Assessment and treatment of planning skills in adolescents with ADHD

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Chapter 3

Two novel CBTs for adolescents with ADHD: The value of planning skills

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Abstract

Objective. Adolescents with ADHD have planning problems, often affecting school- and social functioning. Evidence-based treatments for adolescents with ADHD are scarce and treatment drop-out rates are substantial. The effectiveness of two new, individual, short-term cognitive behavioral therapies (CBT) was investigated: One with an aim at improving planning skills and one solution-focused treatment (SFT) without such an aim. Motivational Interviewing elements were added to both treatments to enhance treatment compliance.

Methods. In a multi-center randomized clinical trial, 159 adolescents (12–17 years) with ADHD were randomly assigned to one of both treatments. Pre-, post and 3-month follow-up data were gathered on five domains: Parent-rated ADHD, planning problems and executive functioning (primary outcomes), neuropsychological measures of planning, comorbid symptoms, general functioning, and teacher measures.

Results. Attrition was low in both treatments (5%). Adolescents improved significantly between pre- and posttest with large effect sizes on all domains. Improvements remained stable or continued to improve from posttest to follow-up, also when controlling for medication use. Marginally significant differences were found in favor of the planning-focused treatment: parents and therapists evaluated this treatment more positively than SFT and the planning-focused treatment showed more reduction of parent-rated planning problems.

Discussion. Two new CBTs with integrated motivational components were feasible and attrition was low. ADHD symptoms and co-existing problems of the adolescents improved from pretest to 3 months after treatment. As the planning-focused treatment was evaluated more positive and had marginal additional beneficial effects to SFT, especially planning-focused CBT seems promising to fill the gap in available treatments for adolescents with ADHD.

Introduction

In theories of Attention Deficit Hyperactivity Disorder, three psychopathophysiological pathways are proposed to underlie ADHD behavior (Sonuga-Barke, Bitsakou, & Thompson, 2010): aberrant executive functioning (EF), with pronounced planning problems in adolescence (Barkley, 2004; Wolraich et al., 2005), deficits in motivation processes: a preference for immediate over delayed reinforcement and deviant sensitivity to reward and punishment (Luman, Oosterlaan, & Sergeant, 2005), and deficits in temporal processing that include problems with time estimation. In adolescence, specifically during secondary school, various environmental changes take place that particularly appeal to these pathways. The control and help of parents and teachers diminishes as compared to childhood, whereas the transition to secondary school increases the need for EF and time estimation. Adolescents are expected to independently plan long-term projects, study for tests, and complete and turn-in assignments for multiple classes and teachers (Evans et al., 2009). Also, compared to elementary school, cognitive demands and the number of homework assignments increase. In addition, increasing motivational deficits in adolescence (Spear, 2011) put a challenge on tasks with delayed reinforcement, such as paying attention in class or completing homework assignments. Therefore, it is not surprising that adolescents with ADHD are more likely to demonstrate more disruptive classroom behavior, show lower academic and occupational achievement, have higher suspension rates, drop out of school and have lower high school graduation rates than their typically developing (TD) peers (Weyandt & DuPaul, 2013). Next to these academic problems, adolescents with ADHD show comorbid disorders that persist into adulthood with the most prevalent being oppositional defiant disorder (ODD), conduct disorder (CD), anxiety and mood disorders (Barkley, 2004; Kessler et al., 2006; Wolraich et al., 2005). These problems underline the importance of effective treatment for this vulnerable group of adolescents.

Although effective for reduction of ADHD symptoms, pharmacological treatments often do not reduce the pronounced EF problems (Abikoff et al., 2009). A model posited by Safren et al. states that a history of underachievement is caused by failure to compensate for the core impairments of ADHD (e.g. inattention, inhibition, and self-regulation). Therefore, aiming treatment at these compensatory functional skills like planning and organizing may improve ADHD-symptoms as well as comorbid problems (Safren, 2006).

Psychosocial treatments for ADHD are often a mix of several behavioral, skills-training, and cognitive techniques. Although it is sometimes difficult to distinguish the main focus, in general, treatments can be divided into behavioral treatments (BTs), that generally focus on modifying the behavior of the child by operant techniques that are provided by parents, teachers or others (e.g., behavioral classroom interventions, contingency management), and behavioral training interventions (TI), that generally aim at improving the skills set of the child by directly training the individual (e.g. organizational interventions; Evans, Owens, & Bunford, 2014). In adolescent and adult samples these behavioral skills training interventions also sometimes include cognitive techniques such as cognitive restructuring, and then they often are labeled as cognitive-behavioral therapies (CBT; Antshel & Olszewski, 2014).

In children, few studies focus on the effectiveness of organizational TI's (Evans et al., 2014). A randomized controlled trial (RCT) in children with ADHD, investigating the effects of a TI focused on enhancing planning skills, showed positive results as compared to a waitlist-control group that maintained up to one year post-treatment (Abikoff et al., 2013). However, compared to an active comparison group, a traditional BT, there only was a significant difference in favor of the planning focused TI on reduction of parent-rated organizational skills. In adolescents, treatments more often focus on training of planning skills, which are often impairing in adolescence. An intensive school-based TI, that aimed at enhancing different skills (i.e. planning, organizational and social functioning) showed significant and large improvements from pre- to post treatment as compared to community care (Evans, Schultz, DeMars, & Davis, 2011). In addition, in an RCT a less intensive school based TI focusing on enhancing planning skills showed superior effectiveness of this training as compared to a waitlist control group as rated by parents, but not teachers, with maintenance of effects to three months follow-up (n=47; Langberg, Epstein, Becker, Girio-Herrera, & Vaughn, 2012). Also, a randomized pilot study on a family-based TI aiming at improvement of academic and organizational skills, showed improvement on academic measures rated by parents, but not teachers, as compared to treatment as usual (TAU; Sibley et al., 2013).

Nevertheless, most studies have focused on the effects of interventions without addition of cognitive techniques (Chronis, Jones, & Raggi, 2006), whereas adolescents may have sufficient cognitive capacity to benefit

from CBT (Antshel & Olszewski, 2014; Antshel, Faraone, & Gordon, 2012; Houghton, Alsalmi, Tan, Taylor, & Durkin, 2013). Only one non-randomized study investigated the effects of a training intervention that included cognitive techniques (CBT); this study showed large pre- to post progress on a number of parent- and teacher-rated variables (e.g. ADHD-symptoms, school-measures). In addition, according to parents and teachers, adolescents with comorbid anxiety/depression benefited more from CBT, whereas adolescents with comorbid ODD benefited less from CBT (Antshel et al., 2012). In adults with ADHD, CBTs aiming at planning and organizing skills have been investigated in RCTs (Safren et al., 2010; Solanto et al., 2014). Although the samples may not be representative for all adults with ADHD in the normal population, both RCTs showed positive results in comparison to active control groups from pre- to posttreatment, especially on reduction of ADHD symptoms (Safren et al., 2010) but also on planning related problems (Solanto et al., 2014). All in all, RCTs in adolescent samples are scarce (but Evans et al., 2011; Langberg et al., 2012; Sibley et al., 2013) and no RCTs have been conducted on the effects of planning focused treatment including cognitive techniques (CBT) in adolescents with ADHD. Moreover, to date, most of the training based interventions are quite intensive and often school-based (14–17 sessions or 5 months twice a week), making implementation and dissemination in the current European mental health care system challenging (where funding mental health care in schools is currently not feasible). For wide dissemination, treatments must be feasible for clinicians to implement using the existing infrastructure (Kataoka, Rowan, & Hoagwood, 2009).

Therefore, we compared two individual CBTs containing only eight sessions, thereby easy to implement. One intervention, Plan My Life (PML; Kuin, Boyer, & Van der Oord, 2013) aimed at improving planning and organizing skills that are necessary in adolescent life, including special attention for school- and homework. In this treatment adolescents were learned what strategies can be used for good planning (e.g. How to use a daily planner or a to do list) and maladaptive cognitions were changed (e.g. 'I couldn't do it before, why would it work now?'). PML was compared to a CBT without the specific aim of enhancing planning skills, to control for non-specific treatment effects. To make sure adolescents in this comparison treatment would not selectively drop-out, due to a lack of engagement as often reported in the literature (e.g., Johnson, Mellor, & Brann, 2008; Wolraich et al., 2005), and to make sure the treatment would be deemed equally 'credible' as PML, this

comparison CBT was a solution focused treatment (SFT). SFT was an 'empty' treatment; i.e., there weren't skills taught, there was no specific content, the adolescent had to decide for his/herself what he/she wanted to discuss (Boyer, Kuin, Oberink, & Van der Oord, 2014). The therapist then worked with the adolescent to identify what the adolescent already did well rather than focusing on what was going wrong (e.g. identifying what behavior and cognitions were helpful in periods when the problem was not present). SFT had a positive angle that may enhance treatment engagement, even though no skills were actively learned (Viner, Christie, Taylor, & Hey, 2003). As having an ADHD-diagnosis is predictive of treatment attrition (Johnson et al., 2008), adherence is an important challenge in treatment development for adolescents with ADHD (Wolraich et al., 2005). In this study Motivational Interviewing (MI) was used throughout both treatments (integrated in the workbook as well as in the attitude of the therapist, see methods section) to augment treatment motivation, as MI has been shown to have a positive effect on treatment adherence in adolescents (Erickson, Gerstle, & Feldstein, 2005; Wolraich et al., 2006).

