Academic underachievement and mental disorders in adolescence:

Assessment and treatment

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Abstract: Academic underachievement affects many adolescents and is defined as a notable discrepancy between actual and expected achievement, given the student's cognitive ability level. A significant percentage of adolescents suffer from both academic underachievement and mental disorders, putting them at risk for negative psychosocial development. However, there are few treatments available focussing on these adolescents. The present doctoral thesis evaluated the efficacy of the treatment program "SELBST – achievement problems" in a randomised controlled trial (RCT). Furthermore, the added benefit of a specifically designed smartphone app to improve therapy transfer was investigated.

Methods: The psychometric properties of the primary outcome, the Academic Problems Checklist, were analysed. A clinically referred sample of $n = 60$ adolescents aged 11-18 years was randomised into either the experimental group, receiving weekly cognitive behavioural therapy based on the "SELBST – achievement problems" treatment manual including a therapy smartphone app or into the control group, receiving treatment as usual.

Results: The revised version of the Academic Problems Checklist consists of a 17-item, semi-structured clinical interview for adolescents, parents, and teachers. The analysis of the psychometric properties of the APC showed it is a short, reliable, and valid instrument for assessing academic underachievement of adolescents with mental disorders using a multi-informant approach. The RCT showed for both groups clinically relevant improvements on the primary outcome of academic underachievement. For the teacher-rated academic underachievement, a statistical superiority of the treatment group compared to the control group was found during the follow-up phase. The treatment group showed significant improvements regarding their grade point average compared to the control group. Statistical superiority of the treatment group was found for the individual problemlist measuring individual academic underachievement problems with large effects in the adolescent and parent rating. Mental health problems improved in both groups, however, there was no statistical superiority of either group. These effects remained largely stable during the follow-up period. The smartphone app was well accepted by the adolescents, however, it showed no statistically significant additional benefit compared to the standard SELBST-treatment.

Conclusion: In summary, improvements were found for academic underachievement and mental problems. The treatment satisfaction was high, but the smartphone app provided no significant additional benefit. The study's limitations included the small sample size, the substantial dropout rate in the experimental group, and the technical challenges encountered implementing a smartphone app.

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List of abbreviations

AAPC	Adolescent Academic Problems Checklist
ACES	Academic Competence Evaluation Scales
ADHD	Attention-Deficit/Hyperactivity Disorder
APC-AP	Academic Problems Checklist - Adolescent & Parent
APC-T	Academic Problems Checklist - Teacher
CBCL	Child Behavior Checklist
CBT	Cognitive Behavioural Therapy
CD	Conduct Disorder
CG	Control Group
CHP	Challenging Horizon Program
CI	Confidence Interval
CONSORT	Consolidated Standards of Reporting Trials
CPS	Classroom Performance Survey
DCL	Diagnostic Checklist
DISYPS	Diagnostic System for Assessment of Mental Disorders in Children and Adolescents
DSM 5	Diagnostic and Statistical Manual of Mental Disorders 5th ed.
EG	Experimental Group
FBB	Parent / Teacher report form of DISYPS
FCU	Family Check-Up
GPA	Grade Point Average
ICC	Intraclass Correlation Coefficient
ICD	International Statistical Classification of Diseases and Related Health Problems
IPL	Individual Problemlist
IQ	Intelligence Quotient
IRS	Impairment Rating Scale
JFT	JobFit Training
KMO	Kaiser-Meyer-Olkin
M	Mean
MLM	Multilevel Modelling
mMental Health	Mobile Mental Health
N	Number
ODD	Oppositional Defiant Disorder
PCA	Principal Component Analysis
RCT	Randomized Controlled Trial
SBB	Self-report form of DISYPS
SD	Standard Deviation
SDI	Standardised Diagnostic Interview
SE	Standard Error
SELBST	Therapieprogramm zur Behandlung von Jugendlichen mit Selbstwert-, Leistungs- und Beziehungsstörungen
SELF	Therapy program for the treatment of adolescent with problems in self-esteem, achievement, and relationship
SST	Single Session Therapy
STAND	Supporting Teens' Academic Needs Daily
STARD	Standards for Reporting Diagnostic accuracy studies
STP-A	Summer Treatment Program-Adolescent
TAU	Treatment as Usual

TEQ	Treatment Evaluation Questionnaire
TRF	Teacher Report Form
WFIRS	Weiss Functional Rating Impairment Scale
YSR	Youth Self-Report

1. Academic underachievement

1.1 Definition of academic underachievement

Academic underachievement is a persistent threat leading to adolescents problems in life for themselves and society as a whole (Snyder et al., 2019). This frequently studied concept in the educational and psychological field is characterised by lower grades than predicted based on an adolescent's intellectual ability (Bondurant, 2010; Gowan, 1955; Reis & McCoach, 2000; Smith, 2003; Stipek & Miles, 2008). It is a distinct concept and not the direct result of a learning disability (McCall, Beach, & Lau, 2000; Phillipson, 2008; Reis & McCoach, 2000). Academic underachievement differs from low achievement in that it is marked by a discrepancy between what a student should achieve ("ability") and what the student actually achieves, accomplishes, or produces ("achievement") and goes beyond just poor grades. Underachievement is a multidimensional construct that includes many variables, given the various and complex conceptions of the construct (Obergriesser & Stoeger, 2015).

The definition of academic underachievement remains controversial among practitioners, and presently no universally agreed definition exists (Gowan, 1955; Snyder et al., 2019). The issue of how to precisely conceptualise and empirically assess academic underachievement and moreover how to measure it has persisted for decades (Reis & McCoach, 2000; Snyder et al., 2019; Ziegler, Stoeger, & Vialle, 2012). Most definitions centre around a notable discrepancy between actual achievement and expected achievement, given the student's ability level (Reis & McCoach, 2000). For example, this discrepancy is defined by one standard deviation (Frick et al., 1991; Whitmore, 1980). Definitions range from: "Academic underachievement refers to a poor function in the classroom" (p. 211) (Bruce, 2011) to "Underachievers are those individuals who consistently, over a number of years, perform at higher levels on instruments of academic aptitude or intelligence than they do in regular classroom situations." (p. 152) (Krouse & Krouse, 1981). The most widely agreed-upon definition is that of Reis and McCoach (2000), who described underachievement as the discrepancy between expected achievement based on one's intellectual potential/ability and observed academic performance.

The number of definitions for academic underachievement is problematic as different measuring methods could lead to different populations classified as underachieving students, for which different interventions might be suitable (White, Graham, & Blaas, 2018). "The most striking problem one confronts in reviewing the area of (underachieving gifted students) is the number of definitions" (Reis & McCoach, 2000). Much of the early research on academic

underachievement has focused on gifted children and gifted education and their challenges in translating their skills into academic successes (Cheung & Rudowicz, 2003; Snyder et al., 2019). However, recent research reveals similarities between gifted underachievers and underachievers in general, making the available research and intervention more generalisable and valuable for today's more recent work on underachievers in general (McCoach, Kehle, Bray, & Siegle, 2001).

Adolescents suffering from academic underachievement show poor academic functioning in terms of insufficient school performance, run the risk of having to repeat a school year or experience an extraordinary change to a simpler school level (Sibley, Altszuler, Morrow, & Merrill, 2014). Many of those affected show insufficient academic motivation, a low willingness to study, and excessive deficits in organisational-planning strategies (Brady et al., 2012; Snyder et al., 2019). They are often unable to adequately prepare for exams and tests (Sibley et al., 2014; Snyder et al., 2019). Additionally, they show inappropriate participation in the classroom. They are distracted and can exhibit disruptive behaviour targeting teachers and classmates alike (Brady et al., 2012; Sibley et al., 2014). These mostly long-term performance problems are characterised by pronounced knowledge gaps, such as insufficient knowledge of grammar or vocabulary in foreign languages (Barbaresi et al., 2007). Consequently, underachieving adolescents are inclined to have more problems with self-regulation skills such as self-control, organisation and motivation than non- underachieving adolescents (Bondurant, 2010).

Neither ICD 11 (World Health Organization, 2019; International Statistical Classification of Diseases and Related Health Problems 11th ed.) nor DSM 5 (American Psychiatric Association's, 2013; Diagnostic and Statistical Manual of Mental Disorders 5th ed.) list underachievement as a separate learning disorder (American Psychiatric Association, 2013; World Health Organization, 2018). However, DSM includes underachievement as an axis V-category (V62.3) school difficulties: Poor grades or significant performance deficits for a student with adequate intellectual ability. In the ICD system, underachievement is listed in the Z category (Z55.3 Underachievement in school). In the clinical practice, the difference between the intelligence score and school performance is considered, and underachievement is present when the standard score of the intelligence test is significantly (i.e., about 1.5 standard deviations) above the standard score of the school performance test scores (Brunstein & Glaser, 2014; Lauth, Grünke, & Brunstein, 2014).

1.2 Prevalence of academic underachievement

Academic underachievement is widespread among adolescents (Barriga et al., 2002; Brunstein & Glaser, 2014; DuPaul & Jimerson, 2014; Frick et al., 1991; Lauth & Mackowiak, 2006; Snyder et al., 2019). There are no exact epidemiological figures on this, as the definition is so widespread. However, data from the EU shows that approximately 22 % of students in Europe show academic problems, meaning they are failing in reading, math, and science, among whom there is probably a substantial proportion of academic underachievers. This eventually leads to 10.3 % of students leaving school or university early and dropping out without a diploma (Eurostat, 2018). In the United States, 13.7 % of the students (McFarland, Cui, & Stark, 2018) receive special education services (de Brey, Snyder, Zhang, & Dillow, 2021) and a further American study found that the overall high school dropout rate was 5.4 % (Data of the National Centre for Education – Trends in High School Dropout and Completion Rates in the United States: 2019). Another finding from these studies was that boys tend to be more affected than girls (Brunstein & Glaser, 2014). With a rate of 12.2 % in 2018, more young men in America had left education and training early than young women, whose rate was 8.9 % (Bush, 2005; Lindsay & Muijs, 2006; Nomaan, Hanif, & Rehna, 2016; Veas, Gilar, Castejón, & Miñano, 2016). According to Rumberger and Lamb´s studies (2011; 2003), male students in the USA are three times more likely than girls to drop out of school. A comparative analysis of German educational data shows that the percentage of adolescents who had to repeat a grade was 2.3 % and the percentage of adolescents leaving school without any diploma was 6 % (Data 2016/2017, Statistisches Bundesamt) and similarly, for the German population, this percentage was higher for boys than for girls (Hurrelmann & Schultz, 2012; Krüger, Grunert, & Bruning, 2018; Stamm, 2010).

1.3 Adolescence and the course of academic underachievement

Academic underachievement often already begins during childhood and can have a high persistence with increased comorbidity rates. As students progress through their learning journey, more organisational skills and academic independence are expected. Therefore, it is not surprising that academic underachievement appears to escalate throughout secondary school (Eccles & Roeser, 2012; Hill & Tyson, 2009; Langberg et al., 2008; Langberg et al., 2011). Secondary school students need to complete homework independently and often without the support of their teachers or parents (Barriga et al., 2002; Cooper, Lindsay, & Nye, 2000; Snyder et al., 2019). Additionally, unlike primary school children, they have various teachers and classrooms to which they need to accustom themselves. This requires a high level of self-management and independent implementation of various academic tasks across numerous

settings (Langberg et al., 2011). Adolescents with mental problems may be particularly susceptible to fail in this environment due to their deficits in executive functioning and attention (Barry, Lyman, & Klinger, 2002; Daley & Birchwood, 2010; Loe & Feldman, 2007). Presuming that academic underachievement and emotional and behavioural problems often exacerbate throughout adolescence, it is essential to identify these early and find appropriate and effective treatments before years of academic failure (Lane, Gresham, & O'Shaughnessy, 2002).

1.4 Short- and long-term outcomes of academic underachievement

Academic underachievement in adolescence poses a considerable risk for further psychosocial development (Barriga et al., 2002; Esch et al., 2014; Needham, Crosnoe, & Muller, 2004; Rumberger, 2011), and there is a strong negative impact from academic underachievement on the future development of the affected children and adolescents (Smith, 2005). A coherent result has been that underachieving adolescents are inclined to have more problems with self-regulation skills such as self-control, organisation and motivation than non-underachieving adolescents (Bondurant, 2010; McCoach & Siegle, 2003). Short term consequences of underachievement, such as having to repeat a grade or school dropout, can derail the educational trajectory of an adolescent and can negatively influence the entire occupational path and life course (Biederman et al., 2004; Loe & Feldman, 2007; Mirowsky & Ross, 2003; Needham et al., 2004). Additionally, today it is almost impossible for students without high school diplomas to make a living or participate meaningfully in public life (Neild, Balfanz, & Herzog, 2007). Consequently, individuals who experienced academic underachievement as adolescents are more often without a degree, unemployed, or get paid lower wages (Eccles & Roeser, 2012; Esser, Ihle, Schmidt, & Blanz, 2000; Mirowsky & Ross, 2003; Needham et al., 2004).

Besides future academic success and employment, academic underachievement is also associated with increased prevalence rates of mental disorders (Whiteford et al., 2013). Commonly observed problem behaviours of students failing to fulfil academic standards are often associated with externalising disorders such as attention deficit hyperactivity disorder (Daley & Birchwood, 2010), conduct disorder or oppositional defiant disorder (McEvoy & Welker, 2000). It may also influence other mental health areas such as depression, substance abuse, low self-esteem, higher delinquency rates and violent behaviour (Borkowski & Thorpe, 1994; Ek, Sovio, Remes, & Järvelin, 2005).

2. Common mental disorders in adolescence

Mental disorders are widespread among children and adolescents, and especially the period of adolescence marks an increase in mental problems (Kessler et al., 2007). Numerous studies show that 10-20 % of children and adolescents worldwide suffer from mental disorders (Fazel, Hoagwood, Stephan, & Ford, 2014; Kieling et al., 2011; Polanczyk et al., 2015) with a median of 12 % across different studies (Costello, Foley, & Angold, 2006). A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents found a prevalence rate of 13.4 % (anxiety disorder 6.5 %, any depressive disorder 2.6 %, attention-deficit hyperactivity disorder 3.4 % and any disruptive disorder 5.7 %) (Polanczyk et al., 2015). A German study found that 14.5 % of adolescents suffer from at least one mental disorder (Ravens-Sieberer et al., 2008). Therefore mental disorders are a continuous challenge for adolescents and, due to their high persistence, limit them in their further school functioning and development (Ravens-Sieberer et al., 2008). The most common types of mental disorders for children and adolescents have been categorised into two categories: externalising and internalising problems (Achenbach, 1978; van der Ende, Verhulst, & Tiemeier, 2020).

2.1 Externalising disorders

Externalising behaviour problems were defined by Liu (2004) as overt behaviours that have a negative impact on the external environment. According to the classifications in the DSM-5, these behaviours include disruptive, hyperactive, and aggressive behaviours (American Psychiatric Association, 2013). They are characterised by dysfunctional impulse-control behaviour, rule-breaking, inattention and impulsivity (Liu, 2004). Instead of turning their feelings within, as is the case with internal disorders, a person with an externalising disorder directs antisocial, violent conduct outward at others (Liu, 2004). Adolescents who have been suffering from an externalising disorder since childhood have an even higher association with school dropout (Esch et al., 2014; Sagatun, Heyerdahl, Wentzel-Larsen, & Lien, 2014). Given the possible continuity of externalising behaviour problems over the life span, as well as the potential societal costs, externalising behaviour problems, as well as characteristics that may protect adolescents from such difficulties, need additional investigation (White & Renk, 2012).

One of the most common externalising disorders affecting many children and adolescents is ADHD (attention-deficit/hyperactivity disorder). It is a neurodevelopmental disorder that affects between 3 % - 5 % of the general population during childhood and adolescence (Faraone et al., 2021; Willcutt, 2012). A meta-analysis found no significant differences in prevalence between North America and Europe, Asia, Africa, South America,

and Oceania, based on 135 studies and a quarter-million children and adolescents (Polanczyk et al., 2014). The disorder's distinguishing characteristics include inattention, impulsivity, and hyperactivity, all of which impair functioning. ADHD can also result in symptoms such as difficulty managing rage, poor frustration tolerance, and anxiety and depressive symptoms. It is widely agreed upon that it persists throughout adolescence (Molina et al., 2009; Wolraich et al., 2005). Adolescents with ADHD have difficulties in various areas, including academic impairment, interpersonal difficulties, delinquency, possible drug abuse and risky behaviour (Barkley, Fischer, Smallish, & Fletcher, 2006; Molina et al., 2009). Academic impairment is considered a particular negative consequence since it could lead to significant other risk behaviours such as substance use disorders or delinquency (Bryant et al., 2003).

Two other common externalising disorders are oppositional defiant disorder (ODD) and conduct disorder (CD). The DSM-5 defines oppositional defiant disorder as a repeated pattern of developmentally inappropriate, defiant, negative and disobedient behaviour toward authority figures (American Psychiatric Association, 2013). Large community-based studies found prevalence rates of about 3 % (Maughan et al., 2004). Conduct disorder is another debilitating mental condition that often manifests itself in adolescence and is marked by severe antisocial and violent behaviour. It is defined by behaviours that violate the rights of others, such as physical violence towards people or animals, stealing, property destruction, and rule violations (Weisz & Kazdin, 2010). CD affects approximately 3 % of school-aged children and is twice as common in boys as in girls. It often occurs as a comorbidity with ADHD (Fairchild et al., 2019) and is a major reason for referral to mental health care (Weisz & Kazdin, 2010). Relationships with parents, teachers, and classmates are severely harmed in children and adolescents with oppositional defiant disorder (Greene et al., 2002).

Furthermore, delinquent and oppositional defiant adolescents are often distracted from their schoolwork, and they often show little academic motivation and determination (Reis & McCoach, 2000). This can increase the chances of adverse outcomes such as dropping out and failing grades, negatively influencing the aggressive adolescents, making them more resentful and hostile (Chere & Hlalele, 2014). The emergence of externalising behaviour problems in childhood is a risk factor for later juvenile delinquency, violence and adult criminality (White & Renk, 2012). Additionally, children who display externalising behaviour problems may also be suffering on the inside (for example, from anxiety and depression), resulting in externalising and internalising behaviour disorders being highly comorbid (Liu, 2004).

2.2 Internalising disorders

Internalising disorders are inward-looking and indicate a child's psychological and emotional state (Liu, Chen, & Lewis, 2011). The most common internalising disorders are depressive disorders and anxiety disorders. Internalising disorders are often perceived as less worrisome by parents, caregivers and teachers. A reason for this could be that children and adolescents suffering from internalising disorder problems are, rather than outwardly socially unpleasant or disruptive, generally characterised by more silent, inward discomfort, and intropunitive behaviour (Tandon, Cardeli, & Luby, 2009).

Depression is a mental disorder characterised by excessive sadness and a lack of interest in typically pleasurable activities (Liu et al., 2011). According to the most recent version of the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (Association, 2013), depression is classified into two categories: Major Depression and Dysthymia. Depression, being a severe mental health problem, is characterised by a high prevalence. As children enter puberty, their risk of depression rises sharply; 11.7 % of 13 to 18-year-olds fulfilled the criteria for a lifelong major depressive illness or dysthymia (Merikangas et al., 2010; Mojtabai, Olfson, & Han, 2016). In addition to its high morbidity, several researchers have discovered evidence of a negative relationship between depressive symptoms and academic success in school (Fergusson & Woodward, 2002; Försterling & Binser, 2002; Fröjd et al., 2008; Shahar et al., 2006). Adolescents who are having trouble maintaining an average energy level are also likely to struggle in school and are unable to get the grades that are appropriate with their intellect (Schroeder & Gordon, 2002) which has also been found in a study showing that a lower grade point average (GPA) is associated with depression (Fröjd et al., 2008).

Anxiety is described as an unpleasant emotional condition caused by stress or conflict and marked by fear and worries. Anxiety disorders occur when anxiety is persistent and negatively affects school, social interactions, activities or family functioning, making them one of the most common psychiatric disorders for children and adolescents (Costello, Egger, & Angold, 2004; Liu et al., 2011). Anxiety disorders of the DSM-V are classified into different main disorders: separation anxiety disorder, selective mutism, specific phobia, social anxiety disorder, panic disorder, agoraphobia, generalised anxiety disorder and (Association, 2015; Tandon et al., 2009). Anxiety can frequently co-occurs with other psychiatric illnesses, such as depression, ADHD, ODD or conduct disorder (Costello et al., 2004). Childhood and adolescent anxiety problems are frequently linked to the development of adult anxiety disorders, severe depressive disorders and suicidality (Liu et al., 2011; Pine et al., 1998). Anxiety disorders can

have major consequences for a child's academic achievement, the development of behavioural issues, susceptibility to psychopathology, and even the risk of suicide.

As previously indicated, anxiety and depression may lead to academic underachievement; however, this link can also affect the other way around. Academic problems are the most common cause of chronic and episodic stress for adolescents, and as such academic stress has a significant association with mental disorders such as depression, anxiety, and suicidal thoughts (Anderman, 2002; Jayanthi, Thirunavukarasu, & Rajkumar, 2015). A study found that adolescents who experienced academic stress had a 2.4 times greater risk of depression than adolescents who did not experience academic stress (Jayanthi et al., 2015). Interestingly, a study found that internalising disorders did not appear to influence early school dropout directly but instead influenced the adolescent after school dropout (Esch et al., 2014). Indicating that the adolescents suffering from depression suffer more in silence during their school career, and once they leave school and must face the challenges such as finding a job and moving out, their mental health deteriorates.

2.3 Negative academic outcomes of mental disorders

Adolescents with mental disorders perform less well on standardised achievement tests than their classmates (Barkley et al., 1991; Brunstein & Glaser, 2014; Snyder et al., 2019). They complete fewer assignments and receive poorer course grades (Kent et al., 2011). This causes these adolescents to have a higher chance to fail their courses (Barkley et al., 1991), eventually leading to elevated rates of high school dropouts (Barbaresi et al., 2007; Barkley, Fischer, Smallish, & Fletcher, 2002). One study on academic achievement in high schools found that 10 % of early high school dropout is attributable to mental disorders (Breslau et al., 2009). Students with mental disorders have not only more difficulties in academic functioning but also more problems in making school transitions and fitting in with their peers (DeSocio & Hootman, 2004). Compared to peers without mental disorders, they are more likely to arrive late to class (Kent et al., 2011), be absent from school (Barbaresi et al., 2007) and face disciplinary actions such as suspension (Barkley et al., 2002; Wolraich et al., 2005).

2.4 Combination of academic underachievement and mental disorders

Academic underachievement and mental disorders have reciprocal influences on one another (Breslau et al., 2009; Brière, Janosz, Fallu, & Morizot, 2015; Fröjd et al., 2008). Both are associated with a range of additional adverse outcomes including, but not limited to, excessive risk-taking behaviour and increased likelihood of having to enter the criminal justice system (Barriga et al., 2002; Esch et al., 2014; Fazel et al., 2014; Fletcher, 2008; McLeod &

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Kaiser, 2004; McLeod, Uemura, & Rohrman, 2012; Needham et al., 2004; Riglin, Frederickson, Shelton, & Rice, 2013; Rumberger, 2011). Adolescents who face mental disorders risk finding themselves in a downward spiral brought about by the reciprocal association of mental disorders and negative academic experiences that may climax in school dropout (Esch et al., 2014; Najaka, Gottfredson, & Wilson, 2001; Nelson, Benner, Lane, & Smith, 2004). This is particularly apparent in the relationship between academic underachievement and externalising behaviour problems (Hinshaw, 1992; Lane et al., 2002; Rutter et al., 1975), such as ADHD (Loe & Feldman, 2007; Sibley et al., 2014), antisocial behaviour or oppositional defiant disorder (Barriga et al., 2002; Hoffmann, 2018; Pardini, 2008). Internalising behaviour problems, such as anxiety disorder and depressive disorder, have also been found to correlate with academic achievement problems (Barriga et al., 2002; Birmaher et al., 1996; Clayborne, Varin, & Colman, 2019; Esch et al., 2014; Fröjd et al., 2008; Horowitz & Garber, 2006; Puig-Antich et al., 1993; Quiroga, Janosz, Lyons, & Morin, 2012). However, other studies have not found this relationship and hypothesised that a mediation could partly explain this with attention problems (Barriga et al., 2002).

In a large study carried out with Dutch adolescents ($n = 10.866$), they discovered that secondary school underachievement was linked to adolescents mental health concerns, particularly with symptoms of hyperactivity (Tempelaar et al., 2017). However, the authors note that this relationship could be bi-directional, meaning that educational difficulties may arise because of psychopathology or that the school problems negatively influence adolescents' mental health (Rothon et al., 2009; Tempelaar et al., 2017). The authors conclude that a decline in academic achievement might indicate general psychosocial problems, particularly in students who began their schooling on a high education track and had to "downgrade" in their school careers. This kind of underachievement (downgrading in a lower school form) has not yet been evaluated as much as school dropout; however, it gives informative results as the adolescents receive less education in the long term, which may have long-term repercussions for those impacted (Tempelaar et al., 2017). This negative outcome emphasised the need for early identification during childhood and adolescence to prevent the development of severe mental disorders or academic underachievement, both of which are obstructing adult well-being (Breslau et al., 2009; Rothon et al., 2009).

3. Assessment of academic underachievement

Considering the high prevalence and the long-term consequences of academic underachievement and mental disorders in adolescence, researchers have called for a clinically relevant understanding of the individual risk factors for academic underachievement. Snyder et al. (2019) summarised these findings in a recent meta-analysis on interventions for academically underachieving students. They concluded that a differential diagnosis of the different areas of the students' life is recommended; only then will it be possible for teachers, clinicians and researchers to develop effective treatment options (Snyder et al., 2019).

In assessing academic underachievement in combination with mental disorders, it is crucial to identify the problems to identify the most suitable treatment options. As adolescents with academic problems often struggle with motivation and perseverance, there is little room for error and for trying out treatments. "In a clinical context, assessment is not an end of its own, but a means toward helping the client." (Youngstrom et al., 2017, p. 2). Even though a measure may be promising clinically, often little research focuses on applying the measure in a clinical context such as diagnosis or outcome measurement (Youngstrom & Van Meter, 2016). The assessment of a given problem should ideally lead to a therapy plan or enable the therapist to choose better interventions for the affected. It is vital to focus on psychometrically sound measures and examine whether the assessment tools and measures enable the therapist to do this and provide clear implications for the following clinical steps (Youngstrom et al., 2017). Clinical scales and interviews are potentially a suitable method for this.

3.1 Clinical interviews

Clinical interviews are crucial for the diagnostic process as they quantify the rating of a professional. Standardised diagnostic interviews (SDIs) are frequently regarded as the gold standard for identifying mental disorders (Nordgaard, Sass, & Parnas, 2013; Rettew et al., 2009). SDIs were designed to help operationalise diagnostic criteria and improve diagnoses' accuracy, reliability, and validity. As a result of their utilisation, diagnostic reliability and accuracy increases (Frick, Barry, & Kamphaus, 2010; Leffler, Riebel, & Hughes, 2015; Thöne et al., 2020). The clinical interview approach varies from questionnaires in that the interviewer can investigate the adolescents and parents comments to capture the intended meaning correctly (Hodges, 1990). They have numerous advantages because they allow for the inclusion of different aspects of the adolescent´s behaviour, quantifying observations rather than relying only on descriptive information and anecdotal reports, and the clinical impression is included in the measurement (McConaughy, 2005).

3.2 Multi-informant approach

Since symptoms can fluctuate depending on the situation, clinicians frequently encounter considerable discrepancies between informants (Krause, Bear, Edbrooke-Childs, & Wolpert, 2019). These informant discrepancies in mental assessments are strongly manifested worldwide, as demonstrated by a meta-analysis consisting of over 300 studies measuring these discrepancies in over 30 countries (De Los Reyes et al., 2019). The various sources of bias (e.g., teacher report versus self-report) and the different contexts used for the observations contain a wealth of detail invaluable for a thorough assessment. Thus, if informants disagree whether a patient benefitted from therapy, it could be because the treatment differed across the different contexts, such as a therapy that improves a patients functions at school to a greater extent than at home (De Los Reyes & Kazdin, 2008). As a result, multi-informant approaches incorporating the viewpoints of parents, teachers and adolescents are beneficial in gaining a comprehensive and valid understanding of the variables associated with the adolescent's academic underachievement in numerous settings (Brady et al., 2012; De Los Reyes et al., 2021; Youngstrom, Prinstein, Mash, & Barkley, 2020). This method can potentially be more time-consuming, and it is often challenging to engage adolescents, parents and teachers in a collaborative environment. It is nonetheless very relevant to maximise the informative value since some problems (e.g. no raising hand in class) could be present in one setting only (Brady et al., 2012; Evans, Allen, Moore, & Strauss, 2005)

It is clear that the assessment of academic underachievement must involve information from the teachers (Loeber, Green, & Lahey, 1990). However, teachers can only provide information of academic functioning inside the classroom, and as secondary school demands more independence, students have to study at home regularly and complete homework there. Additionally, there are numerous subject teachers in secondary school, making it even more challenging to represent the students' academic achievement behaviour comprehensively. Even though obtaining information from secondary school teachers is vital, given these difficulties, it is recommended to include different informants in the diagnostic process besides the teacher (Brady et al., 2012; Sibley et al., 2014; Wolraich et al., 2005). Even though parents might be inappropriate informants of a student's classroom behaviour, they can evaluate the learning behaviour that takes place at home (Sibley et al., 2014).

The agreement between parents and teachers when reporting externalising behaviour problems in a structured interview process shows that parents often give a higher estimate of behaviour problems than teachers (Loeber, 1991; Reynolds, 2010). Multiple studies have

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demonstrated that agreement between parent and teacher informants is more robust for younger children than for adolescents, a reason for this being that the behaviour of younger children is more observable and cross situationally consistent (Achenbach, McConaughy, & Howell, 1987; De Los Reyes & Kazdin, 2005). Given the difficulties in obtaining reliable parent and teacher reports, it could be hypothesised that adolescents themselves would be desirable informants. However, at the same time, students rarely provide credible and reliable self-reports about their problematic behaviours (Smith et al., 2000). They tend to neglect their academic problems, and there is a high likelihood for underrepresentation, further weakening their reliability as informants (Kramer et al., 2004; Wolraich et al., 2005). Previous studies have suggested that parents are better informants than adolescents on disruptive behaviour problems and that adolescents might be better at determining internalising problems (Kamphaus & Frick, 2005). Regarding the adolescents and parent agreement, a frequent finding is that especially boys report less conduct problems than their parents (Loeber et al., 1992). As a result, it is vital to include all individuals in the assessment and therefore using a multi-informant approach is most suitable in the assessment of academic underachievement in adolescence.

