

Parent training for preschool ADHD in routine, specialist care: A randomized controlled trial

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Abstract

Objective: Parent training (PT) is recommended for attention-deficit/hyperactivity disorder (ADHD) in preschool children. Evidence-based interventions are important, but only if they produce better outcomes than usual care.

Method: We conducted a multi-center, two-arm parallel group randomized controlled trial in routine, specialist ADHD clinics in Danish Child and Adolescent Mental Health Services (CAMHS). Children (N=164, age 3-7) with ADHD received either a well-established PT programme (New Forest Parenting Programme (NFPP)) (n=88) or treatment as usual (TAU) (n=76). The primary outcome was parent ratings of child ADHD symptoms. Secondary outcomes included teacher ratings and direct observations of ADHD symptoms. Outcomes were measured at baseline (T1) and post-treatment (T2) and at follow-up (T3: 36 weeks after T2). Representativeness of participants was evaluated against the total national cohort of children (n=1378) diagnosed with ADHD during the same time period, using the Danish Civil Registration System. Statistical analysis employed a repeated measure model.

Results: By T2, NFPP was superior to TAU on parent-rated ADHD symptoms ($p=0.009$; ES $d=0.30$), and on parenting self-efficacy and family strain. Effects persisted to T3. There were no effects on teacher ratings or direct observations of ADHD or on ratings of conduct problems or parenting. Our clinical sample was similar to the national cohort of young children with ADHD.

Conclusions: Evidence-based PT has value as an intervention for preschool ADHD in routine clinical settings. As in previous trials effects were restricted to parent-reported outcomes. Surprisingly, there were no effects on child conduct problems.

ClinicalTrial.gov identity no: NCT01684644. A Controlled Study of Parent Training in the Treatment of ADHD in Young Children (D'SNAPP)

Introduction

Behavioral parent training (PT) is recommended as the first-line treatment for pre-school ADHD¹ and is often favored by parents over medication². Medication appears less effective in the treatment of preschool ADHD, compared to the effects of medication for school-aged children with ADHD, and is associated with more adverse effects². A recent systematic review supported the classification of behavioural PT as a well-established treatment for preschool children with ADHD³.

Different behavioral PT approaches have been manualized and trialed with preschoolers^{4,5 6,7}, and produce a reduction in ADHD symptoms following treatment⁸. In general, the positive effects of behavioral parenting interventions are not mirrored on blinded outcomes^{9,10}. Although PT can reduce ADHD symptoms and conduct problems as reported by parents, access to evidence-based PT remains limited¹¹⁻¹³. Also, we do not know whether PT programs improve outcomes for preschoolers in routine settings, as trials have rarely been run in this context¹⁴. This is problematic as one cannot necessarily generalize the findings of most trials to treatments implemented in everyday practice in real world clinics¹⁵.

The purpose of this study was to evaluate evidence-based PT for preschool ADHD in routine specialist clinics in public Child and Adolescent Mental Health Services (CAMHS), where most children receive their care, and where PT had not previously been available. The New Forest Parenting Programme¹⁶ (NFPP) was selected as a suitable evidenced-based PT intervention for

implementation in CAMHS as it offers individual sessions to parents with the child present for some sessions. The individualized mode of delivery is compatible with the objectives of personalized treatment for young children with ADHD¹⁷, and with the mission of the Danish public health service¹⁸.

NFPP has been implemented and trialed in different countries¹⁹. Trials have mainly been implemented as community interventions delivered in family homes^{6,7,16,20}. However, it is not known whether NFPP can improve outcomes for children seen in routine specialist settings. In this study, we conducted a multicenter RCT to assess the effect of NFPP versus treatment as usual (TAU) in three routine CAMHS settings in Denmark. The trial was pragmatic in orientation²¹, although exclusion criteria and fidelity checks were applied unlike in routine care.

We predicted that NFPP would be superior to TAU and lead to significantly larger reductions in parents' ratings of children's symptoms of ADHD and conduct problems and improve parenting sense of competence and family wellbeing. We assessed the effect of NFPP on children's ADHD symptoms using parents' and teachers' ratings and with direct laboratory observation; and on parent and teacher ratings of conduct problems, parenting sense of competence, levels of family strain and parent-child interaction. We also tested whether previously identified moderating factors (single parenthood^{22,23}, parental ADHD²⁴, child conduct²⁵ and gender^{26,27}). To determine whether our participants were representative we compared them to all other Danish children diagnosed with ADHD in routine CAMHS during the same period on key child and parent demographics, including socioeconomic status.

Methods

The study was approved by the Ethics Committee for Central Danish Region (No: 1-10-72-140-12), and by the Danish Data Protection Agency (No. 1-16-02-611-15). A detailed research protocol has been published ²⁸.

Study design, participants and setting

The study was a multi-center, randomized, controlled trial comparing the effectiveness of NFPP and TAU in the treatment of ADHD for young children. Children and their parents were recruited between May 2012 and November 2015 from 3 different specialist ADHD clinics (Risskov, Herning and Glostrup) for preschool children (ages 3-7) in Danish CAMHS.

Eligibility Criteria

Inclusion criteria were: age between 3-7 years; clinical ADHD diagnosis supported by the Development and Well-Being Assessment (DAWBA)²⁹; Danish as a first language spoken at home. Exclusion criteria were: Intellectual disabilities (IQ < 70); autism spectrum disorder diagnosis; in receipt of pharmacological or psychosocial treatment for ADHD. Severe parental psychiatric disorder (i.e. untreated psychosis, bipolar or severe depressive disorder); severe social adversity in the home (i.e. active child protection involvement).

Procedure

The trial was imbedded in everyday clinical practice. Parents of eligible referrals completed the online DAWBA²⁹ and received standard clinical, multidisciplinary assessment, medical examination, evaluation of intelligence quotient (IQ) based on the Wechsler Intelligence Scales, and when indicated, supplementary neuropsychological assessment and Autism Diagnostic Observation Schedule²³. ADHD diagnosis was made by specialist child and adolescent psychiatrists based on

results from all clinical assessments and DAWBA profiles, conducted by trained raters³⁰.

