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Assessment and treatment of planning skills in adolescents with ADHD

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Chapter 6

General discussion

BACKGROUND

Planning problems are prominent in the daily lives of adolescents with ADHD (Barkley, 2004; Wolraich, 2005), are highly predictive of academic functioning in adolescents with ADHD (Langberg, Dvorsky, & Evans, 2013) and may cause comorbid conditions and functional impairments (Safren, 2006). Therefore a good estimation of planning skills of adolescents is important, both scientifically (*What percentage of adolescents with ADHD has planning problems? Do planning problems differ between DSM-IV subtypes?*) as well as clinically (*Does this adolescent have planning problems? Can we enhance his/her planning skills? And how can we enhance their planning skills?*). The central aim of this thesis was to assess planning skills of adolescents with ADHD and to investigate whether these planning skills can be enhanced using cognitive behavioral therapy (CBT). This was investigated in four empirical chapters. First the main conclusions of these four chapters are provided, followed by a general discussion of these findings and future directions. Finally, clinical implications will be discussed.

CONCLUSIONS

This thesis suggests that even though adolescents with ADHD show planning problems as compared to typically developing (TD) adolescents, not all adolescents with ADHD have planning deficits and that these deficits may not be visible on all (neuropsychological) measures. Subtypes of ADHD show differences in planning problems as compared to typically developing (TD) adolescents, with the combined subtype showing additional executive functioning problems in daily life and the inattentive subtype needing more time to plan. The discrepancy between parent-rated planning problems and neuropsychological measures may imply that assessment in a one-on-one testing situation that motivates the adolescents is less suitable for measuring daily life planning skills (**chapter 2**).

Further, this thesis suggests that adolescents receiving either CBT aiming at planning skills (Plan My Life; PML) or CBT not aiming at planning skills (Solution Focused Treatment; SFT) improve on ADHD- and comorbid symptoms as well as associated impairments up to one year after treatment (**chapter 3 and 4**). Attrition rates were low and evaluations by parents and adolescents were positive. Even though adolescents receiving PML showed less parent-reported planning problems three months after treatment as

compared to those receiving SFT (**chapter 3**), one year after treatment no differences between treatments were observed (**chapter 4**), indicating either that it is not necessary to aim CBT at planning skills or that more prolonged PML treatment or booster sessions are necessary. Even though ADHD is a highly heterogeneous disorder, no qualitative subgroups were found in terms of the general evolution from pretest to three months after treatment. Based on these results personalized treatment allocation is not necessary, because the effects of both CBTs were comparable for most adolescents. Yet, for one subgroup of adolescents with ADHD ($n=45$), those with comorbid anxiety symptoms but low depression, PML did appear the treatment of preference (**chapter 5**).

ASSESSMENT OF PLANNING PROBLEMS OF ADOLESCENTS WITH ADHD

This thesis investigated how many adolescents with ADHD actually have planning problems, if there are subtype differences in planning problems and on what aspects of planning they show deficits. Not only were differences in planning problems between adolescents with and without ADHD investigated at a group level, but also how many adolescents show planning problems on a clinical level (**chapter 2**). Even though differences between adolescents with ADHD and their TD peers were reported on parent-rated measures (Langberg et al., 2013; Toplak, Bucciarelli, Jain, & Tannock, 2009), we now know that only half to two-third of the adolescents with ADHD scored within the clinical range of planning- or EF problems in daily life as rated by their parents. These findings are in line with studies showing that only a proportion of children with ADHD have EF deficits (Willcutt et al., 2005) and with theories of multiple pathways associated with ADHD behavior (Sonuga-Barke, Bitsakou, & Thompson, 2010).

In addition, by using multiple measures to explore planning problems in adolescents with ADHD in **chapter 2**, we have found marginal indications for differences between the DSM-IV inattentive and combined subtype with the combined subtype showing additional executive functioning deficits in daily life on a parent-rated measure, and the inattentive subtype needing more time to adequately plan on a neuropsychological measure. This is in accordance with additional hyperactivity/impulsivity symptoms in the DSM-IV combined subtype and the sluggish cognitive tempo that the inattentive subtype has been associated with (American Psychiatric Association, 2000;

Langberg, Becker, & Dvorsky, 2014).