3.3 Diagnostic assessment tools

The valid assessment of academic underachievement in adolescence remains difficult. The commonly used measures of academic success, such as school grades, fail to recognise the underlying causes that have led to the poor grades and are therefore not practical to identify suitable interventions (Brady et al., 2012). Other instruments used in the assessment are often targeted towards elementary school children (DuPaul & Stoner, 2014; Foley & Epstein, 1993; Meyer & Kelley, 2007; Reynolds, 2010). However, the multiple settings across an adolescents' day and the increasing complexity of the academic demands make the assessment more challenging than for elementary students (Brady et al., 2012; Kent et al., 2011; Wolraich et al., 2005).

One available scale focusing on adolescents is the Classroom Performance Survey (CPS), which measures adolescents' academic achievement problems (Brady et al., 2012). It is an 18-item teacher rating scale summarised into two broadband scales (academic competence and interpersonal competence). The items can be rated on a 5 point Likert scale ranging from 1 (always) to 5 (never), with higher scores indicating poorer classroom performance. Evaluation of the psychometric properties showed good reliability ($\alpha = .91$ and $\alpha = .98$ for the two factors, respectively) and a valid factor structure. It has only been evaluated with a sample of students without mental disorders and is only completed by the teacher (Brady et al., 2012).

The Academic Competence Evaluation Scales (ACES) is likewise only completed by the teacher (DiPerna & Elliott, 1999). It assesses academic skills, attitudes, and behaviours contributing to success in school (interpersonal skills, engagement, motivation). Despite demonstrating good psychometric properties (DiPerna & Elliott, 2001), with 73-items, this is an extensive questionnaire; therefore, the length of this measure prohibits it for certain research and practice applications, possibly limiting the use in the everyday school routine. Both described measures are solely assessed by the teacher and therefore only focuses on the classroom area. Another shortcoming of the available measure is the lack of appropriate standardisation for adolescents with mental disorders (Brady et al., 2012; Sibley et al., 2014). To increase generalizability, it would be beneficial to evaluate the measures in a sample of adolescents with different mental disorders.

The Impairment Rating Scale (IRS) is a 7-item (parent version) or 5-item (teacher version) scale measuring the impairment level on different domains, one of them being academic impairment (Fabiano et al., 2006). It is a widely used measure that has been evaluated with secondary students and has shown to be reliable and valid across different settings and informants, including adolescents with mental disorders (Evans et al., 2013; Fabiano et al., 2006). It has been translated into other languages, demonstrating good psychometric properties (german version: $\alpha > 0.7$) (Dose, Hautmann, & Döpfner, 2019). However, while the IRS may identify the presence of underachievement, it is limited in that it is relatively brief and does not provide substantial information to identify necessary interventions. In addition, no self-rating version has been developed; therefore, the adolescents' input is not included.

The Adolescent Academic Problems Checklist (AAPC) by Sibley et al. (2014) could be a suitable and promising measure for adolescents suffering from both academic underachievement and mental disorders. It is a behavioural, clinical rating scale measuring academic problem behaviour in adolescents and uses a multi-informant approach. The 24-item scale measures secondary school-specific problems in academic underachievement and has been validated in a sample of adolescents with ADHD ($n = 324$). They found a two-factor structure (academic skills, e.g. careless mistakes on work) and (disruptive behaviour, e.g. arrives late to class), with strong internal reliability ($\alpha = 0.92$) and good concurrent validity (GPA: $r = 0.3$; Inattention symptoms teacher: $r = 0.8$) for the parents and teacher scale. However, the data of the self-report ratings did not provide meaningful or interpretable data, and thus the authors suggested interpreting adolescents reports of academic functioning with caution (Sibley et al., 2014). The use of a clinical rating scale is another strength of this measure.

While promising efforts have been made to improve the assessment of academic underachievement, it remains difficult, and the AAPC is the only clinical scale available to date.

Therefore, Walter and Döpfner (2009) developed a new clinical rating scale, the Academic Problems Checklist (APC), measuring academic underachievement for adolescents. The checklist is part of a german treatment program for academic achievement problems in adolescents with mental disorders (Walter & Döpfner, 2009). It is a standardised, semi-structured clinical interview targeting adolescents with both academic underachievement and various mental disorders using a multi-informant and time-economical approach. It consists of a collective clinical rating based on a semi-structured adolescent and parent interview (APC-AP) and a clinical rating based on a teacher interview (APC-T). A collective adolescent and parent interview was chosen to account for dissimilating tendencies of the adolescent and to compensate for the areas in which the parent is not present to improve validity (Walter and Döpfner, 2009). The items were developed by a clinical expert panel consisting of four members who screened existing rating lists and standardised questionnaires targeting youth with academic underachievement. While the interview is commonly used in Germany, its psychometric properties have not been investigated. Therefore, part of the current study is the evaluation of the APC and the clinical relevance for the field.

4. Treatment of academic underachievement and mental disorders

The aim of research on interventions with academically underachieving students is to find strategies and methods that can assist in reversing the phenomenon so that students are supported in achieving accordingly with their capacity (Snyder et al., 2019). Given the frequency and developmental relevance of academic underachievement, it is not surprising that a large number of guides, self-help manuals and support and training programmes have been developed. Most of these programmes come from the field of education and educational psychology (Lauth et al., 2014; Paunesku et al., 2015; Snyder et al., 2019; Walter & Döpfner, 2007). Some are aimed at teachers to improve classroom conditions or as guides for parents, but the majority directly address students of all ages and grade levels.

In the beginning, research on academic underachievement focused on the characteristics of the student, e.g., self-regulation and self-image (Gowan, 1955). Boekaerts and Corno (2005) found that students with higher self-regulation skills were better at participating in school assignments and had higher GPAs. Numerous interventions have focused on targeting the beliefs and behaviours of underachieving students. These counselling interventions, using cognitive behavioural, psychodynamic and humanistic approaches, were aimed to improve the self-concept and goal-setting behaviours (Wilson, 1986). Studies found mixed results regarding their effectiveness (Snyder et al., 2019). Self-concept is another commonly used term in the studies of underachievement: It is an individual's general understanding of themselves in achievement situations and is relatively stable over time (Obergriesser & Stoeger, 2015; Shavelson & Bolus, 1982). Closely linked to the self-concept is self-efficacy, which signifies an individual's belief in his or her ability to perform academic tasks successfully and achieve specific goals. Self-efficacy is more task-specific and malleable, therefore modifiable through intervention (Bandura, 1977; Bong & Skaalvik, 2003).

Furthermore, many researchers identified a lack of motivation as a potential cause for underachievement (Rea, 2000) and therefore focused on this as a theoretical basis for interventions. Negative emotions of fear, frustration, and boredom correlate negatively with intrinsic motivation, effort, learning behaviour, and success, while pleasure correlates positively with these aspects (Ainley & Hidi, 2014). Students emotions impact their self-regulated learning and motivation, which in turn influences their academic achievement (Mega, Ronconi, & De Beni, 2014). A study by Obergriesser and Stoeger (2015), which investigated a self-regulation intervention for German primary school children, found positive effects for improving the learning behaviours of the affected children. However, this effect was not found

regarding self-efficacy or anxiety (Obergriesser & Stoeger, 2015). Even though they report using the appropriate learning techniques, many school students are not yet able to optimally self-regulate their learning (Obergriesser & Stoeger, 2015).

Instead of changing the individual student's behaviour or self-concept, researchers have also investigated the effectiveness of altering the context of the adolescents, such as the curriculum, course placement and teacher behaviour (McCoach & Siegle, 2003; Ritchotte, Matthews, & Flowers, 2014). These researchers hypothesise that by changing the context of the students, their attitudes can be altered as well. These context-focused interventions have similarly demonstrated mixed results but also found that the earlier the context change is applied, the more successful the intervention is (Karnes et al., 1961; Reis & McCoach, 2000). Therefore, many of these interventions have only focused on younger students (Sibley et al., 2014; Snyder et al., 2019).

4.1 Differences between primary and secondary school treatments

Research on academic underachievement interventions has, for the most part, focused on the primary school level (Eccles & Roeser, 2012). During primary school, the teachers often deliver the treatment for the children. However, in middle school and high school, this is often impossible as teachers take care of many more children a day and are unable to individually look after every child in such a time-intensive manner that the adolescent would need (Eccles & Roeser, 2012; Langberg et al., 2012). It was found that treatment effectiveness decreases with age, resulting in a more pessimistic outlook for treatments for adolescents (Dowdall & Colangelo, 1982; Ritchotte, Rubenstein, & Murry, 2015; Snyder et al., 2019). Results from studies that evaluated interventions conducted by secondary school staff imply that standard behavioural interventions are difficult to deliver in secondary schools (Evans, Serpell, Schultz, & Pastor, 2007), and available behaviour therapy interventions for children, such as school-based interventions, do not work well in a secondary school setting (Sibley et al., 2013).

A reason for this might be that the student's self-concept has already manifested itself throughout their school career and is challenging to readjust in a later stage. Another explanation could be that treatment and interventions have focused too much on primary school children and have not been adapted appropriately to adolescents' subgroup, as adolescents strive for greater autonomy and more independence (Yeager, Fong, Lee, & Espelage, 2015). As a result, it is essential to pay careful attention to the interventions implemented for older students (Snyder et al., 2019).

The findings from the meta-analysis of Snyder and colleagues state a need for research focusing on the (post) secondary school level (2019). Furthermore, they discovered no significant differences in the overall treatment effects between gifted and unspecified samples of underachievers, implying that interventions for underachieving students tend to work similarly well at different ability levels (Snyder et al., 2019). Snyders et al. predicted that the effectiveness of programs for academically underachieving students would improve over time, and while this result was observed for achievement outcomes, it was not found for psychosocial outcomes. They found no evidence that non-achievement outcomes have changed in any way since the 1960s (Snyder et al., 2019). Therefore, a problem- and resource-oriented approach, individually tailored to the patient and involving the relevant caregivers, seems to be more promising (Borg-Laufs, 2009; Döpfner & Walter, 2002).

4.2 Self-management approach

Against this backdrop, the self-management approach offers a promising heuristic treatment model for working with adolescents and addresses the low motivation for treatment. The self-management approach includes behavioural, solution-oriented, positive, small-step, flexible and future-oriented thinking (Kanfer, Reinecker, & Schmelzer, 2006). Self-management implementations are also available for learning difficulties, for stress management for adolescents with school problems, for improving cooperation in class with performance problems and for reducing disruptive behaviours in class (Kraag et al., 2006; O'Connell, Boat, & Warner, 2009; Zenner, Herrnleben-Kurz, & Walach, 2014). Self-management interventions are frequently students administered; therefore, less time of the teachers is required in the administration. Self-management strategies help pupils change and develop appropriate (learning) behaviour (Martella, Nelson, Morgan, & Marchand-Martella, 2013). An advantage is that students can choose their own pace, allowing groups of heterogeneous students to study at different rates (Mooney et al., 2005).

The five most prevalent self-management interventions are self-monitoring, self-evaluation, self-instruction, goal setting, and strategy instruction (Mooney et al., 2005; Zimmerman, 1990). Self-monitoring is a multi-step procedure that involves observing and recording one's actions (Mace, Belfiore, & Hutchinson, 2001). Self-evaluation is a process in which students evaluate their performance to a previously defined criterion set by themselves or a teacher (e.g., improvement of performance over time) and are rewarded for meeting the criterion (Mace et al., 2001; Mooney et al., 2005). Self-instruction is a term that refers to strategies using self-statements to guide behaviour (Graham, Harris, & Reid, 1992). Goal

setting is a process in which a student chooses behavioural objectives, for example, completing a term paper, to help students structure their efforts, offers them a progress tool, and motivates them (Schunk & Zimmerman, 2013). Strategy instruction teaches students a set of steps that they need to follow independently to solve a problem or reach a specific goal (Coyne, Kame'enui, & Simmons, 2001; Mooney et al., 2005).

Students suffering from mental disorders and academic underachievement often have difficulties managing their behaviours in school-based situations. Teaching them self-management skills is beneficial and improves their academic outcomes, with substantially and educationally meaningful magnitudes (effect sizes up to d =1.8) (Mooney et al., 2005). Therefore, self-management appears to be a promising method to improve academic underachievement in adolescence.

4.3 Treatment and therapy programs

The high prevalence of academic underachievement in adolescence and the long-term threat to their further development requires appropriate intervention measures. A major shortcoming of existing German and international approaches to the treatment of academic underachievement in adolescents is the lack of essential aspects, such as developing a motivation to change, the involvement of parents and teachers, or the transfer to everyday school life are mostly insufficiently addressed. Most of the empirically available research focuses on the treatment of academic underachievement in combination with ADHD (Pelham Jr & Fabiano, 2008). The two evidence-based therapies for children and adolescents with ADHD are behavioural therapy and stimulant medication (Fabiano et al., 2015). Stimulant therapy is recommended as a first-line treatment for adolescents with ADHD and has been shown to increase academic functioning (Evans, Langberg, Egan, & Molitor, 2014). However, many adolescents ultimately refuse to take stimulant drugs, and there is almost no evidence that stimulant drugs improve academic outcomes in the long term (Molina et al., 2009). Additionally, the application is limited due to problems with side effects and poor adherence (Lerner & Wigal, 2008).

The other evidence-based therapy for ADHD is behaviour modification. Due to the developmental and environmental changes that occur during adolescence, therapies that are beneficial for children with ADHD may not be appropriate for teenagers. Not surprisingly, parent training programs for children have shown little clinical improvement for adolescents with ADHD (Young & Myanthi Amarasinghe, 2010). For the age group of adolescents with ADHD, only a few studies of behavioural therapy have been conducted.

The few evaluated programs are often intended for students with severe academic impairment problems. One of these programs is the Summer Treatment Program-Adolescent (STP-A), an 8-week intensive behavioural day treatment program that is effective regarding improvement in academics and classroom behaviour in adolescents with ADHD (Sibley et al., 2011). After-school behaviour therapy programs, such as the Challenging Horizon's Curriculum, have also improved parent and teacher ratings of academic functioning (Evans, Schultz, DeMars, & Davis, 2011). Nonetheless, the intensity of these therapies (10 to 40 hours a week of direct treatment) required substantial financial and extensive workforce resources. As a result, delivering such intensive therapies to all students with ADHD is not cost-effective (Sibley et al., 2016).

Three studies focused on parent training to better address the requirements of adolescents and their parents (Fabiano et al., 2016; Sibley et al., 2016; Sibley et al., 2013). The mechanisms during these trainings are primarily behavioural. Like traditional parent training, the three programs include a therapist meeting with the parents. However, unlike a typical parent training, the adolescent is included during these meetings and the rules and behavioural constraints are negotiated and implemented together and then recorded in a contract between the parents and the adolescent. Techniques for motivational interviewing and communication training are incorporated into the programmes (Evans, Owens, Wymbs, & Ray, 2018). Sibley and colleagues developed and evaluated the Supporting Teens' Academic Needs Daily (STAND), a ten-session parent-adolescent joint behavioural intervention for adolescents with ADHD, delivered either in schools, clinics, or community settings (Sibley et al., 2013). It involves adapting different skills such as homework, organisation, time management, note-taking, and test-taking. Studies about the effectiveness of STAND indicate that beginner therapists with high therapy fidelity can already implement it and that it is popular with families. The objective of STAND is to alleviate the secondary school teachers of the extra burden of delivering school-based interventions and rather educate the parents to implement these interventions. Participants of the STAND group outperformed the treatment as usual group (TAU) in terms of parent-rated observed academic and symptom indices. However, regarding the teacher ratings, no such effect was found. Students of the STAND group had a small but significant gain on their GPA ($d = .25$) compared to the TAU group (Sibley et al., 2013). The results of the larger randomised trial similarly revealed significant improvements of moderate to large size regarding parent-rated academic problems, ADHD symptoms, and self-observed use of a planner by the adolescent. Significant improvements were not observed regarding GPA, teacher reports of ADHD symptoms or academic performance (Sibley et al., 2016).

Another family-focused intervention is the Family Check-Up (FCU) developed for middle school-aged children with behaviour and school problems (Dishion & Kavanagh, 2003). It is based on the theory that parents play a crucial role for young students in promoting academic success by active parent-school involvement, such as monitoring the homework situation (Stormshak, Fosco, & Dishion, 2010). As a result, a focus is laid on a supportive rather than critical or intrusive involvement, which has shown to be effective (Rogers, Wiener, Marton, & Tannock, 2009). FCU has been proven to successfully minimise the growth of problem behaviour, improve parental skills, reduce family conflict, reduce substance abuse in middle school youth and improve GPA compared to controls (Dishion & Kavanagh, 2003).

Evans and colleagues (2014) conducted a study about a training intervention called Challenging Horizon Program (CHP) with high schoolers. They hypothesised that up to 50 training sessions might be required to establish a degree of repetition and practice of the targeted skill to improve that adolescents impairment profiles (Evans, Schultz, & DeMars, 2014). The median number of sessions in the study of the school-based CHP was 36 (maximum was 59), and adolescents practised all the skills at every session (sessions lasted 2 hr 15 min). The duration of the study was five months. The impairment in the classroom decreased over time for the treatment group ($d = -0.37$) measured with the Classroom Performance Survey (CPS). However, the rating on the IRS of the parent and teacher revealed no statistically significant treatment benefit. Teachers reported being mostly satisfied with the CHP program, though the high burden with the paperwork and questionnaire was a substantial limitation (Evans et al., 2011).

Castro (2008) developed and implemented a high school intervention program for underachieving gifted Latinos with 11-sessions over 13 weeks. A mixed-methods approach was used, and the data from students, teachers and mentors was analysed regarding the grades in three subject areas for work habits, including cooperation, discipline and attendance. The findings revealed no significant improvement in student academic grades or their related work habits and collaboration grades, assessed by the teachers. However, the students themselves did report significant improvements regarding their academic behaviour, such as improvement in self-regulation and motivation (Castro, 2008).

A study conducted with American underachieving high school students ($n = 101$) investigated the effects of a structured group counselling program (Dobbins, 1992). The students were randomly assigned to a wait control group and a treatment group that received a weekly cognitive behavioural therapy (CBT) group counselling training for nine weeks.

Outcome measures were grade point average (GPA), perceived levels of aspiration and anxiety, and academic interest. Significant differences between the treatment and control group were found on all dependent variables, and during the follow-up and specifically, anxiety scores were significantly lower (Dobbins, 1992). Another study investigating a treatment program for female American high school students (*n* = 22) evaluated a treatment program with eight sessions focusing on self-efficacy enhancement, goal setting, self-monitoring, and attribution retraining. The control group received a career developmental program. The study results suggest that the treatment group improved more on content knowledge. No differences were found between the other outcome measures (Way, 1994).

Such programmes do not address specific disorders but rather teach general social and emotional skills to help adolescents cope with their problems in everyday life. Likewise, Petermann and Petermann (2010) designed a training programme that focuses primarily on work and social behaviour in the age group of 13–20-year-old adolescents. It focuses on behaviour such as aggression and social insecurity and practises work-related skills however specific interventions against academic underachievement are not included. The training is divided into groups and individual sessions. Parents or other caregivers are not integrated into the training (Petermann & Petermann, 2010). The school-based version of this training program JFT (JobFit Training) was evaluated in a within-group study. The training is carried out in the classroom and comprises ten modules, each of which takes two lessons. While the training with adolescents pursues explicitly the reduction of problem behaviour, the JFT aims to teach skills and strengthen resources. Significant improvements with medium to large effect sizes were found in some of the scales assigned to social behaviour. The JobFit training thus represents an effective, school-based preventive measure for improving social skills (Schultheiß, Petermann, & Petermann, 2015).

Although there are numerous empirically supported treatment programs, the limitations are various. As previously mentioned, many have been conducted on primary school children. Additionally, numerous school-based interventions are ineffective when they are not implemented systematically and consistently, with a high level of treatment fidelity. This is often difficult, given the limited resources of teachers in most schools (Hallfors et al., 2006). Another limitation is the lack of an all-inclusive treatment, involving not only the teachers or adolescents or only the parents but all relevant people in one treatment program. Another concern is the sustainability of the available treatment programs as few studies have conducted

follow up studies or focused on the transfer of the learned skills into long-term behavioural changes.

4.4 Therapeutic homework in adolescence

Therapeutic homework is an essential and influential component of the success of CBT (Kazantzis, Whittington, & Dattilio, 2010). In psychotherapy, "homework" is defined as between-session tasks or activities that deliver therapeutic benefit for the patient. It involves recording the problem behaviour in daily life, transferring therapy contents into the everyday life of the patient and training and strengthening newly learned strategies between the individual sessions (Kazantzis et al., 2010). It is an indispensable and influential component of cognitive behavioural therapy success. Therapy homework is routinely assigned to consolidate skills acquisition and encourage the use of skills in the real world (Watts et al., 2013). Clinical experience and research show that adolescents often have significant problems implementing therapeutic homework, whether due to a lack of motivation or organisational problems. Adolescents often struggle or refuse to complete their therapy homework. This can occur for several reasons: (1) not remembering to do it, (2) not wanting to complete written tasks or (3) not knowing how to complete the homework (Silk et al., 2020). This could lead to adolescents benefitting less from therapy because they do not implement and practise the skills and tasks in daily routines. Homework compliance in CBT remains a challenge in real-life practice. This often reduces the effectiveness of interventions. The popularity of smartphones and apps could potentially be an opportunity to improve therapeutic homework compliance.

5. The treatment program SELBST

CBT for adolescents proposes an additional challenge. This is not least due to the frequent comorbidity of disorders in adolescence, including often subclinical manifestations and low motivation for treatment (Schürmann, Walter, Rademacher, & Döpfner, 2018). Adolescents can have a multitude of symptoms that often cannot be depicted in the current diagnostic classification systems. Frequently there are symptoms from the external disorder group such as residual symptoms of ADHD, combined with aggressive-dissocial problem behaviour. At times also symptoms from the internal spectrum such as low self-esteem, reduced drive and anhedonia are part of the symptom cluster (Groen & Petermann, 2011). Many adolescents thus show mixed pictures of subclinical manifestations, which altogether show a high level of functional impairment with an associated considerable danger to their further development (Walter, 2004). According to clinical experience, disorder-specific manuals for adolescents often do not achieve the desired treatment effects as they do not consider the variety and diversity of symptoms.

The German therapy program *Basics of self-management therapy with adolescents SELF-Therapy programme for the treatment of adolescents with problems in self-esteem, achievement, and relationship, Volume 1 (SELBST- Grundlagen der Selbstmanagementtherapie bei Jugendlichen SELBST- Ein Therapieprogramm zur Behandlung von Jugendlichen mit Selbstwert-, Leistungs- und Beziehungsstörungen Band 1)* is a multimodal, non -disorder-specific, problem- and resource-oriented treatment programme (Walter, Rademacher, Schürmann, & Döpfner, 2007b). SELBST does not refer to a specific disorder according to ICD-10 or DSM-IV but instead considers that in adolescence, a mixture of problems from different disorder areas can often be observed, which are difficult to represent by the diagnostic categories of the classification systems. It was developed based on the self-management approach by Kanfer and colleagues (Kanfer et al., 2006). During the period of adolescence, the desire for autonomy increases and the self-management approach considers this by teaching them effective self-control, self-regulation, and self-control strategies. The SELBST therapy programme is intended for adolescents from 13 to 18 years; however, the concept is also modifiable to other age groups. The treatment takes place in an individual setting with separate sessions with parents or family sessions. Teachers or other relevant caregivers can also be included. The treatment frequency usually is one hour per week.

It consists of seven treatment phases: a diagnostic phase (phases 1 to 3) and an intervention phase (phases 4 to 7). The adolescent defines therapy goals in consultation with the therapist. In addition, parental and other caregivers' suggestions are also integrated into the goal-setting

phase. The explicit focus of the SELBST program is the transfer to everyday life and the stabilisation of the achieved behaviour changes. The programme is modular and includes various modules tailored to the different problem areas. There are modules for adolescents, which can be tailored to their individual needs, and there are also modules for the parents. In line with the self-management approach, the therapist's role is that of a counsellor, a coach, an advocate who encourages the adolescent to initiate behavioural change (Rademacher, Walter, & Döpfner, 2002; Walter, 2004; Walter et al., 2007b).

5.1 SELBST achievement problems

Walter & Döpfner (2009) developed the multimodal, cognitive-behavioural treatment program "SELBST- Volume 2. Achievement problems in adolescence" (*Leistungsprobleme im Jugendalter: SELBST - Therapieprogramm für Jugendliche mit Selbstwert-, Leistungs- und Beziehungsstörungen. Band 2 / Achievement problems in adolescence: SELBST - Therapy programme for adolescents with self-esteem, achievement, and relationship problems. Volume 2*). The treatment program targets one of the four intervention areas of the treatment manual SELBST, academic problems. The manual is modular, consists of different modules consisting of adolescent and parent-centred interventions, and focuses primarily on adolescent academic achievement problems, which cannot be attributed exclusively to giftedness deficits. One crucial part of this treatment program focuses on the transfer into daily life. This is achieved by a dynamic exchange with the teacher and a focus on therapy homework. The regular involvement of a teacher is crucial and can usually be realised through phone calls about every three to four weeks. It is a transdiagnostic treatment program and is adjustable to various mental disorders (Walter & Döpfner, 2009).

The treatment is divided into a diagnostic phase (phase 1-3) and an intervention phase (phase 4-7). Before one can start implementing the interventions of academic underachievement, it must first be ensured that the adolescent is taught at an appropriate school level and is not in a situation of excessive or insufficient demands. Whether the adolescent has a partial performance deficit that makes appropriate learning behaviour difficult, such as dyslexia or dyscalculia, should also be checked. This takes place during the diagnostic phase. The motivation to change, the malfunction model of the disorder as a basis for all CBT interventions and the definition of therapy goals occur during the first four phases. Phase five contains most of the academic achievement problems interventions and can be tailored to the individual performance problem (Walter & Döpfner, 2009). Phases six and seven focus on evaluating the therapy success, stabilisation, and prophylaxis of further problems.

As phase five compromises the crucial treatment phase, it will now be described in more detail. It compromises five specific modules to reduce dysfunctional cognitions, enhance organisational skills and academic motivation, improve active participation during class, and reduce knowledge gaps.

1. Dysfunctional cognitions: Distorted basic assumptions (for example, "... The teacher does not like me anyway, so there is no point to study ..." or "... I will not understand it anyway ...") lead to an insufficient willingness and a low motivation to try. Dysfunctional cognitions are step by step identified, analysed, and changed. Targeted positive self-instructions are developed and implemented in everyday life. Self-reward techniques are used to strengthen the willingness to make an effort and the ability to persevere (Walter & Döpfner, 2009).

2. Dysfunctional cognitions of the parents: Dysfunctional academic performance-related cognitions concerning the adolescent, or the teacher can also often be identified at the parental level (for example, "... if we do not keep up with the homework every day and check it, our son will not do anything for school, will not graduate and will not find a job and will be unemployed ..."). In separate therapy sessions with the parents, they learn about the connection between situations, thoughts, feelings, and behaviour. Dysfunctional cognitions are identified, the assumptions underlying these cognitions are worked out, modified, and replaced by more appropriate and functional cognitions (Walter & Döpfner, 2009).

3. Problems in learning organisation and learning behaviour: Many adolescents with academic underachievement show deficits in the organisational-planning area. For example, they fail to complete homework regularly and appropriately. The reasons for this are diverse as some adolescents have already forgotten what homework they have been given or have left the necessary materials, such as textbooks, at school. Numerous adolescents also do not have an adequate workplace and therefore complete their homework at different spots with many distracting stimuli (for example, smartphones, laptops, magazines, snacks, or TVs). Academic achievement problems are also often exacerbated because adolescents do not prepare adequately and in time for exams. They often lack the necessary structuring tools on how to study efficiently. Therefore, strategies are developed on studying more economically and retaining the information over time (Walter & Döpfner, 2009).

4. Deficient oral participation or disruptive behaviour in class: A lack of participation or disruptive behaviour during class often exacerbates achievement problems. If this applies, strategies are developed, for example, instructing the adolescents to record how often they raised their hand during class and how often the teacher called on them. In this way, the

average oral participation frequency per lesson can be determined. In the next step, the aim is to systematically increase the participation frequency. It makes sense to establish with the adolescent that the therapist will also regularly collect feedback from the teacher, to clarify to what extent the teacher also notices changes during class. Increasing oral participation also often reduces disruptive behaviour. If the disruptive behaviour is severe, a combined conversation with the teacher and the adolescent can occur, whereby the most disrupting behaviour is noted. Then both the adolescent and the teacher record how many times that specific behaviour occurred during a week, and the adolescents' task is, together with the therapist, to systematically reduce it one step at a time. The teacher then gives weekly feedback, positively reinforcing progress (Walter & Döpfner, 2009).

5. Subject-related knowledge gaps: It should always be clarified whether and to what extent there are knowledge gaps in different subjects. Together with the adolescent and the responsible teachers, the therapist obtains an overview of the extent of the missed learning content. Then, together with the parents, the adolescent, and the teachers, they consider whether it seems feasible to make up for the gaps. If the knowledge gaps exceed a certain extent, school placement measures, for example, a change to a lower grade or a change of school, may make more sense. To catch up on the missed learning content, a feasible learning plan is drawn up, for example, with the help of a monthly and weekly planner (Walter & Döpfner, 2009).

The SELBST achievement problems module was empirically evaluated in a pilot study on a clinical sample of ten adolescents aged between 13 and 16 years, mostly suffering from ADHD. The sample consisted of eight boys. The participants were at least of average intelligence and had to be educated according to their cognitive abilities. The Individual Problemlist (IPL) (Walter, Rademacher, Schürmann, & Döpfner, 2007a) was the main instrument for assessing achievement-related changes. It is used to examine four of the adolescents' individual main difficulties on a weekly basis. For the IPL, good effects in the parents', adolescents', and teachers' judgement were found, which remained throughout the follow-up phase. Overall, a substantial and statistically significant decline of problems in academic performance and mental health problems was found, with medium to large effects (Walter & Döpfner, 2006; Walter, 2004; Walter & Döpfner, 2007). Comorbid expansive and internal symptoms had also been partially reduced. Treatment satisfaction was high. The most significant limitation of these results is undoubtedly the limited generalizability due to the small sample size and the lack of a control group (Döpfner & Walter, 2006; Walter, 2004). One finding of the pilot study was that the adolescents reported having completed the therapy

homework tasks "fairly well", whereas the therapists reported that the therapy task was "incomplete". This discrepancy and the incomplete therapy homework are common obstacles in psychotherapy and, therefore, a focus lies on developing solutions for this.

5.2 Transfer from therapy into daily life

Psychotherapy appears to be most successful when it is possible to activate and see the problematic behaviour during the therapy situation (problem actualisation in therapy) and work on it directly, as is the case during exposure therapy. However, some problems are difficult to activate in the therapy session (e.g. aggressive behaviour, some anxiety disorders) (Döpfner, 2020). Moreover, a well-known difficulty is to transfer therapy successes from the therapy session to everyday life (Mausbach et al., 2010). This is especially an issue for therapies with adolescents as they often are unmotivated throughout the week to complete therapy tasks or "work" on their therapy goals. A problem is often the "inaccessibility" of the adolescent.