Diagnostic agreements between DAWBA expert diagnoses and clinical diagnoses have been found to be fair to moderate and comparable to other structured diagnostic interviews³¹. Research team members met parents of eligible children at the end of a routine diagnostic feedback session, and provided verbal and written information about the content of the study and its treatment arms.

Written, informed consent was obtained. Research assistants administered all outcome measures and saw children and parent/s for baseline assessments (T1), follow-up at T2 (12 weeks post T1), and T3 (36 weeks post T2). Assessment measures were implemented electronically in Trialpartner³² by the Data Management Unit in The Central Denmark Region and administered to parents and teachers/day-care staff for online completion.

Randomization and masking

Participants were randomly assigned (1:1) to NFPP and TAU following T1 assessment. Randomization was conducted in blocks of four or six and in 12 strata defined by center, gender and age (3-5 and 6-7 year) using a web-based and logged randomization service within Trialpartner³². Research assistants were masked to treatment allocation and located separately to avoid contamination; trial participants could not be masked. Parents were asked not to reveal treatment status of their children to teachers. Videotaped observations were rated by trained assessors blind to treatment allocation. Treatment fidelity was rated by qualified psychologists without access to outcome information, but aware of study goals. All data was stored by the independent Data Management Unit and released one month after the last participant completed T3. Treatments between T1-T3 were limited to NFPP and TAU. Access to interventions outside CAMHS was beyond the control of the trial.

Treatment

NFPP includes 5 elements²⁰: 1) Psychoeducation about the nature of preschool ADHD to enhance parents' understanding of child's behavior; 2) Scaffolding to help parents work from the child's level of development; 3) Promoting proactive parenting and enhancing parent-child interaction to support child development and reduce parental stress; 4) Improving child's ADHD symptoms and related neuropsychological deficits through play and games that target attention, impulsivity and self-regulation; 5) Guiding parents in the use of behavioral strategies to improve behavior and ADHD symptoms. Therapists provide weekly homework assignments tailored to child and parent needs, including videotaped practice of specific tasks. The original NFPP manual¹⁶ consists of eight sessions delivered individually to parents in the child's home, with the child present during 3 sessions. This delivery mode was changed in the present study to enhance the acceptability and feasibility of the NFPP to Danish CAMHS with six sessions delivered in the clinic and two in the home. The content of the NFPP manual was otherwise unchanged (see protocol²⁸). Four therapists from each CAMHS sites were recruited and trained to deliver NFPP, and placed in buildings separate from the clinical teams to avoid treatment contamination. Therapists had different professional backgrounds (clinical psychologists (2); nurse specialist (1); nursery teacher (1)). All had extensive clinical experience of preschool ADHD (5-15 years), but no experience of delivering manualized treatments or of practicing behavioral methods. They received weekly 2-hour clinical supervision sessions in groups of two delivered by the main investigator, who in turn received fortnightly supervision by the original NFPP developers.

TAU typically consisted of a standard package of psycho-education delivered to groups of individual parents by specialized staff. The majority of parents were offered between 3-4 group

sessions each lasting between 2-3 hours, and some were offered individual sessions in addition to or instead of group intervention. TAU included information about a) ADHD as a developmental disorder; b) How ADHD symptoms obstruct normal play and the development of preschool skills, and c) how ADHD and executive dysfunctions interrupt daily routines. Parents were also offered practical advice on how to support young children through psychosocial management, e.g. visual aids and daily structure. TAU was not homogenous between or within the 3 sites, reflecting different clinical practices in everyday CAMHS. At all sites TAU was carried out by mental health professionals with different backgrounds (clinical psychologists (n=3); specialist nurses (n=3) with extensive clinical experience of preschool ADHD (5-15 years).

Fidelity

Fidelity was assessed in a random selection of videotapes from 20 cases (5 per therapist). An 80-item check list where each item was rated ‘completed’; ‘not completed’ or ‘not relevant’ to yield a total fidelity score (range 0-80 was used).

Measures

Measures were chosen to enhance comparability to previous trials of PT for ADHD. To enhance methodological rigor, blinded and observed measures were also used. Internal consistency of all measures in this sample was good (see Appendix A, table S8).

Primary outcome: Parent ratings (total score) on the ADHD Rating Scale-IV–Preschool Danish Version ³³ measured change in ADHD symptom severity.

Secondary outcomes

Child: Teacher ADHD RS-IV ratings. Directly observed ADHD behaviors during solo play ‘index of attention/engagement’ using the Child Solo Play instrument¹⁶. Conduct problems - parent and teacher ratings on the conduct scale of the Strengths and Difficulties Questionnaire (SDQ)³⁴.

Parent: The Parenting Sense of Competence Scale (PSOC)³⁵ assessed parental self-efficacy and satisfaction. The Family Strain Index (FSI)³⁶ measured levels of stress in the context of living with a child with ADHD. The Adult ADHD Self-Report Scale (ASRS-v1.1) measured levels of parental ADHD³⁷. The direct observation schedule *The Global Impressions of Parent-Child Interactions* (GIPCI-R)³⁸ evaluated parent and child interaction. The General Health Questionnaire (GHQ12) data on maternal mental wellbeing was collected but was unavailable for analysis due to errors in the electronic set-up.

Sample size calculation

The primary endpoint was parent ADHD ratings at T2. It was estimated that a total sample of 126 would be sufficient to demonstrate statistically significant difference between NFPP and TAU with 80 percent power and effect size of .50 (Cohen’s d) and expected drop-out of 10%³⁹ - the minimum effect size and power generally recommended when calculating sample size in clinical trials^{40,41}. The study was powered to detect difference between NFPP and TAU arms, not to conduct moderator effects.

