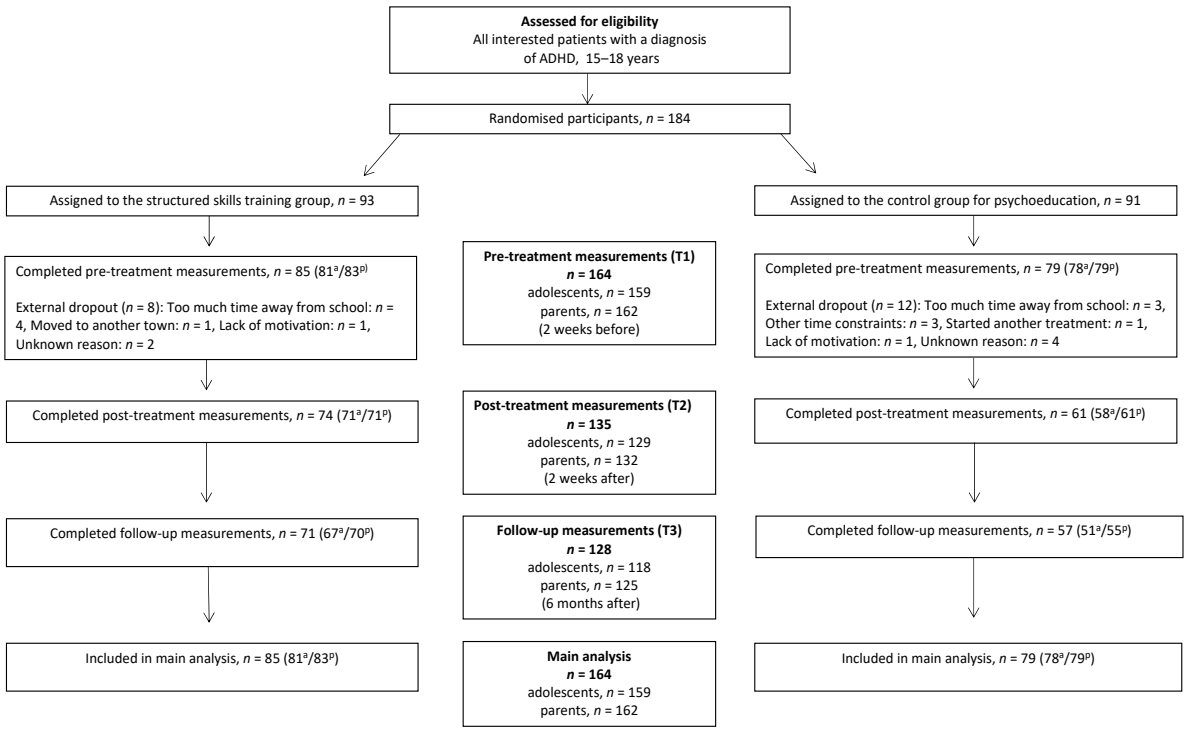


Figure 2. Participant flow in Study I

ADHD attention-deficit/hyperactivity disorder, *a* adolescents, *p* parents

In Study II, T3 was used as the primary endpoint and an additional inclusion criterion was used, where both the baseline and follow-up measurements had to be completed by the adolescents and/or their parents. Hence, 128 participants from the RCT were included in Study II (n = 118 self-reports and n = 125 parental reports).

In Study III, adolescents who participated in the SSTG during the spring of 2016 and 2017 were asked to participate. The adolescents were first informed about this study by the group leaders, during the last sessions of the SSTG. Thereafter, all interested adolescents were contacted via telephone by one of the researchers, who provided more information about the study. Of 21 eligible adolescents, one declined participation. Hence, 20 adolescents were included in Study III.

Study IV included a clinical sample of adolescents with ADHD and a community-based sample of adolescents without the diagnosis, which served as a reference group. The clinical sample stemmed from Study I and was recruited in accordance with the procedure described above. In Study IV, only the pre-treatment measurements were used and completion of these measures was an inclusion criterion for this study. In total, 164 patients with ADHD were included (159 self-reports and 162 parental reports). The reference group was recruited at their high school by a research assistant who provided written and verbal information about the study to the students. Those who expressed interest received additional written information about the study and the students and their parents signed up and consented to the study via an online platform. Inclusion criteria for the reference group were being aged 14–19 years and having completed a set of questionnaires (self-reports and/or parental reports) which corresponded to the questionnaires completed by the clinical sample. The questionnaires were completed from home on a digital platform. Exclusion criteria were an ADHD diagnosis, as reported by the parents, or clinical levels of ADHD symptoms in the Adult ADHD self-report scale for adolescents (ASRS-A) (168). The latter was only applied if parental reports were missing (n = 12), and clinical levels of ADHD symptoms were based on dichotomized scoring, where a cut-off score of 9 or higher was used, in accordance with previous studies (168, 169). In total, 106 participants were included in the reference group (103 self-reports and 94 parental reports).

Interventions

The participants in Studies I and II participated in either the SSTG or the control intervention, while all participants in Study III participated in the SSTG.

Similarities between the SSTG and the control intervention

Both interventions were group-based and included psychoeducation about ADHD and closely related difficulties (e.g., difficulties with planning, organizing, structuring daily routines, and stress management). A PowerPoint presentation was used to present the information, group discussions were included (e.g., about challenges and strengths with ADHD), and the participants received homework assignments to encourage practicing between the sessions. Each group included 5–9 participants.

SSTG

The SSTG was an age-adapted version of a manualized DBT-based treatment originally developed for adults with ADHD (150, 151). For information about the age adaptations, see Appendix. The SSTG consisted of 14 weekly two-hour sessions, including breaks. The themes and contents of the sessions are described in Table 2. In summary, the SSTG included psychoeducation about ADHD and related difficulties, group discussions, and active practicing of skills. DBT techniques, such as mindfulness, acceptance, behavioral chain analysis, and social skills, were practiced during the treatment. The content of each session was presented in a PowerPoint presentation and each participant received a workbook. Each group was led by two therapists, who were clinicians working at the CAP units, of whom at least one was trained in DBT.

Table 2.Themes and content of the structured skills training group.

Session	Themes and contents
1	*Introduction:* Information about the treatment, overarching themes, and goals. Psychoeducation about ADHD, where symptom strengths and difficulties are discussed. Formulation of individual goals.
2	*Neurobiology and mindfulness I:* Neurobiology of ADHD. Introduction and practice of mindfulness. Mindfulness training is included in all later sessions.
3	*Homework and mindfulness II:* Rationale for homework is presented and strategies for accomplishing home assignments are discussed. Continued focus on mindfulness.
4	*Acceptance and mindfulness III*: The concepts acceptance and wise mind are introduced, discussed and practiced.
5	*Chaos and control:* Discussion about difficulties in organization and planning. Strategies for how to manage these difficulties are introduced, discussed, and practiced.
6	*Emotions:* Learning about emotions, including practice in identifying, observing, and describing emotional signals in order to better manage emotions.
7–8	*Behavioral analysis:* Introduction to behavioral chain analysis. Strategies to find alternative more adaptive behaviors are discussed, practiced, and applied to own examples. Behavioral analysis is thereafter used throughout the treatment.
9	*Medication, mental illness, and how to increase wellbeing:* Information about pharmacological treatment for ADHD. Symptoms of depression and other emotional problems are discussed. Information and discussions about treatment options and preventive strategies.
10	*Impulsivity, risk behaviors, and addiction:* Symptoms of addiction and other forms of risk behaviors are introduced and discussed. Practice in identifying own triggers and impulsive behaviors. Strategies for preventing and managing impulsive behaviors are explored.
11	*Stress:* Physiological reactions to stress and the relationship between stress and performance are presented. Practice in identifying and learning about personal stress in terms of triggers and reactions. Strategies for stress management are introduced.
12–13	*Self-esteem and relationships:* Differences between self-esteem, self-confidence, and self-respect are clarified, including the impact of ADHD on these areas. Social skills are taught and practiced.
14	*Retrospect and outlook:* The participants summarize their experience of the group treatment, evaluate their own progress, and plan for how to continue their work outside the treatment.

ADHD attention-deficit/hyperactivity disorder.

Control intervention

The control intervention was a manualized psychoeducational group program named SKILLS, which was developed for our RCT. The intervention consisted of three two-hour sessions, including breaks. In short, the intervention included information about ADHD, sleep and diet, stress management, problem-solving, and structuring of daily life routines. The content of each session is described Table 3. The participants received homework assignment at the end of the first two sessions. The participants also received a book focusing on tools to facilitate schoolwork. Each group was led by two therapists, who were clinicians working at the CAP units. DBT-related components were not included in the control intervention.

Table 3.Themes and content of the control intervention.

Session	Themes and content
1	*What is ADHD?* Psychoeducation about ADHD including etiology, neurobiology, symptomatology, difficulties and strengths with ADHD, and examples of famous people with the diagnosis.
2	*Take charge over your daily life:* Information about how to structure daily life routines and the importance of sleep, food, and activity. Stress management and problem-solving skills are presented.
3	*Take charge over your ADHD:* Further work with the problem-solving model, following the structure: Stop and think, get organized, use tools (e.g., mobile apps), use support and coaching.

ADHD attention-deficit/hyperactivity disorder.

Treatment fidelity

The therapists were trained in the respective treatment methods and were informed to stay strictly to the manual and use the PowerPoint presentation that was connected to each session for the respective treatment condition. Continuous supervision for each method was offered during the study period, where the therapists received support and guidance for the coming sessions in order stay adherent to the method. Adherence to the SSTG method was assessed by ratings of 27 video-recorded sessions. The adherence scale was based on a rating scale used in a previous trial on adult patients in Germany (155). The scale was translated into Swedish and adjusted for the age-adapted SSTG. Two clinical psychologists with expertise in CBT and the SSTG method performed adherence ratings on a five-point scale, ranging from 1 (unacceptable) to 5 (excellent). The average adherence was considered acceptable to good

(M = 3.57, SD = 0.34). No formal adherence assessment was performed for the therapists in the control group.

Assessments

In Study I, the outcome measures were assessed before treatment, post-treatment, and at follow-up. Study II included pre-treatment assessments and follow-up assessments. In Study III, a semi-structured interview was conducted to collect data. In Study IV, only pre-treatment assessments were used for the clinical group, with corresponding measures for the reference group.