A multi-center RCT was conducted comparing both CBTs: A large sample of adolescents was assessed pre-treatment, post-treatment and at 3-month follow-up. Our first research question was therefore: Do ADHD-symptoms, planning and EF problems, comorbid symptoms and general functioning of adolescents with ADHD improve from pre- to follow-up test? Based on the non-randomized study by Antshel et al. (2012), we expected improvement on all areas in both CBT-groups. However, following the study of Antshel et al., effects of CBT would be less pronounced on comorbid ODD- and CD-symptoms, but more pronounced on comorbid anxiety and depressive symptoms (Antshel et al., 2012). The second research question was, whether adolescents who received PML (aiming at planning skills) improve more than adolescents who received SFT (not specifically aiming at planning skills). This comparison of both treatments enabled us to make inferences about what the value is of focusing on enhancing planning skills in CBT. Outcome measures included parent-rated ADHD-symptoms and planning skills as primary outcomes, and EF-measures, measures of comorbid problems and teacher measures. In addition, neuropsychological measures of planning skills (see also chapter 2) were added as outcome measures, to investigate whether effects of CBT were also apparent on a cognitive level. We expected that adolescents in both treatments would show improvement in

ADHD, comorbid symptoms and planning skills, but following the model posited by Safren (2006) and previous studies (Abikoff et al., 2013; Safren et al., 2010; Solanto et al., 2014) the group receiving PML would improve more than the group receiving SFT, especially on ADHD-symptoms, planning skills and EF (which were therefore our primary outcomes).

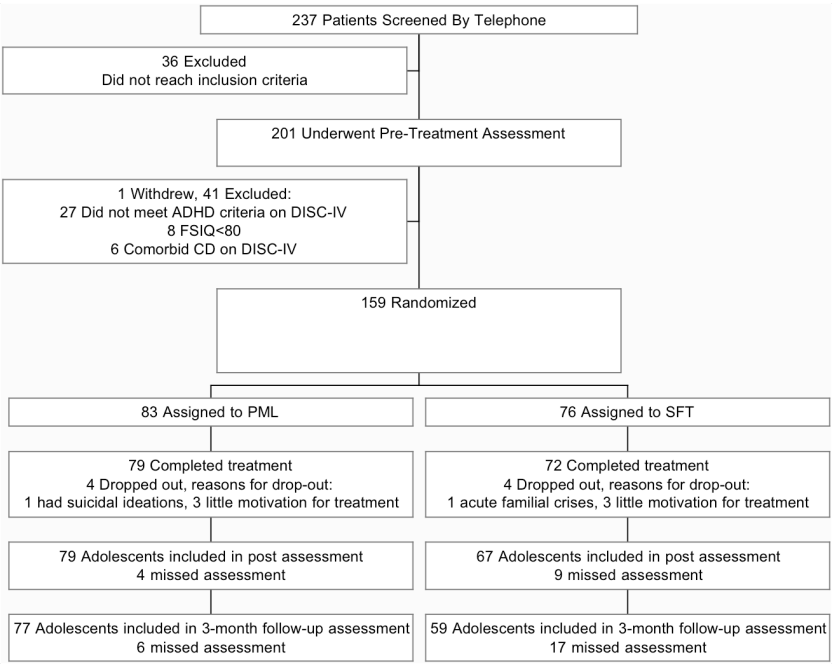
Methods

Participants

The study was presented to parents, adolescents and therapists as a study to determine which nonpharmacological treatment is most effective for adolescents with ADHD. Sixteen participating mental health care institutes in the Netherlands hang posters up and placed flyers in their waiting rooms, and therapists attended their clients to the possibility of following these treatments. Adolescents and their parents then applied for the study. For inclusion in the study, adolescents had to meet the following criteria: 1) a prior DSM-IV-TR diagnosis of ADHD (American Psychiatric Association, 2000), by a child psychiatrist or certified psychologist, 2) confirmed ADHD diagnosis on the ADHD sections of the Diagnostic Interview Schedule for Children for DSM-IV parent version (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). The DISC-IV is a structured diagnostic interview based on DSM-IV, which establishes ADHD group membership based on a diagnostic algorithm, including a check for the presence of cross-situational impairment, 3) between 12 and 17 years old, 4) attending secondary school, 5) sufficient understanding of the Dutch language (adolescents and parents), 6) a full scale IQ (FSIQ) > 80 measured by the short version of the Dutch Wechsler Intelligence Scale for Children (WISC-III; Kort et al., 2005), 7) in case the adolescent already received pharmacological treatment for ADHD, it had to be stable for four weeks prior to pre-testing. Adolescents were requested not to change medication status and dose between pre- and post-assessment. Participants on methylphenidate discontinued medication at least 24 hours before assessments, allowing for a complete wash-out (Greenhill, 1998).

Adolescents were excluded if: 1) the adolescents themselves or their parents received alternative nonpharmacological treatment between pre- and post assessment aimed at the participating adolescent. This included treatment in mental health care, but also out-of-school tutoring and in-school remedial services. When the adolescent or parents did receive alternative

Figure 3.1. Flow chart



ADHD: Attention Deficit Hyperactivity Disorder; CD: Conduct Disorder; DISC-IV: Diagnostic Interview Schedule for Children; FSIQ: Full Scale IQ; PML: Plan My Life; SFT: Solution-Focused Treatment.

treatment, they could only participate if they stopped this treatment until posttest had taken place, 2) they had a comorbid autism spectrum disorder (because our pilot study showed both treatments are unsuitable for adolescents with ASD), 3) they had predominant addiction, depression with suicidal ideations, acute familial crisis or CD (DISC-IV-criteria were used to detect comorbid CD). Because these disorders bring forward risks for participants themselves or others it was unethical to discourage additional treatment, 4) they received pharmacological treatment with Atomoxetine. Our study design included assessments with neuropsychological tests, during which medication was discontinued; Atomoxetine does not allow short-term interruption of treatment, thus these adolescents were excluded. Details of adolescent trial flow are presented in Figure 3.1.

Procedure

The study was approved by the Ethics Committee of the University of Amsterdam (2010-KP-1079). Upon referral to either participating center, inclusion criteria were checked with an extensive phone screen. Before pretest started both the parent and the adolescent gave their informed consent. After pretest, adolescents were randomly assigned to either PML (n=83) or SFT (n=76) using covariate adaptive randomization (Taves, 1974) by a blinded and independent researcher, and were stratified on gender and medication use (yes/no). Posttest took place within a week after treatment and follow-up test approximately three months after treatment, by blinded research assistants. Pretest started with the WISC-III. All three assessments consisted of neuropsychological tasks that were counterbalanced, followed by a break after an hour and concluded with questionnaires. During all assessments parents filled in questionnaires. All assessments and treatment took place in the same outpatient mental health care clinic where the participant applied for treatment.

Measures

Outcome measures

Outcomes were collected on six domains: 1) Parent-rated ADHD, EF- and planning problems (primary outcomes), 2) Neuropsychological measures of EF, 3) Comorbid symptoms, 4) General functioning, 5) Teacher measures, 6) Medication use.

1. Parent-rated ADHD, EF- and planning problems

ADHD symptoms of the adolescent are measured using the Disruptive Behavior Disorder rating scale parent version (DBD; Oosterlaan, Scheres, Antrop, Roeyers, & Sergeant, 2000; Pelham, Gnagy, Greenslade, & Milich, 1992). The DBD contains four scales composed of the DSM-IV criteria for ADHD Inattention, ADHD Hyperactivity/Impulsivity, Oppositional Defiant Disorder, and Conduct Disorder. The ADHD symptoms scale is calculated, summarizing the ADHD Inattention and the ADHD Hyperactivity/Impulsivity scales, with a higher score indicating more symptoms of ADHD.