Statistical analysis

All outcomes were analyzed with a repeated measure model in STATA (version 14.1)⁴². Covariates included: randomization arm, center, gender, age (above or below 5 year) and year of randomization. We estimated the intervention effect at T2 (Intervention –TAU) in terms of the change from T1 to T2 and T1 to T3. We considered four potential moderators of the primary

outcome, gender, living with single parent, parental self-reported ADHD symptoms and parent reported levels of child conduct at T1. We repeated all analyses excluding observation with residuals exceeding 2.5* standard deviations (SD). The repeated measure model is relatively robust to data missing at random, but we supplemented all the analyzes with sensitivity analyses representing four missing not at random scenarios. Missing outcome were substituted with the models-based-prediction adding or subtracting 0.2*SD in the intervention or the TAU arm. All analyzes were based on intention to treat. P-values below 5% were considered statistically significant.

Sample representativeness

We assessed the representativeness of participants against data from the Danish Civil Registration System (CRS) ⁴³. The CRS contains detailed data on all Danish citizens, including a personal identification number that enables accurate linkage between and within the numerous nationwide registers (e.g., linking parents with children). Data was obtained through and linked by Statistics Denmark (DST) and the Danish National Health Board (DNHB)⁴⁴. Background and socio-demographic data for all other children diagnosed in Danish CAMHS, aged 3-7, who were diagnosed with ADHD (ICD-10 diagnoses: F90.x & F98.8) between 2012 and 2015 was used.

Results

Representativeness

The study sample (N=164) were somewhat older, parents were slightly less educated, family income was somewhat lower, and more parents were single compared to the comparison group of children (N=1378) of similar age, who received a diagnosis of ADHD in the same time period (Table 1).

TABLE 1

Allocation, drop out and fidelity

In total, 164 participants were randomized (Fig 1). Outcome measures were completed by mothers (n=139), fathers (n=15) and foster parents/other (n=9). Eighty-eight families were randomized to NFPP, and 83 completed all 8 sessions. (mean no. of hours/family = 12.07). Sessions were attended by both parents (58.8%), mother (29.5%), father (4.5%) (see Table S10, available online). Content fidelity was 95.3% (range: 83-100%). Seventy-six families were randomized to TAU (mean no. hours/family=8.8 hours). Patient records showed that 20 of these families did not receive any treatment between T1 & T3. Forty-six families attended parent groups and 32 families attended individual sessions instead of or in addition to group intervention across the three sites.

FIG 1.

Background and clinical characteristics, including diagnosed comorbid disorders, of the sample at baseline were well balanced across arms (see tables S1 and S9, available online) Response rates at all time-points on the primary outcome were satisfactory, although somewhat lower for TAU (Table 2).

TABLE 2

NFPP versus TAU

Table 2 reports raw scores for the primary and secondary outcomes across assessment points. At T2, 2%, and 15% of primary outcome data were missing for NFPP and TAU, respectively. Table 3 reports the adjusted change scores and the group difference between the adjusted change scores. Although a decrease was observed between T1 and T2 on parents' reports of ADHD symptoms for both arms (NFPP: 4.31 95% CI (2.90; 5.71) and TAU: 1.46 (-0.13;3.05)), NFPP was statistically superior to TAU ($p=0.009$). The effect persisted to T3 ($p=0.031$). There were also significant benefits of NFPP over TAU measured on the Family Strain Index ($p= 0.017$; $p= 0.010$), and Parenting Efficacy (T2: $p=0.004$ and T3: $p=0.028$) at both time-points. The effect for parenting sense of satisfaction at T2 bordered significance ($p= 0.051$). All other outcomes were non-significant. All exploratory moderation analyses were non-significant (see Table S2, available online). Outlier and sensitivity analyses showed similar results (see tables S3-S7, available online). For effect sizes see table S11, available online. The results are illustrated in figure SF1, available online.

TABLE 3

Discussion

Our clinical sample was representative of a national cohort of children of similar ages diagnosed with ADHD during the same time period. NFPP delivered in CAMHS was superior to TAU in terms of reducing parent-rated ADHD symptoms. The effect size of $d.=0.30$ seems to be somewhat smaller than that found in the previous four published NFPP trials (0.34-1.26)^{45 6,7,16}. This may be explained by the fact that previous NFPP trials were conducted in community settings, with control conditions involving minimal⁷ or no intervention or a wait-list condition^{6,16}. The smaller effect size

may also be related to the effectiveness oriented trial design where effect sizes are commonly smaller for trials delivered in real life clinical settings⁴⁶.

Effects did not generalize to teacher ratings or to direct observations. This finding is consistent with results from a meta-analysis of behavioral interventions for ADHD (nearly all of which involved PT), and with a meta-analysis involving PT for preschoolers with ADHD^{9,10,14}. Taken together, these findings have important implications and there is considerable debate about the clinical importance of parent-rated changes in ADHD following PT when they are not corroborated by informants blind to treatment allocation^{3,14,20,47}. Firstly, it may be unrealistic to expect correspondence between parent and teacher and parent and observer ratings of ADHD symptoms, as the effects of PT in the home may not be observable in other contexts with different demands and contingencies³. Secondly, teacher or blinded observer ratings are limited by the narrow context in which symptoms are rated, i.e. nursery school or the laboratory⁴⁸. Thirdly, parents may rate behavior over a period of time while observations are snapshots. Finally, teacher ratings may lack reliability as studies, to the best of our knowledge, do not standardize teacher ratings at different time-points. To optimize improvements in ADHD symptoms across domains, combined PT and teacher training interventions for young children with ADHD have been proposed, but trials have so far shown nonsignificant results on core ADHD symptoms^{49,50}. Parents are important informants when evaluating treatments for children³, but further research is needed understand the significance of parent ratings and the value of PT in improving the lives of young children with ADHD.