It is noteworthy that we did *not* find group differences between adolescents with and without ADHD on the majority of our neuropsychological measures of planning skills (on 8 of 9 measures). When comparing our results on neuropsychological measures of planning skills in **chapter 2** to the existing literature, a discrepancy was visible that may be related to differences in methodology: Earlier studies using a computerized neuropsychological test showed impaired planning skills of adolescents with ADHD (Gau et al., 2010; Gau & Shang, 2009; Toplak et al., 2009), while studies using paper-and-pencil version of these same tests did not (this study; Qian, Shuai, Chan, Qian, & Wang, 2013). This may be related to differential motivational influences. Paper-and-pencil tests inevitably require more involvement of an examiner, create a more structured environment and are more 'hands-on', therefore possibly causing adolescents to be more motivated, more actively involved and more engaged to the task as compared to computerized tasks (Power, 1992; Toplak West, & Stanovich, 2013). If this is the case, one might argue that adolescents with ADHD know how to plan, as long as they are motivated enough.

This thesis contains the first randomized clinical trial (RCT) in adolescents with ADHD also using neuropsychological measures of planning skills to assess treatment outcome. **Chapter 3 and 4** showed that after receiving treatment, adolescents improved on most measures (mainly questionnaires), but not on 2 of 4 neuropsychological measures of planning skills: the Trail Making Test of the DKEFS (Delis, Kaplan, & Kramer, 2001) and the Zoo Map test of the *Behavioral Assessment of the Dysexecutive Syndrome* (BADS; Wilson, Alderman, Burgess, Emslie, & Evans, 1996). This may not be surprising given that the performance of the ADHD group on three of these measures at pretest was not deviant from the performance of the TD group (**chapter 2**) and one could therefore argue that the room for improvement on these measures was limited. One could also wonder whether a treatment that focuses on planning skills at a behavioral level (making to do lists, using a daily planner) can alter these neuropsychological functions. The treatment focuses on usage of compensatory strategies for these deficits and may not ameliorate the deficits themselves. Perhaps the use of neuropsychological measures as treatment outcome should be limited to treatments explicitly aiming on altering underlying deficient neuropsychological constructs, like for example cognitive training or neurofeedback (e.g., Bink, Van Nieuwen-

huizen, Popma, Bongers, & Van Boxtel, 2014; De Vries, Schmand, Geurts, & Prins, 2014; DAVIS, Van der Oord, Wiers, & Prins, 2015).

Taken together, not all adolescents with ADHD have planning deficits and these deficits may not be visible on all measures. When diagnosing planning problems in adolescents with ADHD and when evaluating treatment outcomes, neuropsychological measures do not seem suitable and ratings of daily life planning behavior appear to better detect these problems. With regard to treatment development for adolescents with ADHD, it appears that if low motivation can cause planning problems, augmenting motivation could help adolescents with ADHD to adequately plan.

TREATMENT OF ADOLESCENTS WITH ADHD

Given the current situation in Dutch mental healthcare and to make implementation and dissemination of treatments for adolescents with ADHD possible in the Netherlands, development of clinic-based treatments is necessary. This thesis investigated two nonpharmacological clinic-based treatments for adolescents with ADHD that proved feasible within the Dutch existing healthcare system. Sixteen mental healthcare institutes in the Netherlands participated in our RCT (even more institutes applied for our study, but were not able to participate due to logistical limitations of the study) and remained engaged until the end of the project, which suggests that these treatments filled a need in the existing Dutch mental healthcare. Also satisfaction rates of therapists, parents and adolescents of both treatments were high, with parents and therapists evaluating PML even higher than SFT (**chapter 3**).

Even though the results of previous clinic-based treatments were promising, studies had small sample sizes (Sibley et al., 2013), designs lacked a control group (Antshel, Faraone, & Gordon, 2012) or comparisons were made to a waitlist (Vidal et al., 2015), or to a TAU group (Sibley et al., 2013). Without an active control group, effect sizes may be high but could also be the result of non-specific treatment effects, like for example attending treatment sessions, visiting a mental health care institute or therapist, engaging in procedures directed at behavior change. This thesis contained the first RCT in a large sample of adolescents with ADHD ($n=159$) comparing two clinic-based CBTs, one with and one without a focus on planning skills, thereby controlling for non-specific treatment effects. **Chapter 3** showed that attrition rates were low, adolescents receiving both treatments improved from

pre- to posttest with large effect sizes, and that these improvements were maintained until one year after treatment (**chapter 4**). Yet only marginal treatment differences were found in favor of PML three months after treatment (although differences were specific on our primary outcome, planning deficits; **chapter 3**) and treatment differences dissipated one year after treatment (**chapter 4**).