Diagnostic interview

Each participant's current ADHD presentation was established using the ADHD module in the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID) (170). ADHD presentation was based on the number of prevalent symptoms in the preceding six months, and was assessed in accordance with the DSM-5 (1). Those who met fewer than six symptoms of both inattention and hyperactivity/impulsivity (< five symptoms for adolescents aged 17 years and older) were categorized as having unspecified ADHD (ADHD UNS).

Questionnaires

Adult ADHD Self-Report Scale for Adolescents (ASRS-A)

ADHD symptoms were assessed using self-ratings and parental ratings on the adolescent version of the ASRS (168, 169, 171). The questionnaire contains 18 items (9 items for each subscale), corresponding to the diagnostic symptoms of each ADHD domain (i.e., inattention and hyperactivity/impulsivity). The occurrence of each symptom is measured on a 5-point scale from 0 (never) to 4 (very often), with higher scores indicating more symptoms. The ASRS-A has displayed promising psychometric properties in clinical populations of youths with ADHD (168, 171).

Child Sheehan Disability Scale (CSDS)

Functional impairment was assessed using the Child Sheehan Disability Scale, CSDS (172, 173). Both the self-ratings (three items) and the parental ratings (five items) assess the adolescent's impairment in school, with friends, and at home. Two additional items are included in the parental rating scale which assess the impact on the parents' work and social activities of having a child with ADHD (these were not included in Study IV). The impairment of

each area is measured on a 11-point scale ranging from 0 (not at all) to 10 (very much), with higher scores indicating more impairment. The CSDS has gained psychometric support in samples of children and adolescents with and without psychiatric disorders (172-174).

Impact of ADHD Symptoms (IAS)

The impact of ADHD-related symptoms on the adolescents' wellbeing was measured using the six-item questionnaire Impact of ADHD Symptoms, IAS, which was constructed for Study I. In IAS, the respondent is instructed to rate how much their wellbeing (during the preceding week) has been affected by impulsive behaviors, attentional deficits, hyperactivity, sleep problems, ED, and stress. Each item is rated on an 11-point scale ranging from 0 to 10, where 0 = not at all, 2 = a little, 5 = quite a lot, 8 = a lot and 10 = very much. No evaluation of the psychometric properties of IAS has been performed. The internal consistency for the sample in Study I was good (*alpha* = 0.80).

Global Quality of Life scale (GQL)

Quality of life was measured using the one-item questionnaire Global Quality of Life scale, GQL (175). The respondents answer the question "How is your life right now?" on a scale ranging from 0 (the worst imaginable life situation) to 10 (the best imaginable life situation). The original scale is a 10-cm visual assessment scale, but since the ratings were performed in a digital format in Study I, the GQL was transformed into a 11-point scale. The GQL has shown acceptable psychometric properties in clinical samples of adults with psychiatric disorders (175).

Five Facet Mindfulness Questionnaire (FFMQ)

Mindfulness was measured using the self-rating scale Five Facet Mindfulness Questionnaire, FFMQ (176, 177). The FFMQ contains 29 items that are measured on a 5-point scale from 1 (never/almost never) to 5 (always), where higher scores reflect a higher level of mindfulness. The scale has shown promising psychometric properties in studies on adults (176, 177).

Strengths and Difficulties Questionnaire (SDQ)

Behavioral and emotional problems were assessed using self-ratings and parental ratings on selected subscales of the Strengths and Difficulties Questionnaire, SDQ (178-180). The included subscales were ADHD symptoms, conduct problems, emotional problems, and peer problems. Each subscale consists of 5 items where each item is measured on a 3-point scale ranging from 0 (not true) to 2 (certainly true), with higher scores indicating more severe problems. The psychometric properties of the SDQ have been shown to be acceptable in samples of children and adolescents with and without psychiatric disorders (178-180).

Hospital Anxiety and Depression Scale (HADS)

Symptoms of anxiety and depression were measured using self-ratings on the Hospital Anxiety and Depression Scale, HADS (181, 182). The questionnaire contains 14 statements (seven items per subscale) measured on a 4-point scale, ranging from 0 to 3, where higher scores indicate higher severity of symptoms. The HADS has shown acceptable psychometric properties for adolescents with and without psychiatric disorders (182).

Pressure Activation Stress scale (PAS)

Perceived stress was measured using self-ratings on the Pressure Activation Stress scale, PAS (183). The questionnaire consists of 11 items, measuring symptoms of stress on a 5-point scale ranging from 0 (never) to 4 (always), where higher scores indicate more stress. The scale has displayed promising psychometric properties in a study of adolescents (183).

Karolinska Sleep Questionnaire (KSQ)

Sleep problems were measured using self-ratings on the Karolinska Sleep Questionnaire, KSQ (184). The KSQ includes seven statements about difficulties falling asleep and waking up. Each item is measured on a 6-point scale, ranging from 0 (never) to 5 (always), where higher scores indicate more sleep problems. The KSQ has shown adequate psychometric properties in adult populations (184).

Treatment acceptability

After each treatment, the participants answered four questions: if their knowledge about ADHD had increased, if they were more able to manage problems related to ADHD, how much they benefitted from the treatment, and if they would recommend the treatment to others. These questions were inspired by a questionnaire from the Swedish treatment manual for adults (151), and were adapted and shortened by the research team to be used for adolescents.

Semi-structured interview

A semi-structured interview was conducted to collect data in Study III. An interview guide was constructed for this study and included the following questions: How did you experience participating in a group? What did you appreciate about the treatment? What did you dislike about the treatment? Did the treatment result in any changes? What aspects of the treatment will you benefit from? What should be different in the treatment? Follow-up questions such as “tell me more” and “can you give an example” were asked when appropriate, to obtain more information. Visual support (e.g., themes of the treatment) was used to help the participants remember the content. The

interviews were audio-recorded and lasted for about 20–60 minutes, and were transcribed verbatim prior to analysis.

Other measures

For the clinical sample, a clinically ascertained ADHD diagnosis was retrieved from the patients' medical record and information about sex and age was retrieved from their personal identity number. For the reference group (Study IV), this information was reported in the questionnaire. Medication was reported by the parents. Attendance at the treatment sessions and homework completion was registered by the group leaders.

Analyses

All statistical analyses (Studies I, II, and IV) were conducted with IBM SPSS Statistics for Macintosh, version 26, 27, or 28. All the reported results were considered significant at the 5% level.

Study I

The effectiveness of the treatment was investigated with a linear mixed model (185), where the participants' baseline values were used as random intercept, time and treatment as fixed factors, and time by treatment as an interaction term. In addition, major changes in medication (i.e., started or ended ADHD medication during the study) was used as a covariate. The effectiveness was evaluated by contrasting the longitudinal mean changes between the groups at each timepoint, where the separate changes in symptoms from T1 to T2 and from T1 to T3 was compared. Within-group changes were explored by calculating the mean changes within each group at each timepoint. The participants who attended at least two thirds of the sessions were categorized as completers and a separate sensitivity analysis was conducted on this group (SSTG, n = 54; control group, n = 62). Cohen's d was used as a measure of effect size, 0.20 = small effect, 0.50 = moderate effect and ≥ 0.80 = large effect. Treatment acceptability was investigated using descriptive statistics for each group. As a supplementary analysis, group differences in acceptability were explored using the chi-squared test.

Study II

Potential moderators of the long-term treatment outcome were explored through regression-based analysis using the PROCESS macro in SPSS (159). The changes (follow-up score minus pre-treatment score) in ADHD symptoms and functional impairment were included as dependent variables,

whereas treatment condition, the potential moderators, and the interactions between treatment condition and the potential moderators were included as independent variables. A moderating effect was defined as a significant interaction between treatment and a moderator on the outcome, i.e., when the two interventions led to significantly different outcomes in relation to different levels of the moderator. The Johnson-Neyman technique was used for the continuous moderators to identify the point(s) along the moderator where the relationship between treatment condition and outcome transitions from being nonsignificant to statistically significant (159). As a sensitivity analysis, each significant moderator was analyzed again while adjusting for the other significant moderators, which were entered as covariates in the model. In addition, to clarify the predictive value for the significant moderators on the treatment outcome within each group, simple linear regression analyses were performed.

Study III

The interview data were analyzed with qualitative content analysis, using an inductive approach (186, 187). The analysis was conducted by the author of the thesis and a senior researcher with thorough experience of the method. First, the material was read multiple times to achieve an optimal understanding of the content. Second, all meaning units, defined as one or more sentences or just parts of one sentence, carrying a meaning connected to the research question, i.e., the experience of participating in the group treatment, were extracted from the material. Third, the meaning units were shortened to their essence and thereafter labelled with a code that mirrored the data. Fourth, coded text units with similar meanings were grouped into mutually exclusive categories reflecting central messages in the interviews. Fifth, categories were divided into subcategories based on dissimilarities within the categories. Sixth, themes were derived through an interpretation of what the participants were talking about, to describe the essence of their experiences. Seventh, the interview text was read again and the categories, subcategories, and themes were compared and validated against the text.

Study IV

Functional impairment (overall, in school, with friends, and at home) were used as outcomes in this study. To investigate differences in these outcomes between adolescents with (clinical sample) and without ADHD (reference group), Mann–Whitney U-tests was conducted. Next, potential differences across combinations of group and sex in regard to the outcomes were explored with Kruskal–Wallis tests (with pairwise group comparisons). In addition, Spearman's rho was used to explore correlations between self- and parent-

rated impairment in each group. Non-parametric statistics were used in these analyses because of skewness in the reference group (188).

For the clinical sample, mean differences in functional impairment across ADHD presentations were evaluated with one-way ANOVA, with Tukey's post-hoc test used to explore potential differences further. To investigate the explained variance by each ADHD domain (symptoms of inattention and hyperactivity/impulsivity) on the outcomes of functional impairment, general linear models were conducted in two steps and investigated in separate models for each outcome. First, inattention and hyperactivity/impulsivity were introduced into the model to observe their crude effects on the outcomes. Secondly, conduct problems, emotional problems, sex, and medication status were added to the model to explore the unique explained variance by each of the variables while accounting for the other included variables. Partial eta squared was used as a measure of effect size (0.01 = small, 0.059 = moderate, 0.138 = large).