EF- and planning problems of the adolescent are rated by parents using the Dutch Behavior Rating Inventory of Executive Function (BRIEF; Gioia,

Isquith, Guy, & Kenworthy, 2000; Smidts & Huizinga, 2009). It is a normative behavioral rating scale for children 5 to 18 years old, designed to elicit everyday EF as observed by the parents in natural everyday environments. In this study two scales were used: the Plan/Organize scale to measure planning problems and the Total score to measure EF problems. Higher scores on the subscales of the BRIEF indicate more EF problems.

2. Neuropsychological measures of EF

Four neuropsychological tests were used to measure planning skills of the adolescents. First, the *Tower Test* of the *Delis-Kaplan Executive Function System* (D-KEFS; Delis, Kaplan, & Kramer, 2001) was used. It assesses several key EFs, including planning. The objective of this subtest is to move disks, varying in size from small to large, across three pegs to build a designated tower in the fewest number of moves possible. The total achievement score was used for assessment of planning skills, with a higher score indicating better overall planning skills. Second, three conditions of the D-KEFS *Trail Making Test* (TMT; Delis et al., 2001) were used to calculate a score for the mental flexibility that is necessary for planning. In the 'switching' condition adolescents were instructed to connect items on a page, switching between numbers and letters beginning with 1 and A, and connecting them in numerical and alphabetical order, respectively. In order to control for possible differences in motor speed and familiarity with numbers and letters, the 'number' condition (connecting numbers in numerical order) and the 'letter' condition (connecting letters in alphabetical order) were also administered. In this study flexibility is measured, using the time to complete the switching condition while controlling for the time to complete the number and letter conditions. The higher the difference, the more difficulty is evident in shifting between two sets.

Third, the *Key Search* test from the *Behavioral Assessment of the Dysexecutive Syndrome* (BADS; Wilson, Alderman, Burgess, Emslie, & Evans, 1996) is used to examine the ability to plan an efficient, systematic plan of action. Adolescents are presented with a drawing that represents a field in which they have lost their key and are asked to draw a pathway through which it would be reasonable to search for the lost key. The score is based on whether the rater believes the strategy to be systematic, efficient and likely to be effective. We used the score-time ratio, which is calculated by dividing the score

by the completion time: a higher score indicating a better performance.

Finally, the *Zoo Map* test of the BADS is administered to measures planning skills (Wilson et al., 1996). Zoo Map consists of two conditions. In condition 1 adolescents are asked to plan a route on a given zoo map, passing through a list of animals (the ability to formulate and implement a plan). In condition 2 they have to pass the list of animals in a given order (follow a pre-formulated plan). For each condition the score-time ratio is calculated by dividing the order-score (successful implementation of the plan) by the completion time. The outcome measure was the score on condition 2 minus the score on condition 1. The higher the difference score, the more difficulty is evident in planning skills.

3. Comorbid symptoms

Depressive symptoms are measured using the self-reported Child Depression Inventory (CDI; Sitarenios & Kovacs, 1999; Timbremont & Braet, 2002). Scores range from 0 to 54, in which higher scores indicate more depressive symptoms.

Anxiety is evaluated using the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997; Muris, Bodden, Hale, Birmaher, & Mayer, 2007). Adolescents filled in 69 items, which added up to a total anxiety score, ranging from 0 to 138: Higher scores indicate more anxiety symptoms.

ODD and CD symptoms are measured with the 24 items of the ODD and CD scales of the parent-rated DBD (Oosterlaan et al., 2000; Pelham et al., 1992; for description see domain 1, ADHD symptoms). Scores range from 0 to 72, in which higher scores indicate more externalizing symptoms.

Internalizing problems are measured using the Internalizing Behavior Scale of the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1991; Verhulst, Van der Ende, & Koot, 1996). Parents filled in 32 items, with a total score ranging from 0 to 64, in which higher scores indicate more internalizing problems.

Externalizing problems are measured using the Externalizing Behavior Scale of the CBCL (Achenbach & Edelbrock, 1991; Verhulst et al., 1996). Parents filled in 30 items, with a total score ranging from 0 to 60, in which higher scores indicate more externalizing problems.

4. General functioning

School Attitude is evaluated using the School Attitude Questionnaire (Vorst, 2008). Adolescents filled in 72 items, with a total score ranging from 72 to 216 and a higher score indicating a more positive attitude towards school.

Homework is assessed using the Homework Problems Checklist (Anesko, Schoiock, Ramirez, & Levine, 1987). Parents answered 20 questions with a total score ranging from 20 to 80. Higher scores indicate more homework problems.

Parent-adolescent conflict is measured using the Conflict Behavior Questionnaire (Prinz, Foster, Kent, & O'Leary, 1979). The questionnaire consists of 44 items that had to be answered true or false. After recoding, scores range from 0 to 44 with higher scores indicating more parent-adolescent conflict. Both parents and adolescents filled in the CBQ.

General Impairment is measured using the Impairment Rating Scale (IRS; Fabiano & Pelham, 2002). Parents answered six questions on a scale from 0 to 10, resulting in a total score ranging from 0 to 60, with higher scores indicating high general impairment. On questions of the IRS, a score under 3 implies normalization of functioning. In this study, the IRS question measuring 'the overall severity of this child's problem in functioning and overall need for treatment' was used to measure general impairment and assess how many adolescents normalized after treatment.

5. Teacher measures

ADHD Symptoms of the adolescent are measured using the DBD rating scale teacher version (Oosterlaan et al., 2000; Pelham et al., 1992). The ADHD symptoms scale is calculated summarizing the ADHD Inattention and the ADHD Hyperactivity/Impulsivity scales, with a higher score indicating more symptoms of ADHD.

EF- and planning problems of the adolescent are rated by teachers, using the Dutch BRIEF teacher version (Gioia et al., 2000; Smidts & Huizinga, 2009). In this study two scales were used: the Plan/Organize scale to measure planning problems and the Total score to measure EF problems. Higher scores on the subscales of the BRIEF indicate more EF problems.

ODD and CD symptoms of the adolescent are measured using the DBD rating scale teacher version (Oosterlaan et al., 2000; Pelham et al., 1992). The ODD and CD symptoms scale is calculated, adding the ODD and CD scales, with a higher score indicating more symptoms of ODD and CD.

General Impairment is measured using the IRS teacher version (Fabiano & Pelham, 2002). Teachers answered six questions on a scale from 0 to 10, resulting in a total score ranging from 0 to 60, with higher scores indicating high general impairment.

School functioning is evaluated using the Classroom Performance Survey (CPS; Brady, Evans, Berlin, Bunford, & Kern, 2012). Teachers fill in 20 questions on a scale from 1 to 5, resulting in a total score ranging from 20 to 100, with higher a score indicating worse school functioning.

6. Medication Use

As medication use and dose could change between post- and follow-up assessment, medication use was an outcome measure in post- to follow-up analyses. Parents were asked about the use of medication (yes/no), type (Methylphenidate [MPH]/Dexamphetamine) and dose of medication (daily dose)* at posttest and at follow-up.

Evaluation of treatment

Parents and adolescents evaluated the treatment at posttest. Parents were asked to rate treatment satisfaction on four 5-point Likert scales, and adolescents on five 5-point Likert scales. For both parents and adolescents, a higher score indicated a more positive evaluation. Therapists were asked to answer the following three questions after being trained in both treatments: Which of the two treatments 1) has your preference?, 2) do you think is best suitable for this population?, 3) would you rather carry out? If the case would arise that therapists had a strong preference for one of both treatments, adherence and contamination were measured to monitor if treatment fidelity was affected (see Treatment fidelity).

Treatments

Similarities. Both PML and SFT were individual treatments consisting of eight adolescent sessions and two parental sessions (between adolescent session 2 and 3, and between adolescent session 5 and 6) of 45–60 minutes. In both treatments the adolescent and therapist used a workbook. The treatments had an identical first session, which consisted of psycho-education

* Because some adolescents only use MPH during the school-week, school-week average dose is calculated.

and formulating personal treatment goals. To reduce drop-out, MI was integrated in both treatments and also into the workbooks, in several ways: 1) The adolescents chose their own treatment goals (not those of their parents or teachers), which were written down and were always visible during treatment, 2) In the first part of each session (± 10 minutes), the past week was discussed and attention was paid to progression towards treatment goals, 3) Medication use (when relevant) and school attitude were explored on scales in a MI manner, 4) Assignments were not presented as 'homework', but were formulated as an experiment for the upcoming week. That way the adolescent was free to choose a treatment strategy that fitted his/her life and the strategy could be adjusted according to their experiences, 5) After every session the adolescent evaluated the session on four visual analogue scales regarding the therapist, importance and usefulness of the session subject, and their intention to try the new strategies, 6) Whenever the adolescent was not motivated enough to finish a session, MI was conducted by discussing pros and cons of treatment until the adolescent indicated to have enough motivation for the treatment to continue, 7) In the attitude of the therapist: Therapists were learned to use MI by emphasizing the autonomy of the adolescent, collaborate with them rather than taking an expert role, evoke and elicit reasons and concerns about change instead of imparting advise and, finally, to show empathy in an MI manner (Naar-King & Suarez, 2011). A final similarity between both treatments was that adolescents could earn a reward, which they got from their parents (e.g. doing an activity with their friends or family, choosing desert for a week or getting a present), when they attended all treatment sessions.