Because we found no treatment differences in outcome, these improvements over time could still be the result of non-specific treatment effects. Apart from non-specific treatment effects, both our treatments contain Motivational Interviewing as a treatment mechanism. Motivational Interviewing has been shown to have a positive effect on treatments in adolescents with a wide range of disorders, like for example substance use disorders, eating disorder, obesity, behavior problems, anxiety and depression (Antshel et al., 2012; Erickson, Gerstle, & Feldstein, 2005; Naar-King & Suarez, 2011; Wolraich et al., 2005) and, therefore, could have caused the adolescents to persevere in trying to reach their treatment goals over time.

One might argue that the improvement seen in adolescents could be the result of a natural decline of symptoms of ADHD. ADHD is a neurodevelopmental disorder and symptoms change as a function of age: in adolescence, symptoms of hyperactivity/impulsivity decrease as compared to childhood (Fischer, Barkley, Smallish, & Fletcher, 2005), and problems with inattention often remain stable (Biederman, Mick, & Faraone, 2000). However, even though in adolescence not many children with ADHD still have a full ADHD diagnosis, 90% of adolescents still show evidence of clinically significant impairment (Biederman et al., 2000). Whilst in our study we see a decline of symptoms but also a decline of impairment, this makes it unlikely that the improvement is caused by natural decline. Also, it appears unlikely for natural decline to specifically take place with large effect sizes in the 9 weeks between pre- and posttest (note that between posttest and three-month follow-up generally no additional decline of problems was found), whereas effect sizes of waitlist control groups are generally small (Van der Oord, Prins, Oosterlaan, & Emmelkamp, 2008). For example, in a comparable group of adolescents with ADHD, within-group pre- to posttest effect sizes of waitlist control groups on measures of ADHD, planning and organization were close to zero (Langberg, Epstein, Becker, Girio-Herrera, & Vaughn, 2012).

Another possible explanation for the improvement seen in both treatments are expectancy effects; note that we did not have blinded outcome

measures to test whether there were expectancy effects in our RCT. Considerable differences in outcome have been demonstrated when blinded and non-blinded outcomes are used in treatment studies (Daley et al., 2014). In our study, objective and blinded measures of treatment outcome were scarce, for example due to high rates of missing teacher ratings. As a result, the improvements in teacher-rated planning skills and executive functioning we found in this study are based on a small number of teachers, that may have been responding because of the positive results of CBT, therefore possibly creating a sampling bias. However, one would expect expectancy effects to potentially deteriorate (one year) after active treatment, whilst our results show maintenance of effects or even more improvement from post- to follow-up assessment on our outcome measures. Finally, the lack of treatment effects could be the result of measurement artifacts, for example practice effects due to repeated assessment or regression towards the mean.

Taken together, two feasible clinic-based CBTs for adolescents with ADHD have been developed that were and can be easily implemented in Dutch mental healthcare. Their effectiveness is compared in an RCT with a large sample size of adolescents with ADHD, showing improvement in both treatment groups and marginal treatment differences in favor of PML three months after treatment on our primary outcome (planning deficits), but no treatment differences one year after treatment. Because of this lack of treatment differences, a lack of a no treatment control group and no blinded outcome measures, possible explanations for improvement may be (an interaction of) improvement due to specific treatment effects (e.g., Motivational Interviewing), non-specific (treatment) effects, natural decline of symptoms, measurement artifacts or expectancy effects.

TREATMENT OF PLANNING SKILLS IN ADOLESCENTS WITH ADHD

Previous studies on the effects of treatment in adolescents with ADHD all acknowledge the importance of enhancement of planning skills in treatment (Antshel et al., 2012; Evans, Schultz, DeMars, & Davis, 2011; Langberg et al., 2012; Molina et al., 2008; Sibley et al., 2013; Vidal et al., 2015) and other clinic-based treatments have incorporated modules aiming at planning skills (Antshel et al., 2012; Sibley et al., 2013; Vidal et al., 2015), but none of them focused the entire treatment on enhancement of planning skills and therefore it is yet unknown whether this is an effective treatment mechanism in

adolescents with ADHD. Comparing two CBTs in this thesis, one with and one without a focus on planning skills, enables us to make inferences about enhancing planning skills as a treatment mechanism in CBT. Adolescents improved on multiple domains (**chapter 3**) and specific subgroups of adolescents followed different trajectories from pretest to three months after treatment when receiving these treatments (**chapter 5**; see Figure 5.2 and 5.4). This supports the idea of two clearly separate treatments; both follow different trajectories that seem to converge to comparable endpoints after three months. Yet only marginal treatment differences were found in favor of PML three months after treatment (**chapter 3**) and treatment differences dissipated one year after treatment (**chapter 4**).