Ethical considerations

The studies included in this thesis have been approved by the Regional Ethical Review Board in Uppsala (Dnr 2015/257/1–4) or the National Swedish Ethical Review Board (Dnr 2020-05009). The questionnaires used in these studies included questions about one's symptoms and impairment, which could elicit some discomfort. In relation to this, the interventions included psychoeducation about ADHD, where both strengths and difficulties related to the condition are discussed. Although an increased knowledge about one's own functioning is mainly viewed as a positive outcome, this could also be unpleasant, especially if the treatment does not improve your ability to manage your difficulties. There are some ethical considerations with the group format, particularly in a treatment like SSTG, where participants are encouraged to share personal information with the group (e.g., own experiences of difficulties). In regard to this, the participants had to sign a contract committing to not sharing information about the other participants outside the group. Nevertheless, the group format might have caused discomfort for some individuals and there is no guarantee that everyone adhered to their contract.

Neither of the treatments had previously been evaluated for adolescents, and the potential risk of negative outcomes had to be considered and weighed against the benefits of providing an intervention that might help these patients. Although the potential harm of the treatment was expected to be low, it was a limitation that no assessment of adverse events was included. In regard to the safety for the participants, the treatments were conducted in a clinical setting by experienced therapists working at the CAP units. In the case of impaired

wellbeing during the period of treatment, the clinicians could provide support and, if needed, help the participant to meet with their main responsible therapist at the clinic. Another difficulty could be the potential dependency that some participants may experience in relation to their parents and/or the clinicians at CAP, and we cannot rule out that some adolescents primarily consented to participate in order to please their parents and/or the clinicians. However, the adolescents were clearly informed that their participation was voluntary and that their decision would not affect their access to regular care. In addition, they were told about their right to terminate their participation in the study at any time.

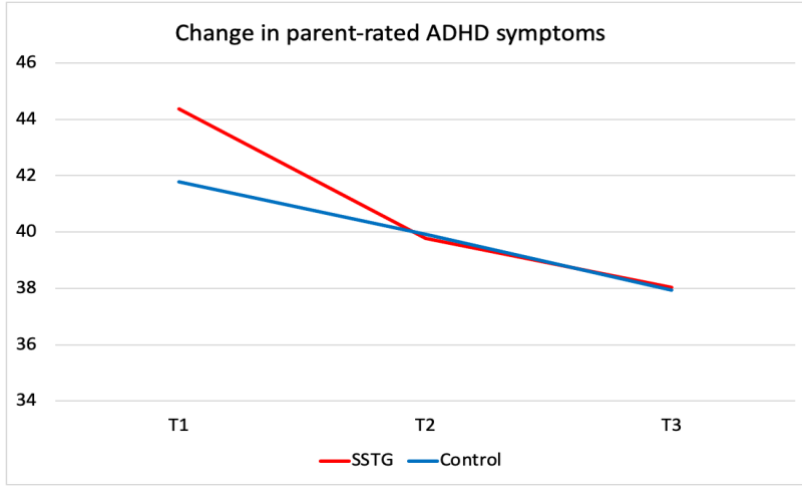
Main results

Study I

No significant group differences were found regarding the primary outcomes, which was also confirmed in the sensitivity analyses among the completers.

Parent-rated change in ADHD symptoms and functional impairment is illustrated in Figure 3. For the secondary outcomes, only one group difference was found – in regard to sleep problems, which was in favor of the control group. However, this finding was neither preserved to follow-up nor confirmed in the sensitivity analysis. Effect sizes indicated no to small effects regarding all group comparisons (d = 0.01–0.36).

Both groups showed significant within-group changes in the primary outcomes of ADHD symptoms and functional impairment, as well as in the secondary outcomes of emotional and behavioral problems. Moderate within-group changes were found in the SSTG regarding parent-rated change of ADHD symptoms (d = 0.59 [T1–T2], d = 0.62 [T1–T3]), and behavioral and emotional problems (d = 0.68 [T1–T2], d = 0.69 [T1–T3]). All the remaining within-group changes were found to be small (d = 0.25–0.46). As regards acceptability of the SSTG, a majority of the responding participants reported that they gained knowledge about ADHD (92.7%), improved their ability to control problems related to the condition (89.1%), and would recommend the treatment to others (87.9%). Comparable results were found in the control group and no group differences were observed regarding acceptability.



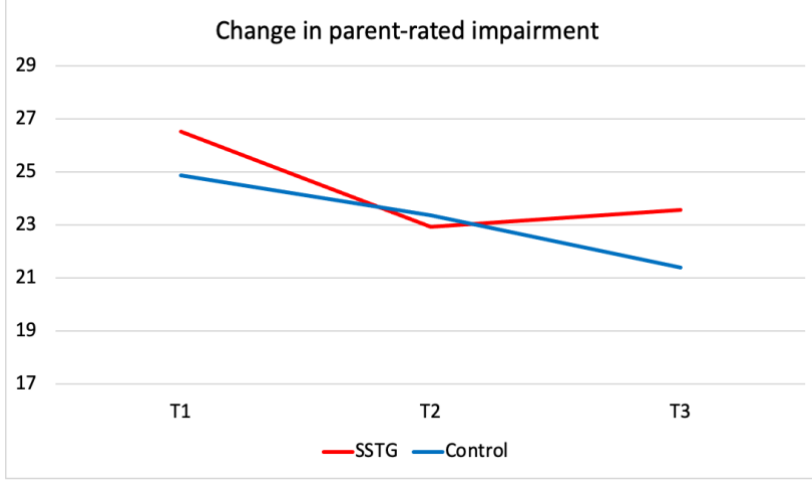
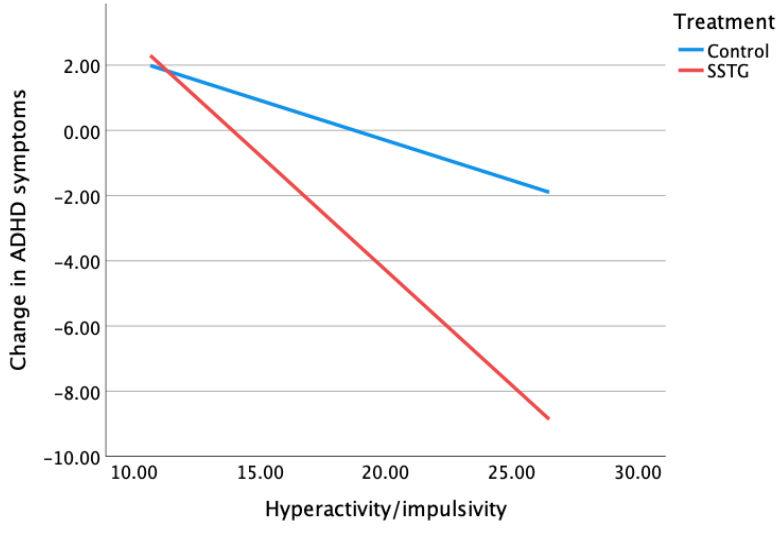


Figure 3. Changes in parent-rated ADHD symptoms and functional impairment.
ADHD attention-deficit/hyperactivity disorder, *SSTG* structured skills training group, *T1* Pre-treatment assessment, *T2* Post-treatment assessment, *T3* Follow-up assessment.

Study II

Three significant interactions were found, which are illustrated in Figure 4. Self-rated symptoms of hyperactivity/impulsivity, conduct problems, and impairment of ED were identified as moderators regarding the outcome of self-rated change in ADHD symptoms. More specifically, those participants who reported elevated symptoms of hyperactivity/impulsivity (a score of ≥ 19), conduct problems (a score of ≥ 3.2), and/or impairment of ED (a score of ≥ 5) before treatment, showed a significantly larger reduction of self-rated ADHD symptoms after the SSTG than after the control intervention ($p < .05$). In addition, the three moderator variables were also confirmed as predictors of within-group changes for the SSTG. No other interaction effects were found, meaning that neither sex, age, ADHD presentation, severity of inattention, anxiety, depression, nor functional impairment moderated the treatment outcomes. No moderators were identified in the parental ratings or in regard to change in functional impairment.



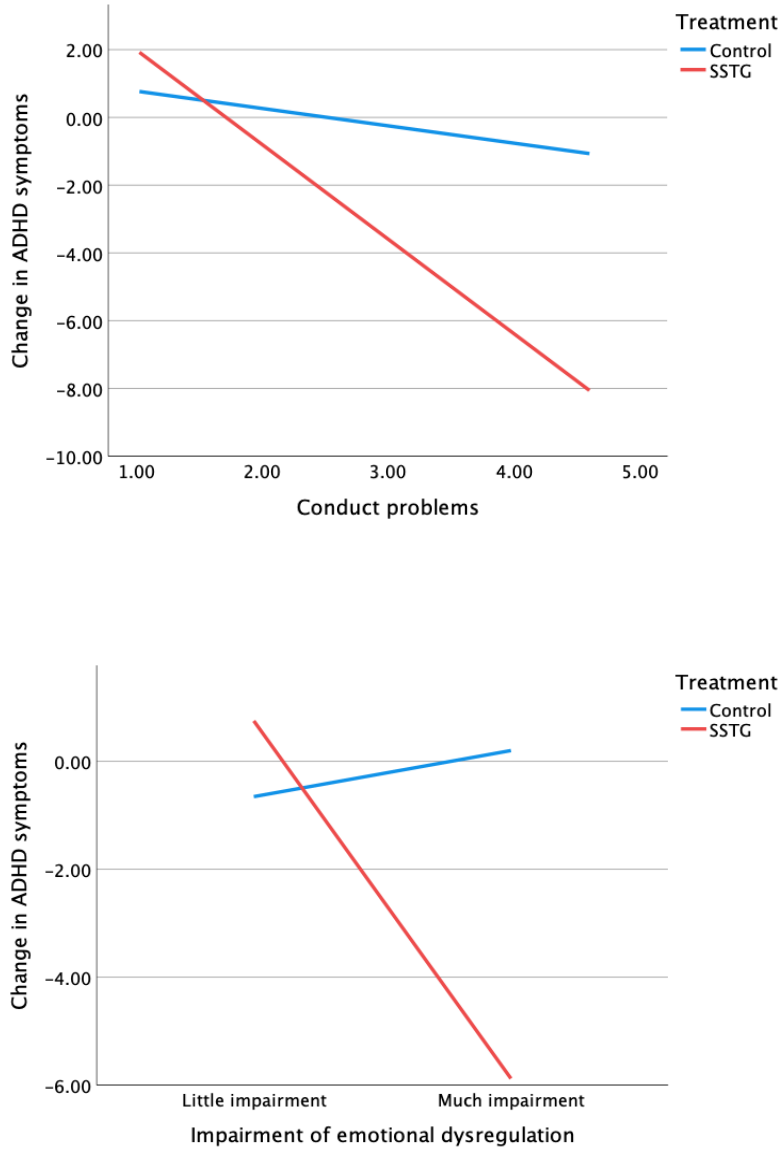


Figure 4. Interactions between treatment condition and the moderators on the outcome of self-rated change in ADHD symptoms.