6. Digital interventions and smartphone apps

Smartphones are now omnipresent in everyday lives, as the worldwide percentage of smartphone owners has gradually increased in the last decade (Fischer-Grote, Kothgassner, & Felnhofer, 2019; Statista, 2016). In Germany, 95 % of adolescents own a smartphone (Berg, 2019). The functions of smartphones such as communication, internet and multimedia access offer advantages and can increase productivity facilitate information searching and social media interaction (Van Deursen, Bolle, Hegner, & Kommers, 2015). Given the influence of smartphone technology in younger generations' lives, this effect could be potentially used. It offers new opportunities to further increase the efficiency of behavioural therapy (Südwest, 2020). Smartphone apps are marketed as useful tools for tracking and treating mental health issues. They have the potential to improve the transfer from the contents of therapy into everyday life, help with the implementation of therapy tasks and may significantly improve treatment accessibility.

Despite these opportunities, a growing body of research also suggests that smartphones may have negative implications and pose a risk for further development (Fischer-Grote et al., 2019). Among these are excessive usage, increased uncontrolled habits like continually checking for alerts and notifications, mental health issues including anxiety and depressive symptoms, and physical issues (Panova & Carbonell, 2018). Excessive smartphone use has been described as a type of behavioural addiction similar to an internet or gaming addiction (Cha & Seo, 2018; Van Deursen et al., 2015). Therefore, introducing and recommending such smartphone apps should be carried out with great caution.

On the other hand, the use of new technologies, such as smartphone apps, have the potential to improve the current care situation and can be used in prevention, diagnostics, and therapy (Donker et al., 2013; Terhorst, Rathner, Baumeister, & Sander, 2018). The use of smartphone apps could lead to cost savings, promote access to evidence-based services, increase adherence (Aitken & Lyle, 2015), improve data availability and improve patients autonomy (Kuhn & Amelung, 2016; Terhorst et al., 2018). Apps also offer the opportunity to provide and improve follow-up treatment or step-down treatment and improve the experience for people who either refuse or are confronted with long waiting times, and lastly, they can offer low-threshold support (Price et al., 2014). In addition, smartphone apps allow for treatment flexibility and improve treatment adherence through feedback and reminders (Whittaker et al., 2012). Mental health smartphone apps have the potential to reach people without access to care, such as patients living in remote areas that are currently not reached by traditional care services

(Kuhn & Amelung, 2016; Terhorst et al., 2018; Wasil, Venturo-Conerly, Shingleton, & Weisz, 2019). The fact that the usage of smartphones is flexible, interactive, and can happen spontaneously is considered beneficial to encourage continuous access to treatment outside of the therapy session (Seko, Kidd, Wiljer, & McKenzie, 2014).

6.1 Characteristics of smartphone therapy apps

Of approximately 15,000 disease-specific smartphone apps, almost 1/3 were mental apps in 2015 (Neumayr, Voderholzer, & Schlegl, 2021). Due to the sheer number of apps, it is difficult to figure out which are helpful and what their purpose is (Anthes, 2016; Wasil et al., 2019). There has been a recent surge of industry-developed smartphone apps addressing child and adolescent mental health, as the potential of smartphone apps assisting with emotional disorders was recognized (Grist, Porter, & Stallard, 2017; Hollis et al., 2017; Silk et al., 2020). Smartphone apps that were developed in academia that were led by evidence-based research, on the other hand, have taken longer to reach the market (Bry, Chou, Miguel, & Comer, 2018), and the evidence foundation for the efficacy of currently accessible apps is unclear (Grist et al., 2017).

These new digital technologies can either complement or partially replace therapeutic work for the patients themselves or their parents and caregivers (Silk et al., 2020). First, they can help to minimise the import problem, that problems of the patient's everyday life often do not become visible during the therapy situation, and thus individual problems can be dealt with more concretely in the therapy session. Secondly, they can help to minimise the export problem, therefore, improving the transfer of contents and coping strategies developed in therapy into everyday life so that concrete therapy tasks can be better implemented in everyday life (Silk et al., 2020). Furthermore, the use of digital technologies can help minimise the motivation problem (Kazdin & Rabbitt, 2013) and make therapy and especially therapeutic homework more attractive to increase the motivation of the children and adolescents and the caregivers to carry out the therapy tasks (Grist et al., 2017; Hollis et al., 2017; Silk et al., 2020). In addition, they can support the implementation of diagnostics and progress monitoring.

Possible functions of these therapy apps include reminders via push messages of their tasks, providing instructions for the actual implementation, recording the adolescents' real-life experiences and reward systems within the smartphone app that can increase therapy homework adherence (Tang & Kreindler, 2017).

6.2 Effectiveness of therapy apps

Mobile phone technology has been praised as a promising technique to deliver mental health therapies to adolescents. The efficacy of Mobile Mental Health (mMental Health) interventions has been well established in physical and lifestyle interventions, such as smoking cessation, diabetes self-management, asthma support, and anti-obesity behaviour modification (Seko et al., 2014). Although mental health apps may potentially be effective and enhance treatment accessibility, most of the currently available apps lack scientific evidence about their efficacy (Lüdtke et al., 2018; Silk et al., 2020; Terhorst et al., 2018; Wasil et al., 2019). Initial reviews on smartphone mental health apps for children and adolescents with mental problems point to the potential of these technology-based interventions (Domhardt, Steubl, & Baumeister, 2018). Current findings should be interpreted with care, pending replication, due to the small number of studies and participants, the high risk of bias, and the unclear efficacy of long-term follow-up (Donker et al., 2013).

In a review, Grist and colleagues identified 15 smartphone apps that had been evaluated in publications for children and adolescents on the topic of mental health (2017). Most of these apps contained self-monitoring functions measuring mood, emotions, and behaviour. One app also contained instructions for an active intervention in the form of exposures (The Mayo Clinic Anxiety) (Whiteside et al., 2019). Five of the 15 apps were described as complementary to face-to-face treatment: ©"Mobile Mood Diary" (Matthews & Doherty, 2011), ©"Smart Cat" (Pramana, Parmanto, Kendall, & Silk, 2014), ©"Safety Plan" (Kennard et al., 2015), ©"The ACT App" (Verstappen, Gardner, Poon, & Bettridge, 2014), ©"no Name" (Scotti, 2014). Another systematic review evaluating smartphone apps for children and adolescents with various mental disorders found 15 studies with 14 different apps (Melbye, Kessing, Bardram, & Faurholt-Jepsen, 2020). Eight of these apps included specific therapy treatment content in addition to mood and behavioural monitoring functions (Melbye et al., 2020).

A few studies exist with small sample sizes (e.g. ©Mobile type, ©MEMO, ©SmartCAT) (Whittaker et al., 2012). In an RCT for adolescents with depression, results showed that those who used the mood tracking app had a significant decrease in depressive symptoms (Luxton et al., 2011). ©SmartCAT 2.0 is a mobile health program complementing CBT for anxiety disorders by improving and shortening it for adolescents. This is achieved by providing the opportunity to practice CBT skills outside of the therapy session using a gamified and interactive interface. It compromises an app and a clinician portal connected to the app allowing secure 2-way communication with the therapist (Silk et al., 2020).

Specifically designed smartphone apps focusing on therapy homework have been developed for the adult market. These apps remind the patients about their therapy homework and support them in completing exposure exercises (e.g., ©PE Coach/ ©Psychassist). They have been shown to be effective, and high user satisfaction was found (Clough & Casey, 2015; Reger et al., 2013). Reger and colleagues (2013) developed the "PE Coach" app, focusing on prolonged exposure therapy. The app was created to increase patients' participation both within and outside the therapy sessions. It includes different areas to help with the exposure hierarchy design, incorporates audio recording sessions, homework adherence tracking and symptomology tracking. Nevertheless, the app's effectiveness has yet to be scientifically evaluated (Clough & Casey, 2015; Reger et al., 2013). No such therapy homework apps have been developed to date, focusing on adolescents or children.

Nonetheless, exposure is merely one component of treating mental disorders, especially anxiety disorders. An app containing additional features including psychoeducation, symptom monitoring, incentive activities and motivational exercises would make it easier to integrate therapy apps into the patient's overall treatment plan. The available apps focus on one specific mental disorder, such as depression or anxiety. However, clinicians and psychotherapists acceptance and integration of such therapy apps into their daily treatment plans are unlikely to occur if they need to become familiar with a separate app for each disorder (Clough & Casey, 2015). Therefore, a more generalised therapy app that can be used across numerous common mental disorders and adjusted by the therapist to match the patient's individual needs and treatment goals would be beneficial. This follows the current approaches of more transdiagnostic therapy techniques (Clough & Casey, 2015; Ellard et al., 2010).

Overall, at present, there is insufficient empirical data to support the efficacy of smartphone apps for children and adolescents with mental disorders. Given the tempo with which mHealth applications are being introduced in app stores, methodologically sound research studies evaluating their safety, efficacy, and usefulness are urgently required. There is a need for critical discussion regarding diverse ethical issues associated with mobile phone use in therapy, one of them being data protection and confidentiality but also the scarcity of studies conducted in low and middle-income countries and the absence of information about the real-life feasibility of therapy apps. Therefore, there is a need to address these technical and health literacy issues of both young users and mental health professionals. The public must be taught and educated on how to identify the few available evidence-based mental health apps in the

public domain. More rigorous research is necessary to develop and test evidence-based programs (Donker et al., 2013).

6.3 Development of the therapy app "todoly"

For this study, the smartphone app "todoly was developed by a team of researchers of the technical university of Cologne (TH Köln – University of Applied Sciences). The team consisted of one professor, one student assistant and a team of master students. There was a continuous exchange of information between the therapists, the researchers and developers of the app. The primary aim of "todoly" was to improve adolescents' adherence to between-session therapy assignments, which included homework practice of various skills and tasks linked to their individual academic underachievement problems. "todoly" was designed as an addition to face-to-face CBT in the treatment of adolescents with academic underachievement and various mental disorders.

During the screening sessions, the adolescents and parents were informed about the use of the app and gave their informed consent. Patients received a unique user ID with which the therapist could track the use of the smartphone online in between the sessions. The data was stored on a remote and secure server. The patients' interface of "todoly" was divided into three main areas: daily reminders about the therapy jobs, a reward system, and a knowledge database. The main screen showed the adolescent what they had to do that day and provided an overview of the other jobs for that week. They could follow their progress with the tracking tool showing how many jobs they had completed, not completed or forgotten in the last week. Adolescents received positive feedback on completing a job and coins, which could be exchanged for rewards. These rewards had been previously discussed with the family and could either be exchanged with the therapist (e.g., eat ice cream together) or be exchanged into a small material gift or reward (e.g., more screentime, makeup, mobile phone cases, small games). In the knowledge database, adolescents found information on academic underachievement and tools for dealing with a lack of motivation or structure. At the end of the psychoeducational text, an electronic questionnaire assessed individual motivational deficits and dysfunctional cognitions about the learning behaviour. The answers were stored in the app's tracking part, and adolescents could monitor their symptoms and progress throughout the treatment period.

7. Summary state of research and research gaps

Many adolescents suffer from academic underachievement, therefore not succeeding in school as well as they could and often having to leave school without a degree. In addition, mental disorders are widespread among children and adolescents. As the period of adolescence marks an increase in mental problems, a significant percentage of adolescents suffer from both mental disorders and academic underachievement. This combination puts them at an increased risk for their further psychosocial development. A valid and reliable assessment of these symptoms is crucial for understanding the underlying problems and developing appropriate treatments. Because symptoms vary based on the context, clinicians regularly have to deal with significant discrepancies between informants. Therefore a multi-informant approach is recommended in assessing academic underachievement for adolescents. However, few diagnostic tools have been psychometrically evaluated, focusing on this particular subgroup of adolescents.

The available diagnostic tools and treatment programs have mainly been developed for primary school children. Additionally, the evaluated treatment programs for adolescents often only focus on one disorder, mostly ADHD, and therefore lack generalizability for other mental disorders. The effects of these programs show mixed results. Especially in the teacher rating, few studies have found significant effects. A lack of motivation is a common problem in this particular subgroup of adolescents. In light of this, the self-management approach provides a promising therapeutic paradigm for treating adolescents and addressing the low motivation for therapy and school. The multimodal CBT program "SELBST – achievement problems" targets adolescents suffering from both academic underachievement and mental disorders (Walter & Döpfner, 2009). It is a transdiagnostic treatment program and combines adolescent-, parent- and teacher-focused interventions using the self-management approach. It has been only evaluated in a small pilot study.

Another principal issue that emerged from the available research was the lack of therapy transfer and the sustainability of the therapy effects into daily school life. Approaches involving adolescents outside of the session may be particularly helpful for improving therapy results. A standard tool in CBT therapy is therapy homework. However, clinical experiences have shown that adolescents frequently struggle to complete therapy homework due to a lack of motivation or organizational issues. New digital technology, such as smartphone apps, might provide suitable solutions to this problem, as they could help minimise the motivational problems and serve as a daily reminder and make therapy homework more exciting and accessible for the adolescent. The newly developed smartphone app "todoly" aims to fill this gap.

This present study had two aims. The first was to evaluate the psychometric properties of the Academic Problem Checklist (APC) and assess whether it is a suitable tool for assessing academic underachievement and mental health problems in adolescence. The second aim was to evaluate the "SELBST – achievement problems" treatment program (Walter & Döpfner, 2009) in a randomized controlled trial and to evaluate the added benefit of the specifically developed therapy app "todoly".

8. Methods

The study was registered at the German Clinical Trials Register (identifier study: DRKS00009862) and approved by the Medical Ethics Committee of the University Hospital of Cologne. The Rheinenergie Stiftung supported the study (Grant number: W-15-2-002). The STARD 2015 guidelines (Standards for Reporting Diagnostic accuracy studies) and the CONSORT 2010 statement (Consolidated Standards of Reporting Trials) were followed for this study (Bossuyt et al., 2015; Schulz, Altman, & Moher, 2010).

8.1 Study goals and hypotheses

8.1.1 Hypothesis and goal of the first study: Psychometric properties of a clinical checklist

The first part of the study aimed to add knowledge to the research field by being the first to investigate the psychometric properties of the APC in terms of factor structure, internal consistency, inter-and intra-rater reliability, convergent and divergent validity, and a regression analysis within a sample of adolescents with different mental disorders. The goal of this clinical checklist was to obtain a multi-informant and time-economical scale with good reliability and validity. It was hypothesized that the APC and the subscales could be factorially confirmed. Regarding the validity, the underlying hypothesis was that the APC correlates higher with questionnaires measuring academic progress and externalizing behaviour problems than with questionnaires measuring internalizing behavioural problems. It was expected that symptoms of ADHD would explain the most significant proportion of variance in academic underachievement. The data for this study was taken from the first assessment point (T1) of the RCT, including sixty adolescents.

8.1.2 Hypothesis and goal of the second study: RCT

The goal of the second part of the study was to examine the efficacy of the "SELBST – achievement problems" module in an RCT with a sample of adolescents suffering from academic underachievement and mental disorders. It was hypothesized that the experimental group receiving the SELBST treatment would show a significant decline compared to the control group on the primary outcome measuring academic underachievement and on the secondary outcomes measuring mental health problems. Additionally, it was hypothesized that there would be a statistically superior reduction of academic underachievement during the second treatment phase with the todoly app compared to the treatment phase without the app.

8.2 Inclusion and exclusion criteria

To be included in the study, participants had to fulfil the following criteria:

(1) Attendance of a school-level appropriate to their intellectual abilities, measured with a standardized intelligence quotient (IQ) test (Wechsler, 2003): lower-track secondary school IQ ≥ 85; medium-track secondary school IQ ≥ 90; higher-track secondary school IQ ≥ 105; comprehensive school; basic courses IQ ≥ 85 & advanced courses IQ ≥ 105)

(2) The main cause for clinical referral was insufficient academic performance documented on their most recent school report, defined as at least one failed school subject and additionally one school subject below average, or three school subjects below average

(3) Meeting the symptom criteria for at least one of the following mental disorders according to ICD-10 (World Health Organization, 1992): ADHD, ODD, anxiety disorder, or depressive disorder. All clinical diagnoses were based on clinical examination with a German semi-structured clinical interview (diagnostic checklist DCL - DISYPS-III) based on the diagnostic criteria of DSM-5 and ICD-10 (Döpfner & Görtz-Dorten, 2017).

8.3 Recruitment

The sample was recruited between February 2016 and October 2018 from 23 secondary schools in Cologne and the School of Child and Adolescent Cognitive Behavior Therapy outpatient unit at the University Hospital Cologne (AKIP Uniklinik Köln). Assessment for eligibility, including an intelligence test, was conducted before randomization. The adolescents and parents were informed about the study's purpose and provided written informed consent. A total of 119 patients were approached and assessed for eligibility. Attrition and refusal to complete consent forms resulted in a final total of 60 participants enrolled in the trial. Details of participation flow are presented in figure 1 (Schulz et al., 2010).

Participants and their parents completed a series of questionnaires and were asked to provide contact information of a suitable core academic teacher who would be able to observe the most severe academic problems. Afterwards, a combined clinical interview with the adolescent and parent (APC-AP) and a separate interview (APC-T) with the teacher was conducted by telephone.

Figure 1. CONSORT flow diagram of participants

Recruitment and telephone
screening

n=119

Inclusion criteria not met during telephone pre-screening (n=23):
•n=16 other problem more critical
•n=4 limited German knowledge
•n=3 psychological symptoms below cut off

Screening phase
n=96

Inclusion criteria not met during screening session (n=36):
•n=20 no therapy motivation
•n=11 inadequate school level
•n=5 did not want randomization

T1 – Assessment and
Randomization

n=60

Experimental group

n=30

Control group

n=30

n=27

Dropouts: n=3 lack of therapy
motivation

T2 - Intermediate
assessment

n=30

Dropouts: n=0

n=20

Dropouts: n=5 another problem
became more prominent, n=2
finished school

T3 – Post
assessment

n=30

Dropouts: n=0

n=19
Dropout: n=1 declined to
participate further

T4 - Follow up

n=28
Dropout: n=2 could not be
reached any longer

8.4 Study design

This study was carried out as an RCT, and adolescents were allocated to either group by block randomization. There were four assessments points in self-, parent- and teacher-rating. The first assessment (T1) took place during the screening session. After the first ten sessions, the intermediate assessment (T2) in the experimental group took place to assess within-group changes with and without the app. Post-assessments (T3) were conducted after the 20th session in the experimental group or after 20 weeks in the control group. Additionally, after three months, a follow-up took place in both groups (T4) (Thelen et al., 2022).

Experimental group: The experimental group (EG) received weekly CBT specialized for academic underachievement. The adolescents of the EG were randomly assigned to one of five psychotherapists in training, all employed at the university hospital of cologne. The treatment phase was manualized based on the treatment program "SELBST – achievement problems" module for adolescents in an individual face-to-face setting targeting academic underachievement, behavioural, and family problems (Walter & Döpfner, 2009). Weekly supervision was provided at the university hospital by one licensed clinical psychologist from the research team with thorough experience delivering and supervising SELBST. The study consisted of twenty weekly sessions attended by the adolescent and the parents at regular intervals. The first five treatment sessions focused on interventions to strengthen the therapeutic relationship, increase treatment motivation, and contained psychoeducational elements. The following treatment sessions focus on individual academic achievement problems, which were derived from the Individual Problemlist and the APC. The accompanying involvement of the parents and the teachers served to consolidate the adolescents' resources and to support the adolescents. There was a focus on integrating the learned skills into the daily routine and transferring new habits to the school setting. Weekly homework tasks were set to focus on and implement the learned strategies in daily life. During the first ten sessions these were carried out with paper and pencil tasks. The adolescents received the specially designed smartphone app "todoly" on their phones from the eleventh session onwards. Henceforth the therapeutic tasks were completed using the app.

Control group: The control group (CG) received treatment as usual (TAU) and were encouraged to seek services in the community, including school and local providers. TAU families were also offered behavioural treatment immediately after the post-assessment to incentivize retention. TAU service utilization is described in the results.

8.5 Measures

Academic Problems Checklist (APC). The primary outcome measure was the APC, a semi-structured clinical interview exploring academic underachievement. It consists of a collective adolescent and parent interview (APC-AP) and a clinical rating based on a teacher interview (APC-T) (Walter & Döpfner, 2009). The items were developed by a clinical expert panel consisting of four members who screened existing rating lists and standardized questionnaires targeting youth with academic underachievement. This process led to a collection of 34 Likert-type items that are identical in both versions (APC-AP and APC-T), rated from 0 ("does not apply at all") to 3 ("applies very much"), a 4-point Likert scale (0 = "not true", 1 = "somewhat true", 2 = "often true", 3 = "very true") with higher scores indicating greater severity. A mean of $x \leq 1.5$ was considered the clinical cut off point (Walter & Döpfner, 2009). The items were a priori aggregated into six theoretically meaningful subscales (dysfunctional cognitions of the student and the parent, organizational skills, learning strategies, participation during class time, and knowledge gaps).

Diagnostic Checklist. All clinical diagnoses were based on clinical examination using a German semi-structured clinical interview (diagnostic checklist DCL-DISYPS-III) based on the diagnostic criteria of DSM-5 and ICD-10 (Döpfner & Görtz-Dorten, 2017).

Individual Problemlist. The individual problemlist (IPL) is used to examine four of the adolescents' individual main difficulties on a weekly basis. The individual problem list aims to record the most specific individual behavioural problems from the everyday academic life of the adolescent. The list of problems, which focused exclusively on academic underachievement, was developed in collaboration with the adolescent and the parent and approved by the teacher at T1. The four individual problem behaviours were specified as precisely as possible (e.g., «Can't manage to start doing his homework after lunch»). The adolescent evaluates the problem of the problemlist at the start of each therapy session, and it also serves as a progress tool. At each of the four assessment points, the parents and the teachers complete the questionnaire online. The functional impairment degree of the problems is scaled on a ten-Likert scale (0 = "no problem" to 9 = "it couldn't have been worse"), and the frequency level is scaled on a seven- Likert scale (0 = "never" to 7 = "all the time") (Döpfner, Schürmann, & Frölich, 2007; Walter & Döpfner, 2009).

Child Behavior Checklist and derivations. To assess mental problems and competences, the German versions of the Child Behavior Checklist (CBCL/6-18R), the Teacher Report Form (TRF) and the Youth Self-Report (YSR) were used (Achenbach, 1991; Achenbach, Dumenci, & Rescorla, 2001; Döpfner, Plück, & Kinnen, 2014). These parent-,

teacher-, and self-rated instruments assess a broad spectrum of child and adolescent behavioural and emotional problems and competences. The first part of the questionnaire assesses demographic data, psychosocial and school competencies, adolescent problems, and general concerns. In the second part, the items measure behavioural problems, whereby these items (CBCL: 120 items, TRF: 100 items, YSR: 112 items) can be aggregated into eight syndrome scales (aggressive behaviour, anxious/depressed, attention problems, rule-breaking behaviour, somatic complaints, social problems, thought problems, and withdrawn/depressed) and three broadband scales (Externalizing Problems, Internalizing Problems, Total Problems). The adolescent´s behaviour referring to the past six months is rated on a 3-point Likert scale (0 = "not true/ applicable", 1 = "somewhat or sometimes true," 2 = "very true or often true"). Higher scores indicate greater severity. Sufficient reliability and validity (α = 0.69 - 0.93) of the German versions of these instruments have been shown (Döpfner et al., 2014).

Diagnostic System for Assessment of Mental Disorders in Children and Adolescents (DISYPS-III). The German symptom questionnaires for ADHD (FBB-ADHS: parent and teacher-rated version and SBB-ADHS: self-rated version) and ODD, (FBB-SSV: parent and teacher-rated version; SBB-SVV: self-rated version), are part of the DISYPS-III and measure symptoms according to DSM-5 and ICD-10 (Döpfner & Görtz-Dorten, 2017). The items are rated regarding their severity on a four-point Likert scale ranging from 0 (not at all) to 3 (very much); higher scores indicate higher symptom severity. Satisfactory internal consistency (α > .80) and factorial validity has been shown (Döpfner & Görtz-Dorten, 2017; Döpfner & Görtz-Dorten, 2020; Erhart, Döpfner, & Ravens-Sieberer, 2008).

FBB-ADHS and SBB-ADHS: Both questionnaires comprise twenty items assessing ADHD symptoms (e.g., "has problems in organizing tasks or activities"). The items can be aggregated into two subscales (inattention and hyperactivity/impulsivity) and a total scale. Higher scores indicate a higher degree of symptoms. Both the FBB-ADHS and the SBB-ADHS have shown satisfactory internal consistency (α > .80) and factorial validity (Döpfner & Görtz-Dorten, 2017; Görtz-Dorten & Döpfner, 2008; Ravens-Sieberer et al., 2008).

FBB-SSV and SBB-SVV: The questionnaires consist of 25 items (e.g., "is irritable) that can be aggregated into two subscales (oppositional behaviour and antisocial behaviour) and one total score. Satisfactory internal consistency and factorial validity has been shown for all subscales and the total score (Döpfner & Görtz-Dorten, 2017; Görtz-Dorten & Döpfner, 2008; Ravens-Sieberer et al., 2008).

Weiss Functional Rating Impairment Scale (WFIRS). Functional impairment was measured using the German adaptation of the WFIRS-P (Dose et al., 2019; Kernder, Doepfner,

Dose, & Görtz-Dorten, 2019), which is derived from the IRS (Fabiano et al., 2006). This parent-rated questionnaire consists of 40 items aggregated into five impairment subscales: family, school, life skills, child's self-concept, and social activities. The scales have demonstrated good reliability and validity (Dose et al., 2019; Kernder et al., 2019).

Grade Point Average (GPA). GPA was calculated from the student's most recent school report by calculating the mean of all academic grades.

Treatment Evaluation Questionnaire (TEQ). Treatment satisfaction was measured at post-assessment (T3) using the TEQ for patients and their parents of the EG. The questionnaire consists of 20 items (21 items for the parents), which are rated on a scale from 0 (poor) to 4 (excellent). The internal consistency ($\alpha \geq 0.80$) and retest reliability for the total score was acceptable. For each rater, a mean score can be calculated by adding the item scores and dividing them by the number of items. The range of the scores can be interpreted as follows: completely unsatisfied ($0 \leq x \leq 0.5$); predominantly unsatisfied ($0.5 < x \leq 1.5$); partly satisfied ($1.5 < x \leq 2.5$); predominantly satisfied ($2.5 < x \leq 3.5$); completely satisfied ($3.5 < x \leq 4.00$) (Mattejat & Remschmidt, 1998). The total scores and the success scores were analysed in this study.

Therapy Compliance. This questionnaire measured the extent to which the patient or the parent attended the sessions, completed therapy materials and completed the therapy homework. It was measured with a specifically developed questionnaire (patients: $n = 5$ items; parents $n = 4$ items) with a four-point Likert scale ($0 = $ "not at all" to $3 = $ "completely agree"), that the therapist completed after every session (Attachment 2: Questionnaire therapy compliance). One total scale of therapy compliance was formed for patients and parents.

Therapy Adherence. Treatment adherence is the extent to which an intervention is delivered as intended. The therapist's adherence to the "SELBST – achievement problems" manual was measured using a specifically developed questionnaire with n = 8 items completed after every session (Attachment 3: Questionnaire treatment adherence). The results were descriptively analysed.

Smartphone App Evaluation Questionnaire (Todoly-app). The satisfaction with the smartphone app todoly was evaluated in the EG at the end of treatment (T3). Both the adolescent and the therapist completed a self-constructed questionnaire. The questionnaire of the adolescents consisted of $n = 34$ items evaluating success, functionality, design, usage, and content of the knowledge database on a four-point Likert scale ($0 = $ "not at all" to $3 = $ "completely agree"). The questionnaire of the therapists consisted of $n = 12$ items

evaluating success, functionality, and usage. The questionnaire items were descriptively analysed (Attachment 4 & 5: Todoly app satisfaction).

8.6 Statistical analysis

8.6.1 Statistical analysis of the psychometric evaluation of the APC

For this part of the study, data from the first assessment point (T1) was analysed. Analyses were conducted for both clinical rating perspectives of the APC (APC-AP, APC-T). First, internal consistencies of the six subscales were analysed (Cronbach's alpha), with an internal consistency of at least $\alpha \geq .70$ considered as satisfactory (Nunnally, 1978). Additionally, corrected item-scale correlations were computed. Correlations of $.25 \leq r \leq .50$ were considered as moderate, and item–scale correlations of $r > .50$ were regarded as high (Howard & Forehand, 1962), whereas correlations of $r \leq .25$ led to the removal of the respective item (Kline, 2015).

Second, to test the suitability of the data for a principal component analysis (PCA), the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were carried out (Bühner, 2011). Subsequently, an exploratory PCA with varimax rotation was conducted separately for the APC-AP and APC-T to investigate the underlying factor structure. Initial eigenvalues were inspected using Kaiser's criterion (eigenvalue > 1 rule) (Kaiser, 1960). Moreover, Cattell's scree test was examined (Cattell, 1966), and the cumulative percent of variance was extracted (Horn, 1965).

Third, to investigate the reliability of the final version of the APC, three different analyses were conducted: (1) calculation of Cronbach's alpha; (2) examination of inter-rater reliability (degree of agreement among different raters); and (3) examination of intra-rater reliability (consistency of scoring by a single rater). To explore the inter-rater reliability, a rating manual was developed with an item description, rating anchors, and delimitations of the specific item from similar items. Subsequently, rating exercises of a random set of n = 5 audiotaped sessions were conducted and discussed. An additionally trained therapist and a specially trained student assistant blindly rated n = 30 randomly selected audiotapes of the clinical interviews. Intraclass Correlation Coefficient (ICC) estimates were based on a mean rating (k = 2), absolute agreement, and a two-way mixed-effects model. An ICC > .75 was considered excellent (Cicchetti, 1994). Finally, to analyse the intra-rater reliability, one blinded rater rated n = 20 randomly selected audiotapes again six months later. These two ratings were then compared using the ICC measures of absolute agreement, with a two-way mixed-effects model looking at single measures (Koo & Li, 2016).

Pearson's correlation coefficients (r) were examined to investigate convergent and divergent validity. For convergent validity, the APC-AP and the APC-T were correlated with the following scores/scales: GPA, IQ total score, WFIRS (school scale), CBCL, TRF, YSR (externalizing, internalizing, attention problems and school competence scales) and FBB-/SBB-ADHS (inattention and hyperactivity/impulsivity scales). Divergent validity was analysed by examining correlations with the following scales: WFIRS (social activities and life skills scale), CBCL, YSR, TRF (social problems and thought problems scales).