Plan My Life (PML; Kuin et al., 2013, also see **Appendix**, p. 151) was a CBT in which every session a fixed, planning skills focused, subject was discussed. Planning- and organization strategies (such as a to-do list) were presented of which the adolescent could compose the strategies he/she wanted to try the following week. Whenever needed, negative thoughts about the new strategy were challenged and helping thoughts formulated. Every session, strategies that had been tried during the past week were discussed, including successes, possible room for improvement, and associated cognitions. Also, the adolescent showed his/her daily planner and to do list of the past week. The two parental sessions aimed at finding a balance between keeping control of their child and letting go, by discussing which parenting goals were worth the struggle. Next, parents were taught how to formulate and implement

Table 3.1. Content of both treatments

Session	PML	SFT
1	Psycho-education and treatment goals	Psycho-education and treatment goals
2	Finding new solutions for existing problems and use of daily planner	Solve self-formulated problem
Parent1	Treatment content and parenting goals	Solve self-formulated problem
3	Use of to do list and prioritizing	Solve self-formulated problem
4	Divide big problem in small steps	Solve self-formulated problem
5	Concentration in classroom and during homework	Solve self-formulated problem
Parent2	Household rules	Solve self-formulated problem
6	Planning homework	Solve self-formulated problem
7	Help from friends and family	Solve self-formulated problem
8	Relapse prevention	Repetition of solutions

PML: Plan My Life; SFT: Solution Focused Treatment.

rules in the household and how to facilitate positive communication with the adolescent.

In the *Solution Focused Treatment* (SFT; Boyer et al., 2014) every session the adolescent discussed a problem he/she encountered. Following fixed questions, the adolescent was guided towards a solution for the posited problem. The fixed questions were: 1) What is the subject you chose? Describe the situation, 2) How is the present situation a problem for you?, 3) How would you like it to be?, 4) What are solutions you used in the past and what are other possible solutions to the problem?, 5) Does the situation, as it is now, have advantages?, 6) Would you like to change the situation now/later/not at all, 7) If you choose to change, what is your plan? If you choose to change later or not at all, what are your considerations (pros and cons)? Every session started with the therapist asking the adolescent what went well in the past week and whether the subject of last week had to be discussed again today. In the parental sessions the same questions were asked regarding parenting problems. In this treatment the therapist did not tell the adolescent or parent what to do and did not teach them new skills, but guided them towards a solution, using the fixed questions.

Differences. Whereas in PML every week planning skills were actively learned by discussing a fixed subject, in SFT the adolescent/parent had to choose the subjects themselves and was guided to his/her own solution (see Table 3.1).

Therapists

To control for therapist effects (Anderson, Ogles, Patterson, Lambert, & Vermeersch, 2009), the 56 participating therapists provided both treatments. All therapists worked in one of 16 participating mental health care institutes and were kept blind from the hypothesis that PML would have greater treatment effects that SFT. Within every institute two to nine therapists participated, who all at least had a master degree in psychology. Therapists varied in years of working experience (M=5.9; SD=5.5; range=0.3–25.0). The number of adolescents treated by the therapists was variable (M=4.2; SD=2.1; range=1–10). Every other week therapists had supervision to discuss ongoing treatments, from a certified supervisor of the Dutch Association for Behavioral and Cognitive Therapies. During supervision role-play was used to practice problem situations and video recordings of therapists' treatments were examined to provide corrective feedback of the therapists' performance whenever needed.

Treatment fidelity

To assure intervention fidelity, several actions were taken (Gearing et al., 2011). To promote intervention fidelity session-to-session therapist manual and adolescent workbook were written for both treatments, to work with during sessions. Therapists were trained in both treatments in a two-day training, which was given by the treatment developers and member of Motivational Interviewing Network of Trainers (MINT). Since this within-therapist design enhances the chance of spillover effects, during this training similarities and differences between treatments were emphasized. Also, role-playing was used for practice and videos were showed to model both treatments. Every other week therapists had supervision to discuss ongoing treatments. Eight participating supervisors, acknowledged by the Dutch Association for Behavioral and Cognitive Therapies, were trained by the treatment developers and a MINT member (for 3 days), specifically on supervision of MI and both treatments. During supervision role-play was used to practice problem situations and films of therapists' treatments were watched to monitor treat-

ments and provide corrective feedback whenever needed. A year after training all therapists attended a one-day booster training where again similarities and differences between treatments were emphasized and in addition, problems/pitfalls that came forward in supervision were discussed.

Measures of intervention fidelity

Recorded adherence and contamination. Five digitally recorded sessions were randomly chosen from all sessions of each treatment condition to rate adherence (percentage of elements that are addressed in the right session of the right treatment) and contamination (percentage of elements that are addressed in one treatment although actually belonging in the other treatment), resulting in 100 rated sessions (i.e. 5.4% of all sessions). For the adolescent sessions in both treatments, all sessions had to be conducted as described in the manual to reach 100% adherence. Also, for the parental sessions in SFT, therapist had to conduct both sessions as described in the manual to reach 100% adherence. In case of PML however, the manual stated that the therapist could choose 2 out of 3 possible sessions to fill in the parent sessions. Therefore, when 2 out of 3 sessions are conducted in PML (i.e. 66%), adherence is 100%.

An alphabetical list of all elements of both treatments was created for rating. Four master level psychology students were trained by the treatment developers to recognize all treatment elements of both treatments, while being blind to which treatment the elements belonged. Raters were also blind to the session number and treatment of the films they rated. The four students had a high inter-rater reliability of ICC(1, k)=.97. Adherence is measured by calculating the percentage of elements that are addressed in the right session of the right treatment. Contamination is measured by calculating the percentage of elements that are addressed in one treatment while actually belonging in the other treatment. Adherence and contamination were calculated for adolescent and parent sessions separately.

Therapist-reported adherence. Therapists filled in registration books to rate their treatment adherence. Percentages of addressed elements (i.e. adherence) for both adolescent and parent sessions were calculated.

Treatment Diffusion. As in six sessions of SFT the discussed subject was chosen by the adolescent, diffusion from PML to SFT is measured by examining the chosen subject. The percentage of sessions in SFT devoted to

a planning related subject that is also discussed in PML (i.e. diffusion) was calculated.

Missing data

Intent-to-treat analyses were conducted. Missing parent and adolescent data were imputed using stochastic regression (Baraldi & Enders, 2010). These missing data were not related to any subject characteristic and were as a result missing completely at random (Little & Rubin, 2002). Unfortunately, there were high rates of missing teacher data (46.5% missing at pretest, 50.9% at posttest, 63.5% at follow-up). Replacement of missing values is not reliable at these high rates, thus missing teacher data could not be imputed (Scheffer, 2002). As a result, we conducted our main analyses on the first four domains, and we analyzed teacher data only exploratory.

Statistical analyses

Sample description and baseline comparison. To test for group differences in demographic variables at pretest, *t*-tests were used for continue variables and chi-square tests for categorical variables. To compare outcome variables between treatment groups at baseline, three MANOVAs were used: one on adolescent measures, one on parent-rated measures and one on the teacher-rated measures.

Treatment fidelity. Percentages of rated adherence and contamination were calculated for both recorded adolescent and parent sessions. Also, treatments were compared on therapist-reported adherence using independent *t*-tests on the percentages of addressed elements for both adolescent and parent sessions. Finally, the percentage of diffusion of PML elements into SFT was calculated.

Medication change and additional treatment. Using chi-square test the number of adolescents, that changed medication status or received additional nonpharmacological treatment, was compared between treatment groups, from pre- to posttest as well as from post- to follow-up test. Possible changes in average MPH dose between post- and follow-up test and between treatment groups were analyzed using repeated measures analyses.