ADHD attention-deficit/hyperactivity disorder, *SSTG* structured skills training group.

Study III

The themes, categories, and subcategories revealed in the analysis are shown in Table 4. The group format was experienced as positive by most of the participants, who described it as meaningful to share experiences and strategies with peers who also had ADHD. Feelings of togetherness and being less lonely were also described in relation to the group format. Moreover, the contents and themes of the treatment were generally appreciated. The participants emphasized that active parts of the treatment, including discussions and practicing of skills, were helpful. In contrast, some elements were described as too repetitive and school-like, and a few participants stated that the language was sometimes overly complicated. The participants gave suggestions for how the treatment could be improved, such as more practical exercises and increased time for discussions. The participants associated the treatment with positive changes, such as increased knowledge and acceptance of themselves and ADHD, improved self-esteem, and behavioral changes (e.g., involved in fewer conflicts). At the same time, some said that the treatment was not enough for them and that they would need further help to achieve pronounced changes in life.

Table 4.Themes, categories, and subcategories.

Themes	**A need to belong**	**A need to be an active participant in one's own treatment**		
Categories	To meet others in a group	The design and content of the skills training group	Changes for the adolescents	Overall satisfaction
Subcategories	♦ Recognition & togetherness ♦ Sharing ♦ Group therapy vs. individual therapy ♦ The group climate ♦ New friends	♦ Appreciation for exercises & themes ♦ Room for improvement	♦ Increased awareness and understanding ♦ Change in emotions ♦ New behaviors ♦ Changes for the worse	♦ Satisfaction ♦ Incompleteness

Study IV

The results revealed higher levels of both self- and parent-rated impairment for adolescents with ADHD, as compared with peers without the diagnosis ($p < .001$). As regards sex, girls with ADHD rated higher overall impairment than boys with ADHD ($p < .01$), whereas no sex differences were found in the reference group or in the parental ratings. Overall, low to moderate correlations were found between self-reports and parental reports of functional impairment, in both groups ($\rho = 0.22–0.46$, $p < .01$).

As regards ADHD presentation, the self-ratings showed that overall impairment and impairment in school was most elevated in participants with ADHD-C. In contrast, the parental reports did not display any difference in overall impairment across the presentations and showed roughly comparable impairment in school between ADHD-C and ADHD-I. Overall impairment across presentations is illustrated in Figure 5.

In the adjusted general linear models, inattention was strongly associated with impairment in school, in regard to both self-ratings ($B = .22$, $p < .001$, $\eta_p^2 = .15$) and parental ratings ($B = .27$, $p < .001$, $\eta_p^2 = .27$). In contrast, hyperactivity/impulsivity was not associated with academic impairment. Both inattention ($B = .11$, $p < .05$, $\eta_p^2 = .04$) and hyperactivity/impulsivity ($B = .07$, $p < .05$, $\eta_p^2 = .03$) were modestly associated with self-rated impairment with friends. In the parental ratings, inattention was related to parent-rated impairment with friends ($B = .13$, $p < .01$, $\eta_p^2 = .07$) and at home ($B = .10$, $p < .05$, $\eta_p^2 = .04$), while hyperactivity/impulsivity was not. The adjustment for emotional problems and conduct problems attenuated the explained variance by ADHD symptoms on functional impairment, especially in regard to impairment at home. Emotional problems explained most of the variance in self-rated impairment at home ($B = .31$, $p < .01$, $\eta_p^2 = .06$), whereas conduct problems were identified as the strongest associated predictor of parental rated impairment in this life domain ($B = .75$, $p < .001$, $\eta_p^2 = .25$).

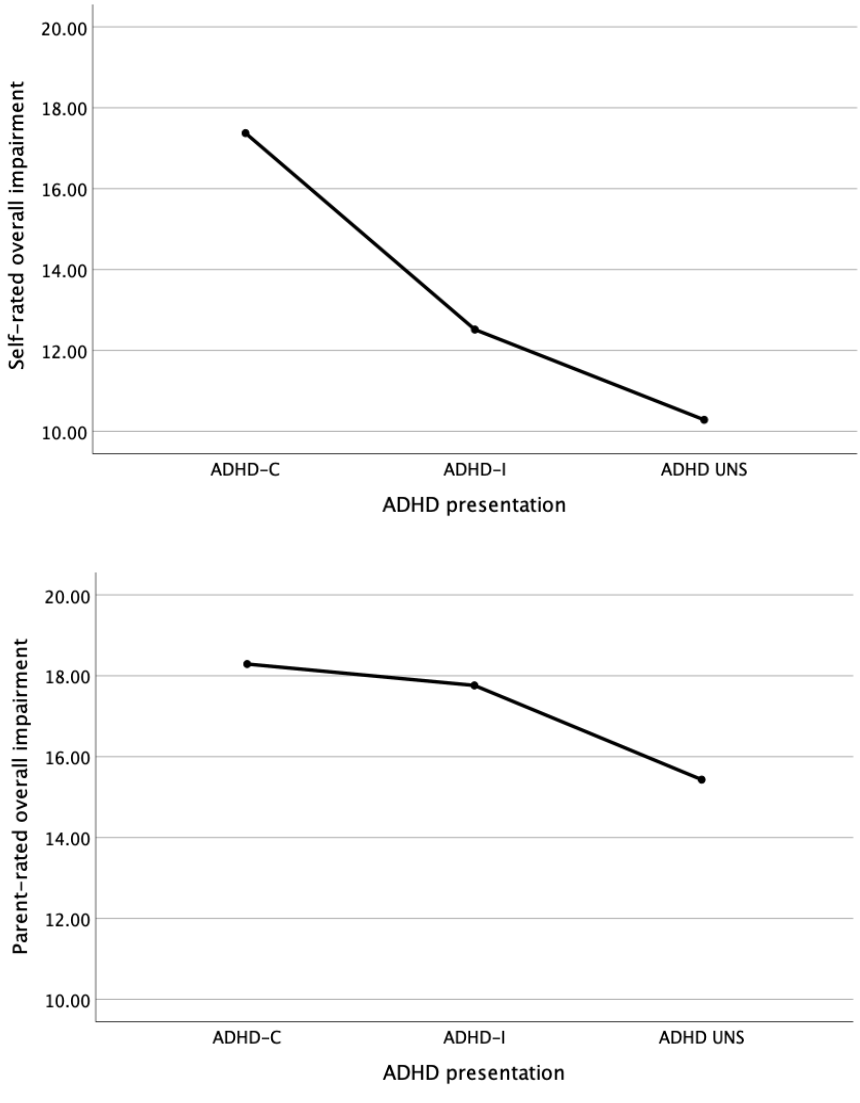


Figure 5. Self- and parent-rated impairment across ADHD presentations.
ADHD attention-deficit/hyperactivity disorder, ADHD-C combined presentation, *ADHD-I* predominantly inattentive presentation, *ADHD UNS* unspecified ADHD.

Discussion

Main findings

In light of the daily impairment associated with ADHD in adolescence, this thesis aimed to evaluate the effectiveness, acceptability, and experience of a DBT-based skills training group for adolescents with ADHD. Moreover, I sought to increase knowledge of how clinical factors are related to functional impairment in this age group.

In Study I, no group differences were found in favor of the SSTG. However, a majority reported that they benefitted from the treatment and would recommend it to others. In Study II, pre-treatment symptoms of hyperactivity/impulsivity, conduct problems, and impairment of ED were identified as moderators of treatment effect. Those who displayed pronounced symptoms of these moderators had better effects from the SSTG than from the control intervention. In Study III, the results indicated that the group format of the SSTG was perceived as meaningful, and that the treatment was appreciated and associated with improvements. At the same time, the participants suggested changes that emphasized a need for further adaptations of the treatment. In Study IV, ADHD was associated with impairment across several life domains and girls with ADHD rated more impairment than their male counterparts. ADHD-C was associated with the highest levels of self-reported impairment, while the parental ratings indicated comparable levels of overall impairment across the presentations. Symptoms of inattention were identified as the strongest associated predictor of impairment in school. Adjustment of comorbid symptoms attenuated the effect of ADHD symptoms on impairment, especially in regard to impairment at home.

Effectiveness of the SSTG

Given the lack of group differences in Study I, the hypothesis of the SSTG being superior to the control intervention was not supported. The effectiveness of psychosocial treatments for adolescents and adults with ADHD has gained most support in studies using non-active control groups (139, 140, 142, 144), while the results here were more in line with studies that compared active interventions (141, 155, 189, 190). An advantage of an active control group is that it may decrease the risk of confounders from common factors (e.g.,

attention from a therapist, being in a group) (191), and might also be a more ethical option in longitudinal designs. However, the use of an active control group only enabled inferences about the treatment's relative effectiveness, while it precluded conclusions about the absolute effects of the SSTG (191).

To the best of my knowledge, only one large RCT has previously evaluated group-based CBT for adolescents with ADHD (142), which also included young adults (up to 21 years old). In addition, former studies evaluating the SSTG have been conducted on adults (149, 152-156). It is possible that the group format is more suitable for older age groups and that increased maturity may give the participants better prerequisites to benefit from a group treatment like the SSTG. Study I was the first to evaluate the effectiveness of the SSTG for adolescents, and although some age adaptions of the treatment were made (see Appendix), the findings of this study suggested that these might not have been enough. For example, the SSTG includes several themes, where new concepts and skills are introduced and practiced over a relatively brief period of time. This may have placed too high demands on the adolescents to absorb new information and implement the practiced skills in their everyday lives on their own. More extensive practice, including regular performance feedback on each skill, might be needed to enable behavioral changes (93). This could be achieved by increasing the length of the treatment (137, 155, 156) and/or by narrowing the focus of the treatment with more intense practicing of a few key skills (139). In addition, the involvement of parents and/or teachers is warranted in order to support the adolescents' practicing and use of the skills in their everyday life (137-140, 145). This may also facilitate implementation of operant reinforcement and environmental adaptations which could promote adaptive behaviors (93, 139, 145).