Finally, for both clinical interviews (APC-AP and APC-T), a multiple regression analysis was conducted to predict academic underachievement based on mental problems. First, bivariate correlations were carried out to assess the relationship between the APC and each potential predictor of mental problems (externalizing, internalizing, attention problems, and school competence scales of CBCL, TRF, YSR and FBB-/SBB-ADHS). Second, the statistically significant predictors ($p < 0.05$) were entered into a multiple regression analysis in one step using the enter method (Myers, 1990). Variables with high multicollinearity were excluded (variance inflation factor > 10, tolerance < 0.1).

8.6.2 Statistical analysis of RCT using multilevel analysis (from Thelen et al., 2022)

To analyse the primary and secondary outcomes of the RCT, multilevel modelling (MLM) was used (Goldstein, 2011; Raudenbush & Bryk, 2002). This is a method based on the principles of standard regression. The multilevel analysis is particularly suitable for therapeutic evaluation studies in which data from one level of analysis are hierarchically nested at another level (Nezlek, Schröder-Abé, & Schütz, 2006). It enables the simultaneous investigation of variables and their correlations on several levels: 1) the micro-level, i.e., the individual level of the adolescents, 2) the group level, i.e., EG or CG, and 3) the different time points, e.g., T1-T4. In this way, the changes on the adolescent level can be estimated while controlling for the different time points and variation both within the group and between the groups can be taken into account (Nezlek et al., 2006; Raudenbush & Bryk, 2002). Accordingly, we specified models that account for a multilevel structure.

By determining the effect size according to Feingold (2009), it will be possible to compare the time intervals between the groups. The basis for the calculation is the slope coefficient β obtained via multilevel modelling. It is multiplied by the respective number of intervals and then divided by the standard deviation of T1.

$$d = \frac{\beta \times \text{intervals}}{SD_{T1}}$$

To calculate the incremental effect, the EG phase's slope coefficient and the CG phase's slope coefficient are multiplied and subtracted and subsequently divided by the standard deviation of T1.

$$d = \frac{\beta_{EG} - \beta_{CG}}{SD_{T1}}$$

Power calculations showed that $n = 30$ participants per group were sufficient to expect medium effects sizes (Cohen's d ≥.50). The effect of the intervention was examined for each variable using mixed model analyses with time (T1 to T4) and the group as the independent variable (EG and CG). Dependent variables were self-, parent-, and teacher-rated academic underachievement problems (APC, GPA, Individual Problemlist) and mental health outcomes (CBCL, YSR, TRF, DISPYS-III, WFIRS). An alpha of α < .05 was used for all tests.

The first objective of the analysis was to show that the EG had a significant growth rate compared to the control group. For the first treatment phase (T1-T2), changes were covered by the growth rate $\beta_{treatment}$. The second period included the app (T2-T3) and was covered by the growth rate $\beta_{treatment\&app}$. The second objective was to show that the growth rate $\beta_{treatment\&app}$ was significantly larger than the growth rate $\beta_{treatment}$ (change between treatment phases) as a test for the app treatment effects.

Cohen's d effect size was calculated for each group as a measure of change over time and interpreted using standard guidelines (.2 = small effect, .5 = medium effect, .8 = large effect), using the pooled standard deviation from pre (T1) (Cohen, 1988). For GPA to consider relative change between the groups, the effect size difference based on the mean baseline to post-treatment change in the EG and the mean baseline to post-treatment change in the CG was calculated using the pooled baseline standard deviation (Morris, 2008).

Treatment satisfaction, treatment integrity and therapy compliance were descriptively analysed.

9. Results

9.1 Sample Characteristics

The sample consisted of $n = 60$ adolescents (85.0 % boys) aged 11 to 18 years ($M = 13.25$, $SD = 1.7$). Table 1 shows the demographic and diagnostic characteristics of the sample. $N = 17$ (28.3 %) students had already repeated at least one school year, and $n = 7$ (11.6 %) had an irregular change of school level due to academic underachievement. Most adolescents suffered from an externalizing disorder (83.3 %), and the most common diagnosis was ADHD ($n = 42$, 69.9 %). More than half of the parents (58.3 %) had received an advanced school certificate (German translation to Abitur) or a higher degree of education. Analysis of differences between the experimental and control groups revealed no significant differences, indicating that the randomization was successful.

Table 1. Demographic and diagnostic characteristics of the sample

Demographics	
Age: *M (SD)*	13.25 (1.7)
Male: *n* (%)	51 (85.0)
Patients receiving medication: *n* (%)	3 (5)
Total-scale IQ: *M (SD)*	104.25 (10.98)
Average school grades*: *M (SD)*	3.4 (0.45)
School type, n (%)	
Lower-track secondary school	6 (10.0)
Medium-track secondary school	13 (21.7)
Comprehensive school	25 (41.7)
Higher-track secondary school	16 (26.7)
Highest school degree parent, n (%)	
No degree	1 (1.7)
High school diploma	23 (38.3)
Advanced school-leaving certificate	23 (38.3)
University diploma	12 (20.0)
Unknown	1 (1.7)
ICD-10 diagnosis, n (%)	
Attention-deficit/hyperactivity disorder (F90.x / F98.8)	36 (59.9)
Hyperkinetic conduct disorder (F90.1)	6 (10.0)
Conduct disorder (F91.x)	8 (13.4)
Depressive disorder (F32.x / F34.x)	6 (10.0)
Anxiety disorder (F40.x)	4 (6.7)

*Note. * School grades scale: 1 = very good to 6 = insufficient. M = mean, n = 60, SD = standard deviation*

9.2 Control group description and drop out

Control group care

$N = 13$ (43 %) participants of the TAU group attended some sort of counselling or therapy sessions or pharmacotherapy outside of the university hospital during the treatment phase (table 2). $N = 8$ (27 %) participants received counselling sessions at school psychological services or other counselling institutions, attending on average $M = 4.6$ sessions. $N = 2$ (6 %) participants started CBT at an external psychotherapist clinic and had an average of $n = 20$ sessions there. $N = 3$ (10 %) adolescents of the CG amended or started pharmacotherapy due to ADHD symptoms: $n = 2$ began a new treatment (Elvanse and Ritalin 40 mg each), and $n = 1$ switched the medication from Ritalin to Kinecteen (same dosage). Additionally, $n = 6$ control group participants attended tutoring sessions, on average thirty sessions.

Table 2. Treatment description and dosage of the control group

	n	**Dosage (average amount of sessions)**
Counselling session (incl. school psychological services)	8	4.6
CBT at external child and adolescent psychotherapist	2	30
Medication	3	Ritalin and Elvanse (2x 40 mg), change from Ritalin to Kinecteen (27 mg)
Tutoring classes	6	30

Note. CBT = Cognitive Behaviour Therapy, n = 30

Drop Out

The dropout rate in the EG was 33 % ($n = 10$). $N = 3$ adolescents discontinued during the first ten-week phase due to a lack of therapy motivation. Two additional adolescents had finished their diplomas after the 10th session and decided not to continue with school. The other five dropouts developed another symptomatology that became more prominent (e.g., one patient developed a gaming addiction) or a different problem occurred (e.g., one patient developed cancer) that became more prominent during the treatment course. In the CG, the dropout rate was 13 % during the follow-up phase ($n = 4$) (see figure 1: Consort Flow Diagram).

An analysis comparing the drop out cohort with the completer group revealed no significant differences in outcome measures or descriptive statistics at the pre-assessment (T1). An exception was age, whereby a significant difference ($p = 0.01$) between the two groups was found, with older adolescents in the drop out group ($M = 14.6$) and younger adolescents in the completer group ($M = 12.85$).

9.3 Psychometric properties of the Academic Problem Checklist

Internal consistency and discriminatory power of the original version of the APC

The six a priori determined subscales of the APC could not be confirmed in the internal consistency analyses, as low item-subscale correlations emerged for all subscales ($\alpha < 0.5$). Moreover, 17 items displayed low item-total correlations ($r \leq .25$) and were removed. Specifically, all items investigating cognitive dysfunctions (items 1 to 14) and three additional items measuring disruptive behaviour (items 29, 30, and 34) were eliminated (table 3 & Attachment 1: SELBST Checkliste Leistungsprobleme).

The resulting shortened scale was identical in both versions (APC-AP, APC-T) and comprised $N = 17$ items that were merged into one total scale (table 4). The mean score on the APC-T ($M = 2.08, SD = 0.55$) was statistically higher ($p < 0.01$) than the mean score on the APC-AP ($M = 1.85, SD = 0.46$). There was a statistically significant correlation between the two clinical ratings ($r = .36, p < 0.01$).

Table 3. Item means, standard deviations, and item-total correlations of the complete item pool (34 items) of the Adolescent & Parent Clinical Rating (APC-AP) and Teacher Clinical Rating (APC-T)

	APC-AP		APC-T	
	M (SD)	Item-total correlation	M (SD)	Item-total correlation
*1. School refusal	1.72 (1.01)	.21	1.50 (1.16)	.17
*2. Dislikes various subjects and teachers	1.78 (0.98)	.19	1.06 (1.10)	.18
*3. Thinks unable to influence study results	0.78 (0.89)	.06	1.38 (1.07)	.00
*4. Intense fear against tests	0.47 (0.87)	-.25	0.44 (0.82)	.19
*5. Thinks school is useless	1.42 (1.11)	.21	1.18 (1.09)	.19
*6. Thinks cannot succeed in school	0.68 (1.03)	.05	0.74 (1.08)	.09
*7. Thinks can pass school effortlessly	0.57 (0.91)	.07	1.18 (1.17)	-.19
*8. Parents blame school	0.70 (0.81)	-.05	0.56 (0.86)	.07
*9. Parents blame lack of motivation of student	2.47 (0.65)	.10	2.26 (0.99)	.19
*10. Parents to high expectations	0.95 (0.96)	-.10	0.41 (0.89)	-.48
*11. Parents overestimate negative consequences	0.88 (0.92)	.17	0.32 (0.72)	-.15
*12. Parents think no need to support students	0.67 (1.00)	-.37	0.79 (1.12)	-.10
*13. Parents think extreme control is necessary	1.65 (1.26)	.14	1.26 (1.28)	.30
*14. Feel extreme guilt for problems	1.3 (1.06)	.20	0.79 (0.95)	-.15
15. Homework space untidy	1.63 (1.22)	.34	2.03 (1.09)	.60
16. No information about homework	1.65 (1.07)	.52	2.09 (1.11)	.79
17. No knowledge about exam dates	0.90 (1.05)	.48	0.94 (1.07)	.67
18. No fixed study times	2.35 (1.04)	.43	1.88 (1.23)	.58
19. Messy exercise books	1.92 (1.11)	.43	2.26 (1.05)	.83
20. No timely preparation for exams	2.38 (0.87)	.51	2.50 (0.83)	.70
21. Forgets to bring school equipment	1.40 (1.08)	.26	1.82 (1.19)	.46
22. Unable to do homework independently	1.92 (1.01)	.29	2.21 (0.95)	.49
23. Does not study enough for exams	2.45 (0.81)	.51	2.50 (0.75)	.54
24. Unstructured learning	2.33 (0.91)	.32	2.35 (0.88)	.59
25. No strategies for task processing	2.08 (1.06)	.44	2.15 (1.16)	.55
26. Interrupts or talks during class	1.78 (1.08)	.26	1.94 (1.10)	.22
27. Disrupts other classmates	1.33 (1.16)	.36	1.91 (1.21)	.26
28. Does not participate during lessons	2.05 (0.75)	.42	1.74 (0.86)	.28
*29. Comments and provokes students	1.08 (1.20)	.23	1.29 (1.20)	-.18
*30. Mentally not present	1.65 (1.19)	.22	1.38 (1.26)	.10
31. Easily distracted	2.37 (1.01)	.36	2.53 (0.83)	.62
32. Does not understand content in several subjects	1.67 (0.99)	.58	1.32 (1.09)	.28
33. Large knowledge gaps	2.03 (0.94)	.39	1.74 (1.16)	.29
*34. Unable to catch up at all	0.58 (0.98)	.19	0.62 (0.78)	-.04

Note. * Items that were removed due to low item-total correlation (r < .25). M = mean, n = 60, SD = standard deviation

Table 4. Item means, standard deviations and item-total correlations of the final versions (17 items) of the Adolescent & Parent Clinical Rating (APC-AP) and Teacher Clinical Rating (APC-T)

	APC-AP		APC-T	
	M (SD)	Item-total correlation	M (SD)	Item-total correlation
Homework space untidy	1.72 (1.12)	.38	2.07 (1.01)	.53
No information about homework	1.58 (0.93)	.58	2.10 (1.02)	.69
No knowledge about exam dates	1.05 (0.98)	.54	1.06 (1.12)	.51
No fixed study times	2.47 (0.81)	.37	2.36 (0.87)	.67
Messy exercise books	1.85 (0.97)	.48	2.27 (0.90)	.73
No timely preparation for exams	2.22 (0.92)	.51	2.44 (0.73)	.43
Forgets to bring school equipment	1.35 (1.05)	.28	2.00 (1.11)	.67
Unable to do homework independently	1.67 (0.86)	.46	2.22 (0.94)	.62
Does not study enough for exams	2.38 (0.78)	.52	2.45 (0.68)	.46
Unstructured learning	2.48 (0.75)	.42	2.56 (0.77)	.57
No strategies for task processing	1.98 (0.99)	.40	2.17 (1.01)	.59
Interrupts or talks during class	1.68 (0.91)	.38	1.92 (1.09)	.16
Disrupts other classmates	1.25 (0.97)	.25	1.70 (1.18)	.30
Does not participate during lessons	1.80 (0.78)	.37	2.03 (0.08)	.28
Easily distracted	2.33 (0.97)	.32	2.53 (0.79)	.42
Does not understand content in several subjects	1.72 (0.87)	.39	1.63 (1.16)	.41
Large knowledge gaps	1.92 (0.87)	.36	1.85 (1.04)	.52
Total scale (*n* = 17 items)	1.85 (0.46)		2.08 (0.55)	

Cronbach´s α = .82
Average ICC = .93 (CI .83-.71)

Cronbach´s α = .87
Average ICC = .96 (CI .89-.98)

Note. CI = 95 % confidence interval, ICC = intraclass correlation coefficient, M = mean, SD = standard deviation

Reliability analyses

Internal consistency (Cronbach's α) of the final 17-item scale was high for both versions (APC-AP: α = .82 and APC-T: α = .87). Item-total correlations were mostly moderate (r = .32 - .73; table 4). Unsatisfactory correlations emerged for one item on the APC-T ("interrupts or talks during class"; r = .16). As deleting this item did not lead to an improvement in internal consistency, the item was retained.

The ICC estimates of the inter-rater agreement with their 95 % confident intervals (CI) were in the excellent range, APC-AP ICC = .93 (CI: .83 - .97) and APC-T ICC = .96 (CI: .88 - .98) (table 4), demonstrating a high level of agreement between raters. Intra-rater reliability involved the analysis of the re-scored twenty audiotapes six months later, and showed almost perfect intra-rater agreement, ICC = .90 (CI: .77 - .96).

Factor analyses

Both versions met the criteria for conducting a PCA (APC-AP: KMO = .68, Bartlett's test of sphericity: x^2 = 352.34, df =136, p < .001; APC-T: KMO = .76, Bartlett's test of sphericity: x^2 = 543.04, df =136, p < .001). The PCA for the APC-AP showed initial eigenvalues > 1.0 with a five-factor solution (EEVA1 = 4.52, EEVA2 = 2.14, EEVA3 = 1.48, EEVA4 = 1.30, EEVA5 = 1.16), with 62.0 % of explained variance. Similarly, the initial eigenvalues > 1.0 for the APC-T yielded a five-factor solution (EEVA1 = 6.08, EEVA2 = 2.5, EEVA3 = 1.50, EEVA4 = 1.15, EEVA5 = 1.07), with 73.0 % of explained variance. However, none of the factors appeared to be meaningful or interpretable either theoretically or regarding content.

A two-factor solution based on the scree plot result with varimax rotation for the APC-AP explained 39.0 % variance (APC-T: 51.0 % variance, respectively). Nevertheless, the two factors yielded no meaningful interpretation (e.g., items with double loadings and no clear theoretical meaning for factor 2). Consequently, the one-factor solution was examined and decided as the most appropriate solution. This one-factor solution explained 27.0 % of the variance in adolescent and parent rating (APC-AP) and 36.0 % in teacher rating (APC-T).

Validity analyses

Table 5 shows results of the convergent and divergent validity analysis. Regarding the convergent validity in adolescent- / parent-rating (APC-AP), as expected, statistically significant correlations were found for the following scales: GPA (r = .28, p < .05), WFIRS (school scale: r = .32, p < .01), CBCL (school competence scale: r = -31, p < .05), TRF (school competence scale: r = -.41, p < .05), YSR (externalizing scale: r = .35, p < .01), and SBB-ADHS (inattention subscale: r = .34, p < .01).

For the APC-T the following statistically significant correlations emerged: GPA ($r = .37$, $p < .01$), IQ total scale ($r = - .31$, $p < .01$), TRF (externalizing: $r = .37$, $p < .05$; attention problems: $r = .56$, $p < .01$; school competence: $r = -.47$, $p < .01$.), and FBB-ADHS teacher (inattention subscale: $r = .63$, $p <.001$; hyperactivity/impulsivity subscale: $r = .30$, $p < .01$).

For both the APC-AP and APC-T, analysis of divergent validity showed low, non-significant correlations with the non-corresponding subscales of the CBCL, TRF, and YSR (e.g., social problems and thought problems) and WFIRS (life skills and social activities scale).

Table 5. Pearson correlations between the Academic Problem Checklist total score (APC-AP; APC-T) and mental problem measures

		APC-AP	APC-T
General	Grade point average	.28*	.37**
	IQ total score	-.17	-.31*
WFIRS	School scale	.32*	.05
	Social activities scale	-.15	-.07
	Life skills scale	-.11	.10
CBCL	Total scale	.07	.07
	Internalizing	-.04	-.08
	Externalizing	.05	.12
	Attention problems	.14	.06
	Thought problems	.04	.13
	Social problems	-.05	.01
	School competence	-.31*	-.14
TRF	Total scale	.29*	.36*
	Internalizing	.05	-.10
	Externalizing	.28*	.37*
	Attention problems	.29*	.56**
	Thought problems	.26	.11
	Social problems	-.01	.01
	School competence	-.41**	-.47**
YSR	Total scale	.18	.09
	Internalizing	-.01	-.18
	Externalizing	.35*	.08
	Attention problems	.17	-.12
	Thought problems	.16	-.07
	Social problems	.17	.02
	School competence	-.16	.13
FBB-ADHS parents	Inattention	.17	.18
	Hyperactivity/Impulsivity	-.09	.12
FBB-ADHS teachers	Inattention	.25	.63**
	Hyperactivity/Impulsivity	.09	.33*
SBB-ADHS	Inattention	.34**	.01
	Hyperactivity/Impulsivity	.11	.11

Note. $*p <.05$, $**p <.001$. ADHS = Attention Deficit Hyperactivity Disorder, CBCL = Child Behavior Checklist; FBB = Parent / Teacher Rating, SBB = Self-Report Form, TRF= Teacher Report Form, WFIRS= Weiss Functional Impairment Rating Scale, YSR= Youth Self-Report

Regression analyses

The four mental problems subscales that correlated significantly with the APC-AP (YSR and TRF externalizing, TRF attention problems, SBB-ADHS inattention) were entered into a multiple hierarchical regression analysis (table 6) to test if these would significantly predict academic underachievement. A statistically significant regression equation was found with an explained variance of 20 % ($R^2_{adj} = .20$, $F(4, 51) = 4.338$, $p < .01$). It was found that only the SBB-ADHS inattention scale remained as a significant predictor in the model ($\beta = .27$, $t(51) = 5.34$, $p < .001$), whereas the other variables of the model did not significantly contribute to the explanation of variance.

Table 6. Hierarchical regression analysis for the prediction of academic underachievement of the Adolescent & Parent Clinical Rating (APC-AP) with significant predictors

	ßstd	SE	t	p	R² adj.
Constant		3.550	5.343	.00	
YSR-external scale	0.219	0.167	1.617	.11	
TRF-external scale	0.009	0.127	0.054	.96	
TRF- inattention scale	0.250	0.137	1.550	.13	
SBB-ADHS-inattention scale	0.272	2.031	2.046	.04	
					0.195

Note. ADHS = Attention Deficit Hyperactivity Disorder, β_{std} standardized regression coefficient, $R^2_{adj.}$ cumulative adjusted R², TRF =Teacher Report Form, YSR = Youth Self Report

For the teacher version (APC-T), the four significantly correlating mental problems subscales (TRF externalizing and inattention, FBB-ADHS teacher inattention and hyperactivity/impulsivity) were included in the multiple regression analysis (table 7). Likewise, a significant regression equation was found for the APC-T ($R^2_{adj} = .37$, $F(4, 50) = 8.828$, $p < .001$), with an explained variance of 37 %, although only the teacher-rated FBB-ADHS inattention scale remained a significant predictor ($\beta = .48$, $t(50) = 5.07$, $p < .001$).

Table 7. Hierarchical regression analysis for the prediction of academic underachievement of the Teacher Clinical Rating (APC-T) with significant predictors

	ßstd	SE	t	p	R² adj.
Constant		3.376	5.071	.00	
TRF-external scale	0.060	0.129	0.411	.68	
TRF-inattention scale	0.159	0.237	0.661	.51	
FBB-ADHS-teacher inattention scale	0.481	2.515	2.758	.01	
FBB-ADHS-teacher hyp. & impulsivity scale	0.002	1.869	0.012	.99	
					0.367

Note. ADHS = Attention Deficit Hyperactivity Disorder, β_{std} standardized regression coefficient, FBB = Parent / Teacher Rating, $R^2_{adj.}$ cumulative adjusted R², TRF =Teacher Report Form

9.4 Academic Problem Checklist

Means, standard errors and MLM results of the primary outcome APC are displayed in table 8. There were no significant differences on any measures between EG and the CG at T1. When both groups were analysed against each other (between analyses), the descriptively larger effect in the EG was not significant ($p = .33$). There was no statistical superiority of either group during the treatment phase. This remained throughout the follow-up phase ($p = .29$) (table 8).

During the treatment phase (T1-T3), the within analyses showed that both groups significantly improved on the APC-AP (table 9). For the EG a large effect size was found ($p \leq .01$, $\beta = 0.07$, $d = 0.91$), whereas the CG had a medium effect size ($p = 0.02$, $\beta = 0.04$, $d = 0.52$). Only the EG reached a level below the clinical cut-off ($M \leq .1.5$) at the post-assessment (figure 2). During the follow up the EG continued to improve, however this effect did not become significant ($p = 0.06$, $\beta = 0.06$, $d = 0.78$).
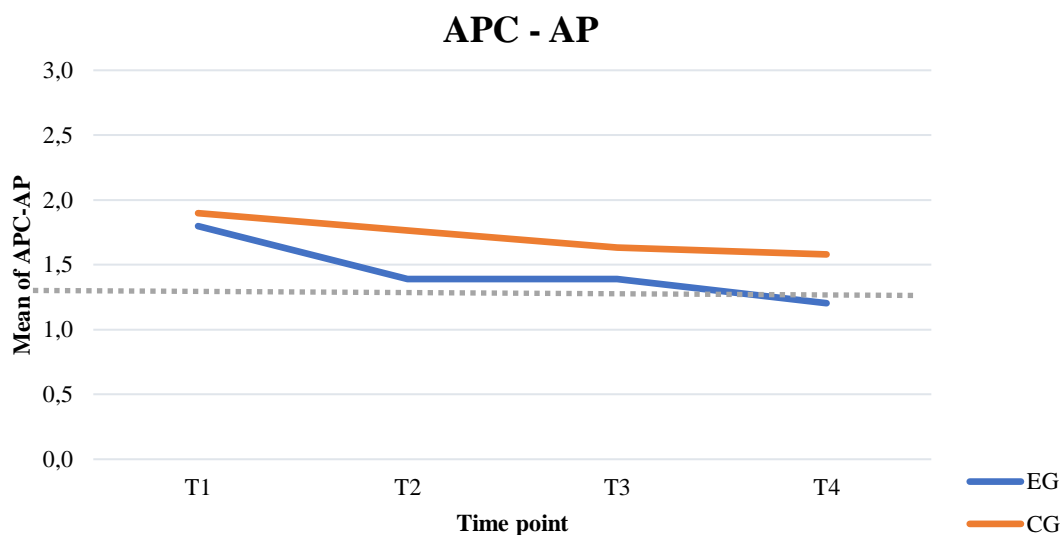
Figure 2. Academic Problem Checklist – Adolescent & Parent (APC – AP) from T1 to T4

Note. Stripped line (clinical cut off). APC-AP = collected adolescent and parent-rated Academic Problem Checklist, CG = control group, EG = experimental group, T1 = pre-assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

Table 8. Multilevel analyses and effect sizes for the adolescent & parent clinical rating (APC-AP) and teacher clinical rating (APC-T) between both groups for treatment and follow-up phase

Scale	Group	T1 M (SE)	T2 M (SE)	T3 M (SE)	T4 M (SE)	Treatment phase (T1-T3)					Follow up phase (T3-T4)				
						β	SE	z	D	p	β	SE	z	d	p
APC-AP	EG	1.80 (0.08)	1.39 (0.09)	1.39 (0.10)	1.20 (0.09)	0.02	0.03	0.98	0.26	.33	0.04	0.04	1.06	0.26	.29
	CG	1.89 (0.08)		1.63 (0.09)	1.58 (0.10)										
APC-T	EG	1.93 (0.11)	1.77 (0.12)	1.68 (0.11)	1.33 (0.13)	-0.02	0.02	-1.01	-0.26	.31	0.14	0.06	2.21	0.79	.03*
	CG	2.21 (0.08)		1.83 (0.14)	1.9 (0.15)										

*Note. * p <.05, ** p <.001. APC-AP = collected adolescent and parent-rated Academic Problem Checklist, APC-T = teacher-rated Academic Problem Checklist, n = 60, SE = standard error, T1 = pre assessment, T3 = post assessment, T4 = follow up assessment*

Table 9. Multilevel analyses and effect sizes for the adolescent & parent clinical rating (APC-AP) and teacher clinical rating (APC-T) within each group for treatment and follow-up phase

Scale	Group	T1 M (SE)	T2 M (SE)	T3 M (SE)	T4 M (SE)	Treatment phase (T1-T3)					Follow up phase (T3-T4)				
						β	SE	z	D	p	β	SE	z	d	p
APC-AP	EG	1.80 (0.08)	1.39 (0.09)	1.39 (0.10)	1.20 (0.09)	-0.07	0.02	-3.90	-0.91	.00**	-0.06	0.03	-1.98	-0.78	.06
	CG	1.89 (0.08)		1.63 (0.09)	1.58 (0.10)	-0.04	0.02	-2.56	-0.52	.02*	-0.02	0.03	-0.63	-0.26	.54
APC-T	EG	1.93 (0.11)	1.77 (0.12)	1.68 (0.11)	1.33 (0.13)	-0.04	0.01	-2.91	-0.45	.00**	-0.12	0.04	-2.91	-1.36	.00*
	CG	2.21 (0.08)		1.83 (0.14)	1.9 (0.15)	-0.06	0.02	-3.53	-0.68	.00**	0.02	0.05	0.44	0.23	.66

*Note. * p <.05, ** p <.001. APC-AP = collected adolescent and parent-rated Academic Problem Checklist, APC-T = teacher-rated Academic Problem Checklist, M = arithmetic mean, n = 60, SE = standard error, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment*

The clinical rating of the teacher (APC-T) similarly showed a reduction throughout the treatment phase (table 8). The between analysis of both groups showed no statistical superiority of either group during the treatment phase ($p = .31$). However, during the follow-up, a significant difference in favour of the EG with a large effect size was found in the teacher rating ($p = .03$, $\beta = 0.14$, $d = 0.79$) (table 8).

The within analyses revealed a small effect size for the EG ($p \leq .01$, $\beta = 0.04$, $d = 0.45$), whereas the CG had a medium effect size ($p \leq .01$, $\beta = 0.06$, $d = 0.68$). During the follow-up, the EG continued to improve with a large significant effect size ($p \leq .01$, $\beta = 0.12$, $d = 1.36$), whereas the EG deteriorated (table 9). Only the EG reached a level below the clinical cut-off ($M \leq 1.5$) at the follow-up assessment (figure 3).
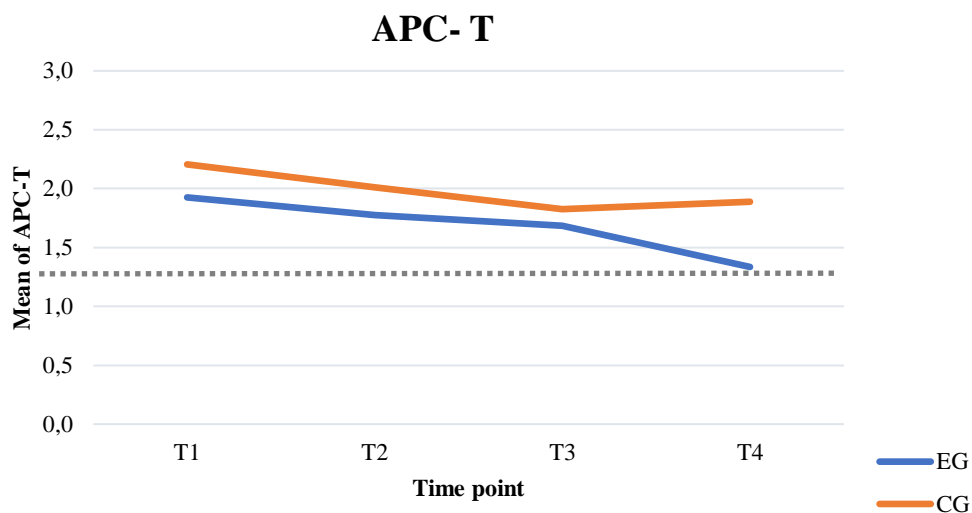
Figure 3. Academic Problem Checklist – Teacher (APC-T) from T1 to T4

Note. Stripped line (clinical cut off). APC-T = teacher-rated Academic Problem Checklist, CG = control group, EG = experimental group, T1 = pre-assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

9.5 School grade outcomes and school progress

Grade Point Average (GPA)

There were no statistically significant differences in GPA at the pre-assessment ($p = 0.29$). The EG improved their GPA statistically significant compared to the CG at post-assessment with a small effect size ($p = .04$, $\beta = 0.04$, $d = 0.43$) (table 10 & figure 4).