Based on these results one could conclude that focusing treatment on planning skills is not necessary for improvement in adolescents with ADHD. If indeed focusing treatment on planning skills is not necessary for improvement, this would not support the *Cognitive-behavioral model of impairment* by Safren (2006; see Figure 1.1 in **chapter 1**), which states that functional problems (for example regarding school- and homework) that arise from the neurodevelopmental symptoms of ADHD (inattention, impulsivity), are mediated by compensatory strategies like planning and organizing. However, as about 66% of chosen topics in SFT *was* related to planning their daily life (**chapter 3**), planning does appear to be an important subject in the life's of these adolescents. Perhaps planning *is* an important subject, but the approaches used in PML and SFT both lead to enhancement of planning skills. Because in SFT adolescents had to find a solution for their problem themselves, this supports the idea that adolescents with ADHD know *how* to plan. 'The problem, then, for those with ADHD is not one of knowing what to do, but of doing what they know when it would be most adaptive to do so' (Barkley, 1997) and perhaps both CBTs help them to implement the planning strategies that are discussed during treatment. This is supported by findings in **chapter 5**, showing that whether an adolescent has planning problems is not a reason for allocation to a CBT focusing on planning problems as compared to one that does not. Moreover, pre-treatment ADHD severity and overall impairment also did *not* moderate treatment outcomes (**chapter 5**). The absence of the moderating effect of severity of pretreatment ADHD, impairment and planning skills, may imply that both treatments have a generic nature and are not specifically beneficial for adolescents with ADHD or with planning problems.

Furthermore, the lack of treatment differences one year after treatment could also be the result of specific difficulties related to long-term follow-up of treatment effects in clinical groups. One issue is the ethic concern when asking participants not to change treatment condition, medication dose or refrain from additional treatment for a longer period of time. As a result our follow-up assessments (**chapter 4**), but also for example the follow-up assessments in the MTA-study (Molina et al., 2009), are actually naturalistic follow-ups of treatment conditions with participants adding or changing pharmacological or nonpharmacological treatments. With this in mind it is not surprising that systematic review of the few studies that *have* investigated long-term treatment effects in children and adolescents (Parker, Wales, Chalhoub, & Harpin, 2013) but also adults (Shaw et al., 2012) with ADHD found that, even though participants overall tend to improve during treatment (especially with medication and combined medication- and behavior treatment), initial treatment differences disappear with time (Molina et al., 2009). However, in our study there were no treatment differences in the number of adolescents that received additional nonpharmacological treatment ($n=29$), started ($n=7$) or stopped ($n=6$) medication or changed medication dose ($n=18$) between three months after treatment and one year after treatment. Also the average medication dose did not change within treatments during this timeframe and covarying for additional treatment and medication use did not influence the lack of treatment differences one year after treatment. Taken together, even though it is hard to rule out effects of participants adding or changing pharmacological or nonpharmacological treatments at follow-up, this does not appear to be the only explanation for the lack of treatment differences in our RCT.

Finally, it is possible that booster sessions or prolonged treatment is needed for a planning focused treatment like PML to be more effective than a treatment without such an aim and for the positive additional effects of PML above SFT to last over time (Evans et al., 2011; Sibley et al., 2014). Improvements after school-based treatments with planning focused elements were less when administered for a portion of the academic year than when administered during the full academic year (Evans, Gerstle, & Feldstein, 2005; Evans et al., 2011; Molina et al., 2008), suggesting that a longer duration of treatment may be necessary for optimal improvement (Evans et al., 2011).