Although the above treatment suggestions may be of particular relevance for younger age groups, it should be noted that comparable suggestions have been made in regard to adult patients as well. For example, Philipson et al., extended the SSTG with 10 monthly sessions to enable more practice of skills (155, 192), and group-based psychoeducation including both the patients and their significant others has shown positive outcomes for adults with ADHD (143). Moreover, after the SSTG was evaluated for adults with ADHD, a Swedish research group identified a need for treatments with a narrower focus on ED for patients with such difficulties (193). Accordingly, a new group-based CBT treatment including elements from DBT, acceptance and commitment therapy and emotional regulation group therapy was developed for adults with ADHD who also have co-existing symptoms of ED. The treatment was evaluated in an uncontrolled feasibility study and showed promising results in regard to outcomes as treatment satisfaction and potential effectiveness (e.g., change in symptoms of ED and ADHD).

Furthermore, the relatively low attendance and rate of homework completion found in Study I indicates a lack of commitment to the treatment, which might have affected the results. Anecdotal descriptions from the group

leaders have also revealed that some participants stated that they primarily participated because their parents wanted them to. Difficulties with treatment engagement among adolescents with ADHD have also been noted previously (136, 190, 194, 195). In a recent study, Sibley et al. explored engagement barriers to behavioral treatment for adolescents with ADHD by coding recorded treatment sessions with adolescents and their parents. Some of the most common barriers for the adolescents where low desire for treatment, forgetfulness, and belief that no change was needed. Moreover, implementation of parent monitoring and behavioral contingencies was found to be challenging for many parents. The authors suggested that treatment barriers should be assessed before treatment starts in order to optimize treatment engagement at an early stage, for example by using engagement strategies like motivational interviewing (194). In relation to this, individualized treatments may enable more adaptations for each adolescent's needs (e.g., more focused work towards individual goals, motivational work, and rescheduling of sessions if needed) (139-141, 194). The group format is not as flexible and it is possible that engagement in the SSTG (e.g., attendance and completion of homework) could have been improved in an individualized format. Nevertheless, the group format creates an opportunity to meet and share experiences with others, and some skills training might benefit from practice within a social setting (196). Traditional DBT combines individual sessions and group sessions (197), which may be a beneficial treatment approach for adolescents with ADHD.

Lastly, Study I was conducted within a clinical context and the study population was heterogenous in regard to severity of ADHD symptoms, symptoms of psychiatric comorbidity, and functional impairment. Although this might have increased the ecological validity of the findings (160), it may have made it difficult to find treatment effects. Previous studies evaluating CBT-based treatment for adolescents with ADHD have used more strict inclusion criteria (140-142). As discussed in the introduction of this thesis, it is unlikely that one treatment fits all adolescents with ADHD (4), which underlines the need to investigate potential treatment moderators.

Acceptability and within-group changes

The acceptability ratings in Study I indicated that the SSTG was perceived as beneficial by a majority of the responding participants, who reported increased knowledge about ADHD and an improved ability to manage difficulties related to the diagnosis. These findings gave preliminary support for the SSTG as an acceptable treatment for adolescents with ADHD. However, similar results were observed in the control group. Corroborating this, both groups showed significant decreases of ADHD symptoms, functional impairment, and behavioral and emotional problems after the

treatments. It is possible that the improvements seen within each group resulted from maturation or regression to the mean (198). At the same time, findings from a recent review suggest that psychoeducation is related to improvements in ADHD symptoms and behavioral problems (199). Though the design of this study precluded inferences about absolute treatment effects (191), it cannot be ruled out that the interventions contributed to the observed improvements.

Moderators of treatment effects

To investigate if certain subgroup(s) had an effect from the SSTG, moderator analyses were performed. The results showed that adolescents who had elevated symptoms of hyperactivity/impulsivity, conduct problems, and/or impairment of ED had better effect from the SSTG than from the psychoeducational control intervention. These results were only observed in relation to the outcome of self-rated ADHD symptoms.

A common argument for DBT-based treatment for ADHD has been the overlap of symptom between ADHD and BPD (e.g., impulsive behaviors and ED) (149, 156, 192, 200, 201). The SSTG includes continuous practice of DBT techniques and the treatment focuses specifically on difficulties with emotional and behavioral self-control (151). These difficulties clearly corresponded to the three identified moderators in Study II. Hence, the results gave some preliminary support for the SSTG as effective for certain subgroups, suggesting that the patients struggling with difficulties specifically targeted in the SSTG were the ones who seemed to benefit the most from the treatment. However, it should be noted that the findings were derived from exploratory analyses and need replication before any firm conclusions can be drawn. The identified moderators in Study II could be used as criteria for inclusion or stratification in future trials evaluating the SSTG or similar interventions (158).

In contrast to the results of Study II, previous findings have indicated poorer treatment outcomes for youths with ADHD and comorbid conduct problems (164, 167). In the SSTG, mindfulness and behavioral chain analysis are practiced continuously. These techniques may increase the adolescents' awareness of their behavioral patterns (i.e., triggers, non-adaptive behaviors, and consequences) and create more room for self-regulation and the use of goal-oriented behaviors (197, 202). Corroborating this, previous studies have shown promising findings for DBT-based skills training for youths with disruptive behaviors (203, 204). However, it should be noted that conduct problems were assessed with questionnaires in Study II, precluding generalization of the findings to patients diagnosed with CD or ODD.

Although the identified moderators indicated that the null result found in Study I did not seem to be valid for certain subgroups, far from all adolescents

with ADHD display symptoms of hyperactivity/ impulsivity, conduct problems, or impairment of ED (1, 70). Some of the participants displayed subclinical levels of ADHD symptoms before treatment exposure, which may reflect effects from their ongoing medication. Thus, in some cases, there might have been limited room for further symptom reduction. Nevertheless, these individuals may still benefit from meeting peers with ADHD and to learn more about their diagnosis. However, for this purpose, a shorter psychoeducational group intervention might be enough.

For some subgroup(s), none of the evaluated interventions might be a favorable treatment option. For example, inattention was not identified as a moderator in Study II and the attrition analysis indicated that those with high severity of inattention were at greater risk of dropout. Inattention has been associated with academic impairment (9, 12, 109), meaning that youths who primarily struggles with inattentive symptoms may benefit more from interventions with an explicit focus on improving adaptive behaviors in school (e.g., organizational skills and time management) (137, 138). The SSTG only included limited practicing of such skills and even if mindfulness training has previously been associated with decreased symptoms of inattention, evidence of its effectiveness is limited (162, 202, 205). Symptoms of anxiety were not identified as a moderator, which is in contrast to previous studies (4, 165, 166). As suggested in treatment guidelines for ADHD, comorbidities should be taken into account when prioritizing the type and sequence of offered intervention (29,123).

Importantly, no moderators were found in regard to change in functional impairment. This suggests that the SSTG was not superior to the control intervention for reducing impairment, neither for the overall group (Study I) nor for any specific subgroup (Study II). As discussed in regard to the findings in Study I, more extensive practicing of skills, a narrower focus on key aspects (e.g., ED), inclusion of parents, and the addition of individualized session are potential adaptations that may optimize improvement of daily functioning (137-140, 193). Further, in a review of Evans et al., the authors argued that it might be unrealistic to expect that behaviors trained in one context (e.g., at the clinic or at home) will automatically be generalized to other contexts involving other demands and contingencies (e.g., school) (93). Therefore, it is preferrable that psychosocial treatments include skills training in several contexts. In addition, it might be more effective and feasible to offer different treatments that are tailored to target impairment in one (or a few) area(s) each, instead of offering one multicomponent treatment that seeks to improve functioning in all life domains.

As no moderators were identified in regard to the parent-rated outcomes, the interaction effects found in the self-ratings should be interpreted with some caution. Nevertheless, the adolescents are the ones who participated in the treatments, meaning their own perspective on this matter is of clinical relevance.

Experience of the SSTG

In Study III, a qualitative design was used to explore the adolescents' experiences of participating in the SSTG. The addition of qualitative data has been suggested when evaluating new treatments, as it can provide further insight into how the treatment is perceived, experienced outcomes, and potential mechanisms of change (206).

The results indicated that the group format was appreciated by most of the participants, who described it as meaningful to meet peers with ADHD. The participants mentioned a value of sharing experiences and tips with each other, which is in accordance with previous reports from adult patients who participated in the SSTG (153). Moreover, feelings of being less alone and gaining increased acceptance of one-self and the diagnosis were described. As the national treatment guidelines suggest (123, 125) and the results indicated: Group-based interventions may have a positive influence on one's perspective of oneself in relation to the diagnosis. The participants described an increased feeling of togetherness from being in the group, which may be an important piece of the puzzle towards improved wellbeing. Previous research has identified a "sense of togetherness" as a critical factor of motivation for adolescents with ADHD (207).

Further, the interviewed adolescents described a need to be active participants in the treatment. Much of the treatment content was appreciated, in particular the parts where the adolescents were more actively involved (e.g., exercises and discussions), which may have helped them to be more engaged and focused. In addition, there were both critiques and suggestions for changes from the participants that indicated a need for a more active approach throughout the treatment. For example, some parts of the treatment were perceived as too similar to school and some asked for more discussions and less homework in the treatment. Similar experiences have been addressed in a study of adult patients participating in the SSTG (153). Moreover, some participants stated that the treatment was sometimes too monotonous and repetitive and suggested more variation in the exercises. Corroborating this, it has been suggested that activities that are too slow, long-lasting, and repetitive can be perceived as aversive for adolescents with ADHD, and the importance of variation in activities for this group has been emphasized (3, 207). When developing treatments for this group, one challenge may be how to combine the need for variety, to keep the adolescents focused and engaged (207), with repetition of each skill to consolidate learning and transfer it to behaviors in their daily lives (93).

Most of the participants described improvements that they related to the treatment. An increased knowledge and understanding of the diagnosis were described, which goes in line with the findings on the acceptability rating in Study I. Moreover, the adolescents gave examples of behavioral changes in their everyday life, such as fewer conflicts, completing assignments on time,

and improved communication with parents. The use of practiced skills such as behavioral analysis and mindfulness were also mentioned in relation to associated improvements. Although no conclusions about treatment effects can be drawn from a qualitative study, the results suggested that the SSTG seemed to be perceived as helpful by at least some adolescents with ADHD.