Table 10. Grade Point Average (GPA) during the treatment phase

		T1 M (SE)	T3 M (SE)	Treatment phase (T1-T3)				
Scale	Group			β	SE	z	d	p
GPA	EG	3.4 (0.08)	3.13 (0.07)	0.04	0.02	1.66	0.43	.04*
	CG	3.53 (0.08)	3.47 (0.09)					

*Note. * p < .05. β = beta coefficient, CG = control group, EG = experimental group, M = mean, SE = standard error, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment*
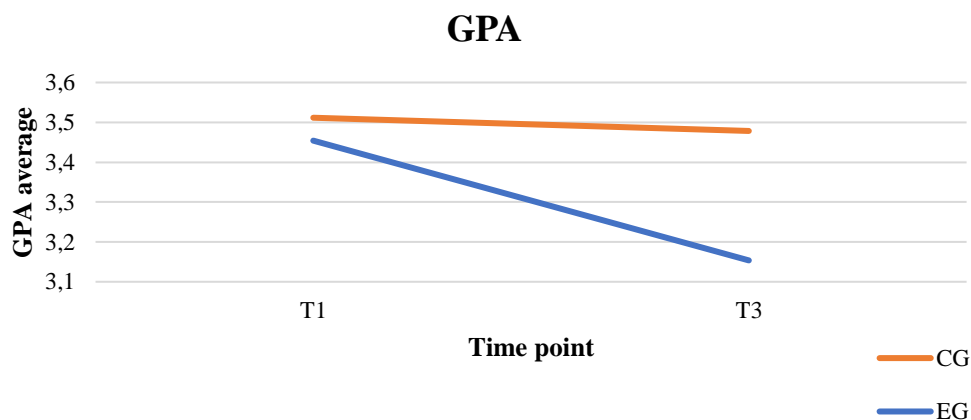
Figure 4. Grade Point Average (GPA) at T1 and T3

Note: CG = control group, EG = experimental group, T1 = pre-assessment, T3 = post assessment

Irregular change of school or repeating a grade

In the CG, two participants had to change their school to an easier school level, and five participants had to repeat a grade. During the follow-up phase, an additional three adolescents had to repeat a grade, and another two had an irregular school change. In the treatment group, two participants had to change to an easier school level, and two had to repeat a grade. Two students repeated a grade during the follow-up, and two had to change to a simpler school level (table 11).

Table 11. School career of both groups at post-assessment and follow-up assessment

	Post assessment (T3)		Follow-up assessment (T4)	
	Repeating grade	Changing school-level	Repeating grade	Changing school-level
	n	*N*	*n*	*n*
EG	2	2	2	2
CG	2	5	3	2

Note: CG = control group, EG = experimental group

9.6 Mental problems outcomes

9.6.1 Achenbach scales

Results of the Achenbach total scales, measuring mental problems, in self-rating are shown in table 12. The comparisons between the two groups found no superiority of the EG on any of the scales. Neither the external scale nor the attention scale of the Achenbach scale had significant differences between both groups at the post- or follow-up assessment.

The within analyses of the YSR total scales showed that only the EG significantly reduced with a small effect during the treatment phase ($p = .05$, $\beta = 1.17$, $d = 0.31$). During the follow-up, the EG continued to improve; however, this effect did not become significant ($p = .64$). In the control group, there were no significant effects (table 13 and figure 5).
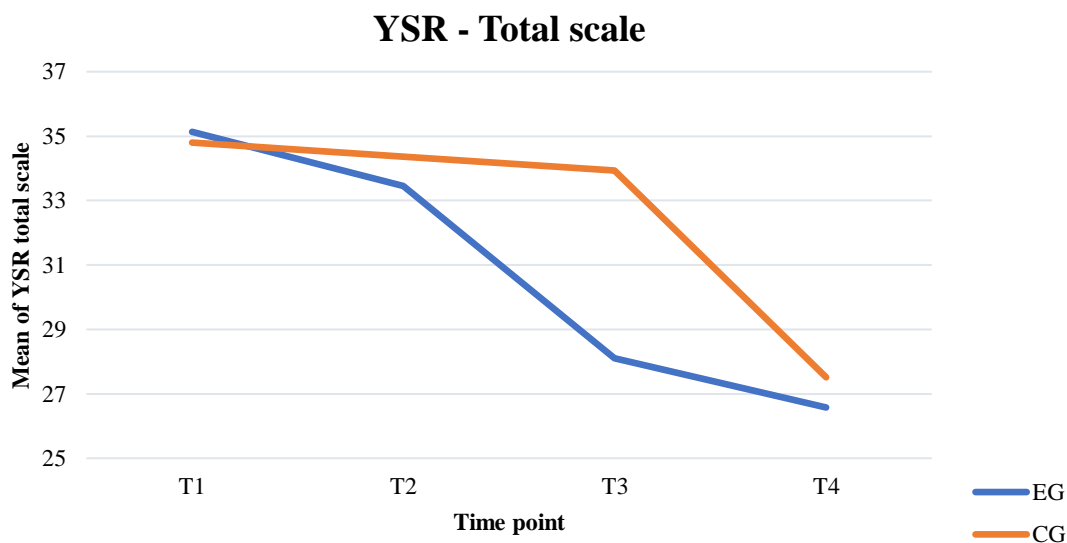
Figure 5. Total scale - Youth Self-Report (YSR) from T1 to T4

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

Similarly, for the parent rating, the CBCL total scale showed no significant differences between both groups at the post- or follow-up assessment (table 12 and figure 6).

The within analyses showed that only the EG significantly reduced with a small effect during the treatment phase ($p = .01$, $\beta = -1.50$, $d = -0.48$). During the follow-up, the EG continued to improve; however, this effect did not become significant ($p = .08$). In the CG, there were no significant effects during the treatment phase; however, a large significant reduction was found during follow-up ($p = .01$, $\beta = -2.88$, $d = -0.92$) (table 13).
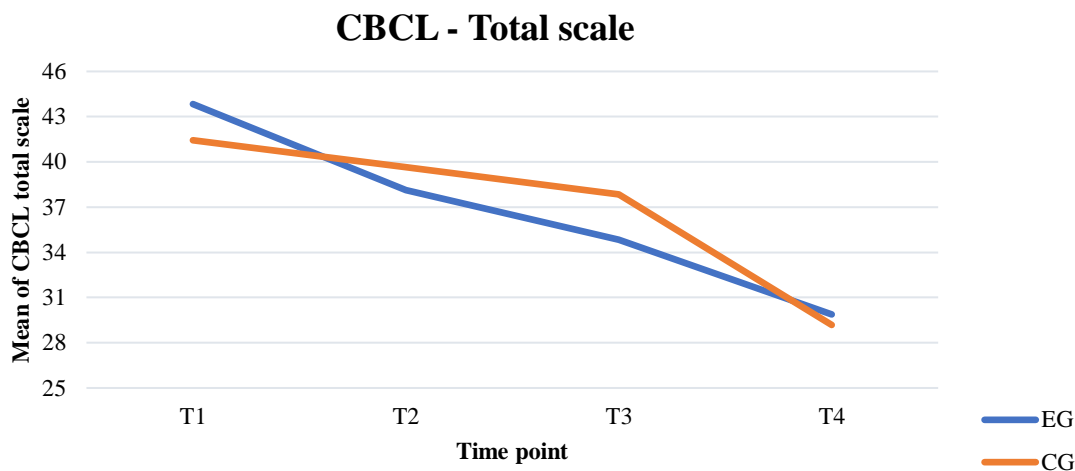
CBCL - Total scale

Figure 6. Total scale - Child Behaviour Checklist (CBCL) from T1 to T4

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

In the teacher rating, between analyses of the TRF-Total showed a statistical superiority of the CG during the treatment phase ($p = .05$, $\beta = 2.13$, $d = 0.52$). A trend towards significance in favour of the EG was found for the teacher-rated total mental health problems (TRF-Total and TRF- Externalizing scale) during the follow-up phase ($p = .10$, $\beta = 3.67$, $d = 0.45$) (table 12 and figure 7).

In teacher rating, the within analysis of the TRF total scale showed that only the CG significantly reduced mental problems with a medium effect during the treatment phase ($p \leq .01$, $\beta = -2.56$, $d = -0.62$). In the EG, there were no significant effects during the treatment phase; however, a large significant reduction was found during the follow-up ($p = .05$, $\beta = -3.38$, $d = -0.82$) (table 13).
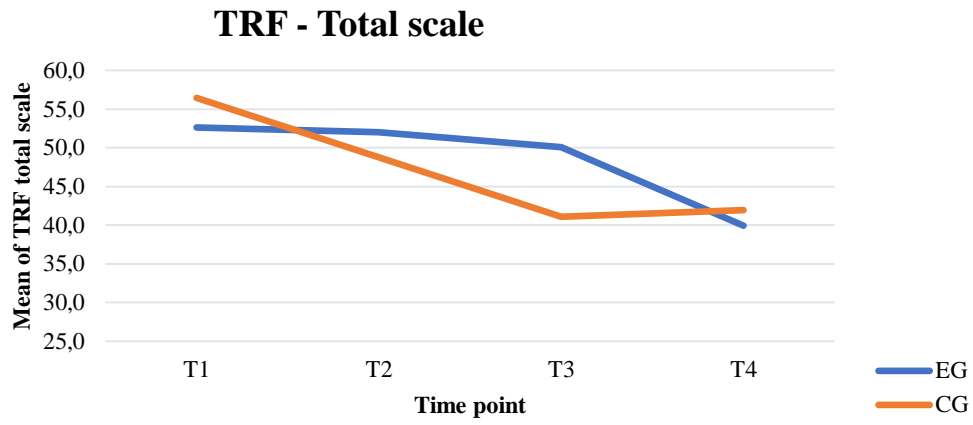
Figure 7. Total scale - Teacher Report Form (TRF) from T1 to T4

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

**Table 12.** Multilevel analyses and effect sizes of the Achenbach scales between both groups for treatment and follow-up phase

Measure	Scale	Group	T1 M (SE)	T2 M (SE)	T3 M (SE)	T4 M (SE)	β	SE	z	d	p	β	SE	z	d	p
							Treatment phase (T1-T3)					**Follow up phase (T3-T4)**				
YSR/11-18R	Total scale	EG	35.13 (3.81)	33.46 (2.89)	28.11 (2.95)	26.58 (3.42)	1.03	0.96	1.07	0.27	.29	-1.6	1.94	-0.8	-0.22	.40
		CG	34.80 (4.42)		33.94 (6.02)	27.51 (4.05)										
	Externalizing	EG	10.60 (1.13)	12.08 (1.08)	9.99 (1.14)	9.72 (6.86)	0.17	0.35	0.5	0.16	.62	-0.6	0.8	-0.8	-0.30	.43
		CG	9.50 (1.20)		9.93 (2.0)	7.78 (1.38)										
	Internalizing	EG	9.17 (1.38)	6.94 (1.09)	5.77 (1.17)	4.29 (0.84)	0.49	0.33	1.48	0.33	.14	0.41	0.57	0.72	0.14	.47
		CG	9.4 (1.87)		8.96 (2.0)	8.71 (1.86)										
	Attention problems	EG	6.90 (0.67)	7.06 (0.54)	6.45 (0.59)	5.95 (0.67)	-0	0.15	-0	-0.02	.98	-0.3	0.28	-1.1	-0.25	.28
		CG	7.33 (0.69)		6.86 (0.71)	5.43 (0.78)										
CBCL/6-18R	Total scale	EG	43.83 (3.27)	38.11 (3.04)	34.82 (3.45)	29.88 (3.74)	0.9	0.75	1.2	0.29	.23	-1.2	1.35	-0.9	-0.20	.36
		CG	41.43 (3.56)		37.83 (3.61)	29.18 (3.32)										
	Externalizing	EG	14.93 (1.52)	12.92 (1.33)	11.05 (1.33)	10.59 (1.48)	0.4	0.29	1.37	0.30	.17	-0.2	0.52	-0.3	-0.06	.78
		CG	13.43 (1.38)		11.97 (1.42)	11.06 (1.76)										
	Internalizing	EG	10.87 (1.07)	8.47 (1.18)	7.78 (1.37)	5.99 (1.33)	0.38	0.28	1.36	0.34	.17	-0.4	0.45	-0.9	-0.19	.35
		CG	9.70 (1.34)		8.87 (1.15)	5.82 (0.95)										
	Attention problems	EG	8.93 (0.55)	8.39 (0.68)	8.00 (0.81)	7.05 (0.80)	0.04	0.15	0.3	0.07	.76	-0.2	0.31	-0.7	-0.19	.48
		CG	9.13 (0.7)		8.47 (0.52)	6.87 (0.63)										
TRF/6-18R	Total scale	EG	52.62 (4.36)	51.99 (5.24)	50.07 (5.62)	39.93 (7.14)	2.13	1.06	-2	0.52	.05*	3.67	2.25	1.63	0.45	.10
		CG	56.44 (4.81)		41.08 (3.89)	41.97 (5.58)										
	Externalizing	EG	13.90 (1.72)	13.20 (2.66)	11.95 (2.06)	9.24 (2.12)	-0.8	0.53	-1.5	-0.46	.13	2.03	1.21	1.67	0.57	.09
		CG	14.28 (2.21)		10.43 (1.82)	10.81 (2.36)										
	Internalizing	EG	9.41 (1.17)	9.57 (1.48)	7.13 (1.55)	7.34 (1.82)	-0.1	0.38	-0.4	-0.10	.73	-0.1	0.51	-0.1	-0.02	.93
		CG	10.13 (1.71)		7.06 (0.87)	7.12 (1.23)										
	Attention problems	EG	24.07 (1.74)	24.30 (2.04)	22.43 (2.52)	20.06 (2.62)	-0.7	0.38	-1.9	-0.46	.06	0.67	0.92	0.73	0.21	.46
		CG	26.21 (1.82)		20.19 (1.76)	19.84 (2.17)										

*Note. * p < .05, ** p < .001. β = beta coefficient, CBCL/6–18R = Child Behavior Checklist 6–18R, CG = control group, EG = experimental group, M = arithmetic mean, n = 60, SE = standard error, TRF/6–18R = Teacher report Form 6–18R, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment, YSR/11–18R = Youth Self-Report 11–18R*

Table 13. Multilevel analyses and effect sizes of the Achenbach total scales within each group for treatment and follow-up phase

Scale	Group	T1 M (SE)	T2 M (SE)	T3 M (SE)	T4 M (SE)	β	SE	z	d	p	β	SE	z	d	p
						Treatment phase (T1-T3)					**Follow up phase (T3-T4)**				
YSR/11-18R Total scale	EG	35.13 (3.81)	33.46 (2.89)	28.11 (2.95)	26.58 (3.42)	-1.17	0.64	-1.84	-0.31	.05*	-0.51	1.07	-0.48	-0.14	.64
	CG	34.80 (4.42)		33.94 (6.02)	27.51 (4.05)	-0.14	0.72	-0.20	-0.04	.84	-2.14	1.66	-1.29	-0.57	.21
CBCL/6-18R Total scale	EG	43.83 (3.27)	38.11 (3.04)	34.82 (3.45)	29.88 (3.74)	-1.50	0.57	-2.65	-0.48	.01*	-1.65	0.91	-1.80	-0.53	.08
	CG	41.43 (3.56)		37.83 (3.61)	29.18 (3.32)	-0.60	0.49	-1.22	-0.19	.23	-2.88	1.03	-2.81	-0.92	.01*
TRF/6-18R Total scale	EG	52.62 (4.36)	51.99 (5.24)	50.07 (5.62)	39.93 (7.14)	-0.42	0.77	-0.55	-0.10	.58	-3.38	1.59	-2.12	-0.82	.05*
	CG	56.44 (4.81)		41.08 (3.89)	41.97 (5.58)	-2.56	0.73	-3.50	-0.62	.00**	0.30	1.18	0.17	0.07	.87

Note. * p < .05, ** p < .001. APC-AP = collected adolescent and parent-rated Academic Problem Checklist, APC-T = teacher-rated Academic Problem Checklist, CBCL = Child Behavior Checklist, CG = control group, EG = experimental group, M = arithmetic mean, SE = standard error, TRF = Teacher Report Form, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment, YSR = Youth Self-Report

9.6.2 DISYPS III

The mental health problems rated using the DISPYS III showed no statistical superiority of either group during the treatment phase in any rater (table 14). During the follow-up phase, there was a trend towards a significance on the ADHS - SBB total scale favouring the EG ($p = .08$, $\beta = 0.06$, $d = 0.38$) (figure 8). There were no differences in the parent and teacher ratings between the two groups (figures 9 & 10).
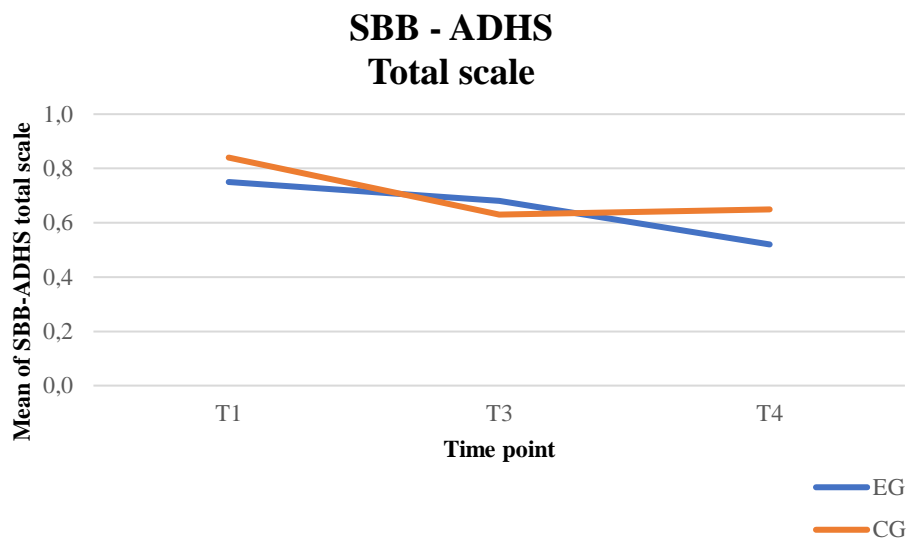
Figure 8. ADHD - Total scale in adolescent rating (DISPYS III: SBB - ADHS)

Note. ADHS = Attention Deficit Hyperactivity Disorder, CG = control group, EG = experimental group, SBB = self-report form, T1 = pre assessment, T3 = post assessment, T4 = follow-up assessment

FBB - ADHS (parent)
Total scale
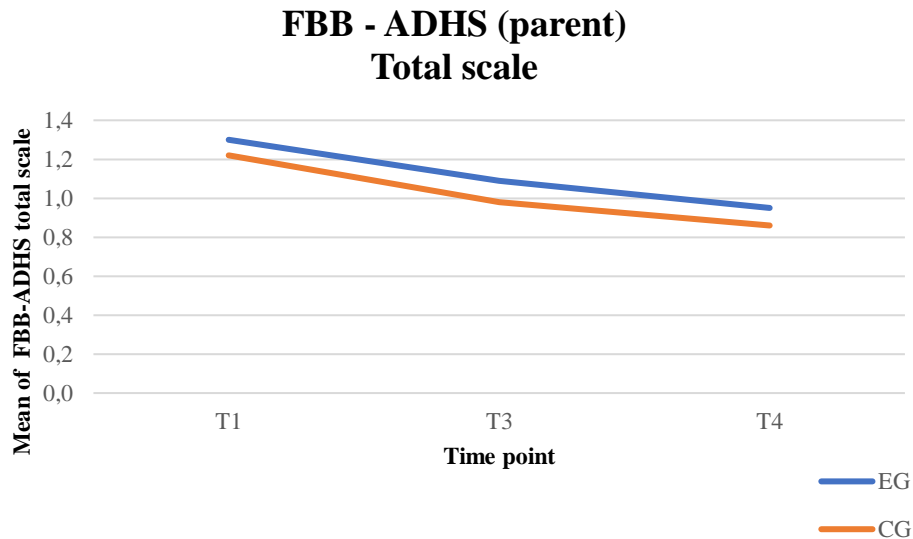
Figure 9. ADHD - Total scale in parent rating (DISPYS III: FBB - ADHS)

Note. ADHS = Attention Deficit Hyperactivity Disorder, CG = control group, EG = experimental group, FBB = Parent / Teacher Rating, T1 = pre assessment, T3 = post assessment, T4 = follow-up assessment

FBB - ADHS (teacher)
Total scale
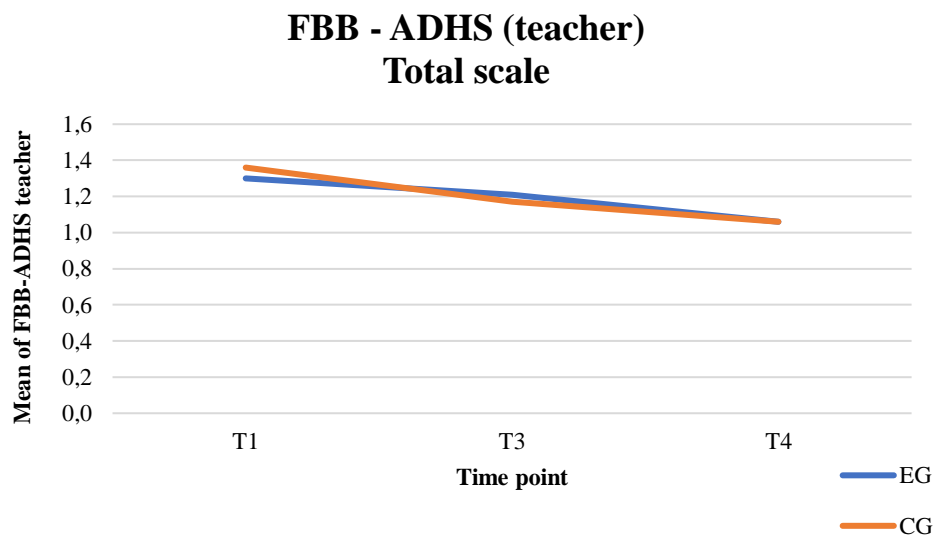
Figure 10. ADHD - Total scale in teacher rating (DISPYS III: FBB - ADHS)

Note. ADHS = Attention Deficit Hyperactivity Disorder, CG = control group, EG = experimental group, FBB = Parent / Teacher Rating, T1 = pre assessment, T3 = post assessment, T4 = follow-up assessment

9.6.3 WFIRS

During the treatment phase, no significant differences between the two groups regarding the WFIRS family scale were found (table 15). However, during the follow-up, the EG significantly improved compared to the CG with a medium effect size ($p = .04$, $\beta = 0.09$, $d = 0.51$) (figure 11). The WFIRS school scale showed no significant differences (figure 12).
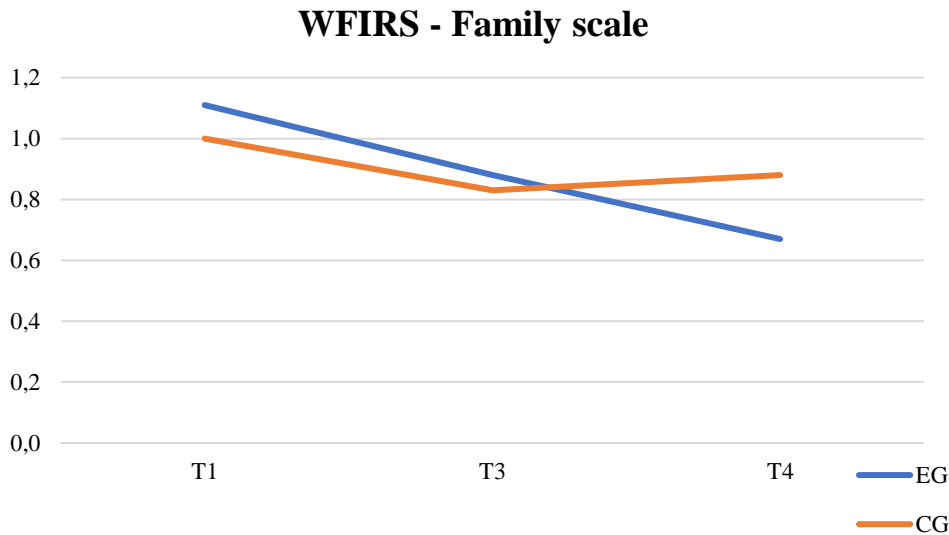
Figure 11. WFIRS - Family scale in parent rating

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment, WFIRS = Weiss Functional Impairment Rating Scale

Figure 12. WFIRS - School scale in parent rating

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment, WFIRS = Weiss Functional Impairment Rating Scale

Table 14. Multilevel analyses and effect sizes of the DISPYS III scales (ADHS and SSV) between both groups for treatment and follow-up phase

Measure	Scale	Group	T1 M (SE)	T3 M (SE)	T4 M (SE)	Treatment phase (T1-T3) β	SE	z	D	p	Follow up phase (T3-T4) β	SE	z	d	p
SBB (adolescent)	ADHD Total	EG	0.75 (0.08)	0.68 (0.08)	0.52 (0.09)	-0	0.02	-1.4	-0.26	.16	0.06	0.04	1.74	0.38	.08
		CG	0.84 (0.09)	0.63 (0.06)	0.65 (0.09)										
	SSV Total	EG	0.31 (0.04)	0.31 (0.06)	0.25 (0.05)	0.02	0.01	1.15	0.41	.25	-0	0.03	-1.2	-0.31	.24
		CG	0.37 (0.06)	0.46 (0.08)	0.34 (0.06)										
FBB (parent)	ADHD Total	EG	1.30 (0.11)	1.09 (0.14)	0.95 (0.13)	0.00	0.02	-0.2	0.00	.83	0.01	0.05	0.14	0.05	.89
		CG	1.22 (0.09)	0.98 (0.08)	0.86 (0.09)										
	SSV Total	EG	0.60 (0.06)	0.44 (0.05)	0.44 (0.06)	0.01	0.01	0.85	0.27	.39	0.00	0.02	-0.1	0.00	.95
		CG	0.53 (0.06)	0.44 (0.06)	0.44 (0.07)										
FBB (teacher)	ADHD Total	EG	1.30 (0.12)	1.21 (0.14)	1.06 (0.17)	-0.01	0.03	-0.7	-0.20	.48	0.01	0.05	0.3	0.05	.76
		CG	1.36 (0.11)	1.17 (0.09)	1.06 (0.14)										
	SSV Total	EG	0.28 (0.04)	0.21 (0.04)	0.15 (0.04)	0	0.01	0.32	0.05	.75	0.03	0.02	1.25	0.40	.21
		CG	0.26 (0.05)	0.22 (0.05)	0.25 (0.06)										

Note. $*p < .05$, $**p < .001$. ADHD = Attention Deficit Hyperactivity Disorder, CG = control group, EG = experimental group, FBB = Parents and Teacher Report, M = arithmetic mean, SBB = Self-Report Form, SE = standard error, SSV = conduct disorder, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

Table 15. Multilevel analyses and effect sizes of the WFIRS scales between both groups for treatment and follow-up phase

Scale	Group	T1 M (SE)	T3 M (SE)	T4 M (SE)	Treatment phase (T1-T3) β	SE	z	d	P	Follow up phase (T3-T4) β	SE	z	d	p
WIFRS Family scale	EG	1.11 (0.09)	0.88 (0.12)	0.67 (0.08)	0.01	0.22	0.45	0.11	.65	0.09	0.44	2.03	0.51	.04*
	CG	1.0 (0.10)	0.83 (0.10)	0.88 (0.11)										
WIFRS School scale	EG	1.34 (0.09)	0.94 (0.10)	0.87 (0.11)	0.03	0.03	1.15	0.38	.25	-0.03	0.54	-0.49	-0.19	.63
	CG	1.23 (0.08)	1.01 (0.08)	0.86 (0.08)										

Note. $*p < .05$, $**p < .001$. CG = control group, EG = experimental group, M = arithmetic mean, SE = standard error, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment, WFIRS = Weiss Functional Impairment Rating Scale

9.7 Individual problemlist

Table 16 displays the mean values, standard errors and MLM results for the frequency and total functional impairment of the individual problem list from T1 to T4 in the adolescent, parent, and teacher ratings.

The between analysis regarding the mean frequency of problems rated by the adolescent showed that the EG improved significantly more ($p \leq .01$, $\beta = 0.25$, $d = 0.51$) than the CG during the treatment phase. The functional impairment scale improved in both groups, but there was no superiority. During the follow-up phase, both groups continued to improve however no statistically significant difference between the groups was found.

The within analyses in the EG showed a significant reduction on the frequency scale during the first phase (T1-T2) with a large effect size ($p \leq .01$, $\beta = 0.33$, $d = 0.93$) (table 17 & figure 13). The CG had no significant effect during the first phase and showed a significant negative effect during the second phase (T2-T3), indicating a worsening of problems ($p = 0.04$, $\beta = -0.17$, $d = -0.48$). For the adolescent rated impairment scale of the IPL, no significant results in either group were found.

Figure 13. Individual Problemlist (IPL) frequency scale rated by the adolescent from T1 to T4
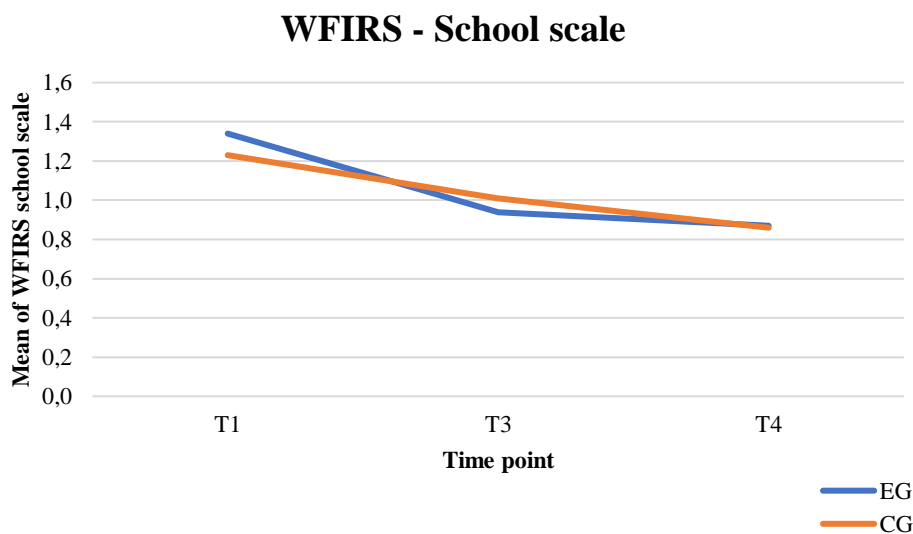
Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

In the parents rating of the IPL, when comparing both groups with each other in a between analyses, a significant difference in favour of the EG was found for the frequency ($p \leq .01$, $\beta = 0.22$) and the impairment scale ($p \leq .01$, $\beta = 0.43$). Both groups continued to improve throughout the follow-up phase, with no statistical superiority of either group (table 17 & figure 14).

The within analyses of the EG showed a significant reduction of the impairment scale ($p \leq .01$, $\beta = 0.65$, $d = 0.85$) during the first treatment phase (T1-T2). No other significant results were found for the within analyses in the parent rating.