Treatment outcomes. The effects of both treatments were investigated on four different domains: 1. Parent-rated ADHD, planning and EF (primary outcomes), 2. Neuropsychological measures, 3. Comorbid problems, 4. General functioning, using four separate repeated measure MANOVA's, with time (pre-, post-, follow-up test) as within variable and treatment (PLM and SFT) as between variable. Multivariate analyses were followed up with univariate analyses and within-subject contrasts to explore time effects and time × treatment effects between pre- and posttest and between post- and follow-up test. To prevent type I error, bonferroni correction was used, resulting in an alpha of .0125. The fifth domain, teacher measures, was analyzed exploratory due to missing data using two repeated measure MANOVAs with time (pre- to posttest in the first analysis, post- to follow-up test in the second analysis) as within variable and treatment (PLM and SFT) as between variable. The reason, for analyzing pre- to posttest and post- to follow-up test separately, was that this increases the number of responders (pre- to posttest n=30, post- to follow-up test n=27). Multivariate analyses were followed up with univariate analyses. In addition, with chi-squared test we assessed how many adolescents normalized after both treatments, according to parent-rated IRS scores, and whether this number differed between treatments.

Covariates. To control for site-effects, analyses were repeated whilst co-varying for site. When this affected results, this is reported in Table 3.4. As after posttest adolescents could start or stop using medication and could start additional treatment, repeated measures MANOVAs were conducted on the post- and follow-up test scores, whilst co-varying for medication use at follow-up (yes/no) and receiving additional treatment after posttest (yes/no). Please note that both covariates have missing values resulting in smaller sample sizes, respectively: n=116, n=132. If co-varying affected results, this is reported in Table 3.5.

Treatment evaluation. Adolescent and parent evaluation of treatment was investigated using t-tests. Therapist evaluation was compared between treatments using binary tests of proportion.

Power analysis. Power analysis was conducted in G*Power. Based on comparable research with adults (ES=1.1; Safren et al., 2005), we expected PML to be an effective treatment, with large effect sizes (ES>.8; Cohen,

Table 3.2: Sample description

	PML (*n*=83)		SFT (*n*=76)		
	M/*n*	*SD*/%	*M*/*n*	*SD*/%	Results
Age in years	14.4	1.2	14.4	1.3	$t(157)=.19$, $d=.00$
Gender (*n* boys)	63	75.9	54	71.1	$\chi^2(1)=.48$, $\varphi=.06$
Father's highest completed education level [a]					$\chi^2(3)=1.79$, $\varphi=.01$
Low	3	3.6	6	7.9	
Average	14	16.9	12	15.8	
Higher	28	33.7	21	25.3	
Highest	34	41.0	32	42.1	
Mother's highest completed education level					$\chi^2(3)=5.46$, $\varphi=.03$
Low	1	1.2	7	9.2	
Average	14	16.9	10	12.0	
Higher	36	43.4	31	40.8	
Highest	30	36.1	28	36.8	
FSIQ	102.5	11.6	104.3	11.9	$t(157)=-.97$, $d=.15$
Age when diagnosed [a]	12.8	2.1	12.2	2.9	$t(133.35)=1.64$, $d=.24$
ADHD Subtype (DISC-IV)					$\chi^2(2)=5.06$, $\varphi=.18$
ADHD-I	62	74.7	50	65.8	
ADHD-HI	6	7.2	2	2.6	
ADHD-C	15	18.1	24	31.6	
Clinical comorbidity					
n ODD	28	33.7	22	28.9	$\chi^2(1)=.42$, $\varphi=.00$
n depression	17	20.5	15	19.7	$\chi^2(1)=.01$, $\varphi=.00$
n anxiety disorder	10	12.0	4	5.3	$\chi^2(1)=2.28$, $\varphi=.01$

ADHD: Attention Deficit Hyperactivity Disorder; ADHD-C: Attention Deficit Hyperactivity Disorder Combined Subtype; ADHD-HI: Attention Deficit Hyperactivity Disorder Hyperactive/Impulsive Subtype; ADHD-I: Attention Deficit Hyperactivity Disorder Inattentive Subtype; DISC-IV: subtype based on Diagnostic Interview Schedule for Children for DSM-IV parent version; FSIQ: Full Scale IQ; MPH: Methylphenidate; MPH IR: Methylphenidate Immediate Release; ODD: Oppositional Defiant Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. *a* On this variable data are missing. * $p<0.05$, ** $p<0.01$, *** $p<0.001$; Cramer's φ effect size: .10 is small, .30 is medium, .50 is large; Cohen's *d* effect size: 0.2 is small, 0.5 medium, 0.8 large.
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1992). We also expected SFT to be an effective treatment (e.g. because of non-specific treatment factors), however with a small to medium ES (between .2 and .5). Therefore, between both treatments we expected a medium ES (.7) and we needed a total of 153 adolescents for sufficient power (alpha level=.0125, power=.8).

Table 3.2: Continued

	PML (*n*=83)		SFT (*n*=76)		
	M/*n*	*SD*/%	*M*/*n*	*SD*/%	
Medication status					
n no medication	21	25.3	14	18.4	$\chi^2(2)=2.13$, $\varphi=.01$
n users dexamphetamine	1	1.2	3	3.9	
n users MPH	61	73.5	59	77.6	
MPH IR dose schoolday [a]	25.0	20.2	26.8	19.7	$t(140)=-.53$, $d=.09$
Treatment history prior to study					
n for ADHD [a]	21	25.3	21	25.3	$\chi^2(1)=.12$, $\varphi=.00$
n for other than ADHD [a]	13	15.7	16	21.1	$\chi^2(1)=.79$, $\varphi=.00$
Treatment characteristics					
Length of treatment (weeks)	9.3	2.6	9.1	2.9	$t(157)=.47$, $d=.07$
n Drop-outs	4	4.8	4	5.3	$\chi^2(1)=.02$, $\varphi=.00$
Assessment attendance					
Posttest	79	95.2	67	88.2	$\chi^2(1)=2.61$, $\varphi=.02$
Follow-up test	77	92.8	59	77.6	$\chi^2(1)=7.35$**, $\varphi=.05$

ADHD: Attention Deficit Hyperactivity Disorder; ADHD-C: Attention Deficit Hyperactivity Disorder Combined Subtype; ADHD-HI: Attention Deficit Hyperactivity Disorder Hyperactive/Impulsive Subtype; ADHD-I: Attention Deficit Hyperactivity Disorder Inattentive Subtype; DISC-IV: subtype based on Diagnostic Interview Schedule for Children for DSM-IV parent version; FSIQ: Full Scale IQ; MPH: Methylphenidate; MPH IR: Methylphenidate Immediate Release; ODD: Oppositional Defiant Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. *a* On this variable data are missing. * $p<0.05$, ** $p<0.01$, *** $p<0.001$; Cramer's φ effect size: .10 is small, .30 is medium, .50 is large; Cohen's *d* effect size: 0.2 is small, 0.5 medium, 0.8 large.

Results

Sample description and baseline comparison

There were no significant differences between conditions on demographic characteristics (Table 3.2). The sample seemed representative for the broader group of adolescents with ADHD: 70.3% of adolescents had the inattentive subtype, 73.5% were boys and 78.1% used psychotropic medication (Barkley, 2004; Wolraich et al., 2005). Also, in both treatments, attrition was low and the length of treatment was comparable. PML showed significantly higher attendance rates than SFT at follow-up assessments. At baseline no group differences were found on the outcome measures (Table 3.3). Also, no differences appeared between drop-outs and completers on demographics and baseline measures.

Table 3.3. Group comparison at baseline.

	PML (n=83)		SFT (n=76)			
	M/*n*	*SD*/%	*M*/*n*	*SD*/%	*F*	η_p^2
Adolescent measures						
Omnibus					$F(8, 150)=1.085$	.055
Tower Test	17.89	2.80	17.29	2.50	$F(1, 157)=2.031$	.013
Trail Making Test	−.91	2.31	−1.41	2.42	$F(1, 157)=1.726$	.011
Key Search	.37	.28	.39	.37	$F(1, 157)=.204$	.001
Zoo Map	.11	.06	.10	.05	$F(1, 157)=2.540$	.016
Depression	10.10	6.51	9.97	5.66	$F(1, 157)=.016$	.000
Anxiety	27.03	19.42	24.07	18.25	$F(1, 157)=.979$	.006
School attitude	158.74	20.30	157.50	16.01	$F(1, 157)=.182$	.001
Conflicts	9.25	8.01	8.63	7.02	$F(1, 157)=.273$	.002
Parent measures						
Omnibus					$F(9, 149)=.835$	.048
ADHD symptoms	25.56	9.48	24.97	9.16	$F(1, 157)=.162$	.001
EF problems	154.53	20.23	153.04	19.28	$F(1, 157)=.225$	.001
Planning problems	28.00	4.47	28.38	4.35	$F(1, 157)=.292$	.002
ODD/CD	6.77	5.29	6.47	4.98	$F(1, 157)=.136$	.001
Internalizing problems	10.47	6.97	10.53	8.57	$F(1, 157)=.002$	.000
Externalizing problems	11.31	6.97	10.39	7.35	$F(1, 157)=.608$	.004
Homework problems	46.90	11.63	49.89	12.37	$F(1, 157)=2.481$	.016
Conflicts	10.93	7.32	9.91	6.83	$F(1, 157)=.812$	.005
Overall impairment	32.30	11.68	30.60	11.32	$F(1, 157)=.865$	.005

ADHD: Attention Deficit Hyperactivity Disorder; CD: Conduct Disorder; EF: Executive Functioning; ODD: Oppositional Defiant Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. *a* On this variable data are missing. * p<0.05, ** p<0.01, η_p^2 effect size: .01 is small, .06 is medium, .14 is large.