All in all, even though both treatments follow different trajectories that seem to converge to comparable endpoints after three months, only

marginal treatment differences were found in favor of PML three months after treatment (**chapter 3**) that dissipated one year after treatment (**chapter 4**). This may indicate that focusing treatment on planning skills is not necessary for improvement in adolescents with ADHD or both treatments have generic elements that are beneficial in adolescents with ADHD (for example Motivational Interviewing), which may be indicated by the low drop out. Other possible causes for the lack of treatment differences are that our follow-up assessments are actually naturalistic follow-ups or that booster sessions or prolonged treatment is needed for a planning focused treatment to be more effective than a treatment without such an aim.

MODERATION OF TREATMENT EFFECTS

This thesis contains the first study on moderation of treatment effects in adolescents with ADHD, more specifically on qualitative treatment-subgroup interactions (**chapter 5**). As ADHD is a heterogeneous disorder (Yoshimasu et al., 2012), these qualitative treatment-subgroup interactions are of great importance, because they are highly relevant for personalized treatment assignment. An innovative statistical analysis technique (QUINT) was used, that provides specific cut-off scores for treatment allocation augmenting clinical use (Dusseldorp & Van Mechelen, 2014). In our data no qualitative treatment-subgroup interactions were found, implying that with regard to the two CBTs under study, there is no need for personalized treatment allocation (**chapter 5**).

Nevertheless, one *quantitative* treatment-subgroup interaction was found, showing a specific subgroup for whom PML is the treatment of preference: adolescents with ADHD and higher anxiety but lower depression (CDI: cut-off point=11.50; SCARED: cut-off point=19.50). Why PML would have beneficial effects in this specific subgroup is unknown. As the more anxious group of adolescents with ADHD showed more positive results when receiving a CBT focusing on planning skills than when receiving a CBT without such an aim, this suggests that the anxiety experienced by adolescents with ADHD may be related to poorer executive functions (e.g., Airaksinen, Larsson, & Forsell, 2005; Eysenck, Derakshan, Santos, & Calvo, 2007; Tucker & Derryberry, 1992). This is supported by research showing increased working memory deficits and increased rates of sluggish cognitive tempo in children with ADHD and comorbid anxiety (Schatz & Rostain, 2006). As we did assess planning measures, we exploratory tested this hypothesis on the plan-

ning measures and sample studied in **chapter 2** (all measures were assessed pre-treatment). The exploratory analyses partly confirmed this hypothesis; it showed that the subgroup with higher anxiety and lower depression has significantly less daily life planning- or executive function problems pre-treatment according to their parents than the other adolescents with ADHD. This subgroup does however, show a significantly longer completion time than the other adolescents with ADHD on one of the neuropsychological measures of planning skills (the BADS Zoo Map test; data available from first author), supporting the hypothesis that adolescents with ADHD and comorbid anxiety symptoms have an increased rate of sluggish cognitive tempo (Schatz & Rostain, 2006). Whether this is an explanation for PML to be more beneficial for this group than SFT has to be further tested.

There is, however, an alternative explanation for the beneficial effects of PML over SFT in this specific subgroup. The results of **chapter 5** showed that this specific subgroup with higher anxiety but lower depression had their medication dose increased from posttest to three-month follow-up when receiving PML, but had lowered their dose when receiving SFT. Medication use itself was not a moderator of treatment effects however, suggesting that the combination of stimulant medication and PML may cause beneficial effects in this specific subgroup compared to SFT. This could for example imply that adolescents with low depression and higher anxiety that received PML, have become more motivated to adhere to medication as compared to SFT. However, as these results are only exploratory, also this hypothesis needs further testing.

What is also unknown is how stable the finding of this quantitative treatment-subgroup interaction is. In **chapter 5** treatment-subgroup interactions were investigated on treatment effects from pretest to three months after treatment. As it is important to investigate the stability of these subgroups over time and their replicability, we exploratory tested the qualitative interactions on treatment effects to one year after treatment (on both parent rated ADHD and planning problems), and again no qualitative treatment-subgroup interactions are generated by QUINT. When also exploratory testing the benefits of PML over SFT in the subgroup with higher anxiety but lower depression, these results became non-significant one year after treatment. This suggests that the quantitative subgroup found three months after treatment, may not be stable over time. The developers of QUINT emphasize that QUINT is an exploratory technique with risks of inferential errors

(Dusseldorp & Van Mechelen, 2014). It is therefore of importance to replicate the findings of **chapter 5** before implementing them in clinical practice.