IPL - Parent frequency
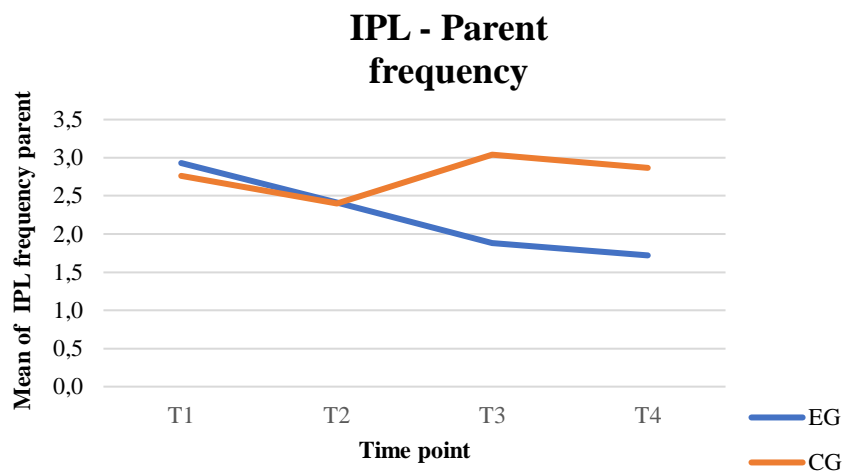
Figure 14. Individual Problemlist (IPL) frequency scale rated by the parent from T1 to T4

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

Neither the between analyses nor the within analyses showed any significant effects on teacher rating in any of the IPL scales (table 17 & figure 15). Both groups improved throughout the treatment phase, with no statistical significance. During the follow-up phase, a trend towards the superiority of the EG was found for the frequency scale ($p = .08$, $\beta = 0.31$).
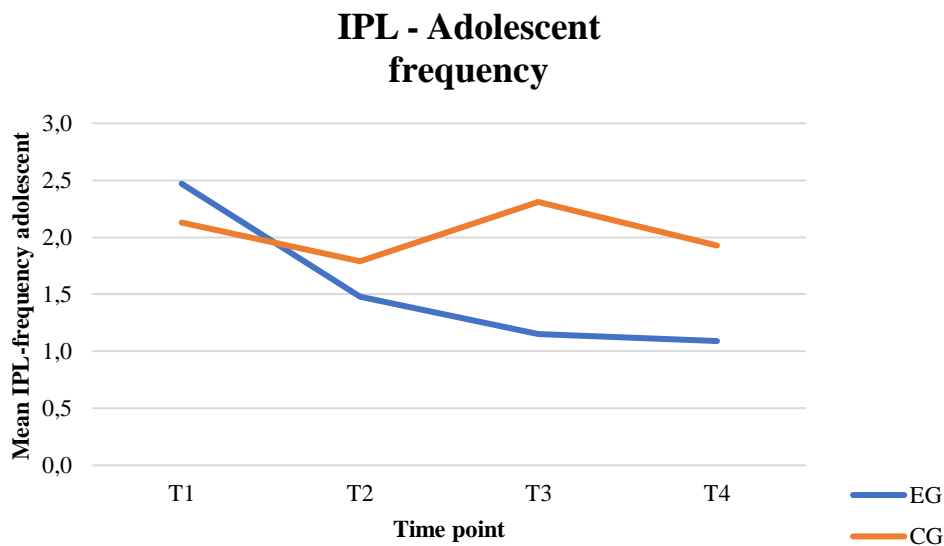
IPL - Teacher frequency
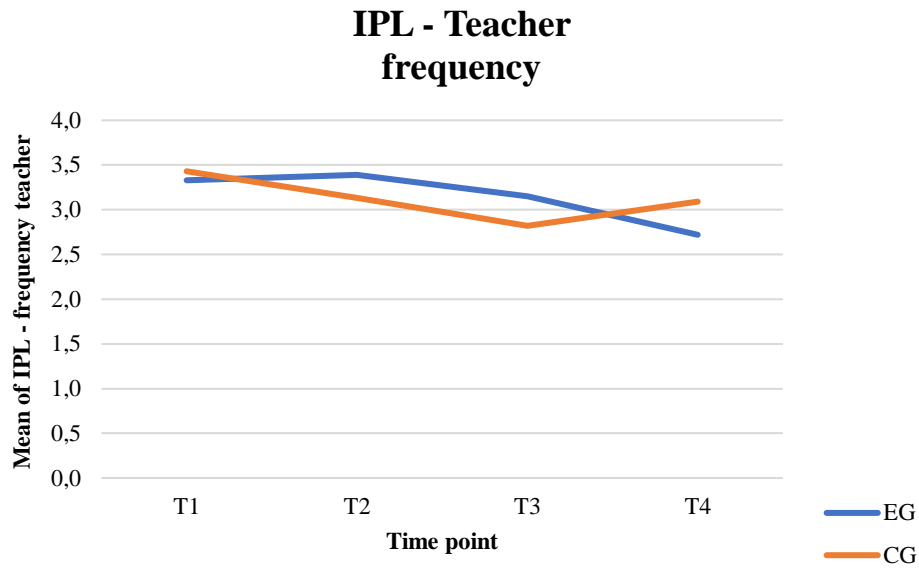
Figure 15. Individual Problemlist (IPL) frequency scale rated by the teacher from T1 to T4

Note. CG = control group, EG = experimental group, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

Table 16. Multilevel analyses and effect sizes for the Individual Problemlist (IPL) between both groups for treatment and follow-up phase

Measure	Scale	Group	T1 M (SE)	T2 M (SE)	T3 M (SE)	T4 M (SE)	β	SE	z	d	p	β	SE	z	d	p
							Treatment phase (T1-T3)					**Follow-up phase (T3-T4)**				
IPL adolescent	frequency	EG	2.47 (0.21)	1.48 (0.16)	1.15 (0.23)	1.09 (0.19)	0.25	0.06	4.10	1.42	.00**	-0.11	0.11	-0.93	-0.31	.35
		CG	2.13 (0.19)	1.79 (0.19)	2.31 (0.24)	1.93 (0.27)										
	total impairment	EG	3.73 (0.43)	2.93 (0.48)	2.73 (0.44)	2.19 (0.46)	0.05	0.12	0.47	0.13	.64	0.03	0.26	0.10	0.04	.92
		CG	3.82 (0.44)	3.16 (0.52)	3.16 (0.49)	2.69 (0.53)										
IPL parent	frequency	EG	2.93 (0.24)	2.41 (0.25)	1.88 (0.23)	1.72 (0.22)	0.22	0.07	3.14	1.10	.00**	0.00	0.14	-0.02	0.00	.98
		CG	2.76 (0.22)	2.40 (0.33)	3.04 (0.25)	2.87 (0.28)										
	total impairment	EG	5.69 (0.48)	3.75 (0.51)	3.08 (0.53)	2.26 (0.34)	0.43	0.13	3.37	1.13	.00**	0.30	0.28	1.06	0.39	.29
		CG	4.42 (0.43)	4.32 (0.55)	4.37 (0.53)	4.45 (0.47)										
IPL teacher	frequency	EG	3.33 (0.25)	3.39 (0.25)	3.15 (0.27)	2.72 (0.28)	-0.07	0.72	-0.97	-0.35	.33	0.23	0.14	1.71	0.57	.08
		CG	3.43 (0.21)	3.13 (0.19)	2.82 (0.22)	3.09 (0.24)										
	total impairment	EG	5.04 (0.50)	5.46 (0.54)	4.66 (0.67)	3.98 (0.56)	-0.12	0.16	-0.73	-0.30	.47	0.50	0.33	1.51	0.63	.13
		CG	5.30 (0.43)	5.25 (0.50)	4.23 (0.51)	5.05 (0.51)										

*Notes. * $p < .05$, ** $p < .001$. M = arithmetic mean, IPL= Individual Problemlist, SE = standard error, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment*

Table 17. Multilevel analyses and effect sizes for the Individual Problemlist (IPL) within each group for treatment and follow-up phase

Measure	Scale	Group	Pre to intermediate assessment (T1-T2)					Intermediate to post-assessment (T2-T3)					Follow-up (T3-T4)				
			β	SE	Z	d	p	β	SE	z	d	p	β	SE	z	d	p
IPL adolescent	frequency	EG	-0.33	0.07	-4.36	-0.93	0.00**	-0.11	0.09	-1.21	-0.31	.24	0.00	0.04	-0.46	0.01	.65
		CG	-0.11	0.09	-1.24	-0.31	0.22	0.17	0.81	2.15	0.48	.04*	-0.13	0.11	-1.18	-0.37	.25
	total impairment	EG	-0.26	0.20	-1.31	-0.34	0.20	-0.07	0.22	-0.30	-0.09	.77	-0.18	0.16	-1.14	-0.23	.27
		CG	-0.22	0.24	-0.92	-0.29	0.37	0.00	0.22	0.00	0.00	.99	-0.16	0.22	-0.72	-0.21	.48
IPL parent	frequency	EG	-0.17	0.11	-1.54	-0.43	0.14	-0.18	0.09	-1.83	-0.45	.08	-0.06	0.07	-0.78	-0.15	.45
		CG	-0.12	0.10	-1.17	-0.30	0.26	0.21	0.13	1.65	0.53	.11	-0.06	1.21	-0.48	-0.15	.63
	total impairment	EG	-0.65	0.24	-2.71	-0.85	0.01*	-0.22	0.21	-1.08	-0.29	.30	-0.27	0.22	.1.21	-0.35	.24
		CG	-0.04	0.21	-0.17	-0.05	0.87	0.01	0.25	0.01	0.01	.95	0.03	0.20	0.14	0.04	.88
IPL teacher	frequency	EG	0.02	0.11	0.17	0.05	0.86	-0.08	0.10	-0.78	-0.20	.44	-0.14	0.12	-1.16	-0.35	.26
		CG	-0.10	0.06	-1.61	-0.25	0.12	-0.10	0.08	-1.24	-0.25	.23	0.09	0.07	1.27	0.22	.22
	total impairment	EG	-0.14	0.21	0.66	-0.18	0.52	-0.26	0.26	-1.03	-0.33	.32	-0.23	0.30	-0.75	-0.29	.47
		CG	-0.02	0.22	-0.07	-0.03	0.94	-0.34	0.21	-1.59	-0.43	.12	0.27	0.23	1.20	0.34	.24

Notes. * $p < .05$, ** $p < .01$ CG = control group, EG = experimental group, IPL= Individual Problemlist, M = arithmetic mean, SE = standard error, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, T4 = follow-up assessment

9.8 Additional effects of the therapy app

App usage and additional app effect

Table 18 shows the results from the app effect analysis. When the treatment phase without the app (T1 to T2) was compared with the treatment phase with the app (T2 to T3), no incremental effect was found for any of the variables favouring the app (figure 16). The phase without the app had a significant decline on the APC-AP compared to the phase with the app with a large effect size ($p = .01$, $\beta = -0.14$, $d = 1.82$).

Table 18. Multilevel analyses and effect sizes of the experimental group for the additionall app effect

Measure	Scale	Treatment phase without app (T1-T2) vs. Treatment phase with App (T2-T3)				
		β	SE	z	d	p
Clinical Rating	APC- AP	-0.14	0.05	-2.53	-1.82	.01*
	APC- T	-0.02	0.06	-0.31	-0.23	.76
YSR / 11-18R	Total Scale	1.23	1.20	1.02	0.33	.31
CBCL / 6-18R	Total Scale	-0.81	1.50	-0.54	-0.26	.59
TRF / 6-18R	Total Scale	0.43	1.88	0.23	0.10	.82
IPL - adolescent	Frequency	-0.22	0.15	-1.51	-1.25	.13
	Total impairment	-0.20	0.39	-0.51	-0.52	.61
IPL - parent	Frequency	0.00	0.18	0.01	0.01	.98
	Total impairment	-0.43	0.40	-1.07	-1.11	.29
IPL - teacher	Frequency	0.10	0.17	0.58	0.48	.56
	Total impairment	0.41	0.36	1.13	1.02	.26

*Notes. * p < .05. APC-AP = collected adolescent and parent-rated Academic Problem Checklist, APC-T = teacher-rated Academic Problem Checklist, β = beta coefficient, CBCL/6–18R = Child Behavior Checklist 6–18R, IPL= Individual Problemlist, SE = standard error, TRF/6–18R = Teacher report Form 6–18R, T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment, YSR/11–18R = Youth Self-Report 11-18R*
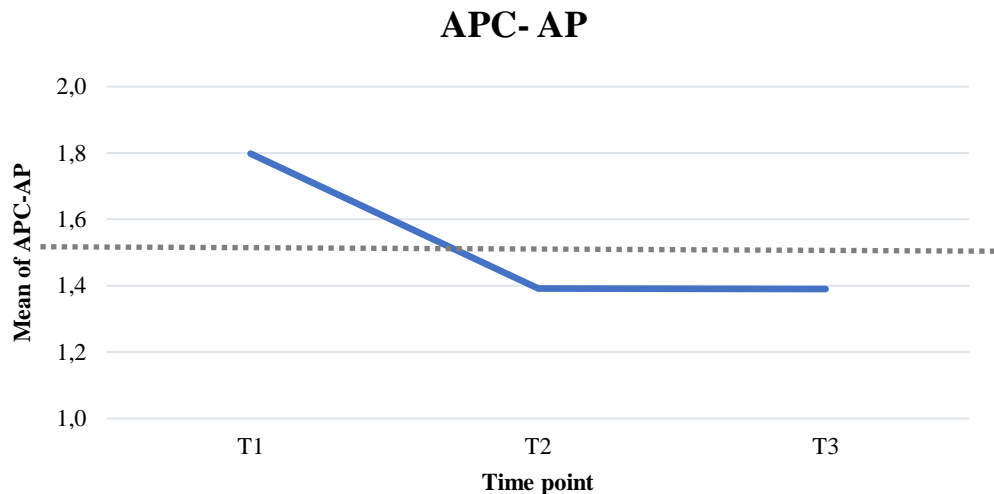
APC- AP

Figure 16. Additional app effect Academic Problem Checklist (APC-AP) of the treatment group

Note. Stripped line (clinical cut off). T1 = pre assessment, T2 = intermediate assessment, T3 = post assessment,

Satisfaction with the therapy app

The questionnaire of the patients evaluating the app showed on the success scale ($n = 5$ items, Cronbach's alpha $\alpha = 0.90$) a partial success ($M = 1.15$). Regarding app use, the adolescents rated using the app too little ($M = 1.61$) on a four-point Likert Scale (range 0-3). The analysis of the app satisfaction therapist evaluating the app showed on the success scale ($n = 4$ items, Cronbach's alpha $\alpha = 0.79$) a partial success ($M = 1.28$). Regarding the app use, the therapist similarly rated that the adolescents had used the app too little ($M = 2.00$).

9.9 Treatment satisfaction and therapy compliance

Treatment Satisfaction (TEQ)

Adolescents rated therapy satisfaction ($n = 19$) at an average $M = 3.52$ ($SD = 0.61$) and success of treatment $M = 3.26$ ($SD = 0.73$). Parents rated therapy satisfaction ($n = 17$) at an average of $M = 3.53$ ($SD = 0.72$) and success of treatment at $M = 2.94$ ($SD = 0.85$). A range of 2.5 to 3.5 may be regarded as "predominantly satisfied," whereas a range of 1.5 to 2.5 can be interpreted as "somewhat satisfied."

Therapy compliance

The evaluation of the questionnaire measuring therapy compliance showed that, on average, patients had a mean of $M = 2.15$ and parents of $M = 2.44$ on a four-point Likert Scale (range 0-3) on complying with therapy. Figure 17 shows the course of the therapy compliance of both adolescents and parents. Descriptively it is shown that the compliance in the adolescent group decreases throughout treatment.
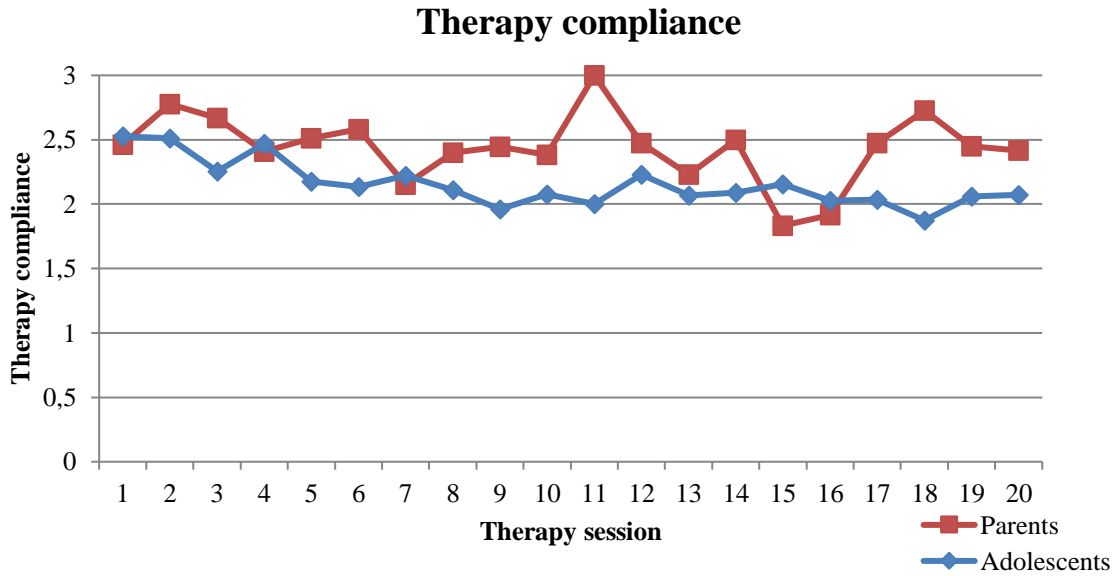
Figure 17. Therapy compliance total scale in adolescent and parent rating

Treatment integrity

The evaluation of the treatment integrity questionnaire showed a high adherence of the therapists to the therapy manual. On average, the treatment integrity was 88 % (Figure 18), indicating that clinicians reported a strong fidelity within implementing the SELBST manual. The remaining time of the sessions that were not spent on academic issues are portrayed in figure 19. Most time was spent building a solid therapist-patient relationship (29 %) and dealing with issues and conflicts between adolescents and the parents (19 %).
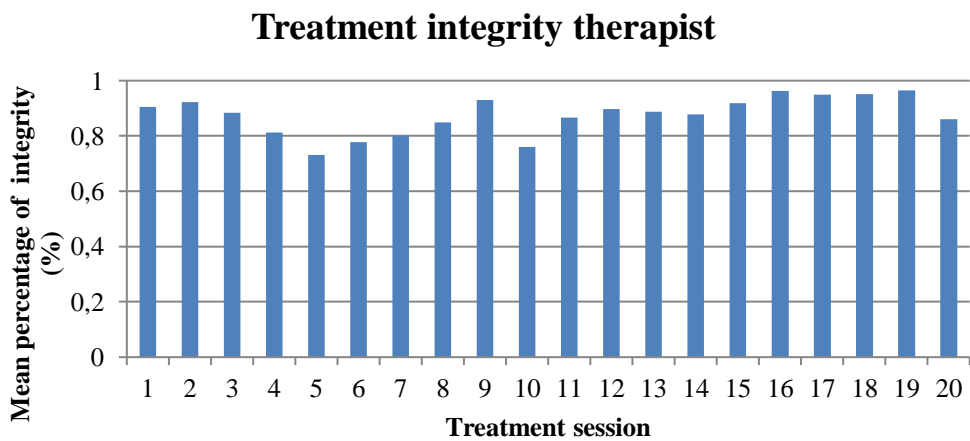
Figure 18. Treatment integrity of therapists

Other topics of therapy

- Strengthening therapeutic relationship
- Parent-adolescent conflict
- Not specified
- Organisational issues
- School conflicts
- Psychoeducation
- Peer Relationships
- Future perspectives
- Completing questionnaires
- Strengthening motivation
- Progress evaluation
- Reinforcement plans
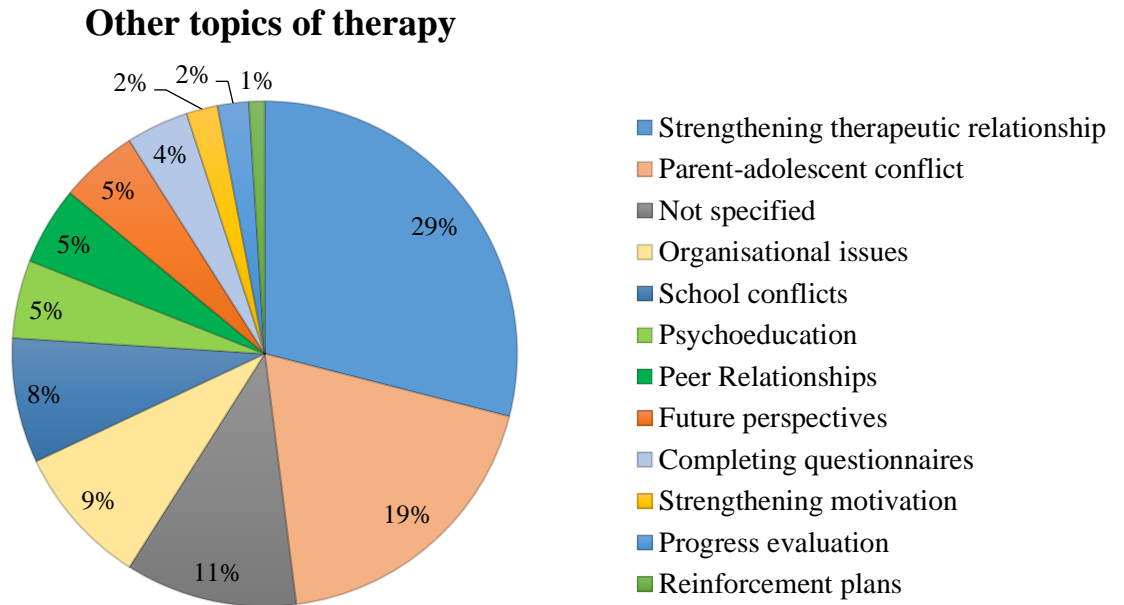
Figure 19. Overview of other topics discussed in therapy beyond academic problems

Therapy job adherence during app phase

It was found that 57 % of the time, adolescents used the app to complete their therapy job. In the other cases, they did not complete their jobs or did not use the app. The adherence to the therapy jobs during the app phase is shown in figure 20.

Therapy job app compliance

- App could be used without problems
- No information
- Smartphone forgotten
- No Jobs
- Smartphone broken
- App did not work properly
- Smartphone battery empty
- Refusal to use app by patient
- App not installed
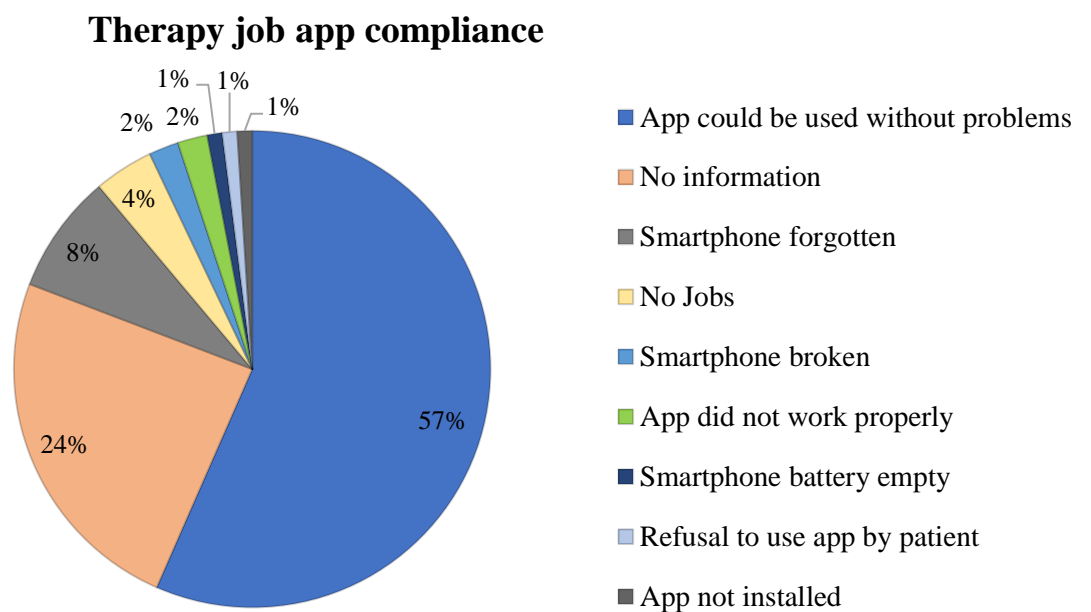
Figure 20. Overview of therapy job app compliance

9.10 Summary of the results

The sample consisted of $n = 60$ adolescents (85.0 % boys) aged 11 to 18 years ($M = 13.25$, $SD = 1.7$). The psychometric properties of the revised primary outcome, the Academic Problem Checklist (APC), showed that it is a valid instrument for clinicians to assess academic underachievement in adolescents with mental disorders. The reliability analysis yielded good internal consistencies ($.82 \leq \alpha \leq .87$) and excellent inter-and intra-rater reliabilities ($.88 \leq \alpha \leq .90$). Convergent and divergent validity analyses confirmed the structure of the APC.

Analyses of the RCT revealed no superiority in either group regarding the combined adolescent and parent assessment (APC-AP) during the treatment or follow-up phase. There is a statistical superiority in the teacher assessment (APC-T) with a medium effect of the EG during follow-up ($d = .79$). The within analyses showed that academic achievement problems measured with the APC were statistically significantly reduced in both groups during the treatment phase with medium to large effect sizes, both in the combined adolescent and parent rating and teacher rating. The EG also showed a statistical superiority over the CG on GPA with a small effect size ($d = 0.43$).

The global mental health questionnaires analyses (CBCL, YSR and TRF) found no overall statistical superiority of the experimental group. For the self-rated mental problems (YSR total scale), the within analyses showed statistically significant symptom reductions during the treatment phase with a small effect size for the EG ($d = .31$) and no CG improvements. Similarly, in the parent rating (CBCL), a significant reduction of mental problems during the treatment phase for the EG was found ($d = .48$). The teacher assessment (TRF) found a significant effect favouring the CG at post-assessment with a medium effect ($d = .52$). The within analyses found large improvements in the EG during the follow-up ($d = .82$). The WIFRS family scale showed a statistical superiority of the EG during the follow up with a medium effect size ($d = .51$). The DISYPS III questionnaires showed no significant differences between the groups in any rater.

The Individual Problemlist (IPL) in self-rating showed a superiority of the EG compared to the CG with a large effect size ($d = 1.42$) on the frequency scale. Similarly, for the parent assessment, a superiority of the EG over CG with a large effect size ($d = 1.10$) was found for the frequency scale ($d = 1.10$) and the impairment scale ($d = 1.13$). Both groups showed a reduction in the teacher assessment of the IPL but no statistical significance or superiority of either group.

When the app was introduced during the second treatment phase, no additional benefit was found on any outcome measures. The treatment satisfaction was high for adolescent, parent and therapist rating.

10. Discussion

The present study investigated the effectiveness of a therapy program for adolescents suffering from academic underachievement and mental problems. For this purpose, an RCT was conducted evaluating the module "SELBST- Volume 2. Achievement problems in adolescence" (Walter & Döpfner, 2009) in a sample of $n = 60$ adolescents aged 11-18 years suffering from academic underachievement and various mental disorders. Additionally, the psychometric properties of the main outcome, the academic problems checklist (APC), were analysed. A smartphone app was developed (todoly) to improve the therapy transfer. It was hypothesized that the improvement of the experimental group would be significantly larger than the changes in the control group, receiving treatment as usual. Significant reductions in academic underachievement measures and mental symptomatology of the adolescents could be demonstrated, but with no statistical superiority of one group. Statistical superiority of the EG was found for the individual problemlist scales rated by the adolescent and the parent with large effects. However, the results indicate that the hypotheses postulated in advance could not be confirmed for all outcome parameters and several limitations exist.

In this chapter, the study results with reference to the current state of research are discussed. First, the sample and the methods, then the results of the psychometric analyses of the APC and the results of the RCT will be discussed. In addition, the experiences of implementing the smartphone app are discussed to identify positive and hindering factors for the practical implementation of the SELBST – achievement problems module and the todoly app. Finally, an outlook is given.

10.1 Discussion of sample and methods

The sample consisted of $n = 60$ adolescents, randomized into two groups (EG and CG), and statistical analyses showed no significant pre-assessment differences between the two groups, indicating successful randomization. As expected, most of our sample consisted of male participants (85.0 %), similar to previous studies (Benson et al., 2021; Sibley et al., 2014) and representing the gender distribution of academic underachievement (Brunstein & Glaser, 2014). The inclusion criteria for age was 11-18 years, and the mean age was $M = 13.25$. Most adolescents suffered from an externalizing disorder (83.3 %), and the mean IQ of the sample was $M = 104$, which is similar to the study by Sibley and co-workers (2016).

Initially, the sample size was defined as sufficiently large for a multilevel analysis (Hox, Moerbeek, & Van de Schoot, 2017). An advantage of multilevel analyses is that all participants with at least one observation are included in analyses, minimising missing data's impact (West,

Welch, & Galecki, 2006). The selected measurement instruments proved to be suitable for testing the hypotheses. The range of instruments allowed the assessment of academic underachievement, mental problems, as well as functional impairments of the adolescents. The majority of the questionnaires have good to very good psychometric properties. In order to obtain a picture as comprehensive as possible of the symptomatology and changes, the rating of the adolescent, the parent and teachers were assessed.

10.2 Assessment of academic underachievement

A valid clinical assessment of adolescent academic underachievement is critical to identify affected adolescents and provide appropriate recommendations and treatment plans. In order to make a well-informed diagnosis of academic underachievement, an assessment tool with valid and reliable psychometric properties is necessary. Therefore, the study's first aim was to examine the psychometric properties of the Academic Problems Checklist (APC). Our results confirm the reliability and validity of the shortened final 17-item version of the APC.

Contrary to our expectations, the internal consistency analysis led to the removal of 50 % of the items of the original 34 -item version due to low item-subscale and item-total correlations, thus leading to the elimination of all items assessing dysfunctional cognition. The dysfunctional cognition items measured global academic self-concept, academic motivation, academic performance fear, and the perceived parental involvement in daily academic life. Academic self-concept is a vital factor to prevent the development of academic underachievement. Academic self-concept and academic underachievement have been shown to have a significant correlation, with reciprocal-effects, whereby previous self-concept influences subsequent academic achievement and previous achievement affects subsequent self-concept (Guay, Marsh, & Boivin, 2003; Marsh, Byrne, & Yeung, 1999; Veas, Castejón, Gilar, & Miñano, 2015). Assured and confident students view complex tasks as challenges that they can conquer rather than threats that need to be avoided. Higher rates of self-concept indicate a willingness to engage in learning and an openness to academic experiences, therefore, improving the achievement. Students believing that they can develop and learn is vital for better academic achievement (Pajares & Schunk, 2001). Therefore, the initial inclusion of these items in the APC had a theoretical foundation.