There were no significant effects of NFPP on child conduct problems reported by either rater. The findings from previous NFPP trials are somewhat inconsistent with regards to impact on conduct problems. While previous trials have reported large effects⁷, two recent trials reported smaller effect sizes around 0.3^{6,20}. A meta-analysis of PT for preschool ADHD found small to

moderate effect on parent-reported conduct problems but no effect on probably blinded measures¹⁰. Levels of conduct problems were fairly low in this sample (see Table S9, available online) in line with the reported lower prevalence of conduct problems in the Scandinavian countries⁵¹, which may explain the lack of effect. It may also be that the Danish version of the five-item conduct SDQ subscale was not sufficiently sensitive to change in the present study?

NFPP had positive effects on indicators of parent and family wellbeing. Family strain was reduced compared to TAU and parenting self-efficacy and satisfaction increased. This is consistent with previous trial results⁴⁷ and highlights the wider benefits of NFPP. Some of these effects persisted to T3. Against expectations – there was no improvement in parenting behaviors directed towards the child during direct observation. Two recent ADHD trials of NFPP^{6,20} also failed to detect changes in parenting practices using these same observation schedules. This may suggest that the schedule lacks external validity as a measure of ADHD related parenting. Alternatively, it may be that parenting does not improve as a function of intervention which would be at odds with a meta-analysis that found that behavioral interventions, which mostly included PT, improved self – reports and also blinded observations of parenting measures⁴⁷.

Finally, exploratory moderator analysis indicated that intervention effects were not influenced by child gender, family SES or composition, parental ADHD or child conduct problems. Levels of treatment adherence (95,3%) and outcomes were encouraging^{21,42} suggesting that therapists from different cultures working in different settings can be trained to deliver NFPP effectively. However, it should be noted that adding fidelity checks may have increased clinical engagement in the active trial and so may have reduced the generalizability of the results to normal clinical setting where such checks are less common.

This study had several strengths. It was conducted in specialized CAMHS where the majority of young children with ADHD are already offered psycho-education and support. Treatment in both arms was carried out by general therapists already in position within participating CAMHS. The study demonstrated sample representativeness by accessing data on a variety of sociodemographic data on the entire population of young children with ADHD from the Danish registers. The trial had an adequate sample, high retention and strong fidelity. The trial was independent, conducted in collaboration with NFPP researchers, but without their involvement in the collection and processing of data. It was the first NFPP trial in a non-English speaking context, where therapist supervision was independent of the original NFPP developers.

However, several limitations have to be recognized. Diagnostic assessment relied on routine clinical procedures, and the utility of the DAWBA in trials with preschoolers has not been established. Also, no data was available on the diagnostic status of the children after treatment. Engagement in treatments outside the clinical system was not recorded, although this could have impacted equally on both arms. Results may have been influenced by expectation bias. Given the finding from previous studies that parents of children with ADHD prefer individualized over group based PT⁵², parents may have expected a more positive outcome from NFPP than TAU. There was a narrow assessment of conduct problems, and no corroboration via direct observation of oppositional behavior. Technical errors prevented an exploration of the impact of intervention on parents' mental wellbeing. The trial was powered for effects on ADHD at T2, and was not powered to study moderator effects. The effects of clustering of therapists and treatment groups as recommended by CONSORT⁵³ could not be fully analyzed due to data protection laws preventing access to patient files. It should be recognized that applied exclusion criteria may have reduced the trial's external validity as an effectiveness trial. Finally, treatment dosage and engagement was higher in NFPP,

as 20 participants did not take up the offer of TAU. Further research is needed to determine the barriers to engagement in clinical services in order to improve patient outcome and increase service efficiency.

Summary

Effective treatments are needed for young children with ADHD. Our findings showed that NFPP was superior to TAU in reducing ADHD symptoms, as rated by parents, increasing parenting satisfaction and efficacy, and reducing strain within the family. Consistent with prior PT trials⁹, these effects did not generalize to teacher ratings and direct observations. There was no effect on children's conduct problems. Further research is needed to understand the significance of parent ratings in the evaluation of PT. Access to evidence based PT in routine CAMHS may contribute towards improved outcomes for young children with ADHD and their parents.

Table 1. Characteristics of randomized children and all Danish children with ADHD at time of diagnosis

Characteristics	Randomized (N=164)	All children (N=1378)
Year of diagnosis		
2012	16%	24%
2013	35%	34%
2014	49%	42%
Age group		
3-5yrs	57%	34%
6-7yrs	43%	66%
Sex		
Girls	27%	26%
Boys	73%	74%
Living arrangement		
Single parent	32%	40%
Both parents	65%	52%
Foster or unknown	4%	8%
Registered mother^a		
Biological mother	99%	99%
Registered father^a		
Biological father	100%	98%
Mother's highest education level^a		
Elementary school	15%	26%
High School level	51%	43%
Bachelor and above	33%	28%
Father's highest education level^a		
Elementary school	15%	24%
High School level	56%	49%
Bachelor and above	26%	25%
Mother employed^a		
Yes	79%	72%
Father employed^a		
Yes	68%	92%
Family gross income (1000 €)^b		
<=50	20%	24%
50-75	12%	19%
75-100	34%	24%
>100	25%	22%
Mother ever received psychiatric diagnosis^a		
Yes	23%	32%
Father ever received psychiatric diagnosis^a		
Yes	16%	17%
Mother's age, mean (SD)^a	35.4 (5.4)	35.5 (5.4)
Father's age, mean (SD)^a	38.5 (5.6)	38.9 (6.0)

*values are for parents living with the child

**of the child's family

Table 2: Observed outcome for New Forest Parenting Programme (NFPP) and Treatment as Usual (TAU) (N: mean (SD))