Treatment fidelity

Recorded adherence and contamination. Based on the rated videotapes of the sessions, adherence was high in the adolescent sessions (PML=86.0%, SFT=83.4%) as well as in the parental sessions (PML=66.0%*, SFT=82.6%) of both treatments. In addition, no contamination was found: no PML elements were rated in the SFT group and vice versa.

Therapist-reported adherence. Therapist report of adherence showed that on average 91.9% (*SD*=8.36, *n*=107) of adolescent sessions and 90.8% (*SD*=11.07, *n*=91) of parent sessions were carried out as described in

* Please note that this is the maximum adherence score.

the treatment manuals, with no significant difference in adherence between treatments.

Treatment Diffusion. Sixty-seven workbooks were collected of the 76 adolescents who were treated with SFT (88.2%). In 61.7% of their sessions the adolescents chose to discuss a planning related problem. Of these planning subjects, 37.3% was related to planning of school and homework, but note that in SFT no planning skills were taught by the therapists (no contamination, see above).

Medication change and additional treatment

Between pre- and posttest a total of nine adolescents (5.6%) changed medication dose, with no group differences (PML n=4, SFT n=5, p=.59, φ=.05). Also, analyses showed no group differences in the number of adolescents who started (n=10) or stopped (n=13) medication between post- and follow-up test (p=.703, φ=.01). Repeated measures analyses showed no within group difference in average MPH dose between post- and follow-up test (p=.07, η_p^2=.033) nor between treatment-groups (p=.20, η_p^2=.017). Also, there were no between group differences in the number of adolescents who received additional nonpharmacological treatment between post- and follow-up test (n=13, p=.865, φ=.00).

Treatment Outcomes

Time effects. Our first research question was whether ADHD-symptoms, planning and EF problems, comorbid symptoms and general functioning of adolescents with ADHD improve from pre- to follow-up test. Analyses showed a consistent pattern: On all four domains omnibus tests showed significant within-group improvement over time, with large ES (η_p^2 range=.319–.452; see Table 3.4 to 3.5 (p. 75)). Univariate follow-up analyses showed that on all outcome-measures a significant within-group improvement over time was found, except for School attitude and two of the neuropsychological tests (TMT, Zoo-Map test).

Within-subjects contrasts showed significant improvements from pre to posttest on 10 of 17 outcome measures, with exception of ODD/CD, externalizing problems, school attitude, the two conflict measures, and the TMT and the Zoo Map test. From post- to follow-up test all measures showed maintenance of effects. In addition, six measures showed further improvement from posttest to follow-up.

Table 3.4a: Means and standard deviations of PML at pretest, posttest and three-month follow-up.

	Pre		Post		FU1	
Domain	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Parent-rated ADHD and EF						
ADHD symptoms	25.56	9.48	18.66	9.64	18.41	9.76
EF problems	154.53	20.23	142.70	20.56	141.44	22.83
Planning problems	28.00	4.47	25.70	4.70	25.10	5.39
2. Neuropsychological measures						
Tower Test	17.89	2.80	18.54	3.13	19.97	3.91
Trail Making Test	−.91	2.31	−1.05	2.12	−1.34	2.06
Key Search	.37	.28	.49	.33	.59	.44
Zoo Map	.11	.06	.14	.14	.12	.06
3. Comorbid symptoms						
Depression	10.10	6.51	8.92	6.82	7.68	5.10
Anxiety	27.03	19.42	20.49	16.17	18.86	14.39
ODD/CD	6.77	5.29	5.84	5.49	4.74	4.30
Internalizing problems	10.47	6.97	8.53	6.38	7.03	6.69
Externalizing problems	11.31	7.43	9.46	6.27	9.21	6.78
4. General Functioning						
School attitude	158.74	20.30	158.16	22.62	161.83	21.35
Homework problems	46.90	11.63	42.52	11.42	42.29	12.10
Conflict (parent)	10.93	7.32	10.02	8.16	9.49	7.95
Conflict (adolescent)	9.25	8.01	8.57	7.69	8.16	7.95
Overall impairment	32.30	11.68	27.44	11.44	26.64	13.36

ADHD: Attention Deficit Hyperactivity Disorder; EF: Executive Functioning; ODD/CD: Oppositional Disruptive Disorder/Conduct Disorder; PML: Plan My Life.

Exploratory analyses on the fifth domain, teacher measures, showed comparable results. Multivariate tests showed significant within-group improvement over time from pre- to posttest, $F(6,23)=2.94$, $p=.03$, $\eta_p^2=.43$. Univariate within-group follow-up analyses showed that from pre- to posttest, teacher-rated EF and impairment significantly improved over time, $F(1,28)=6.73$, $p=.02$, $\eta_p^2=.19$ and $F(1,28)=7.39$, $p=.01$, $\eta_p^2=.21$, respectively. For teacher-rated ADHD-symptoms a trend was visible, $F(1,28)=5.01$, $p=.03$, $\eta_p^2=.15$. On all variables, maintenance of effects was found to follow-up test.

Time × Treatment effects. The second research question was whether adolescents who received PML (aiming at planning skills) improve more than adolescents who received SFT (not specifically aiming at planning

Table 3.4b: Means and standard deviations of SFT at pretest, posttest and three-month follow-up.

	Pre		Post		FU1	
Domain	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Parent-rated ADHD and EF						
ADHD symptoms	24.97	9.16	19.99	9.69	20.02	8.21
EF problems	153.04	19.28	148.13	23.31	143.71	18.17
Planning problems	28.38	4.35	27.50	5.29	26.77	3.66
2. Neuropsychological measures						
Tower Test	17.29	2.50	18.69	3.17	19.98	3.40
Trail Making Test	−1.41	2.42	−1.09	2.57	−1.42	1.82
Key Search	.39	.37	.50	.34	.71	.60
Zoo Map	.10	.05	.11	.06	.12	.08
3. Comorbid symptoms						
Depression	9.97	5.65	9.21	5.57	8.48	4.65
Anxiety	24.06	18.25	19.54	18.17	18.53	16.17
ODD/CD	6.47	4.98	5.99	5.78	4.55	3.80
Internalizing problems	10.53	8.57	9.36	8.67	6.47	5.64
Externalizing problems	10.39	7.35	10.40	7.89	8.21	6.16
4. General Functioning						
School attitude	157.50	16.01	158.41	17.48	158.86	16.58
Homework problems	49.89	12.37	46.77	11.87	43.67	11.65
Conflict (parent)	9.92	6.83	9.43	6.72	7.38	6.77
Conflict (adolescent)	8.63	7.02	7.57	6.99	6.90	6.90
Overall impairment	30.60	11.32	28.73	11.43	27.01	12.45

ADHD: Attention Deficit Hyperactivity Disorder; EF: Executive Functioning; ODD/CD: Oppositional Disruptive Disorder/Conduct Disorder; SFT: Solution Focused Treatment.

skills). Omnibus tests showed no time × treatment interactions: Treatments did not differ in their improvement from pre- to post- to follow-up test, ES of time × treatment interactions were medium (η_p^2 range=.046–.072; see Table 3.4 and 3.5). Also univariate analyses showed no interactions, with one exceptional trend on the externalizing problems measure (p=.03). Complementary within-subject contrasts on the externalizing problems measure showed that PML improved more than SFT between pre and posttest. However, SFT showed greater improvement than PML between post- and follow-up test, resulting in comparable follow-up scores for both on the externalizing problems measure.

Within-subject contrasts showed two more significant time × treatment interactions on our primary outcomes: parent-rated EF and planning. On both

Table 3.4c: Results of repeated measures MANOVAs comparing treatment effects of PML and SFT from pretest to three-month follow-up.