However, a reason for the elimination of these items could be that recent studies have shown that non-cognitive variables may predict academic achievement incrementally better than cognitive variables (Veas et al., 2015). These results fit with recent studies demonstrating that behavioural variables are better predictors of academic underachievement than cognitive

variables (Pajares & Schunk, 2001; Susperreguy, Davis-Kean, Duckworth, & Chen, 2018; Veas et al., 2015). Another possible explanation is that even though students' beliefs and emotions about themselves are essential determinants of academic achievement, the correlation between them is only strong and positive when domain-specific achievements match them (Guay et al., 2003; Valentine, DuBois, & Cooper, 2004). Meaning that there is a strong positive relationship between the domain-specific self-concept (e.g., math skills) and academic achievement in that domain (e.g. math achievement). However, this is not the case when global self-concept and overall academic achievement is compared (Pajares & Schunk, 2001). As the cognitive items of the APC measured concepts of global academic self-concept and self-belief, it is, comprehensible that these did not contribute to the overall consistency of the APC. An idea for further research could be to include domain-specific items about self-concept in the measures of academic underachievement. The scale development should begin with a bottom-up approach and subsequent psychometric analyses to identify suitable items (Cella et al., 2019; Krueger et al., 2018; Schreier, 2012).

After removing 17 items, the final APC-AP and APC-T displayed excellent internal consistency. The high inter-and intra-rater agreement reinforced the usability and application of the APC. The APC was recorded as an interview on tape to avoid an assessor bias. This allowed a blinded assessor to rate the clinical checklist again independently. As previous studies have not focused on this, our study adds important knowledge to the research field by demonstrating a high inter-and intra-rater agreement for an academic underachievement instrument.

The factor analyses identified only one latent factor. However, Sibley et al. (2014) found a two-factor structure (academic skills and disruptive behaviour) for their clinical checklist (AAPC) using a larger sample size ($n = 326$). Even though similar items to these dimensions were included in our analysis, no distinct meaningful second factor could be found here. A possible explanation for this could be the limited sample size and the lack of items measuring disruptive behaviour. The final 17-items APC only contained three items measuring disruptive behaviour, whereas the AAPC checklist of Sibley et al. (2014) contained six items.

The domain with the highest means for all raters was time management (e.g. no timely preparation for exams, no fixed study times) and planning problems (e.g. no strategies for task processing, unstructured learning). Even though troubling behaviour during class time (e.g. disrupts other classmates, interrupts or talks during class) was a problem that all raters reported, it appeared less of a problem than the former two. In contrast to their younger counterparts

(Abikoff et al., 2002), most academically impaired adolescents did not exhibit much disruptive behaviour in the classroom. This is following previous literature that suggests that the hyperactivity aspect of ADHD decreases throughout adolescence, whereas the inattentive problems often remain (Wolraich et al., 2005). This finding possibly reflects the developmental changes in the manifestation of ADHD in adolescence and indicates that ADHD-related causes of academic underachievement may be fundamentally different in childhood and adolescence (Sibley et al., 2014; Wolraich et al., 2005). As much of our sample has consisted of adolescents suffering from externalizing diagnosis, including ADHD, our data supports this finding.

There was a significant but low correlation between the APC-AP and the APC-T, supporting the findings of Sibley et al. (2014), who reported moderate correlations. These results fit perfectly with a large meta-analysis revealing that information differs considerably across raters within clinical samples of adolescents (De Los Reyes et al., 2015). These differences may indicate a lack of opportunity for the informant to observe that specific behaviour or that the adolescent behaves differently in different contexts, or that the observer interprets it differently. For example, parents and adolescents reported higher impairment on items measuring homework, while teachers reported higher impairment on students forgetting school supplies and classroom behaviour problems - a finding in line with the results of Sibley et al. (2014). One reason for this might be that parent involvement around homework increases parent-adolescent conflict, highlighting this problem in the home setting (Steinberg & Morris, 2001).

The validity of the APC with variables in its nomological network was as expected. A high score on the APC-AP was associated with high scores on all parent measures of academic underachievement (school competence scale of CBCL and school scale of WIFRS), supporting previous findings (Sibley et al., 2014). Equally, parental involvement in the adolescent's academic career is vital. A meta-analysis showed that the parent's expectation for their child has the highest correlation with academic achievement, while communication about school matters such as homework and school progress also has a moderate influence on academic achievement (Carter, 2009). The results from this study support the existing evidence that parental reports are vital for a thorough assessment of academic underachievement (De Los Reyes et al., 2015).

The correlation between the APC-T and GPA strongly suggests that teachers rating of the APC-T provides a reliable report of academic functioning. This is also reflected in the moderate to high correlations of the APC-T with the subscales of the TRF (attention and school

competence scale) and the teacher-rated FBB-ADHS (inattention and hyperactivity/impulsivity scale). Teachers´ insights regarding adolescents´ behaviour are particularly relevant as they often spend more time with them than their parents. Consequently, teachers are often the first to recognise behavioural problems (Orpinas et al., 2015). Another valuable factor is that teachers have experience and comparison methods with other students from the same age group, allowing them to establish an informal standard for evaluating students behaviour more objectified than parents (Farrell, Goncy, Sullivan, & Thompson, 2018). Even though it is often challenging to obtain teacher reports about individual students in secondary school, all necessary efforts should be taken by clinicians to obtain this information.

Teachers overall reported more severity on the individual items. It could be that teachers consider only the academic domain when rating students on global indices (e.g. TRF, GPA) or are influenced by the halo effect (Benson et al., 2021; Costello, Loeber, & Stouthamer-Loeber, 1991; Kamphaus et al., 2007; Sibley et al., 2014). The halo effect occurs when one characteristic or trait of a person is utilized to form an overall opinion of that person. On the other hand, parents observe their children in multiple domains throughout the day and could be better at distinguishing between global symptoms and academic achievement problems. As teachers and parents observe adolescents' behaviour in different settings, they are both essential to gain a complete picture.

The school competence scale in the adolescent rating (YSR) did not correlate significantly with the APC-AP. This might illustrate adolescents' tendency to downplay especially academic problems, and lack of ability to provide accurate reports of their school functioning argued previously (Evans et al., 2013; Smith et al., 2000). The APC considers these obstacles by combining both parent and adolescent information into one collaborative clinical rating. Previous studies have shown that despite rating differences, parents, teachers, and adolescents agree on the existence of underachievement problems (De Los Reyes et al., 2015). Nevertheless, while adolescents often show minimal motivation to reduce their academic problems actively, they are the only ones present in all academic situations. Therefore, it seems very important to include their view in the assessment process and motivate them to change their behaviour during the treatment process.

The multi-informant approach used in the present study takes all these facts into account by combining the collective perspective of adolescent and parent interviews with a separate teacher interview. It is critical to consider both the usability and validity of the information obtained while developing a scale for a thorough evaluation (Youngstrom et al., 2020). As such,

the APC seems to provide a practical means to assess academic underachievement appropriately and time-economically. A major strength of the APC is that it is a brief instrument and can be carried out within a ten-minute conversation, making it suitable for regular teacher assessments (Benson et al., 2021). Furthermore, in a conversation between the teacher and the student, the APC could help to shift the conversation from a deficit- and solely results-oriented attitude (e.g., talking about the bad grades) towards actual behaviour that needs to change based on the APC (Guay et al., 2003). A similar study has pointed out the benefits of brief measures, as they can be carried out with multiple teachers to gain a complete insight into the adolescents' academic performance (Brady et al., 2012).

As expected, both the APC-AP and the APC-T showed good divergent validity to dissimilar subscales such as the social problem scale (CBCL, YSR and TRF). This supports previous findings of a lower association between academic underachievement and social problems (Barriga et al., 2002). The low correlations between the APC with both the subscales of the FBB-ADHS and the attention scales of the CBCL indicate that although these instruments measure a common aspect, they are nevertheless not the same, and the APC provides additional information.

The present study is the first to investigate the underlying concepts of scales measuring academic underachievement using regression analyses. In line with expectation, the regression analyses showed that for the APC-AP, 20 % of the variance in academic underachievement was explained when including the YSR-external scale, TRF-external scale, TRF-inattention scale and SBB-ADHS-inattention scale. The self-rated attention problems (SBB-ADHS) seem to have the greatest impact as it is the only significant correlate with the largest ß when including the above-mentioned scales in the regression analyses. For the APC-T, the variance explained by attention problems was even higher, amounting to 37 % of the variance when including TRF-external scale, TRF-inattention scale and FBB-ADHS-inattention scale and FBB-ADHS-teacher hyperactivity and impulsivity scale. The teacher-rated attention problems (FBB-ADHS-inattention) seem to have the greatest impact as it is the only significant correlate with the largest ß when including the above-mentioned scales in the regression analyses. This indicates that both instruments measure some attention construct, but the APC provides additional information on more specific studying and learning behaviour and the process that leads to these symptoms (e.g., no to timely preparation for exams).

In conclusion, the first part of the study showed that the shortened version of the APC with 17 items is a brief, reliable, and valid instrument for assessing academic underachievement

of adolescents using a multi-informant approach and being the first to validate a clinical interview for academic underachievement within a sample of adolescents displaying various mental disorders. The APC assesses adolescent academic achievement issues that are significant failure mechanisms and hence therapy objectives.

10.3 Treatment effect of SELBST achievement problems module

Academic underachievement is widespread in adolescence and often has a high degree of chronicity, leading to significant impairments in the lives of adolescents. Despite the negative consequences of academic underachievement and mental health issues, very few empirically validated treatments exist for this group of adolescents. Due to the multidimensionality and multi-causality of academic underachievement and psychological problems, an individualised, multimodal approach with the involvement of the relevant caregivers appears to be indicated. Based on the self-management approach of Kanfer and colleagues (2000), the multimodal, cognitive-behavioural therapy programme "SELBST- achievement problems" was developed that is modular in structure and integrates adolescent, parent- and teacher-centred interventions (Walter & Döpfner, 2009). The treatment manual was evaluated previously in a small pilot study ($n = 9$), showing statistical improvements (Walter & Döpfner, 2006). Therefore, the study's second aim was to evaluate the efficacy of the "SELBST – achievement problems" module in an RCT within a sample of $n = 60$ adolescents, aged 11-18 years suffering from academic underachievement and various mental disorders. SELBST was associated with improved self-, parent- and teacher-reported academic and mental problems. Even though the results point to the efficacy of the SELBST intervention, the efficacy could not be shown as clearly as hoped, and a direct statistical comparison between the two groups found no significant superiority of the experimental group on the primary outcome. However, the within analyses showed significant reductions in academic underachievement measures and mental problems. Significant effects were small to medium in size. SELBST was well received by the adolescents and the families, as evidenced by high levels of treatment satisfaction. The findings are discussed below.

During the treatment phase, both groups showed improvements on the clinical rating of the collective adolescent and parents rating of the primary outcome (APC-AP). However, no statistical superiority was found between the two groups. Within analyses showed that both groups significantly reduced academic underachievement problems, the effect of the EG was large ($d = 0.91$), whereas for the CG only a medium effect ($d = 0.52$) was found. At the end of the treatment phase, only the adolescents of the EG displayed a mean on the APC-AP below

the inclusion cut-off, indicating clinical success. Even though no statistical superiority of the EG was found, these results demonstrate that the adolescent, and the parents, noticed an improvement during the treatment phase. It provides further evidence that the SELBST achievement module successfully teaches adolescents new skills and reduces academic problem behaviour. The reasoning behind the results of the CG will be discussed further on.

The follow-up gains in the EG showed that the treatment effects were stable or even improved over time. These continued improvements throughout the follow-up phase are encouraging, considering that executive functioning deficits are significant mechanisms of long term developmental problems among adolescents with academic underachievement (Miller, Nevado-Montenegro, & Hinshaw, 2012). This is an important finding as it may indicate a sustainability effect of the learned new skills. The long-term effects of therapy and the transfer of newly learned skills into daily life is a major focus of the SELBST treatment. As few studies have focussed on follow-up assessments, this is a promising result.

Similarly, in the teacher assessment (APC-T), no superiority of the EG was found during the treatment phase. However, one of the most promising findings of this trial was that the EG showed a statistical superiority during the follow-up phase, with a medium effect ($d = 0.79$) compared to the CG. The within analyses of the treatment phase revealed significant small to medium effects for both groups. During the follow-up phase, the EG showed significant large improvements ($d = 1.36$), resulting in a level below the clinical cut-off at the follow-up assessment. The pilot study found similar results, also regarding the follow-up (Walter, 2004). This finding of the superiority of the EG in the teacher rating is particularly interesting as prior research has not found such impacts in teacher-rated measures. Although Sibley and co-workers (2016) demonstrated that the STAND treatment group families displayed larger gains than their control in the parent rating (e.g., organization skills $d = .64$), this effect was only observed in the parent rating and not in the teacher evaluation (Sibley et al., 2016).

Similarly, the HOPS treatment program outperformed the waiting group in the parent rating (e.g., homework completion $d = .85$, materials management $d = .63$), but no effects were found for the teacher ratings (Langberg et al., 2012). They hypothesized that the lack of significant teacher improvements could be due to the subjective nature of the ADHD symptoms and a negative Halo Effect of the teachers (Evans et al., 2005). Additionally, the lack of close supervision in the secondary school context and, therefore, the lack of adult accountability could further weaken adolescents' implication of strategies in the school setting.

As the previous treatment programs (HOPS and STAND) had a larger emphasis on parent focussed behavioural interventions, and on improving the adolescent's school problems in the home setting, it could be that these gains were mainly improvements in the home setting rather than the school setting. Possibly indicating that the skills these adolescents learned were not transferred to the school. A difference to the SELBST program is that it focuses more on autonomy and conveying self-efficacy to the adolescent. Our positive results regarding the teacher-rated improvements indicate that this has been achieved. One explanation why the EG's superiority in the teacher rating was only found during follow-up could be that, while the SELBST achievement module improves academic habits, it may take longer for these behavioural changes to be observed by teachers (De Los Reyes et al., 2021).

Another promising finding of this study was the significant improvements in GPA and the statistical superiority of the EG compared to the CG at post-assessment ($d = 0.43$). Previous studies did not find significant results on GPA favouring the EG (Sibley et al., 2014). As GPA is an objective measure, it is a good indicator of the effects of the treatment on the overall school performance level (Choi, 2005; York, Gibson, & Rankin, 2015). As the GPA incorporates not only one teacher's opinion of the student's academic achievement but rather the overall school performance, this is a positive finding, demonstrating the possible efficacy of the SELBST treatment. Therefore, the improved structuring and the enhanced motivation of the adolescents appear to affect the overall school behaviour. Other studies have not found significant GPA effects. Previous studies on school-based OTP treatments for adolescents found only modest improvements in student grades (Evans et al., 2011; Evans et al., 2007).

Other academic outcome criteria were also analysed, such as repeating a grade or changing school to a simpler school level. Although there were also students in the EG at risk of repeating a grade or changing schools, overall, descriptively, they had fewer changes than the CG (4 compared to 7 changes). These findings (e.g. larger effect sizes, larger effects regarding GPA) might hint that compared to control participants, participants who received the SELBST treatment improved more over time and remained more consistent and stable in their academic functioning.

Results of mental health-related outcomes (Achenbach and DISPYS) revealed overall no statistical superiority of the EG at post or follow-up assessment in any of the raters. During the treatment phase, the EG's self-rated total mental problems (YSR) had a significant small effect in the within analyses ($d = 0.31$). Similarly, in parent-rated mental problems (CBCL), a significant reduction ($d = 0.48$) for the EG during the treatment phase was found. As the primary

focus of the SELBST intervention focuses on academic problems, this finding shows that by reducing academic problems, mental problems also decline. Similarly, the former pilot study found significant medium effect size improvements in parent rating for the mental problems measured with the CBCL (Walter & Döpfner, 2006; Walter & Döpfner, 2007). The present study found a significant medium effect ($d = 0.52$) favouring the CG in the teachers' post-assessment (TRF). However, the EG improves from post-assessment to follow-up with a large effect ($d = 0.82$) and no significant differences between the two groups are found at the follow-up assessment. The explanations for the improvements in the CG during the treatment phase are discussed below.

The analysis of the WIFRS family-scale found that both groups improved during the treatment phase and that the EG outperformed the CG with a significant medium effect size during follow up ($d = 0.50$). This encouraging finding might indicate that the family dynamics improve throughout the therapy process and that these effects remain stable even after the therapy has ended. As family dynamics are often negatively affected by academic underachievement problems (Reis & McCoach, 2000; Steenbergen-Hu, Olszewski-Kubilius, & Calvert, 2020), this indicates that by improving the adolescents' academic behaviour, other contexts of the adolescents' lives are also positively influenced. This is consistent with previous studies using the IRS, which have found similar results, with even larger effect sizes (Sibley et al., 2020).

The SELBST treatment led to significant reductions of mental problems, and nonetheless, when these improvements were compared to an active control condition, the EG did not outperform the CG on most standardised measures during the treatment phase. One possible explanation for the limited improvements regarding mental problems could be that these standardized questionnaires were too broad to measure the sensitive change and detect the subtle individual changes. In this regard, it is important to recall that an increasing number of researchers believe that individually tailored assessments of problematic behaviour are critical in CBT (Dose, Waschau, von Wirth, & Döpfner, 2020; Jensen-Doss et al., 2018; Lindhiem, Bennett, Orimoto, & Kolko, 2016; Weisz et al., 2011). The focus on these individual problems rather than global assessments should be made in order to develop an appropriate individual treatment plan and maintain a constant focus on providing an appropriate assessment modality for continuous evaluation through the therapy (Döpfner, Frölich, & Lehmkuhl, 2013; Dose et al., 2020; Lindhiem et al., 2016; Weisz et al., 2011). As a result, establishing whether

the treatment lessens the most fundamental problems of the patient is an essential emphasis for the clinical practice (Döpfner et al., 2013; Dose et al., 2020; Weisz et al., 2011).

Lindhiem and colleagues (2016) reported in their meta-analysis that effect sizes for psychotherapy treatments were substantially larger for individual and specifically tailored treatment assessments than for symptom checklists. The authors hypothesize that psychotherapy might be more helpful in assisting patients in reaching individual and specific goals rather than decreasing symptoms as determined by standardized tests. Focusing solely on the intervention effects of the symptom checklist may lead to underestimating the treatment´s true worth and benefit in reducing the daily impairments of patients (Lindhiem et al., 2016). A study using the individual problemlist as an additional outcome measure found that the individually specified problem behaviours of the problemlist improved more than the problems on the standardized questionnaires. Therefore, they argue that the individual problemlist better represents changes in disorders-related behaviours (Dose et al., 2020). The significant improvement on the individual problemlist in this sample adds weight to this assumption.

The results of the individual problemlist are particularly interesting in this regard, indicating a statistical advantage of the EG compared to the CG with a large effect in the adolescent ($d = 1.10$) and parent assessment ($d = 1.42$). Adolescents of the EG decreased their individual academic problems throughout the treatment phase and remained more constant in their academic functioning over time than those in the CG. As this is the most specific behavioural outcome measure of the individual academic underachievement, this result is promising and indicates that students receiving SELBST improve and notice the changes and influence on their behaviour. Recording concrete behavioural problems of children and adolescents via the individual problemlist proved useful, as concrete behavioural changes in the course of therapy could be detected more clearly via this parameter than via broadband methods. Further advantages of the individual problemlist are that it facilitates the structuring of the therapeutic process and optimises a transparent approach for those involved. Another benefit is that it makes it easier to discuss and deal with differences in judgement (e.g. between adolescent and teacher) concerning a specific academic problem behaviour.

It is noteworthy to point out the significant improvements of the CG. These improvements during the treatment phase might be explained by the active treatment as usual condition, as 43 % participated in some kind of intervention, making it a strong and conservative comparison for the EG. Many of these adolescents took advantage of various therapeutic options, such as pharmacotherapy, weekly CBT, or guidance counselling. Other

studies often used waitlist comparison groups which therefore are less strong (Langberg et al., 2012). Adding to the individual support, they also benefited from the diagnostic phase and the attention and encouragement of the teachers and their parents. It could be hypothesized that solely the diagnostic process and the knowledge of their intelligence served as a motivator to modify their behaviour and become more encouraged for school. For many adolescents, it was the first time interacting with a psychologist, and the feeling of being heard and seen, even if it was only for two sessions, could have had a positive influence, supporting the finding of previous studies on academic intervention programs, who have shown that having a major adult's attention was important for positive outcomes (Bennett-Rappell & Northcote, 2016).

From a clinical perspective, many adolescents reported being "too stupid" for school, that they were just "not smart" enough and "could not do it". During adolescence, the lack of self-confidence and self-efficacy is a well-known reality (Klassen, 2002; Pajares, 2006). Not surprisingly, adolescents who have suffered from poor school performance have often low self-confidence about their knowledge and intelligence in general. Many adolescents were positively surprised and relieved by their IQ results and were proud when these were also discussed with their parents. Our study's high mean IQ ($M = 104$) emphasizes this. The positive confirmation that they are smart enough for their school level (this was an inclusion criterion) and often even smarter than what is needed could have served as a big motivator to prove that they can succeed in school, both to themselves and their environment.

Since underachieving students are heterogeneous (Reis & McCoach, 2000; Snyder, Carrig, & Linnenbrink-Garcia, 2021; Steenbergen-Hu et al., 2020), it is unlikely that one single intervention will be universally effective. This heterogeneity presents a substantial challenge clinically, conceptually, and methodologically. Because the SELBST treatment is adaptable and multimodal, it can adapt to various problems and issues occurring during adolescents' daily lives. Additionally, the learned strategies can be applied in more than one context (e.g. organization with a planner for school but also for hobbies). In this regard, our high therapist adherence (88 %) shows that the SELBST achievement module is a practical and adaptable tool to work with, even with this heterogeneous group of adolescents suffering from various mental disorders. Therapist adherence (or treatment fidelity) is a term used to refer to the accuracy with which the therapist implements specified elements of the intervention model. The extent to which a therapist adheres to the guidelines is an important aspect of predicting therapeutic outcomes (Lange et al., 2017). A low adherence may lead to the therapist missing out on key elements of the therapy (Collyer, Eisler, & Woolgar, 2020). There is substantial evidence that

therapist adherence influences the outcomes of multisystemic therapy for adolescent antisocial behaviour (Henggeler et al., 1997). Furthermore, the high treatment satisfaction of the therapists with the course of treatment demonstrates that the therapist felt confident about the implemented strategies and self-efficacious.

The high dropout rate in the experimental group (33 % of adolescents did not complete treatment) is an important limitation of the current study and is consistent with current research showing that adolescents with ADHD report a relatively low willingness to participate in treatment (Bussing et al., 2012). Previous research on ADHD and academic underachievement in adolescence reported similar drop-out rates, ranging from 18 % to 38 % (Barkley et al., 2001; Sibley et al., 2020). Motivational deficiencies, inconsistent family routines, parent-adolescent conflict, conflicted family dyads who perceive treatment as an additional source of strife, and scepticism about psychotherapy, in general, are all risk factors and problems that are associated with dropout or early termination. This is especially the case for adolescents with an externalizing disorder (Wolraich et al., 2005). Not surprisingly, due to the high heritability component of ADHD, parents themselves are often affected by ADHD, therefore struggling with their own symptoms and thus not regularly participating in therapy or being able to motivate their children to attend regularly (Chronis-Tuscano et al., 2011). The lack of parental engagement has also been shown in other studies where, when parents are invited to engage in school-based OTP therapy, they tend not to participate (Evans et al., 2011). In this context, it seems important nonetheless to emphasise that the regular inclusion and involvement of the parents' and teachers' is an indispensable necessity to uncover and reduce trivialisation and dissimulation tendencies on the part of the adolescent (Walter, 2004). Another reason explaining the higher dropout rate of the EG compared to the CG could be the treatment group's higher time and energy commitment, which could have led to therapy fatigue.

In previous research, age emerged as a substantial moderator of intervention effectiveness, with the greatest intervention efficacy for both academic and psychological outcomes at younger ages. As a possible explanation, it is hypothesized that behaviour-change techniques may not be developmentally appropriate for older adolescents (McCall et al., 2000; Snyder et al., 2019). Adolescents were more prone than children to drop out of therapy, a reason for this possibly being that parents have greater influence over young adolescents and children than over older and that adolescents have a more unfavourable view about psychotherapy (Garland & Zigler, 1994; Goldston et al., 2003). The significant age differences between the dropout participants and the completer adolescents showed that especially the older adolescents

discontinued therapy. One major reason for this was that other problems became more prominent than the academic underachievement issues, shifting the therapy focus. As adolescents grow older, their daily life often becomes more complicated, and they have to deal with more issues outside of school and may develop co-occurring mental problems, such as mood problems or substance abuse problems (De Los Reyes, Augenstein, & Aldao, 2017). Additionally, older adolescents often struggle more with the continual attendance of psychotherapy, one reason being that their parents are less involved in the therapy process and need to manage the treatment sessions individually.

When adolescents receive mental health treatment, the average length of treatment is on an international level very short, as many terminate therapy after only a few sessions (Harpaz-Rotem, Leslie, & Rosenheck, 2004). According to national insurance reimbursements statistics, the modal number of outpatient psychotherapy sessions is only one session (Hoyt, Young, & Rycroft, 2020), with an average of 3.9 sessions (Harpaz-Rotem et al., 2004). Sufficient dosage is a characteristic of good interventions (Nation et al., 2003); however, determining "sufficient" is difficult. Whereas Teo and Quah (1999) argued that a long duration of an intervention is essential to enhance the motivation levels of underachieving students, Talom and colleagues (Hoyt et al., 2020; Talmon, 1990; Talmon & Hoyt, 2014) developed the single session therapy (SST) approach. SST contains certain components shared by all single session approaches, which emphasise attitudes and mindset, easy accessibility, empowerment, alliance and goal setting (Hoyt et al., 2020). The concept and practice of the SST approach have been adapted to various service contexts throughout the world since Moshe Talmon´s pioneering work (1990).

As previously argued, it could be hypothesized that the few sessions that the CG received were sufficient to implement change. The higher improvements of the EG during the first ten sessions compared to the latter ten sessions additionally add weight to the assumption that shorter periods of treatment length might be beneficial in treating adolescents with academic underachievement (Bloom, 2002; Owen et al., 2015). Moreover, greater improvement may be reflected in a shorter period, or a plateau effect could have been present. A plateau effect occurs during psychotherapy when the learning and improvement curve flattens because the pace of progress has (momentarily) slowed, usually due to therapy fatigue, motivation loss, boredom or newly learned changes in skill level (Howard, Lueger, Martinovich, & Lutz, 1999; Lutz et al., 2001; Owen et al., 2015). Such a plateau effect was found during the second treatment phase. It is, therefore, possible that some adolescents benefitted mostly during the first ten sessions, and afterwards, only little change occurred.

Psychotherapy is a financial burden for society as a whole, and studies investigating the expenses of child and adolescents mental disorders, such as those conducted in the United States, revealed that the financial impact is significant (Lynch & Clarke, 2006). Because mental disorders are so common, their monetary implications and treatments are becoming increasingly important (Altmann et al., 2018; Castelnuovo et al., 2016). Outpatient psychotherapy plays a vital role in this in Germany, where 97.6% of those diagnosed with a mental disorder are treated in an outpatient psychotherapy setting (Gaebel, Zielasek, Kowitz, & Fritze, 2011). Therefore, reducing the treatment length of psychotherapy would significantly reduce these costs. Furthermore, another benefit of reducing the length of treatment would be the greater availability to more patients (Goodyer et al., 2017). However, it is important to consider the severity and magnitude of the disorder and its functional restrictions for the patient. Upcoming research could focus and recognize the potential of shorter or even single sessions therapy and its opportunity for clinical research (Campbell, 2012) and explore the moderation of treatment length.

In conclusion, this is the first RCT to evaluate the SELBST achievement module, including a follow-up. It is the first study that included adolescents with various mental disorders, including internal behaviour problems. TAU, making it a strong and conservative comparison for the experimental group. Therefore, any superiorities of the EG found have a clinical magnitude. The treatment group benefitted from the SELBST treatment on various outcomes, most significantly on GPA and the individual problemlist. However, no superiority of the EG was found regarding the other measurements (including the primary outcome). This is one of the first studies to include and evaluate a smartphone app as part of an RCT in a treatment study. The effects of the therapy app will be discussed below.

10.4 Additional therapy app effects

The use of new media technologies, such as smartphone apps, can help to make therapy more interesting and appealing for children and adolescents and thus minimize motivational problems. While the potential of new technology such as mHealth interventions, to improve mental health services for adolescents has been widely advertised (Grist et al., 2017), the majority of existing smartphone apps have not been developed on the basis of empirical research, and there is insufficient evidence regarding their effectiveness (Radovic et al., 2016; Seko et al., 2014).

In this study, we evaluated the added benefit of the smartphone app "todoly". The app's main goal was to improve patient adherence to between-session therapeutic assignments,

including therapy homework and practising tasks. Homework is an essential part of many therapeutic methods because it allows patients to practice therapeutic skills between sessions and provides continuity (Freeman & Rosenfield, 2002). Increased client compliance with homework assignments has been linked to better treatment results, and it may be especially essential for minimizing the risk of relapse (Scheel, Hanson, & Razzhavaikina, 2004). Despite the advantages of homework assignments, patients and adolescents' compliance with these activities can be a substantial obstacle to therapy (Silk et al., 2020). Therapy homework is also one of the areas where adjunctive technologies might have the most influence (Clough & Casey, 2015).

We hypothesised that the second treatment phase with the app would show greater improvements. However, the opposite effect was found, demonstrating that the app had no significant effect on the improvement. This could be because the app usage was very heterogeneous, which was also influenced by the smartphone app not working properly and functional difficulties. When questioned why the app was not utilized, the adolescents stated having forgotten or lost their smartphone, having deleted the app due to space issues, malfunctioning, or the app was not operating properly. Another hypothesis could be that improvement of academic underachievement occurs faster during the first ten treatment weeks, supporting the previous argument of shorter therapy length, therefore reaching a plateau effect after ten weeks, making it even more difficult to show an added benefit of the app. Including a treatment group receiving the therapy app from the beginning would help deal with this problem.

On a clinical and individual level, the experiences showed that those adolescents who were satisfied with the app did use it regularly and reported that it helped them with their daily task organization. For future studies, it is vital to consider an appropriate developmental timeline, focusing on the design and interface aspects as well as the security and data component of a therapy app. The Study by Clough and Casey (2015), evaluating the ©Psychassist therapy app, demonstrated that when an app is thoroughly tested, the app usage increases and the sustainability of the app grows in the way that their patients indicated that they would continue to use the app after the treatment (Clough & Casey, 2015).