	T1	NFPP T2	T3	T1	TAU T2	T3
Primary outcome						
ADHD-RS-Parent						
Total	86: 33.44 (9.97)	84: 29.18 (9.08)	81: 28.73 (10.13)	75: 35.37 (8.90)	64: 33.98 (8.82)	64: 32.91 (9.26)
Secondary outcome						
ADHD-RS-Teacher						
Total	86: 33.35 (10.37)	80: 31.27 (9.97)	74: 32.02 (10.14)	69: 34.64 (12.52)	67: 32.94 (12.01)	55: 30.69 (13.72)
SDQ-Parent						
Conduct	86: 4.78 (2.44)	84: 4.04 (2.37)	81: 3.99 (2.36)	75: 5.27 (2.50)	64: 4.92 (2.13)	64: 4.77 (2.52)
SDQ-Teacher						
Conduct	86: 5.02 (3.14)	80: 4.25 (2.96)	74: 4.46 (3.11)	69: 5.30 (2.86)	66: 4.89 (3.04)	55: 4.44 (3.01)
GIPCI-Parent						
Average item score	83: 3.38 (0.32)	81: 3.45 (0.32)	78: 3.45 (0.28)	75: 3.35 (0.27)	62: 3.39 (0.37)	58: 3.39 (0.33)
GIPCI-Child						
Average item score	83: 3.88 (0.36)	81: 3.88 (0.29)	78: 3.92 (0.28)	75: 3.92 (0.29)	62: 3.88 (0.35)	58: 3.98 (0.28)
PSOC						
Efficacy	86: 30.54 (5.46)	81: 32.21 (5.67)	81: 32.54 (4.71)	75: 30.19 (6.03)	64: 29.52 (6.05)	64: 30.83 (5.96)
Satisfaction	86: 38.06 (7.01)	81: 39.59 (6.06)	81: 39.45 (6.63)	75: 37.20 (7.11)	64: 36.81 (7.00)	64: 38.05 (7.91)
FSI						
Total	86: 10.37 (5.34)	81: 9.12 (4.82)	81: 8.88 (4.72)	75: 10.39 (4.56)	64: 10.42 (5.16)	64: 10.47 (5.39)
Child solo play						
Switches^a	86: 7.0 (1.0; 15.0)	80: 6.0 (0.0; 17.0)	79: 7.0 (1.0; 17.0)	74: 6.0 (0.0; 15.0)	60: 6.0 (0.0; 22.5)	60: 6.0 (0.0; 16.5)

ADHD-RS: ADHD Rating Scale; SDQ: Strength and Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence; FSI: Family Strain Index

^aN: Median (10th percentile; 90th percentile)

Table 3: Adjusted^a mean changes for New Forest Parenting Programme (NFPP) and Treatment as Usual (TAU)

	Change from T1 to T2				Change from T1 to T3				
	NFPP	TAU	NFPP vs TAU	p-value	NFPP	TAU	NFPP vs TAU	p-value	
	Adjusted mean (95% CI)				Adjusted mean (95% CI)				
Primary outcome									
ADHD-RS-Parent									
Total	-4.31 (-5.71; -2.90)	-1.46 (-3.05; 0.13)	-2.84 (-4.96; -0.73)	0.009	-4.57 (-5.99; -3.15)	-2.23 (-3.81; -0.64)	-2.35 (-4.48; -0.21)	0.031	
Secondary outcome									
ADHD-RS-Teacher									
Total	-2.22 (-4.30; -0.15)	-1.05 (-3.34; 1.25)	-1.18 (-4.27; 1.92)	0.457	-1.85 (-3.99; 0.28)	-2.57 (-5.05; -0.09)	0.71 (-2.56; 3.98)	0.669	
SDQ-Parent									
Conduct	-0.75 (-1.13; -0.37)	-0.38 (-0.81; 0.04)	-0.36 (-0.94; 0.21)	0.212	-0.77 (-1.16; -0.39)	-0.45 (-0.87; -0.02)	-0.33 (-0.90; 0.25)	0.264	
SDQ-Teacher									
Conduct	-0.72 (-1.25; -0.19)	-0.22 (-0.81; 0.37)	-0.50 (-1.29; 0.30)	0.219	-0.58 (-1.13; -0.04)	-0.61 (-1.24; 0.03)	0.03 (-0.81; 0.86)	0.951	
GIPCI-Parent									
Average per item	0.07 (0.01; 0.14)	0.04 (-0.03; 0.11)	0.03 (-0.07; 0.13)	0.517	0.07 (0.00; 0.13)	0.04 (-0.04; 0.11)	0.03 (-0.07; 0.13)	0.586	
GIPCI-Child									
Average per item	0.00 (-0.07; 0.08)	-0.04 (-0.13; 0.04)	0.05 (-0.07; 0.16)	0.420	0.04 (-0.03; 0.12)	0.05 (-0.04; 0.13)	-0.00 (-0.12; 0.11)	0.954	
PSOC									
Efficacy	1.66 (0.83; 2.48)	-0.17 (-1.08; 0.75)	1.82 (0.59; 3.06)	0.004	2.04 (1.21; 2.86)	0.66 (-0.26; 1.57)	1.38 (0.15; 2.61)	0.028	
Satisfaction	1.50 (0.23; 2.76)	-0.39 (-1.80; 1.02)	1.88 (-0.01; 3.78)	0.051	1.28 (0.01; 2.54)	0.56 (-0.84; 1.97)	0.71 (-1.18; 2.61)	0.459	
FSI									
Total	-1.44 (-2.23; -0.66)	-0.02 (-0.89; 0.86)	-1.43 (-2.60; -0.26)	0.017	-1.35 (-2.13; -0.56)	0.19 (-0.68; 1.07)	-1.54 (-2.71; -0.37)	0.010	
Child solo play									
Switches	-0.02 (-1.81; 1.76)	1.63 (-0.39; 3.64)	-1.65 (-4.34; 1.04)	0.230	0.32 (-1.47; 2.11)	0.37 (-1.64; 2.38)	-0.05 (-2.74; 2.65)	0.972	

CI: Confidence Interval; ADHD-RS: ADHD Rating Scale; SDQ: Strength and Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence; FSI: Family Strain Index

^aAdjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child.