	Time		Time × Treatment	
Domain	F	η_p^2	F	η_p^2
1. Parent-rated ADHD and EF				
Omnibus	F(6, 152)=20.01***	0.441	F(6, 152)=1.24	0.046
ADHD symptoms	F(2, 314)=49.95***	0.241	F(2, 314)=1.51	0.010
EF problems	F(2, 314)=32.52***	0.172	F(2, 314)=2.87	0.018
Planning problems	F(2, 314)=20.06***	0.113	F(2, 314)=2.32	0.015
2. Neuropsychological measures				
Omnibus	F(8, 150)=15.49***	0.452	F(8, 150)=.97	0.049
Tower Test	F(2, 314)=32.71***	0.172	F(2, 314)=.92	0.006
Trail Making Test	F(2, 314)=1.07	0.007	F(2, 314)=.68	0.004
Key Search	F(2, 314)=36.12***	0.187	F(2, 314)=1.65	0.010
Zoo Map	F(2, 314)=2.24	0.014	F(2, 314)=.87	0.005
3. Comorbid symptoms				
Omnibus	F(10, 148)=11.36***	0.434	F(10, 148)=1.08	0.068
Depression	F(2, 314)=16.85***	0.097	F(2, 314)=.93	0.006
Anxiety	F(2, 314)=26.33***	0.144	F(2, 314)=.95	0.006
ODD/CD	F(2, 314)=15.90***	0.092	F(2, 314)=.21	0.001
Internalizing problems	F(2, 314)=29.74***	0.159	F(2, 314)=1.02	0.006
Externalizing problems	F(2, 314)=13.71***	0.080	F(2, 314)=3.58*†	0.022
4. General Functioning				
Omnibus	F(10, 148)=6.93***	0.319	F(10, 148)=1.14	0.072
School attitude	F(2, 314)=2.10°	0.013	F(2, 314)=.89	0.006
Homework problems	F(2, 314)=19.38***	0.110	F(2, 314)=1.31	0.008
Conflict (parent)	F(2, 314)=9.55***	0.057	F(2, 314)=1.43	0.009
Conflict (adolescent)	F(2, 314)=3.29*†	0.020	F(2, 314)=.16	0.001
Overall impairment	F(2, 314)=13.85***	0.081	F(2, 314)=1.46	0.009

ADHD: Attention Deficit Hyperactivity Disorder; EF: Executive Functioning; ODD/CD: Oppositional Disruptive Disorder/Conduct Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. η_p^2 effect size: .01 is small, .06 is medium, .14 is large. * p<0.05; ** p<0.01, *** p<0.001; † No longer significant when controlling for site-effects; ° Becomes significant when controlling for site-effects.

measures PML showed a trend towards greater improvement than SFT between pre- and posttest. Between group analyses showed better parent-rated planning skills in PML than SFT at posttest, $t(157)=-2.28$, $p=.02$*, $d=.36$, and at follow-up test, $t(157)=-2.27$, $p=.033$, $d=.37$. Exploratory analyses on the fifth domain, teacher measures, did not show time × treatment interactions from pre- to posttest as well as from post- to follow-up test.

* Due to bonferroni correction alpha=.0125, thus these p-values are considered a trend.

Table 3.5a. Within subjects time contrasts from pre- to post test and post- to follow-up test.

Domain	Pre to post F	η_p^2	Post to follow-up F	η_p^2
1. Parent-rated ADHD and EF				
ADHD symptoms	F(1, 157)=71.88***	.314	F(1, 157)=.02	.000
EF problems	F(1, 157)=29.86***	.160	F(1, 157)=4.27*†	.026
Planning problems	F(1, 157)=18.83***	.107	F(1, 157)=3.66	.023
2. Neuropsychological measures				
Tower Test	F(1, 157)=15.46***	.090	F(1, 157)=17.27***†	.109
Trail Making Test	F(1, 157)=.13	.001	F(1, 157)=2.22	.014
Key Search	F(1, 157)=19.87***	.112	F(1, 157)=23.70***	.131
Zoo Map	F(1, 157)=4.06*	.025	F(1, 157)=.82	.005
3. Comorbid symptoms				
Depression	F(1, 157)=7.68**	.047	F(1, 157)=9.91**†	.059
Anxiety	F(1, 157)=31.96***	.169	F(1, 157)=2.39	.015
ODD/CD	F(1, 157)=3.31	.021	F(1, 157)=12.05***†	.071
Internalizing problems	F(1, 157)=11.38***	.068	F(1, 157)=22.69***	.126
Externalizing problems	F(1, 157)=4.07*	.025	F(1, 157)=8.60**†	.052
4. General Functioning				
School attitude	F(1, 157)=.02	.000	F(1, 157)=3.55	.022
Homework problems	F(1, 157)=17.82***	.102	F(1, 157)=4.66*†	.029
Conflict (parent)	F(1, 157)=2.50	.016	F(1, 157)=6.54*†	.040
Conflict (adolescent)	F(1, 157)=2.60	.016	F(1, 157)=.99°	.006
Overall impairment	F(1, 157)=15.31***	.089	F(1, 157)=1.49	.009

ADHD: Attention Deficit Hyperactivity Disorder; EF: Executive Functioning; ODD/CD: Oppositional Disruptive Disorder/Conduct Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. η_p^2 effect size: .01 is small, .06 is medium, .14 is large. * p<0.05; ** p< 0.01, *** p<0.001. † No longer significant when controlling medication use or additional treatment. ° Becomes significant when controlling for medication use or additional treatment.
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Normalization of impairment

A modest clinically significant within-group improvement was found on the number of adolescents, of which impairment was normalized from pre- to post test, $\chi^2(1)=6.73$, p=.009, φ=.25, that remained stable to follow-up test. The number of adolescents that showed normalization of functioning on the IRS increased from 5.8% at pretest to 13.7% at posttest and to 15.2% at follow-up. However, again no difference between both treatments was found.

Table 3.5b: Time × treatment contrasts from pre- to post test and post- to follow-up test.

	Pre to post		Post to follow-up	
Domain	F	η_p^2	F	η_p^2
1. Parent-rated ADHD and EF				
ADHD symptoms	F(1, 157)=1.89	.012	F(1, 157)=.04	.000
EF problems	F(1, 157)=5.09*	.031	F(1, 157)=1.32	.008
Planning problems	F(1, 157)=3.77*	.023	F(1, 157)=.04	.000
2. Neuropsychological measures				
Tower Test	F(1, 157)=2.11	.013	F(1, 157)=.05	.000
Trail Making Test	F(1, 157)=.87	.006	F(1, 157)=.01	.000
Key Search	F(1, 157)=.09	.001	F(1, 157)=2.84	.018
Zoo Map	F(1, 157)=.23	.001	F(1, 157)=1.33	.008
3. Comorbid symptoms				
Depression	F(1, 157)=.36	.002	F(1, 157)=.64	.004
Anxiety	F(1, 157)=1.06	.007	F(1, 157)=.13	.001
ODD/CD	F(1, 157)=.33	.002	F(1, 157)=.20	.001
Internalizing problems	F(1, 157)=.71	.004	F(1, 157)=2.29	.014
Externalizing problems	F(1, 157)=4.09*	.025	F(1, 157)=5.50*†	.034
4. General Functioning				
School attitude	F(1, 157)=.43	.003	F(1, 157)= 2.18	.014
Homework problems	F(1, 157)= .50	.003	F(1, 157)=3.48	.022
Conflict (parent)	F(1, 157)=.22	.001	F(1, 157)=2.24	.014
Conflict (adolescent)	F(1, 157)=.12	.001	F(1, 157)=.06	.000
Overall impairment	F(1, 157)=3.01	.019	F(1, 157)=.17	.001

ADHD: Attention Deficit Hyperactivity Disorder; EF: Executive Functioning; ODD/CD: Oppositional Disruptive Disorder/Conduct Disorder; PML: Plan My Life; SFT: Solution Focused Treatment. η_p^2 effect size: .01 is small, .06 is medium, .14 is large. * p<0.05; ** p<0.01, *** p<0.001. † No longer significant when controlling medication use or additional treatment. ° Becomes significant when controlling for medication use or additional treatment.

Treatment evaluation

Therapists reported no preference for one treatment over the other (p=.60), but indicated to find PML best suitable for adolescents with ADHD (z=5.124, p=.00) and that they preferred to carry out PML over SFT (z=2.586, p=.01). Parents evaluated PML (M=16.83, SD=2.40) significantly more positive than SFT (M=15.59, SD=3.56; t(111)=2.18, p=.03, d=.39). Adolescents evaluated PML (M=22.3, SD=7.10) slightly more positive than SFT (M=20.6, SD=3.62), but this difference did not reach significance (p=.09, d=.30).