Developing an app and evaluating it in an RCT is an important step towards a more empirically validated use of therapy apps. However, there are still many obstacles in the efficient evaluation and the cause and effect mechanisms behind the use. Very few studies have previously evaluated smartphone apps as part of a psychotherapy treatment study, and there

was little experience and knowledge available beforehand on how to deal with the encountered problems, such as the continuous technical difficulties. The app's testing revealed numerous technical difficulties that had to be addressed in the following updates during the app's development. During the study period, particular challenges were encountered with several mobile phones and operating systems of the different smartphones from the patients. The apps functionality was reduced on various operating systems, such as that there were no alert notifications and complications in the tracking tool. In the beginning, the app was also not programmed with inbuilt pop-up reminders for therapy jobs; this was implemented in a later version of the app. This severely affected the timeline of the development and implementation of the app. Another issue was the security and data protection of the patients' app information and establishing a secure data server that only the therapists could access. The gamification features and interface of the app turned out to be aimed more at younger patients and did not represent the expectations of the older adolescents who used more social media platforms. Finally, accurately assessing the adolescents' app usage was more challenging than anticipated. Only measuring the amount of time the adolescents had opened the app did not indicate whether they had actually used it or completed their therapy jobs. A more detailed and thorough assessment tool would have been necessary to make more distinct statements about the app use. These challenges highlight the significance and importance of thorough pilot testing (Clough & Casey, 2015; Neumayr et al., 2021).

11. Limitations

There are several limitations to the current study that should be noted. First and foremost, the small sample size of $n = 60$ adolescents limits the statistical power. Furthermore, the high dropout rate in the EG led to a further significant decrease in the statistical significance level. Even though we could adjust for missing data by utilizing the MLM, the sample size may be too small for some outcome measures to demonstrate a significant effect in MLM. Additionally, the small sample sizes influenced the factor analysis of the APC. Insufficient sample size has often plagued the application of EFA, which usually demands a much bigger sample. Our factor analysis did not show an adequate fit for any interpretable model of the APC, and accordingly, the factorial validity of the APC could not be confirmed.

Second, while the SELBST achievement module is intended for adolescents with various mental disorders, our sample mainly consisted of adolescents suffering from externalizing disorders (84 %). Because the sample includes many patients diagnosed with ADHD and attention problems without hyperactivity, the sample's generalizability for other conditions is limited. As a result, no generalization can be made for the entire subset of adolescents with varied mental disorders.

Third, we did not include a group only receiving SELBST without the smartphone app or a waitlist phase. Including this would have helped us compare the app effect better and differentiate between the different treatment effects, such as the "justification of effort" effect or other "non-specific" therapy effects. Given the study's design, it is quite possible that these non-specific aspects of therapy - e.g., attention to the problems - contributed to the changes throughout the entire treatment. To clarify these questions sufficiently, extensive studies involving different control groups are necessary. For the evaluation of the APC, a sample without mental disorders or without academic underachievement would have also been beneficial as a comparison group. Therefore, it is impossible to evaluate whether the APC discriminates between adolescents with and without mental disorders or determine the extent to which typically developing adolescents display problems assessed in the APC.

The treatment integrity was measured using a self-assessment questionnaire that the therapist completed. This could have led to a bias. Recording the therapy sessions and having a blinded clinical rater assess these for treatment integrity would improve the validity of this.

Furthermore, the teachers frequently changed, leading to assessor changes in both groups, a known challenge of the secondary school environment. Another constraint is that two principal investigators were also the authors of the evaluated treatment program. Replication by other researchers would be beneficial and rule out the possibility of researcher allegiance. Finally, app utilization was lower than we had anticipated. The app´s use was undoubtedly affected by the technical difficulties, and therefore no conclusions can be made whether therapy apps, particularly this app, have an additional positive effect on psychotherapy outcomes. A between study design comparing a treatment group receiving SELBST and the app with a control group not receiving the app would also clarify the therapy app's added benefit. Future research on therapy apps should concentrate on developing a more stable and functional app examining larger samples in a between study design.

12. Future outlook and developments

New research and developments regarding academic underachievement and disabilities have identified "Twice-exceptional" students. They have the potential for high achievement in one or more domains such as math, science, technology, the social arts, or performing arts and who have one or more (learning) disabilities such as speech and language disorder, autism spectrum disorder, emotional and behavioural disorder or other impairments such as ADHD. These impairments and exceptional skills combine to create a distinct population of students who may fail to exhibit high academic performance (Baum, Schader, & Owen, 2021). Twice-exceptional students frequently struggle at school, where organization, involvement, and long-term planning play a role. These students are often very creative, talkative, inventive, and inquisitive, with great problem-solving skills and a diverse set of interests or a single, all-consuming specialization. However, they may struggle to keep up with the course work and the school demands, leading to inconsistent academic achievement, frustration, issues with writing expression, and being labelled lazy and unmotivated. Therefore, further dampens their enthusiasm for school, harming their drive, self-efficacy and self-confidence (Baum et al., 2021; Foley Nicpon, Allmon, Sieck, & Stinson, 2011). A future focus could integrate these new developments and focus on a suitable treatment considering not only the difficulties but also the strength of these adolescents. The "SELBST – achievement problem" module includes elements focusing on resources and strength of academically underachieving adolescents; however, the finding from the twice-exceptional research could indicate that an even bigger part should focus on strengthening their self-confidence and identifying areas in which they excel.

Recent discussion of psychotherapy researchers has called for an update on how we deal with therapy in general. Due to the growing number of patients needing therapy, not all receive adequate care due to a lack of places. Therefore, we need to develop inventive and creative ways to help more patients. Kazdin (2019) challenged the concept of how psychotherapy can and should be delivered (Kazdin, 2019). He claims that the need-to-access gap would remain stagnant unless the needs of a face-to-face format of an expert with years of training and a physical office are adapted. Kazdin (2019) claims that future therapies may not rely on psychological treatments, which have until now dominated research. Developing therapy apps aiming to enhance the therapy transfer and improve patients' well-being is a first step towards this goal. However, group therapies or online tools helping the adolescents with their daily school struggles could be another opportunity future research could investigate.

13. Summary (English and German)

Academic underachievement and mental disorders in adolescence:

Assessment and treatment

Academic underachievement affects many adolescents and is defined as a notable discrepancy between actual and expected achievement, given the student's cognitive ability level. A significant percentage of adolescents suffer from both academic underachievement and mental disorders, putting them at extra risk for negative psychosocial development. The establishment of evidence-based treatment options for this patient group is becoming an increasing focus of research, not least against the background of rising prevalence figures and the associated costs for the social system. The treatment of adolescents with academic underachievement is considered challenging due to both the heterogeneity of the problems and the limited changeability of the symptoms. The importance of involving parents and teachers in the treatment of adolescents has been proven in numerous studies. Therefore a multimodal treatment approach is recommended, with behavioural interventions being effective in the past. However, only a few evidence-based treatment programmes specifically address this population.

This work evaluated the "SELBST - achievement problems" treatment programme for adolescents between 11 and 18 years with academic underachievement and mental disorders. To test the feasibility and effectiveness of the SELBST programme, $n = 60$ adolescents were included in a randomised controlled trial. The control group was an active control group (TAU), whereby 43 % received some kind of intervention. The treatment group received psychoeducation and developed a disorder model, followed by 15 sessions of therapeutic interventions based on behavioural therapy methods.

Measurement instruments to assess academic underachievement, mental health problems and comorbid symptoms were collected via the adolescent, parent, teacher and clinical judgement. The revised version of the primary outcome, the Academic Problems Checklist (APC), consists of a semi-structured clinical interview with $n = 17$ items for adolescents, parents and teachers. In addition, the adolescents' individual academic behavioural problems were assessed with the individual problemlist, and functional impairments were examined. The analyses were conducted on an inferential statistical level, using multilevel analyses. In addition, a follow-up phase was planned after the intervention period to examine the possible effects of the intervention period regarding their stability over time. Furthermore,

the added benefit of the smartphone app "todoly" was analysed, and how the app may help with the therapeutic transfer. It is the first study evaluating a therapy app in a psychotherapy study.

Analysis of the psychometric properties of the primary outcome (APC) showed that it is a brief, reliable and valid instrument for assessing academic underachievement in adolescents with mental disorders. It is the first semi-structured clinical interview in German for assessing underachievement using a multi-informant approach. In addition, it is the first clinical interview to assess academic underachievement with various mental disorders. Our findings extend the field of research by showing that a collective rating of adolescents and parents could be a useful method to appropriately assess academic underachievement in adolescence.

The randomised control trial results show clinically relevant improvements on the collective adolescents and parents' rating of the primary outcome (APC-AP). Contrary to the assumption, the effects of the experimental group during the therapy phase were not superior to those of the control group. The teacher's assessment (APC-T) showed a superiority of the treatment group during the follow-up phase. Statistical superiority of the treatment group was also found for the individual problemlist with large significant effects in the adolescent as well as in the parent judgement. Likewise, the treatment group showed significantly larger improvements in their grade point average than the control group. Significant reductions in the overall mental health symptoms were found in the adolescent and parent assessments, but the treatment group had no statistical superiority. The functional family level of the treatment group changed positively during the treatment course. These effects remained largely stable during the follow-up phase. The questionnaire on treatment satisfaction showed a high level of satisfaction with the contents and the benefits of the SELBST treatment programme. The smartphone app "todoly" was well accepted by the adolescents but showed no statistically significant benefit, which might be explained by the study design and technical issues. Limitations of the study included the small sample size, the substantial dropout rate of the treatment group and the challenges of implementing a therapy app.

The results of this randomised controlled trial contribute to research by demonstrating that a collaborative treatment strategy between adolescents, parents and teachers can effectively treat adolescents' academic underachievement. There were also significant reductions with small effects concerning mental problems of the adolescents. It is the first study to examine the "SELBST - achievement problems" treatment program in a randomised controlled trial using blinded clinical judgement and other objective measures of school success, such as repeating a

class or GPA. It extends previous research using validated clinical ratings and a multiple informant methodology.

Zusammenfassung (deutsch)

Beurteilung und Behandlung von Jugendlichen mit Schulleistungsproblemen und psychischen Störungen

Einleitung: Schulleistungsprobleme betreffen viele Jugendliche. Ein beträchtlicher Prozentsatz der Heranwachsenden leidet sowohl an schulischen Minderleistungen als auch an psychischen Störungen, wodurch sie einem zusätzlichen Risiko für eine negative psychosoziale Entwicklung ausgesetzt sind. Schulische Minderleistungen werden definiert als eine deutliche Diskrepanz zwischen den tatsächlichen und den erwarteten Leistungen angesichts des Fähigkeitsniveaus der Lernenden. Die Etablierung evidenzbasierter Behandlungs-möglichkeiten für diese Patientengruppe rückt zunehmend in den Fokus der Forschung, nicht zuletzt vor dem Hintergrund steigender Prävalenzzahlen und den damit verbundenen Kosten für das Sozialsystem. Die Behandlung von Jugendlichen mit schulischen Minderleistungen gilt sowohl wegen der Heterogenität der Probleme als auch wegen der begrenzten Veränderbarkeit der Symptome als anspruchsvoll. Allerdings gibt es nur wenige evidenzbasierte Behandlungsprogramme, die sich speziell an diese Gruppe richten. Wie wichtig die Einbeziehung von Eltern und Lehrkräften in die Behandlung von Jugendlichen ist, wurde in zahlreichen Studien nachgewiesen. Es wird ein multimodaler Behandlungsansatz empfohlen, wobei sich verhaltenstherapeutische Maßnahmen in der Vergangenheit als wirksam erwiesen haben. Eine valide Erfassung und Bewertung der Leistungsprobleme sowie der psychischen Auffälligkeiten ist von entscheidender Bedeutung für das Verständnis der zugrunde liegenden Probleme und die Entwicklung geeigneter Behandlungen.

Methode: In dieser Arbeit wurde das "SELBST-Therapieprogramm Leistungsprobleme" für Jugendliche zwischen 11 und 18 Jahren mit Leistungsproblemen und psychischen Problemen evaluiert. Um die Durchführbarkeit und Wirksamkeit des SELBST-Programms zu testen, wurden n = 60 Jugendliche in ein randomisiertes Kontrollgruppendesign eingeschlossen. Bei der Kontrollgruppe handelte es sich um eine aktive Kontrollgruppe, bei der 43 % der Probanden eine Art von Intervention erhielten. Die Behandlungsgruppe entwickelte zunächst auf der Basis von psychoedukativen Informationen ein Störungsmodell. Darauf folgten 15 Sitzungen mit therapeutischen Interventionen auf der Grundlage verhaltenstherapeutischer Methoden. Messinstrumente zur Beurteilung von Kernsymptomen und komorbiden Symptomen wurden von den Jugendlichen, den Eltern, und den Lehrern erhoben. Die überarbeitete Version des primären Outcomes, die Checkliste Leistungsprobleme, besteht aus einem halbstrukturierten klinischen Interview mit 17 Fragen für Jugendliche, Eltern

und Lehrer. Darüber hinaus wurden die individuellen Verhaltensprobleme und funktionellen Beeinträchtigungen der Jugendlichen während einer Prä- und Post- Messung untersucht. Die Fragebogenanalysen wurden auf inferenzstatistischer Ebene unter Verwendung von Mehrebenenanalysen durchgeführt. Zusätzlich wurde eine Follow-up-Phase nach dem Interventionszeitraum durchgeführt, um die möglichen Auswirkungen des Interventionszeitraums im Hinblick auf ihre Stabilität im Laufe der Zeit zu untersuchen.

Dies ist die erste Studie, die eine Therapie-App als Teil einer Psychotherapiestudie evaluiert. Der zusätzliche Nutzen der Smartphone-App todoly wurde analysiert, und es wurde untersucht, wie die App den therapeutischen Transfer unterstützen kann.

Ergebnisse: Die Analyse der psychometrischen Eigenschaften des primären Outcomes, der Checkliste Leistungsprobleme, hat gezeigt, dass es sich um ein kurzes, zuverlässiges und gültiges Instrument zur Erfassung der Leistungsprobleme von Jugendlichen mit psychischen Störungen handelt. Die Checkliste Leistungsprobleme ist das erste semistrukturierte klinische Interview in deutscher Sprache zur Beurteilung von Minderleistungen im schulischen Bereich unter Verwendung eines Multi-Informanten-Ansatzes im Jugendalter. Dieses wurde im Anschluss an die Studie verblindet gerated. Darüber hinaus ist es das erste klinische Interview, das Leistungsprobleme bei Jugendlichen mit unterschiedlichen psychischen Problemen erfasst. Unsere Ergebnisse erweitern das Forschungsfeld, indem sie zeigen, dass ein gemeinsames Rating von Jugendlichen und Eltern eine nützliche Methode zur angemessenen Bewertung der schulischen Leistungsprobleme im Jugendalter darstellt.

Die Ergebnisse der randomisierten Kontrollstudie zeigen, dass beide Gruppen klinisch relevante Verbesserungen erzielen, gemessen mit der Checkliste Leistungsprobleme im gemeinsamen Jugendlichen- und Elternurteils. Entgegen der Vermutung waren die Effekte der Experimentalgruppe während der Therapiephase denen der Kontrollgruppe beim primären Outcome nicht überlegen. Die Einschätzung der Lehrkräfte auf dem primären Outcome zeigte eine Überlegenheit der Behandlungsgruppe in der Follow- Up Phase. Eine statistische Überlegenheit der Behandlungsgruppe für die individuelle Problemliste zur Messung individueller schulischer Minderleistungsprobleme wurde mit großen Effekten im Jugendlichen sowie im Elternurteil festgestellt. Die Behandlungsgruppe zeigte signifikante Verbesserungen bezüglich ihres Notendurchschnitts im Vergleich zur Kontrollgruppe. Signifikante Reduzierungen der psychischen Gesamtsymptomatik der Probanden konnten im Jugendlichen und im Elternurteil nachgewiesen werden, jedoch gab es keine statistische Überlegenheit der Behandlungsgruppe gegenüber der Kontrollgruppe. Diese Effekte blieben während der Follow

up Phase weitgehend stabil. Der Fragebogen zur Behandlungszufriedenheit zeigte eine hohe Zufriedenheit mit den Inhalten und dem Nutzen des Behandlungsprogramms. Die Smartphone-App wurde von den Jugendlichen gut angenommen, zeigte jedoch keinen statistisch signifikanten Nutzen. Zu den Einschränkungen der Studie gehörten die kleine Stichprobengröße, die beträchtliche Abbrecherquote der Behandlungsgruppe und die Herausforderungen bei der Implementierung einer Therapie-App.

Schlussfolgerung: Die Ergebnisse dieser randomisierten Kontrollgruppenstudie tragen zum aktuellen Forschungsdiskurs bei, indem sie zeigen, dass eine gemeinsame Behandlungsstrategie Jugendlichen mit psychischen Problemen und schulischen Leistungsproblemen wirksam behandeln kann. Es ist die erste Studie, die das "SELBST-Therapieprogramm Leistungsprobleme" in einer randomisierten Kontrollgruppenstudie unter Verwendung eines verblindeten klinischen Urteils und anderer Maßstäbe für den schulischen Erfolg untersucht. Sie erweitert frühere Forschungsarbeiten, indem sie validierte klinische Urteile und eine Methodik mit mehreren Informanten einsetzt.

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15. Attachments

Attachment 1: SELBST Checkliste Leistungsprobleme (German original version Academic Problem Checklist)

L01 SELBST-CL-Leistung – Checkliste Leistungsprobleme

Patient(in):	Alter:	Beurteilung basiert auf Exploration der/des:	(ankreuzen)
		Jugendlichen	
		Eltern/Hauptbezugspersonen	
Untersucher(in):	Datum:	Lehrer	
		Andere:	

Spalten: Trifft nicht zu (0) | Trifft ein wenig zu (1) | Trifft ziemlich zu (2) | Trifft voll zu (3) | Nicht beurteilbar (9)

A. Leistung-Kognition Jugendlicher (LKJ)

Item	0	1	2	3	9
1. Hat eine ausgeprägte Schulunlust (z. B. in die Schule gehen, etwas für die Schule machen, über die Schule sprechen, usw.)	0	1	2	3	9
2. Hat eine starke Abneigung gegen mehrere Schulfächer/Lehrer	0	1	2	3	9
3. Glaubt, dass er Misserfolge nicht beeinflussen kann (z. B. weil „zu dumm", „andere dran Schuld", usw.)	0	1	2	3	9
4. Hat eine ausgeprägte Angst vor Klassenarbeiten und/oder beschreibt körperliche Symptome	0	1	2	3	9
5. Glaubt, dass die Schule oder viele Lerninhalte sinnlos sind	0	1	2	3	9
6. Ist der Meinung, die Schule nicht schaffen zu können	0	1	2	3	9
7. Glaubt, die Schule schaffen zu können, ohne viel dafür zu tun	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/7):					

B. Leistung-Kognition Eltern (LKE)

Item	0	1	2	3	9
8. Führen die Leistungsprobleme des Jugendlichen vorwiegend auf schulische Bedingungen zurück (z. B. große Klasse, unfähiger Lehrer)	0	1	2	3	9
9. Führen die Leistungsprobleme des Jugendlichen vorwiegend auf seinen mangelnden Einsatz zurück (z. B. zu faul)	0	1	2	3	9
10. Haben zu hohe Leistungsansprüche	0	1	2	3	9
11. Überschätzen negative Konsequenzen der Leistungsprobleme	0	1	2	3	9
12. Sind der Meinung, den Jugendlichen nicht (mehr) unterstützen zu müssen	0	1	2	3	9
13. Sind der Meinung, das der Schulerfolg ohne eine enge Kontrolle nicht möglich ist	0	1	2	3	9
14. Fühlen sich stark schuldig für die Leistungsprobleme des Jugendlichen	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/7):					

C. Leistung – Methoden: organisatorisch-planerische Fertigkeiten (LMO)

Item	0	1	2	3	9
15. Hausaufgabenplatz ist unübersichtlich, nicht aufgeräumt oder wechselnd	0	1	2	3	9
16. Weiß zu Hause nicht mehr, welche Hausaufgaben aufgegeben wurden	0	1	2	3	9
17. Weiß Klassenarbeitstermine nicht	0	1	2	3	9
18. Hat keine festen Hausaufgaben-/Lernzeiten	0	1	2	3	9
19. Hat keine angemessene Heftführung (z. B. klebt die Arbeitsblätter nicht ein, schmiert in den Heften rum, reißt Blätter heraus)	0	1	2	3	9

Item	0	1	2	3	9
20. Bereitet sich nicht rechtzeitig/gründlich auf Arbeiten/Tests vor (z. B. Aufgaben nacharbeiten, fängt erst zwei Tage vorher an zu lernen)	0	1	2	3	9
21. Vergisst die für das entsprechende Fach notwendigen Materialien zu Hause (z. B. Bücher, Zirkel, Stifte)	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/7):					

D. Leistung-Methoden: Lernstrategien (LMS)

Item	0	1	2	3	9
22. Schafft es nicht, die Hausaufgaben eigenständig und angemessen zu erledigen (z. B. vorschnelles Abbrechen, viele Flüchtigkeitsfehler)	0	1	2	3	9
23. Lernt nicht hinreichend für die Klassenarbeit/Test	0	1	2	3	9
24. Hat kein (adäquates) System zum Lernen (z. B. Vokabelkarten, Lernsoftware, Lernplan)	0	1	2	3	9
25. Hat keine Strategien zur systematischen Aufgabenbearbeitung, arbeitet häufig unstrukturiert oder impulsiv	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/4):					

E. Leistung-Unterricht (LU)

Item	0	1	2	3	9
26. Ruft in die Klasse oder redet mit anderen	0	1	2	3	9
27. Stört andere MitschülerInnen	0	1	2	3	9
28. Beteiligt sich nicht konstruktiv am Unterricht	0	1	2	3	9
29. Fällt durch Clownerien oder Provokationen, Kommentare usw. auf	0	1	2	3	9
30. Wirkt geistig abwesend bis apathisch	0	1	2	3	9
31. Ist leicht ablenkbar	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/6):					

F. Leistung-Wissenslücken (LW)

Item	0	1	2	3	9
32. Versteht den Inhalt des z. Zt. durchgenommenen Stoffes in mehreren Schulfächern nicht	0	1	2	3	9
33. Kann aufgrund von Wissenslücken (z. B. Vokabeln, Pflanzenlehre Biologie) die Hausaufgaben nicht bewältigen oder sich auf Prüfungen vorbereiten	0	1	2	3	9
34. Kann die Wissenslücken sogar mit externer Unterstützung nicht mehr aufholen	0	1	2	3	9
Gemittelte Rohwertsumme (Summe Itemrohwerte/3):					

Aus Walter & Döpfner: Leistungsprobleme im Jugendalter © 2009 Hogrefe, Göttingen

selbst Leistungsprobleme

Attachment 2: Questionnaire therapy compliance

Fragebogen zur Therapie-Compliance

Name des Jugendlichen: ....

Datum: ....

Behandlungsstunde No: ....

Name des Therapeuten: ....

Teilnehmer (bitte ankreuzen):

☐　　Jugendlicher

☐　　Mutter

☐　　Vater

☐　　andere Personen (bitte beschreiben:_____)

1. Wenn Jugendlicher anwesend war:

		Gar nicht	Ein wenig	Weitgehend	Besonders	Wurde nicht gefordert
1.	Der Jugendliche hatte seine Therapie-aufgaben der letzten Woche erledigt.					
2.	Der Jugendliche hat in der Sitzung zugehört.					
3.	Der Jugendliche hat in der Sitzung Fragen beantwortet.					
4.	Der Jugendliche hat die Therapiematerialien in der Sitzung (mit Hilfe) erledigt.					
5.	Der Jugendliche hat sich an der Durchführung spezifischer Interventionenen (z.B. SIT, Erstellen eines Lernplans) aktiv beteiligt.					

2. Wenn Bezugsperson anwesend war:

		Gar nicht	Ein wenig	Weitgehend	Besonders	Wurde nicht gefordert
1.	Die Bezugsperson(en) hat/haben die Therapieaufgaben der letzten Woche erledigt.					
2.	Die Bezugsperson (en) hat/haben in der Stunde Fragen beantwortet und gestellt.					
3.	Die Bezugsperson(en) konnte(n) sich auf das Thema der Stunde einlassen/ haben an der Erarbeitung spezifischer Interventionen aktiv mitgewirkt.					
4.	Die Bezugsperson(en) zeigte(n) Interesse an den Therapieinhalten.					

Attachment 3: Questionnaire therapy adherence

Fragebogen zur Behandlungsadhärenz

1. Welcher **Therapiebaustein** wurde durchgeführt (Kürzel, z.B. LKE)…………..………

………………………………………………………………………………..……..…………..

2. Welcher **Teil dieses Therapiebausteins** stand heute im Zentrum? (siehe Übersichtskasten Therapiemanual pro Baustein)……………..……..……..…………..

3. Wieviel **Prozent der Zeit** habe ich an diesem Therapiebaustein gearbeitet?........%

4. Welche Therapiematerialien habe ich noch eingesetzt, die **nicht Teil des oben angeführten Therapiebausteins** waren (Kürzel, z.B. L07)?..………..……..………..

5. Wieviel Prozent der Zeit habe ich an **nicht-schulischen Themen** gearbeitet? …%

6. **Welche Themen** waren das? - bitte beschreiben……………………….…………

………………………………………………………..………………………..……………….

7. **JOBS der Woche**

Neue JOBS wurden hinreichend thematisiert und festgelegt (bitte ankreuzen):

Gar nicht	Ein wenig	Weitgehend	Besonders	Wurde nicht gefordert

8**. JOBS wurden festgelegt**

☐	mündlich	☐	schriftlich (in Therapiematerialien, auf Zettel o.ä.)
☐	mittels TherapieApp	☐	anders (bitte beschreiben)…………………

Attachment 4: Therapy app satisfaction todoly – adolescent

Todoly- App Zufriedenheit- Jugendlicher

Alter: _____   Geschlecht: _____

	stimmt genau	überwiegend	teilweise	überhaupt nicht
Allgemein				
1. Auf eine Umfrage habe ich jetzt gar kein Bock!				
2. Ich finde die App „SELBST!" für mich sinnvoll.				
3. Ich nutze die App nur deshalb, weil ich es muss.				
4. Ich finde mich in der App gut zurecht.				
5. Die App ist leicht zu verstehen.				
6. Die App ist cool.				
7. Die App hat zu viele Funktionen.				
8. Vor meinen Freunden nutze ich die App ungern.				
9. Die App hat immer funktioniert.				
10. Die Erinnerungsnachrichten der App helfen mir.				
11. Mich stört es, dass ich mein eigenes Smartphone für die Therapie nutzen muss.				
12. Mir ist es unangenehm, meinem Therapeuten mein Smartphone zu übergeben.				
13. Die App motiviert mich, mit der Schule am Ball zu bleiben und meine Ziele zu erreichen.				
14. Seit der Unterstützung der App habe ich größere Fortschritte gemacht als zu der Zeit, als ich die Therapie ohne App gemacht habe.				
15. Die App hat dafür gesorgt, dass ich auch an den Tagen ohne Therapie an meine Jobs gedacht habe.				
16. Ich habe das, was ich in der Therapiestunde gelernt habe, mithilfe der App während der Woche regelmäßig geübt				
17. Ich verstehe, wann und warum der virtuelle Charakter (Avatar) seine Stimmung ändert.				
18. Ich habe das Gefühl, die App nicht genügend benutzt zu haben.				
19. Die App erschwert die Therapie, weil sie für Verwirrung sorgt.				

	stimmt genau	überwiegend	teilweise	überhaupt nicht
Wissensdatenbank				
21 a) Kennst du die Wissensdatenbank der App? ☐ Ja ☐ Nein				
21 b) Ich habe die Wissensdatenbank ca. _____ mal genutzt.				
21 c) Die Wissensdatenbank ist hilfreich.				
21 d) Die Inhalte der Wissensdatenbank sind übersichtlich.				
21 e) Ich lese die Inhalte der Wissensdatenbank regelmäßig.				
Meine Jobs				
22a) Manchmal frage ich mich, warum ich einen Job nicht bearbeiten kann.				
22b) Auf Grund der Jobs konnte ich mich im Alltag mehr strukturieren.				
22c) Ich finde es nicht gut, dass der Therapeut die Jobs anlegt.				
22d) Ich freue mich über den „Daumen nach oben", wenn ein Job erledigt wurde.				
22e) Ich habe die Fragen zu den Jobs der Woche wahrheitsgemäß beantwortet.				
Einstellungen in der App				
23a) Ich habe unterschiedliche App-Farben ausprobiert.				
23b) Ich habe unterschiedliche virtuelle Charaktere (Avatare) ausprobiert.				
23c) Mir gefällt die Auswahl der zur Verfügung stehenden Avatare.				
Sonstiges				

24. Wie würdest du die virtuellen Charaktere (Avatare) bewerten (z.B. motivierend, peinlich, langweilig, albern...)?
_____

25. Welchen weiteren virtuellen Charakter (Avatar) würdest du dir wünschen? Wie würden die aussehen?
_____

26. Welche Funktionen nerven dich?
_____

27. Welche weiteren Funktionen würdest du dir für die App wünschen?
_____
_____

Todoly - App Zufriedenheit Therapeut

Alter: _____   ID:_____   Geschlecht: _____

	stimmt genau	überwiegend	teilweise	überhaupt nicht
Allgemein				
1. Für diesen Jugendlichen hat die App „SELBST!" eine wichtige und sinnvolle Unterstützung für die Therapie dargestellt.				
2. Mir ist es unangenehm, während der Therapiezeit auf dem Smartphone dieses Schülers zu tippen				
3. Die App hat dafür gesorgt, dass der Jugendliche auch an den Tagen ohne Therapie an seine Jobs gedacht hat.				
4. Die Jobs haben dafür gesorgt, dass der Jugendliche sich im Alltag besser strukturieren konnte.				
5. Durch die Wissensdatenbank konnte der Jugendliche seine organisatorisch-planerischen und Lernstrategien auch außerhalb der Therapiesitzung verbessern.				
6. Ich glaube, dass das Belohnungssystem innerhalb der App (Avatar) den Jugendlichen zusätzlich motiviert hat, diese zu nutzen.				
7. Die Notfallfunktion hat dem Jugendlichen geholfen, für ihn brisante Situationen besser zu meistern.				
8. Ich denke, dass sich bei diesem Jugendlichen Therapieeffekte durch die App noch weiter gesteigert haben.				
9. Ich glaube, dass der Jugendliche die App ausreichend benutzt hat.				
10. Ich glaube, dass der Jugendliche die Fragen und Jobs der Woche wahrheitsgemäß beantwortet hat.				
11. Ich glaube, dass es dem Jugendlichen Spaß gemacht hat, die App zu benutzen.				

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