Taken together, one could conclude that QUINT is an innovative technique with important consequences for personalized treatment allocation. Based on **chapter 5**, tailored treatment does not seem necessary with regard to PML and SFT, except for one specific subgroup of adolescents with ADHD combined with higher anxiety and low depression for whom PML appears the treatment of preference (at least until three months after treatment). Why PML is beneficial for this specific subgroup is unknown, but is possibly related to a slowed cognitive processing in individuals with ADHD and comorbid anxiety symptoms or increased doses of medication. Because this subgroup appears to be unstable over time, replication of these results in an RCT is necessary before implementation in clinical practice.

WELL-ESTABLISHED TREATMENTS?

For PML or SFT to be considered evidence-based treatments, they need to be more effective than medication, a waitlist control group or TAU group or at least equally effective to an already established treatment, like medication (Evans, Owens, & Bunford, 2014). Due to ethical and practical considerations we did not include a waitlist, medication only, or TAU group. Because effective nonpharmacological treatments for adolescents with ADHD are lacking in the Netherlands, TAU mainly consists of pharmacological treatment only. As one of the main aims of this study was exploring the long-term effects of CBT, this implies inclusion of a waitlist, medication only, or TAU group in the design of the study until one-year follow-up. To not withhold adolescents from potential effective treatments for longer periods of time, we did not include such control groups. Further, because treatment cessation is so much higher in adolescents, specifically when they are diagnosed with ADHD (Johnson, Mellor, & Brann, 2008), we did not want to take the risk of selective drop-out (in waitlist- or non-credible control conditions) and we wanted to assure participation of mental health institutions (being able to offer two active treatments).

Because of the lack of a medication-only, TAU- or waitlist control group in the present study, one could argue that symptoms of adolescents with ADHD improved not because of the treatments, but due to non-specific treatment effects, natural decline of symptoms, measurement artifacts or expectancy effects. However, studies in children and adults with ADHD did already es-

establish the beneficial effects of a planning focused treatment as compared to a waitlist control, medication only or a nonpharmacological control treatment (Abikoff et al., 2013; Safren et al., 2005, 2010; Solanto et al., 2014). Moreover, school-based interventions with an aim at planning skills show improvement as compared to a waitlist control group in adolescents with ADHD (Langberg et al., 2012). Earlier studies that *have* been conducted on the effects of treatment in adolescents with ADHD all acknowledge the importance of enhancement of planning skills in treatment and have incorporated modules aiming at planning skills (Antshel et al., 2012; Evans et al., 2011; Langberg et al., 2012; Molina et al., 2008; Sibley et al., 2013; Vidal et al., 2015). In sum, proceeding from comparable studies that did include waitlist-, medication only, control treatments or TAU groups one could expect CBTs like PML and SFT to cause improvements in adolescents with ADHD. However, based on this thesis effectiveness of PML and SFT cannot be proven.

FUTURE DIRECTIONS

As may have become clear from the previous paragraphs, several recommendations can be made with regard to future research. To be considered effective, our treatments have to be more effective than a waitlist control group or TAU group or at least equally effective to an already established treatment like medication only (Evans et al., 2014). To date, no study of a controlled clinic-based CBT has been completed that would allow conclusions related to the efficacy of that specific intervention (Sibley et al., 2014). A waitlist control group would allow drawing conclusions on effectiveness of both CBTs controlling for effects of natural decline of symptoms over time, practice effects due to repeated assessment, and regression towards the mean. A placebo-treatment without active elements of Motivational Interviewing would allow conclusions regarding the effects of Motivational Interviewing or non-specific treatment effects. And comparison to a medication only and a combined CBT-medication group would allow drawing conclusions on the specific contribution of CBT, next to medication use. RCTs that compare (prolonged) CBT to a less active treatment like TAU, a waitlist control group or a medication only group are needed to determine efficacy of CBT in adolescents with ADHD (Chambless & Ollendick, 2001; Evans et al., 2014). Also the use of objective (blinded-) or academic achievement measures as more objective outcomes of treatment effectiveness, preferably including long term

follow-up assessments, are recommended in studies on CBT in adolescents with ADHD and would control for expectancy effects. Based on the improvements that adolescents made receiving both treatments (**chapter 3 and 4**), PML but also SFT, should be considered for such an RCT.