Figures

Fig 1. CONSolidated Standards of Reporting Trials (CONSORT) diagram

Supplemental figures

Supplementary figure 1: Changes in parent-rated mean scores for New Forest Parenting Programme (NFPP) and Treatment as Usual (TAU)

Supplemental tables:

Table S1: Characteristics at time of ADHD diagnosis among 86 children randomized to New Forest Parenting Programme and 76 children randomized to Treatment as Usual (TAU)

Table S2: Results of moderator analyses on the primary outcome (ADHD-RS-parent rated)

Table S3: Adjusted^a mean changes among 86 children randomized to New Forest Parenting Programme and 76 children randomized to Treatment as Usual (TAU)

Table S4: Adjusted^a mean changes among 86 children randomized to New Forest Parenting Programme (NFPP) and 76 children randomized to Treatment as Usual (TAU)

Table S5: Adjusted^a mean changes among 86 children randomized to New Forest Parenting Programme (NFPP) and 76 children randomized to Treatment as Usual (TAU)

Table S6: Adjusted^a mean changes among 86 children randomized to New Forest Parenting Programme (NFPP) and 76 children randomized to Treatment as Usual (TAU)

Table S7: Adjusted^a mean changes among 86 children randomized to New Forest Parenting Programme (NFPP) and 76 children randomized to Treatment as Usual (TAU)

Table S8: Schedule of measures together with internal consistency coefficients of the scales used

Table S9: Comorbid diagnoses (ICD-10*) at baseline for both groups

Lay summary

This study investigated whether parent training (PT) added value in the treatment of ADHD in young children referred to three routine, specialized Child and Adolescent Mental Health Services (CAMHS) in Denmark. We found that PT was superior to treatment as usual in CAMHS because it reduced parent-rated ADHD symptoms (ES: 0.30). There were no effects on teacher or observer rated ADHD outcomes. The significance of parent ratings and the clinical value of PT in improving outcomes for young children require further exploration.

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Appendix A: Supplementary data (Tables S1-S11, and SF1)

Table S1: Schedule of measures together with internal consistency coefficients of the scales used

Assessment measures	Timeline (weeks)			Cronbach's α (reliability coefficient)
	Baseline (T1)	12 (T2)	36 (T3)	
Primary Outcome Measure	x	x	x	
<i>ADHD symptoms</i>				
Preschool ADHD-RS (parent rated)	x	x	x	0.90
Secondary Outcome Measures				
<i>ADHD symptoms</i>				
Preschool ADHD-RS (teacher rated)	x	x	x	0.93
Child solo play – observation measure	x	x	x	NA
<i>Behavioral symptoms</i>				
SDQ P2-4 & P4-16 – (parent rated)				
Conduct subscale	x	x	x	0.73
SDQ T2-4 & T4-16 – (teacher rated)				
Conduct subscale	x	x	x	0.81
<i>Parent ADHD</i>				
The Adult ADHD self-report scale (ASRS-V1.1)	x			
<i>Perceived parenting</i>				
Parenting Sense of Competence Scale (PSOC)				
Efficacy	x	x	x	0.78
Competence	x	x	x	0.77
Family Strain Index (FSI)	x	x	x	0.86
<i>Positive and constructive parenting</i>				
Global Impressions of Parent-Child Interactions (GIPCI: (Jigsaw/Tidy up/Freeplay)) observation measure	x	x	x	NA

Note: ADHD-RS: ADHD Rating Scale; SDQ: Strength and Difficulties Questionnaire.

Table S2: Proportion of adult/s attending New Forest Parenting (NFPP) sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
Both biological parents ^a	58 %	62.5 %	63.6 %	65.9 %	54.5 %	58 %
Biological mother ^b	30.6 %	28.4 %	28.4 %	22.7 %	32.9 %	28.4 %
Biological father only	5.7 %	3.4 %	2.3 %	4.5 %	5.7 %	4.5 %
Foster parents ^c	3.4 %	3.4 %	3.4 %	3.4 %	3.4 %	2.3 %
Attendants not registered	2.3 %	2.3 %	2.3 %	3.4 %	3.4 %	6.8 %

^a includes both biological parents and other person (i.e. professional)

^b includes biological mother and other person (e.g. stepfather, friend, grandparent)

^c Includes foster mother only + foster parents and other person (e.g. professional)

Table S3: Characteristics at time of ADHD diagnosis among 88 children randomized to New Forest Parenting Program and 88 children randomized to Treatment as Usual (TAU)

	NFPP
Year of diagnosis	
2012	15
2013	29
2014	44
Site	
1 (Risskov)	50
2 (Herning)	9
3 (Glostrup)	29
Child: Clinical ADHD diagnosis	
F90	84
F98.8	5
Age	
3-5yrs	49
6-7yrs	39
Sex	
Girls	27
Boys	61
Living arrangement	
Single parent	>25
Both parents	58
Foster or Unknown	<5
Registered mother ^a	
Biological mother	84
Registered father^a	
Biological father	59
Mother's highest education level^a	
Elementary school- first 10 years	12
High School level - 10 to 13 years	41
Bachelor or Higher	30
Father's highest education level^a	
Elementary school-first 10 years	10
High School level - 10 to 13 years	33
Bachelor or Higher	16
Not applicable	29
Mother employed^a	69
Father employed^a	56
Family gross income (1000 €)^b	
<=50	19

	50-75	11
	75-100	29
	>100	21
Mother ever recieved a psychiatric diagnosis^a		19
Father ever recieved a psychiatric diagnosis^a		12
Mother's^a age mean (sd)		36.1 (5.5)
Father's^a age mean (sd)		38.6 (4.9)
Parent ASRS-score. n:mean(sd)		84: 7.24 (5.45)
Child conduct (SDQ parent rated) n:mean(sd)		86: 4.78 (2.44)

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; ASRS: Adult Self Report Scale; SDQ: Strength and

Questionnaire

^avalues are given for the parents living with the child

^bof the child's family

Table S4: Comorbid diagnoses (ICD-10^a) at baseline for both groups

Comorbid diagnoses (ICD-10^a)	
Oppositional defiant disorder/conduct disorder (F91.x; F92.x)	
Emotional disorders (F93)	
Disorders of social functioning (F94.x)	
Tic disorders (F95)	
Other behavioral and emotional disorders (F98.x)	
Specific developmental disorders (F80-F89 (excluding F84))	
Borderline intellectual functioning (R41.83: IQ =70-84)	

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual

^aInternational Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) WHO behavioural disorders.