However, some participants described that the treatment was not enough and that further support was needed to improve their behaviors in their everyday life. These findings could be related to the lack of treatment effect on functional impairment found in Study I and Study II, and confirmed previous suggestions of further adaptations of the treatment (e.g., more extensive practice of skills). In addition, single statements revealed that an increased insight about one's difficulties was related to negative feelings, and that ending the treatment was associated with impaired wellbeing. Similar findings have been reported in adult patients with ADHD (153). Though the identified discomfort was described as transient in Study III, the findings emphasized the importance of clinicians being alert to impairment, both during and after treatment.

The participants gave several suggestions of possible modifications of the SSTG, which should be considered for further adaptions of the treatment. However, the range of suggestions across the interviewed participants indicated a heterogeneity and different care needs within the group. For example, while some stated that the treatment was too basic, others perceived parts of it as too difficult. There were suggestions of both reducing and increasing the number of sessions, and while some requested more information about ADHD, others asked for more focus on psychiatric comorbidities. This variability highlights the complexity of developing a group treatment that suits everyone's needs. As previously discussed, the use of stricter inclusion criteria may result in more homogenous groups and the addition of one-to-one sessions might be one solution to better meet individual needs.

In regard to the previous discussion about potential advantages of involving parents in the treatment, it should be noted that none of the interviewed adolescents suggested this. As adolescence is associated with increased autonomy (122), it is not evident that involvement of their parents necessarily would be appreciated. However, parents can be involved in several ways that might not interfere with the teen group sessions, which potentially should be kept among adolescents only. In previous studies on DBT for adolescents, parents have been involved in individual family sessions, by telephone coaching, in multifamily skills training groups or in parental groups (197).

Associated predictors of functional impairment

Previous research on youth with ADHD has shown inconsistent treatment effects on functional impairment (93, 208) and the results of Studies I–III indicated a need for further adaptations of the SSTG to enable improvement of daily functioning. One important step towards more effective interventions is to clarify the associations between clinical characteristics and impairment in different life domains for this age group, which was the aim of Study IV.

As expected, the results showed that adolescents with ADHD displayed higher levels of functional impairment in regard to all life domains as compared with peers without the diagnosis, which confirmed earlier findings (9, 12, 109). It should be noted that majority of the patients had medication for ADHD (76.5%), which suggests that additional interventions might be needed to improve functioning further.

Moreover, girls with ADHD rated more impairment in school and with friends than their male counterparts, while no sex differences were found in the reference group or in the parental ratings. These findings are supported by previous studies, where comparable levels of impairment between the sexes have been reported by parents and teachers (115-117), whereas self-ratings among young adults with ADHD have shown more impairment in females (118-120). It has been suggested that males with ADHD might underestimate both their symptoms and impairment (118, 209). At the same time, studies have shown that girls are diagnosed with ADHD later in life, which may delay proper treatment and increase the risk of developing comorbid symptoms and additional impairment (33, 35, 118, 120).

The above findings indicate that the influence of sex varied in relation to the informants. As both self-ratings and parental ratings are subjective in nature, it cannot be determined if one of these informants is more reliable than the other. In accordance with previous findings (210, 211), the results in Study IV revealed low to moderate correlations between self-rated and parent-rated impairment. Thus, the poor agreement between youths and their parents needs to be considered when planning and delivering interventions to this group of patients. For example, if an adolescent perceives low impairment with friends (as found among boys in the sample in Study IV), this will probably affect his/her motivation to take part in a social skills training group. Hence, the inclusion of self-reports is of importance in both clinical practice and research with this age group (92, 111, 210, 211).

The influence of ADHD presentation (ADHD-C, ADHD-I, or ADHD UNS) on functional impairment also seemed to vary in relation to the informant. The self-ratings showed that ADHD-C was associated with the highest level of overall impairment, which was in agreement with the original hypothesis as well as with previous findings (12). This result indicated that self-perceived impairment was affected by the number of met ADHD symptoms. In contrast, the parental ratings showed comparable levels of

overall impairment across the ADHD presentations, suggesting that impairment remains high even when the ADHD symptoms have decreased to subthreshold levels (i.e., ADHD UNS). Further, ADHD-C and ADHD-I were associated with roughly similar levels of parent-rated impairment in school, which was in line with the original hypothesis and corroborates results from previous studies (12). However, according to the self-ratings, ADHD-C was related to most impairment in all life domains.

To add a more dimensional perspective on the diagnosis, the associations between severity of symptoms in each ADHD domain and functional impairment were explored, while also adjusting for comorbid symptoms, sex, and medication. The results revealed inattention as the strongest associated predictor of both self- and parent-rated impairment in school, which is in accordance with previous findings (9, 12, 109), and confirmed the original hypothesis. Hyperactivity/impulsivity was not found to be significantly related to impairment in school. Hence, psychosocial interventions and environmental adaptions with a specific focus on decreasing and/or compensating for attentional deficits in relation to school work, are warranted for this age group (93, 123, 124, 137, 138). In line with my previous discussion, such skills should be practiced in the targeted contexts (e.g., both in school and at home), and teachers and parents should be involved to support the practicing and implementation of environmental and pedagogical adaptations (93, 123, 124). While the evidence of school-based programs previously has been based on studies with younger adolescents (137, 138), a recent multi-center trial evaluated a school-based program for high-school students with ADHD (Mean age 15.0) (212). The intervention was conducted over one school year and involved both individual sessions for the adolescents and parental sessions. The results were in line with prior studies on younger adolescents (137, 138), showing improvements on parent-rated academic functioning, homework completion and organizational skills, but not in regard to self- and teacher rated outcomes (212).

In line with the original hypothesis, the effect of the ADHD domains was partly attenuated in relation to impairment with friends and at home when adjusting for comorbid symptoms, sex, and medication. In the self-ratings, both symptom domains were modestly associated with impairment with friends. In the parental ratings, inattention was still associated with parent-rated impairment with friends and at home, while no associations were found between hyperactivity/impulsivity and parent-rated impairment. The findings from Study IV suggested a relatively limited influence of hyperactivity/impulsivity on impairment, which might be related to the decline of overt ADHD symptoms that is often seen in adolescence (1, 5, 12, 109).

Symptoms of conduct problems and emotional problems contributed to the explained variance of functional impairment in several life domains, which is in line with previous findings (9, 110-113). However, the results varied in

relation to the specific life domains, as well as in relation to the informant (i.e., self-reports vs. parental reports). As regards self-ratings, comorbid symptoms were not significantly associated with impairment with friends, which was surprising given previous findings (9, 111, 112). In Study IV, the adolescents reported relatively low impairment with friends, which may have affected the results. In contrast, the results from the parental ratings were more in line with prior studies (9, 111), showing that both emotional problems and conduct problems added to the explained variance of impairment with friends. Furthermore, the self-ratings indicated greater influence of emotional problems than of conduct problems in regard to impairment in school and at home. At the same time, conduct problems were identified as the strongest associated predictor of parent-rated impairment at home, which is in accordance with previous findings based on parental reports (9). Hypothetically, conduct problems may be perceived as more disturbing by the surroundings than by the adolescent him-/herself and it has been suggested that youths tend to underestimate their externalized symptoms (213). Meanwhile, emotional problems may be perceived as more impairing for the adolescent and might also be more difficult for others to observe (210, 211, 213). Taken together, the results suggest that comorbid symptoms add to the daily impairment in adolescents with ADHD, which underscores the importance of assessing and treating psychiatric comorbidities as part of the clinical care for these patients. In addition, both parental reports and self-reports should be taken into account to broaden the perspective on adolescents' current health and impairment.

Methodological considerations

Design

The main strength of Study I was the RCT design, which decreased the risk for systematic group differences and confounders. However, the randomization was performed before the pre-treatment assessment (T1), which allowed dropout of already allocated participants before T1 (n = 20). This hindered the performance of an intention-to-treat analysis in its strict definition (i.e., including all randomized participants) (214) and introduced a risk of a selective dropout and systematic differences between the groups. In addition, the lack of data of those who dropped out before T1 precluded an attrition analysis of this group. However, for those participants who were included in the analyses (n = 164), no group differences were found at T1.

The aforementioned limitations also apply to Study II, for which the sample was derived from Study I. Study II included only those who completed the follow-up measures (n = 128), which further compromised the randomization and the representativeness of the sample. The attrition analysis showed higher

symptoms of inattention among the internal dropouts, which may have restricted the generalizability to those with severe attentional deficits. However, no systematic differences were found between the treatment conditions at T1. As Study II was based on a sub-sample from the RCT, there may have been restricted power for identifying treatment moderators (158). In addition, the researchers did not pre-register any hypotheses or methods for this study. Hence, the results in Study II are based on explorative analyses, which is important to bear in mind when interpreting the findings. There has been a lack of evaluations of long-term effects of psychosocial treatments (13, 93), meaning that the inclusion of the six-month assessment (T3) could be regarded as a strength in Studies I and II.

The qualitative design and the small sample size in Study III (n = 20) hindered the drawing of conclusions on causal relationships and limited the generalizability of the findings. However, the qualitative analysis enabled a deeper insight into how the treatment was perceived by the adolescents and could be regarded as an important complement to the quantitative evaluations conducted in Studies I–II (206). Moreover, the cross-sectional design of Study IV precluded drawing conclusions about the predictive value of the examined variables over time, as well as making inferences about any causal relationships. Nevertheless, identification of associated predictors of the adolescents' current impairment is of clinical relevance.

Measures

All the quantitative studies of this thesis (Studies I, II, and IV) included many outcomes, in particular Study I. This is not in line with recommendations for clinical trials, where use of as few primary outcome(s) as possible is favored (214, 215).