In addition to these methodological recommendations, it is also important to explore possibilities in school-based mental health care. In the current European mental health care system, funding mental health care in schools is challenging and mainly takes place in mental health care institutes (World Health Organization, 2008). Aiming treatments at schools creates the possibility to directly reach large numbers of adolescents who need treatment of the skills needed at school, but also to prevent school problems in adolescents (Evans et al., 2011; Langberg et al., 2012; Molina et al., 2008). This way adolescents can be helped before failing a grade or drop out of school, have higher rates of suspension, are less likely to attend college, show lower academic and occupational achievement, have lower rates of high school graduation and demonstrate disruptive classroom behavior (Barkley, Fischer, Edelbrock, & Smallish, 1990; Fisher, Barkley, Edelbrock, & Smallish, 1990). It is worthwhile to investigate ways to make implementation and dissemination of treatment programs in schools possible using the existing infrastructure (Kataoka, Rowan, & Hoagwood, 2009).

CLINICAL IMPLICATIONS

This thesis brings forth some clinical implications. Not all adolescents with ADHD have planning deficits in daily life (about 55% according to their parents) and these deficits may not be visible on all measures. We have found marginal differences between the inattentive and combined subtype in planning problems, with the DSM-IV combined subtype showing additional parent-rated executive functioning deficits in daily life, and the inattentive subtype needing more time to adequately plan on a neuropsychological measure. When diagnosing planning problems in adolescents with ADHD and when evaluating treatment outcomes, neuropsychological measures do not seem suitable and ratings of daily life planning behavior appear to better detect these problems (**chapter 2**). However, whether it is necessary to assess planning problems is debatable: for personalized treatment assignment to either CBT with (PML) or without (SFT) an aim on planning skills it is not necessary to have significant planning problems or impairment (**chapter 5**).

The findings of this thesis suggest that two credible and feasible CBTs have

been developed, which can be implemented in the existing Dutch mental healthcare (**chapter 3 and 4**): adolescents with ADHD receiving PML or SFT showed improvements in with large effect sizes on ADHD- and comorbid symptoms as well as associated impairments during treatment, that are maintained to one year after treatment (**chapter 3 and 4**). Both were combinations of CBT and Motivational Interviewing and the attrition rate in our study was low, suggesting that Motivational Interviewing may have elevated motivation for treatment in adolescents with ADHD (Wolraich et al., 2005). Also, evaluations by parents and adolescents are positive (**chapter 3**). Three months after treatment, marginal treatment differences were found in favor of PML on parent rated planning problems. However, one year after treatment, treatment differences dissipate and only 26% of adolescents show normalization of functioning, which suggests that focusing treatment on planning skills is not necessary for improvement or that longer/intensive treatment may be necessary (**chapter 4**).

Because of the lack of an adequate control group, in this thesis the effectiveness of PML and SFT cannot be proven. Nevertheless, adolescents improved on multiple domains and the different trajectories of both treatments in subgroups of adolescents from pretest to three months after treatment do suggest that different treatment mechanisms result in the same end point (**chapter 5**). Even though results of both treatments were comparable, this thesis may give clinicians reasons to prefer PML over SFT: parents and therapists (and adolescents marginally) evaluated PML more positive than SFT, three months after treatment PML shows more benefits on reduction of planning problems, adolescents receiving SFT often choose planning related subjects in their treatment sessions (**chapter 3**) and for a specific subgroup of adolescents with ADHD and comorbid anxiety symptoms but low depression, PML appears to be more beneficial than SFT (**chapter 5**). And, even though both treatments are being implemented in Dutch mental healthcare, it is important that clinicians are aware of the fact that to date their effectiveness has not been proven and also inform their patients about this.

CONFLICT OF INTEREST

Bianca E. Boyer is co-developer and author of the manuals 'Plan My Life' and 'Solution Focused Treatment': she receives royalties for the sales of both interventions. Saskia van der Oord has been a paid consultant for Janssen Pharmaceuticals in the development of a serious game 'Healseeker': aimed

at training cognitive functions. Also, she is co-developer and author of the manuals 'Plan My Life' and 'Solution Focused Treatment'. However, she has no financial interest in the sales of the interventions. She has received speaker's fees from MEDICE and Shire. Pier Prins is member of Stichting Gaming & Training, a nonprofit organization that facilitates the development and implementation of 'Braingame Brian'. Other authors declare no conflict of interest.

A treatment is considered to be efficacious when two independent investigatory teams show superior results in two independent settings. In the future, it would be preferable if an independent research team would conduct research on PML and SFT.