Table S5: Results of moderator analyses on the primary outcome (ADHD-RS-parent rated)

Moderator	Number of children	Change from T1 to T2	
		NFPP vs TAU Adjusted mean (95% CI) ^a	NFPP vs TAU p-value ^b
Gender			
Boy	117	-1.71 (-4.17; 0.75)	0.173
Girl	44	-5.70 (-9.82; -1.59)	0.007
Difference	161	-3.99 (-8.79; 0.80)	0.103
Single Parent			
Yes	49	-1.10 (-4.93; 2.74)	0.576
No	112	-3.57 (-6.08; -1.05)	0.006
Difference	161	-2.47 (-7.06; 2.12)	0.291
ASRS-score of the parent			
Per unit	156	-0.10 (-0.49; 0.30)	0.633
SDQ Conduct-score (parent rated) at T1			
Per unit	161	0.10 (-0.74; 0.94)	0.818

Note: ADHD-RS: ADHD Rating Scale; NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; C: Conduct Disorder Self Report Scale; SDQ: Strength and Difficulties Questionnaire

^a Adjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child

^b Wald test, 1 df.

Table S6: Adjusted^a mean changes among 88 children randomized to New Forest Parenting Programme as Usual (TAU)

Measure	Change from T1 to T2				p-value	NFPP Adjusted mean (95% CI)
	NFPP	TAU	NFPP vs TAU	NFPP		
	Adjusted mean (95% CI)			Adjusted mean (95% CI)		
Primary outcome						
ADHD-RS-Parent						
Total	-4.50 (-5.79; -3.22)	-1.45 (-2.89; 0.00)	-3.06 (-4.99; -1.13)	0.0019	-4.21 (-5.51; -2.90)	
Secondary outcome						
ADHD-RS-Teacher						
Total	-2.23 (-4.11; -0.36)	-1.16 (-3.27; 0.94)	-1.07 (-3.89; 1.75)	0.4569	-1.88 (-3.81; 0.05)	
SDQ-Parent						
Conduct	-0.85 (-1.22; -0.48)	-0.38 (-0.80; 0.03)	-0.46 (-1.02; 0.09)	0.1008	-0.86 (-1.23; -0.48)	
SDQ-Teacher						
Conduct	-0.82 (-1.30; -0.34)	-0.21 (-0.74; 0.32)	-0.61 (-1.32; 0.11)	0.0955	-0.50 (-0.99; 0.00)	
GIPCI-Parent						
Average per item	0.07 (0.01; 0.14)	0.04 (-0.03; 0.11)	0.03 (-0.06; 0.13)	0.5291	0.07 (0.00; 0.13)	
GIPCI-Child						
Average per item	-0.03 (-0.10; 0.04)	-0.04 (-0.12; 0.04)	0.01 (-0.10; 0.11)	0.9029	0.02 (-0.05; 0.09)	
PSOC						
Efficacy	1.63 (0.85; 2.40)	-0.48 (-1.35; 0.38)	2.11 (0.95; 3.27)	0.0004	1.88 (1.11; 2.65)	
Satisfaction	1.44 (0.24; 2.64)	-0.40 (-1.72; 0.93)	1.84 (0.05; 3.63)	0.0436	1.14 (-0.06; 2.33)	
FSI						
Total	-1.25 (-1.98; -0.53)	0.14 (-0.67; 0.95)	-1.39 (-2.48; -0.30)	0.0121	-1.33 (-2.06; -0.60)	
Child solo play						
Switches	-0.10 (-1.53; 1.32)	0.48 (-1.13; 2.09)	-0.58 (-2.73; 1.57)	0.5958	0.57 (-0.86; 1.99)	

Note: CI: Confidence Interval; NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; ADHD-RS: ADHD-RS Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of

^a Adjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child

^b Total number of observations in the analysis when outliers excluded.

Table S7: Adjusted^a mean changes among 88 children randomized to New Forest Parenting Programme as Usual (TAU)

Sensitivity analysis 1

NFPP	0.2 ^a sd added to predicted	TAU
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Measure	Change from T1 to T2				p-value	NFPP
	NFPP	TAU	NFPP vs TAU	Adjusted mean (95% CI)		
	Adjusted mean (95% CI)					
Primary outcome						
ADHD-RS-Parent						
Total	-4.29 (-5.59; -2.99)	-1.46 (-2.86; -0.06)	-2.83 (-4.74; -0.91)	0.0038	-4.53 (-5.83; -3.22)	
Secondary outcome						
ADHD-RS-Teacher						
Total	-2.14 (-3.97; -0.32)	-1.05 (-3.01; 0.92)	-1.10 (-3.78; 1.58)	0.4218	-1.70 (-3.53; 0.12)	
SDQ-Parent						
Conduct	-0.74 (-1.10; -0.39)	-0.38 (-0.76; 0.01)	-0.36 (-0.88; 0.16)	0.1733	-0.76 (-1.11; -0.41)	
SDQ-Teacher						
Conduct	-0.70 (-1.17; -0.24)	-0.22 (-0.72; 0.28)	-0.48 (-1.16; 0.20)	0.1696	-0.54 (-1.01; 0.08)	
GIPCI-Parent						
Average per item	0.07 (0.02; 0.13)	0.04 (-0.02; 0.10)	0.03 (-0.05; 0.12)	0.4469	0.07 (0.01; 0.13)	
GIPCI-Child						
Average per item	0.00 (-0.07; 0.07)	-0.04 (-0.12; 0.03)	0.05 (-0.05; 0.15)	0.3509	0.05 (-0.02; 0.12)	
PSOC						
Efficacy	1.68 (0.93; 2.43)	-0.17 (-0.97; 0.64)	1.85 (0.75; 2.95)	0.0010	2.06 (1.31; 2.81)	
Satisfaction	1.53 (0.38; 2.69)	-0.39 (-1.63; 0.85)	1.92 (0.23; 3.62)	0.0263	1.32 (0.16; 2.47)	
FSI						
Total	-1.42 (-2.13; -0.71)	-0.02 (-0.78; 0.75)	-1.40 (-2.45; -0.36)	0.0086	-1.32 (-2.03; -0.61)	
Child solo play						
Switches	0.05 (-1.57; 1.67)	1.63 (-0.12; 3.37)	-1.57 (-3.95; 0.81)	0.1948	0.41 (-1.21; 2.03)	