From a statistical point of view, having a large number of outcomes will increase the number of analyses and thereby the risk for type I errors (i.e., rejecting the null hypothesis though is actually true) (214, 215). Having a large number of outcomes may also increase the risk for reporting bias (e.g., selective reporting of significant findings) (214, 215). Such bias can however be avoided by reporting all the pre-registered outcomes, which was done in Study I. Another limitation may be that it is more time-consuming for participants to fill in many questionnaires. Adolescents with ADHD are at certain risk of having difficulties with sustained focus and motivation during tedious tasks (3, 207), which might have impaired the reliability of their reports and contributed to missing data. Moreover, the choice of one (or a few) primary outcome(s) is an important step in the design of a study, where the research group need to carefully consider the most relevant outcome(s) in relation to the target population and the treatment. Fewer outcomes can clarify the focus of a study and thus improve the communication of the findings to the reader. That being said, the chosen outcomes in Study I were based on

previous studies on the SSTG (152, 154, 157) and their relevance in relation to the study population and the treatment. The SSTG is a multicomponent treatment with a rather broad range, and its effectiveness had not previously been evaluated for adolescents. Hence, the decision was made to explore a variety of outcomes. A potential advantage with including a large number of outcomes may be that it provides a broader perspective on the benefits (or lack of benefits) from a treatment.

Both self-ratings and parental-ratings were used for some of the outcomes in Study I and for all of the outcomes in Studies II and IV. Even if this resulted in more analyses, I regard the use of multiple informants primarily as a strength of this thesis. Much of the evidence regarding both treatment effects and associated predictors of impairment in youth with ADHD is based on other informants than the patient him-/herself (9, 12, 13, 93), which is why I wanted to include the perspective of the adolescents. Moreover, in Study IV, it was considered more informative to explore functional impairment in different life domains than to use one global index of overall impairment. However, the potential benefits with many outcomes need to be balanced against the addressed limitations.

To the best of my knowledge, some of the instruments included in Study I (FFMQ, GQL, and KSQ) have not been validated on groups younger than 18 years of age. Hence, their usability for adolescents is not established, which is a clear limitation. In regard to FFMQ, Lilja et al. included several age groups and their results indicated lower ratings of mindfulness for young adults (< 25 years) (177). Similar findings were mentioned in the evaluation of the GQL (175). Accordingly, reference values based on adults may not be suitable for adolescents. In addition, no psychometrical evaluation had been conducted on the IAS, which was designed for Study I. The lack of established reliability and validity of an instrument leads to more uncertain conclusions on the results.

The IAS was the only instrument that explicitly asked about impairment from ED and it would have been warranted to use a validated measure of ED, such as Difficulties in Emotion Regulation Scale (216). Further, the SSTG primarily focus on practice to increase awareness and acceptance of one's own functioning, as well as improvement of self-control in relation to individual difficulties and goals. Although such improvements could affect global measures of ADHD symptoms and overall functioning (as hypothesized in Study I), it might have been motivated to add outcomes more specifically related to the practiced behaviors and the participants' own goals.

Moreover, the participants were not blinded to the interventions which could have biased their reports (214). A more objective evaluation of the primary outcomes, e.g., by a clinician blinded to the treatment conditions, would have been warranted. Moreover, the participants' expectations of each treatment could have been assessed at baseline and explored in relation to the

results. An additional limitation was the lack of assessment of adverse events which should be included in all clinical trials (198, 214, 215).

Lastly, in Study IV, we primarily focused on factors that may add to the daily impairment in ADHD. However, not all individuals with ADHD experience severe impairment in all life domains and many also live enjoyable and productive lives (37). Accordingly, factors that may enhance functioning and could compensate for the presence of risk factors should be explored further (56, 111). In a previous study of young adolescents with ADHD, participation in leisure activities and parental involvement (e.g., asking questions about the adolescent's daily activities) were associated with better social functioning and did also seem to compensate for the negative effect from risk factors (111). Hence, strengthening of such factors could be of greater focus in psychosocial interventions (111,112).

Study sample, confounders and generalizability

The studies in this thesis were conducted in a clinical setting and included patients diagnosed with ADHD who were recruited from CAP units from several regions in Sweden. This may have strengthened the ecological validity of the study findings (160). However, the characteristics of the sample and the lack of sociodemographic data need to be considered, in regard to both generalizability and potential confounders.

As previously discussed, rather generous inclusion criteria were used in the RCT, and patients who currently presented with subthreshold symptoms of ADHD were also included (i.e., ADHD UNS). Hence, it could be argued that these participants had remitted from their ADHD and should not have been included in a trial for adolescents with ADHD. However, a large majority of those with subthreshold symptoms had current medication for ADHD (87%), and the results from the parental ratings in Study IV suggested that this group was about equally impaired as those who fulfilled the diagnostic criteria. This is in line with previous research that also suggests that ADHD symptoms tend to fluctuate over repeated assessments, and that remission at one timepoint may not be preserved at a later assessment (14). Hence, patients with ADHD UNS seem to be a clinically impaired group who need additional support. Nevertheless, the heterogeneity of the sample may have affected the results, and for future trials, more restricted inclusion criteria will be considered.

Since a majority of the clinical sample in all four studies had pharmacological treatment for ADHD, the generalizability to non-medicated patients was limited. Further, a majority of the participants were females, which does not correspond to the sex distribution of ADHD (1). Notably, a similar sex distribution was found for the reference group in Study IV, and previous Swedish studies on adolescent and adult patients with ADHD have also revealed an overrepresentation of females (153, 154, 168, 193). This

might reflect a self-selection bias, where females in Sweden may be more willing than males to participate in research projects.

A general limitation for all the included studies was the lack of background data on the sample, such as parental educational level, parental mental health, national origin, teen-parent relationship, cognitive ability, clinician-assessed comorbidities, and treatment history. Such data would have clarified the representativeness of the study sample and could have been used in the attrition analyses, explored as potential moderators in Study II, and as covariates in Study IV. The lack of this data leaves the question of potential confounders unanswered.

In Study I, there was a relatively large internal drop-out ($n = 25$), where the participants did not complete any of the post-treatment measures and a majority of these choose to end their participation early in the treatment. Similar findings have previously been observed among patients with ADHD (136, 155, 190, 193), and may both reflect a lack of commitment to the interventions as well as difficulties in completing tasks (e.g., questionnaires). Since the results from the main analysis and the sensitivity analysis of completers were comparable, the findings of no group differences in Study I appeared to be valid and not confounded by internal dropouts. In relation to dropout, one limitation of Study III was that only those who continued their participation in the SSTG were interviewed (Mean attendance = 12 sessions), which might have biased the results to more positive experiences. Accordingly, extending the inclusion to participants who dropped out from treatment would potentially have yielded other results.

Conclusions and implications

The work in this thesis has contributed with new knowledge on the effectiveness, acceptability, and experience of an age-adapted SSTG for adolescents with ADHD. Further, it has strengthened the evidence of associated predictors of impairment in ADHD, with increased insight into the perspective of the adolescents. Conclusions and implications of this work are presented below.

In regard to the overall effectiveness of the treatment, the findings from Study I suggested that the SSTG was not more effective than a shorter psychoeducational intervention for adolescents with ADHD within CAP. However, Study II gave some preliminary support for the SSTG as more effective for certain subgroups (i.e., those with elevated symptoms of hyperactivity/impulsivity, conduct problems, and impairment of ED). The findings of Study II need to be replicated before any firm conclusions can be drawn and primarily provides implications for future trials, where the identified moderators could be used as criteria for inclusion or stratification. Neither of these studies (I–II) found support for the SSTG as effective for

reducing functional impairment, and the results from Study III indicated a need for more practice and support. Hence, the findings suggested that further adaptation of the SSTG is needed to enable behavioral changes in daily life.

In regard to acceptability and the participants' experience of the SSTG, the findings were more promising. The results from Study I gave preliminary support for the SSTG as an acceptable treatment for adolescents with ADHD, where a majority associated the treatment with increased knowledge about ADHD and an improved ability to manage difficulties related to the diagnosis. In accordance with this, the interviewed participants in Study III described several positive changes in relation to the treatment, such as improved understanding and acceptance of oneself and the diagnosis. In addition, the group format seemed to enable a meaningful exchange between the participants.

Taken together, if the current version of the SSTG is to be offered to adolescents with ADHD within CAP, the purpose of the treatment needs to be clarified and communicated to the patients. Based on the findings herein, the SSTG may not be used with the purpose to effectively reduce symptoms and impairment. Although this might be an outcome for some adolescents, further research is needed to establish the effectiveness for certain subgroups. However, the treatment could possibly be offered as an intervention for learning more about one's functioning, the diagnosis, and related difficulties such as ED, as well as an opportunity to meet and exchange experiences with peers.

In Study IV, the findings confirmed previous evidence of ADHD being related to functional impairment across several life domains in adolescence. Findings also indicated that adolescent girls with ADHD may perceive more impairment than boys with ADHD. More research is needed to investigate if this finding is replicable and possible reasons for this potential sex difference.

The influence of ADHD presentation on functional impairment was suggested to differ in relation to the informant. While the number of ADHD-symptoms seemed to affect the level of self-perceived impairment, the parents reported comparable impairment across the presentations. The latter speaks to the importance of continued support for patients with childhood ADHD, even when symptoms are reduces beyond clinical cut-offs.

I conclude that symptoms of inattention seem to have a particularly strong influence on impairment in school, which implies a need for interventions that can decrease and/or compensate for attentional deficits. Furthermore, symptoms of psychiatric comorbidity seem to add to the daily impairment in several life domains, which emphasizes the need to assess and treat comorbid symptoms in this group. Lastly, the results in study IV indicated a discrepancy between self- and parent-rated impairment and its associated predictors, which underscores the importance of including the adolescent's perspective in research and clinical practice with this age group.

Regarding the heterogeneity among adolescents with ADHD, future interventions might be more tailored for different subgroups and/or in regard to impairment in a certain life domain. Accordingly, the availability to different types of evidence-based interventions for adolescents with ADHD needs to be increased, where an improved collaboration between health care, home, and school is likely to be of great importance to enable and support the adolescents use of adaptive behaviors. Hence, more work is needed to improve the evidence and access to effective care and support for these patients.

Sammanfattning på svenska

Bakgrund

ADHD karaktäriseras av svårigheter med koncentration, överaktivitet och impulsivitet som bidrar till nedsatt funktionsförmåga i skolan, sociala relationer och fritidsaktiviteter. En majoritet av de som har ADHD lider även av annan psykisk ohälsa vilket ytterligare kan försämra funktionen i vardagen. ADHD är förknippat med svårigheter att styra och reglera kognitiva processer (t.ex. planering), beteenden och emotioner, vilket försvårar för individen att agera i enlighet med sin mål.