Discussion

This study was the first large scale, multi-site RCT for adolescents with ADHD, exploring the immediate and middle-long term effects of two CBTs: one with and one without a focus on planning skills. Moreover, the study was conducted in Dutch mental health care, enhancing generalizability of findings to European clinical practice. Our first research question was whether ADHD-symptoms, planning and EF problems, comorbid symptoms and general functioning of adolescents with ADHD improve from pre- to follow-up test. Our results demonstrated a consistent pattern: attrition was low in both treatments and in both treatments there was an improvement of ADHD-symptoms, planning and EF, comorbid symptoms, and general functioning with medium to large effect-sizes. This improvement was maintained at assessment three months later, or even continued to improve. These findings are in line with an earlier non-randomized study showing the positive effects of a planning focused CBT in adolescents from pre- to posttest (Antshel et al., 2012). Also, we replicated the non-significant effects on the reduction of ODD, but significant effects on the reduction of comorbid symptoms of depression and anxiety (Antshel et al., 2012). In extension to the study by Antshel et al. (that showed improvement from pre- to posttest), our study showed maintenance of effects up to three months after treatment, which indicates generalization of learned skills. And, even though only a small number of teachers responded and analyses were only exploratory, teacher measures also showed significant improvements on measures of EF and impairment and a trend towards improvement of ADHD-symptoms from pre- to posttest, with maintenance of effects to follow-up. However, even though significant improvements have been shown on self-reported, parent-reported and teacher-reported ratings in both treatments, only 15.2% of adolescents showed normalization of functioning at follow-up. All in all, these results may imply that adolescents had sufficient cognitive capacity to benefit from CBT (Antshel & Olszewski, 2014), but were still impaired after treatment.

The second research question was whether adolescents who received PML (aiming at planning skills) improve more than adolescents who received SFT (not specifically aiming at planning skills). In general, findings showed no differences in improvement between PML and SFT; the most noteworthy being the lack of treatment difference with regard to improvement of ADHD-symptoms. However, there were several marginal indications of additional beneficial effects of PML over and above the effects of SFT. As expected,

PML resulted in marginally better planning skills than SFT as rated by parents (primary measure), directly after treatment and again three months later (with small ES). These findings are in line with an RCT in children with ADHD (Abikoff et al., 2013) and an RCT in adults with ADHD (Solanto et al., 2014) on the effects of similar treatment models, that have shown pronounced effects on reduction of planning problems in comparison to an active control group. Also, adolescents in the PML group attended more follow-up assessments than adolescents receiving SFT, which may have been the result of improved planning skills or might have been caused by their satisfaction with the received treatment resulting in higher engagement than in SFT. However, this is speculative and needs to be further tested. In addition, parents evaluated PML more positively than SFT (and adolescents also marginally more positive), and therapists indicated to rather execute PML than SFT with adolescents with ADHD. Finally, it is noteworthy, that when adolescents got the chance to choose a subject for treatment in SFT, in 61% of the sessions a planning related topic was addressed. This suggests that — even though as effective as SFT — enhancement of planning skills is an important topic in the lives of these adolescents. Taken together, although adolescents positively improved during both treatments, PML appears to fit the needs of adolescents with ADHD and their parents slightly better.

Finally, the effects of both CBTs were less pronounced on the neuropsychological measures of planning. Even though performance on some neuropsychological measures (tower and key search test) did improve during CBT (but with small ES and without treatment differences), the performance on other neuropsychological measures (trail making and zoo map test) did not improve at all. Based on these results, one might argue that effects of CBT that are visible in ratings of adolescent behavior, are not associated with changes on a cognitive level. However, although the adolescents were impaired on parent-rated planning deficits at baseline, our sample showed no deficits in planning skills as assessed by neuropsychological tasks (see chapter 2), making it hard to capture the effects of CBT on these outcomes. One might wonder whether neuropsychological measures of underlying mechanisms are suitable and sensitive for assessment of psychosocial treatment outcomes.

Limitations

First, our design lacked a waitlist control group or TAU group. One of the main aims of this study was exploring the long-term effects of CBT, which implies inclusion of TAU and waitlist control groups in the design of the study until follow-up. As effective nonpharmacological treatments for adolescents with ADHD are lacking in the Netherlands, TAU consists mainly of only pharmacological treatment. To not withhold adolescents from potential effective treatments for longer periods of time, to assure participation of mental health institutions, and to reduce the chance of selective drop-out in TAU or waitlist control groups, we did not include such conditions.

Second, because of this lack of a waitlist control group, one could argue that symptoms of adolescents with ADHD improved as the effect of any intervention. Nevertheless, one would expect these placebo effects to deteriorate after active treatment whilst our results show maintenance or even more improvement from post- to follow-up assessment on many outcome measures. Spontaneous recovery does not seem plausible, as we know ADHD is a persistent neuro-developmental disorder. Also, effect sizes of waitlist control groups are generally small (Van der Oord, Prins, Oosterlaan, & Emmelkamp, 2008). For example, Langberg et al. (2012) showed within-group pre- to posttest effect sizes close to zero on measures of ADHD, planning and organization, in a to our study comparable group of adolescents with ADHD. However, no study of clinic-based CBT has been completed using a control condition that would allow conclusions related to the efficacy of that specific intervention. The only randomized study in adolescents with ADHD is a pilot study, comparing a family-based TI aiming at improvement of academic and organizational skills to TAU, which did show improvement on academic measures rated by parents, but not teachers (Sibley et al., 2013). Also, a study in children with ADHD did already establish the beneficial effects of a planning focused treatment as compared to a waitlist control condition (Abikoff et al., 2013). Taken together, RCTs that compare CBT to a less active- or waitlist control group are needed to determine efficacy of CBT in adolescents with ADHD.

Third, one could question the representativeness of our sample: parents were highly educated, the age of initial diagnosis was higher than usual (M_{age}=12.5), and only a small percentage had a history of nonpharmacological treatment. Some might argue that this indicates a less impaired sample. However, in this study a high percentage of adolescents (78%) already

received pharmacological treatment before entering the study and still applied for additional nonpharmacological treatment, indicating impairment. Yet, as patients and their parents did apply for treatment themselves, this may have resulted in a higher than usual motivation for change.

Fourth, even though we strived towards blindness of therapists regarding our research questions (e.g. by presenting the study as a study designed to find out what treatment is most effective for adolescents with ADHD), we cannot assure they may have been aware of the hypothesis that PML was more effective than SFT on reduction of ADHD, planning and EF deficits. Finally, considerable differences in outcome have been demonstrated when blinded and non-blinded outcomes are used in treatment studies (Daley et al., 2014). In this study, objective and more blinded measures of treatment outcome were scarce, due to high rates of missing teacher ratings. The improvements in teacher-rated planning skills and EF found in this study are based on a small number of teachers, who may have been responding because of the positive results of CBT, therefore possibly creating an ascertainment bias. Also, ratings of high school teachers are often of limited validity, due to for example lack of engagement with their students, short amounts of time spent with their students causing lack of knowledge and change of teachers every year, that hampers repeated measuring (Wolraich et al., 2005). In future studies, the use of blinded third party raters (e.g. clinicians), objective weekly monitoring of treatment effects (e.g., using checklists of the target behavior), or academic achievement measures are advised as more objective outcomes of treatment effectiveness.

Clinical implications

Whereas short, effective treatments for adolescents with ADHD are lacking, now two credible CBTs have been developed, which can be implemented not just in North America, but also within the European context. As treatments were investigated within existing mental health care, they are feasible and ready for immediate use in mental health care, which alleviates low-cost implementation and dissemination of the protocols. In this study adolescents, who received either of both short-term treatments, improved with regard to ADHD and comorbid symptoms and secondary problems. Also, PML had marginal additional beneficial effects to SFT on the so pronounced and invalidating planning problems and it harvested high satisfaction rates in parents and therapists. Both were combinations of CBT and MI and the attrition

rate in our study was low, suggesting that MI may have elevated motivation for treatment in adolescents with ADHD (Wolraich et al., 2005). However, as only 15.2% of adolescents showed normalization of functioning three months after treatment, most adolescents were still impaired. Therefore one might argue that such a short-term CBT (consisting of only eight adolescent sessions and two parental sessions) does not cause normalization on the long term, and maybe for this aim more intensive treatments are needed (Evans et al., 2011). Finally, even though more research is needed on the effects of CBT and MI in adolescents with ADHD, for now, two treatments have been developed that showed encouraging within group effects: only 5% of adolescents dropped-out of treatment and ADHD symptoms and co-existing problems of the adolescents improved from pretest to three months after treatment. As PML is evaluated more positive and has marginal additional beneficial effects to SFT, especially PML seems like a promising asset to fill the gap in mental health care for adolescents with ADHD.