För ungdomar med ADHD rekommenderas ett multimodalt och stegvis behandlingsupplägg där psykoedukation och anpassningar i miljön är en viktig första insats, följt av läkemedelsbehandling för de som fortfarande uppvisar funktionsnedsättande symptom. För många kvarstår dock viss funktionsnedsättning trots medicinering, en del upplever biverkningar, och följsamheten till medicinsk behandling har visat sig vara särskilt låg bland ungdomar. Som ett komplement till medicinering rekommenderas kognitiv beteendeterapi (KBT) med fokus på bland annat sociala färdigheter, hantering av impulsiva beteenden och emotioner. Gruppbaserade insatser har förslagits kunna vara ett kostnadseffektivt behandlingsalternativ som även kan minska känslor av exkludering och stigma.

Endast några få större randomiserade kontrollerade studier (RCT) har utvärderat KBT baserade behandling för tonåringar med ADHD. Resultaten har varit lovande men evidensen avseende psykologisk behandling för denna åldersgrupp är fortfarande bristfällig. Studierna är få (särskilt avseende gruppbehandling), utvärdering av långtidseffekter saknas ofta, effekten på funktion i olika områden är fortfarande oklar, studiepopulationerna är inte alltid representativa för kliniska populationer, och ungdomens eget perspektiv på behandlingen lyfts sällan fram. Vidare saknas utvärdering av behandlande insatser med tydligt fokus på svårigheter med sociala relationer och reglering av impulsiva beteenden och känslor.

En strukturerad färdighetsträningsgrupp (SSTG) baserad på dialektisk beteendeterapi (DBT) har utvecklats för vuxna med ADHD. Behandlingen har bland annat fokus på reglering av känslor och impulsiva beteenden och har visat en del lovande resultat i studier på vuxna. Dock har behandlingseffekten varit tvetydig vid jämförelse mot en aktiv kontrollgrupp. Hittills saknas utvärdering av en åldersanpassad SSTG för ungdomar med ADHD.

Trots att ett huvudsakligt mål med psykologisk behandling bör vara att förbättra patienten funktion i vardagen, har tidigare behandlingsforskning för ungdomar med ADHD visat inkonsekventa fynd. Därför finns ett behov av att öka kunskapen om vilka faktorer som är relaterade till funktionsnedsättning i ungdomarnas vardag.

Det övergripande syftet med den här avhandlingen var att utvärdera en åldersanpassad version av SSTG för ungdomar med ADHD samt att undersöka hur kliniska faktorer var relaterade till funktionsnedsättning i olika områden i livet för denna patientgrupp.

Metod och resultat

I Studie I var syftet att utvärdera den övergripande effekten av SSTG för ungdomar med ADHD samt att undersöka hur väl behandlingen accepterades av ungdomarna. Studien var en RCT och genomfördes inom barn- och ungdomspsykiatrin i sju regioner i Sverige. Hälften av ungdomarna randomiserades till att delta i SSTG (DBT-baserad gruppbehandling med 14 sessioner) och hälften till en aktiv kontrollgrupp (psykoedukation i grupp under tre sessioner). Före, efter och ett halvår efter behandlingen svarade ungdomarna och deras föräldrar på en rad frågeformulär avseende förekomst av symptom och funktionsnedsättning. Efter behandlingen fick deltagarna även svara på ett frågeformulär avseende den upplevda nyttan med behandlingen. Resultaten visade inga gruppskillnader gällande minskning av ADHD symptom, funktionsnedsättning och psykiatriska symptom. Båda grupperna uppvisade en minskning av dessa utfall efter behandlingarna. En majoritet av ungdomarna rapporterade en ökad kunskap om ADHD och att de bättre kunde hantera problem relaterade till diagnosen. Liknande fynd framkom även för kontrollgruppen.

Syftet med studie II var att undersöka om någon/några subgrupp(er) av ungdomar med ADHD hade bättre effekt av SSTG jämfört med kontrollinterventionen genom att utforska potentiella moderatorer för långsiktigt behandlingsutfall. Studien baserades på de deltagare i RCT'n som genomfört halvårsuppföljningen. Behandlingsutfallen var förändring av ADHD symptom och funktionsnedsättning från förmätningen till halvårsmätningen. Variabler som inhämtades före behandlingen (t.ex. symptombörda, kön) undersöktes som potentiella moderatorer för behandlingseffekt. En modererande effekt definierades som en interaktion där behandlingseffekten (skillnad mellan grupperna i utfall) varierar beroende på värdet på en tredje variabel (moderatorn). Tre moderatorer identifierades (symptom på hyperaktivitet/impulsivitet, symptom på uppförandeproblem samt påverkan av emotionell dysreglering). De ungdomar som hade förhöjda skattningar på dessa mått visade sig ha bättre effekt av SSTG jämfört med kontrollinterventionen. Modererande effekter framkom endast i relation till

förändring av självskattade ADHD symptom och inte i relation till förändring i funktion eller föräldraskattade utfall.

Studie III var en kvalitativ studie med syftet att undersöka ungdomarnas upplevelse av att delta i SSTG, vilket undersökes i intervjuer med en mindre grupp ungdomar efter att de genomgått behandlingen. Deltagarna beskrev att det var skönt att träffa andra med liknande svårigheter, att de kände sig mindre ensamma och upplevde en ökad gemenskap. Behandlingsinnehållet var överlag uppskattat, särskilt aktiva moment som diskussioner och övningar. Några upplevde att delar av behandlingen påminde för mycket om skolan och att språket ibland var för svårt. Deltagarna kom med olika förslag på möjliga förbättringar av behandlingen, där bland annat mer diskussion, övningar och färre hemuppgifter föreslogs. Deltagarna förknippade behandlingen med flera positiva förändringar, så som ökad kunskap, förståelse och acceptans för sig själva och diagnosen, samt ökat välmående och positiva beteendeförändringar. Ett behov av vidare stöd för att få till mer omfattande förändringar i sin vardag uttrycktes av vissa.

Studie IV syftade till att undersöka associationerna mellan ADHD och funktionsnedsättning i olika områden i livet, samt om dessa associationer varierade beroende på kön och symptom på samsjuklighet. I studien ingick dels en grupp ungdomar med ADHD samt en grupp ungdomar utan ADHD vilka användes som en referensgrupp i några av analyserna. Resultaten visade högre skattad funktionsnedsättning hos ungdomar med ADHD jämfört med referensgruppen. I ADHD-gruppen rapporterade flickorna högre funktionsnedsättning än pojkarna. Ingen könsskillnad framkom i referensgruppen eller i föräldraskattningarna. Avseende påverkan av ADHD presentation visade resultaten olika beroende på informant. I självskattningarna framkom högst funktionsnedsättning för de som hade ADHD kombinerad presentation, medan föräldraskattningarna indikerade jämförbar funktionsnedsättning oavsett ADHD presentation. Vidare undersöktes associationer med funktionsnedsättning i en justerad modell där flera potentiella associerade prediktorer ingick (symptom på ouppmärksamhet, hyperaktivitet/impulsivitet, emotionella problem, uppförandeproblem, kön och medicin). Resultaten visade att symptom på ouppmärksamhet var starkast relaterade till funktionsnedsättning i skolan. Symptom på emotionella problem och uppförandeproblem var relaterade till funktionsnedsättning i flera livsområden och stor del av variansen av funktionsnedsättning i hemmet förklarades av dessa symptom. Överensstämmelsen mellan ungdomarnas och föräldrarnas skattning av funktionsnedsättning var låg till måttlig.

Slutsatser

Resultaten i Studie I tyder på att SSTG inte var mer effektiv än en kortare psykoedukativ insats för ungdomar med ADHD. Samtidigt upplevde många att de dragit nytta av behandlingen och resultaten gav preliminärt stöd för att behandlingen accepterades väl av deltagarna. Resultaten i Studie II gav även preliminärt stöd för att SSTG kan vara effektiv för vissa subgrupper av ungdomar med ADHD, där de med svårigheter i linje med fokus för behandlingen (emotionell dysreglering och impulsivitet) verkar ha bäst effekt. Fynden behöver dock replikeras innan säkra slutsatser kan dras. I studie III indikerade resultaten att gruppformatet upplevdes som meningsfullt och att behandlingen tycks kunna bidra till ökad förståelse och acceptans för sig själv och sin diagnos. Resultaten i Studie I, II och III tyder på att vidare anpassningar av behandlingen behövs för att möjliggöra mer påtagliga förändring av beteenden och funktion i vardagen. Mer omfattande träning av färdigheter, övning i flera miljöer och involvering av föräldrar som kan stödja och förstärka ungdomens användning av hjälpsamma färdigheter är förslag på möjliga anpassningar. Vidare kan individuella behandlingssessioner vara ett värdefullt komplement som kan möjliggöra mer individanpassat arbete utifrån personliga mål och behov.

Resultaten från Studie IV bekräftade tidigare fynd av att ADHD i tonåren är förknippat med funktionsnedsättning inom en rad områden i livet. Den identifierade könsskillnaden i självskattningarna tyder på att flickor med ADHD kan uppleva större funktionspåverkan än pojkar med diagnosen. Mer forskning behövs för att vidare undersöka potentiella könsskillnader. Avseende påverkan av ADHD presentation antyder resultaten att antal uppfyllda symptom påverkar graden av självupplevd funktionsnedsättning. I kontrast till detta indikerade föräldraskattningarna hög funktionsnedsättningen oavsett ADHD presentation, vilket tyder på att även de som har symptom under kliniska gränsvärden är i behov av stöd. Symptom på ouppmärksamhet verkar bidra starkt till funktionsnedsättning i skolan vilket är i linje med tidigare fynd. Resultaten talar för ett behov av insatser med fokus på att minska och/eller kompensera för dessa symptom i relation till skolarbete. Involvering av både föräldrar och lärare är önskvärt för att implementera hållbara stödinsatser och anpassningar. Symptom av emotionella problem och uppförandeproblem tycks bidra till den dagliga funktionsnedsättningen hos ungdomar med ADHD, vilket betonar vikten av att även fånga upp och behandla samsjuklighet. Resultaten från studie IV visade en diskrepans mellan ungdomens och föräldrarnas rapportering vilket talar för att både förälderns och ungdomens perspektiv bör beaktas vid forskning och kliniskt arbete med patientgruppen.

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