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; CI: Confidence Interval; ADHD-RS: ADHD-RS Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence

^a Adjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child

^b Total number of observations including imputed values

Table S8: Adjusted^a mean changes among 88 children randomized to New Forest Parenting Programme (NFPP) and Treatment as Usual (TAU)

Sensitivity analysis 2	NFPP	0.2 ^a sd Subtracted from predicted	TAU
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Measure	Change from T1 to T2				Adjusted mean (95% CI)
	NFPP	TAU	NFPP vs TAU	p-value	
	Adjusted mean (95% CI)				
Primary outcome					
ADHD-RS-Parent					
Total	-4.32 (-5.63; -3.02)	-1.46 (-2.86; -0.06)	-2.86 (-4.78; -0.95)	0.0034	-4.61 (-5.92; -3.31)
Secondary outcome					
ADHD-RS-Teacher					
Total	-2.30 (-4.12; -0.48)	-1.05 (-3.01; 0.91)	-1.25 (-3.93; 1.42)	0.3591	-2.01 (-3.83; -0.19)
SDQ-Parent					
Conduct	-0.75 (-1.11; -0.40)	-0.38 (-0.76; 0.01)	-0.37 (-0.89; 0.15)	0.1623	-0.79 (-1.14; -0.43)
SDQ-Teacher					
Conduct	-0.74 (-1.21; -0.28)	-0.22 (-0.72; 0.28)	-0.52 (-1.20; 0.17)	0.1375	-0.62 (-1.09; -0.16)
GIPCI-Parent					
Average per item	0.07 (0.01; 0.13)	0.04 (-0.02; 0.10)	0.03 (-0.05; 0.12)	0.4702	0.07 (0.01; 0.12)
GIPCI-Child					
Average per item	0.00 (-0.07; 0.07)	-0.04 (-0.12; 0.03)	0.05 (-0.06; 0.15)	0.3710	0.04 (-0.03; 0.11)
PSOC					
Efficacy	1.63 (0.88; 2.38)	-0.17 (-0.97; 0.64)	1.80 (0.70; 2.90)	0.0014	2.01 (1.26; 2.76)
Satisfaction	1.46 (0.30; 2.61)	-0.39 (-1.63; 0.85)	1.84 (0.15; 3.54)	0.0330	1.24 (0.08; 2.39)
FSI					
Total	-1.47 (-2.18; -0.75)	-0.02 (-0.78; 0.75)	-1.45 (-2.50; -0.40)	0.0066	-1.37 (-2.08; -0.66)
Child solo play					
Switches	-0.09 (-1.72; 1.53)	1.63 (-0.12; 3.37)	-1.72 (-4.10; 0.66)	0.1569	0.24 (-1.39; 1.86)

Note: New Forest Parenting Programme; TAU: Treatment as Usual; CI: Confidence Interval; ADHD-RS: ADHD Rating Scale Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence

^a Adjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child

^b Total number of observations including imputed values

Table S9: Adjusted^a mean changes among 88 children randomized to New Forest Parenting Programme Treatment as Usual (TAU)

Sensitivity analysis 3

NFPP

as predicted

TAU

Measure	Change from T1 to T2				p-value	NFPP	Adjusted mean (95% CI)
	NFPP	TAU	NFPP vs TAU				
	Adjusted mean (95% CI)						
Primary outcome							
ADHD-RS-Parent							
Total	-4.31 (-5.61; -3.00)	-1.35 (-2.75; 0.05)	-2.96 (-4.87; -1.04)	0.0025	-4.57 (-5.87; -3.27)		
Secondary outcome							
ADHD-RS-Teacher							
Total	-2.22 (-4.04; -0.40)	-1.02 (-2.98; 0.94)	-1.21 (-3.88; 1.47)	0.3773	-1.85 (-3.68; -0.03)		
SDQ-Parent							
Conduct	-0.75 (-1.10; -0.40)	-0.35 (-0.73; 0.02)	-0.39 (-0.91; 0.12)	0.1352	-0.77 (-1.13; -0.42)		
SDQ-Teacher							
Conduct	-0.72 (-1.19; -0.26)	-0.21 (-0.71; 0.29)	-0.51 (-1.19; 0.17)	0.1440	-0.58 (-1.05; -0.12)		
GIPCI-Parent							
Average per item	0.07 (0.01; 0.13)	0.05 (-0.02; 0.11)	0.03 (-0.06; 0.11)	0.5499	0.07 (0.01; 0.13)		
GIPCI-Child							
Average per item	0.00 (-0.07; 0.07)	-0.04 (-0.11; 0.04)	0.04 (-0.06; 0.14)	0.4447	0.04 (-0.03; 0.11)		
PSOC							
Efficacy	1.66 (0.91; 2.41)	-0.10 (-0.91; 0.70)	1.76 (0.66; 2.86)	0.0017	2.04 (1.29; 2.79)		
Satisfaction	1.50 (0.34; 2.65)	-0.29 (-1.53; 0.95)	1.78 (0.09; 3.48)	0.0394	1.28 (0.12; 2.43)		
FSI							
Total	-1.44 (-2.16; -0.73)	0.05 (-0.72; 0.81)	-1.49 (-2.54; -0.44)	0.0053	-1.35 (-2.06; -0.63)		
Child solo play							
Switches	-0.02 (-1.64; 1.60)	1.83 (0.08; 3.57)	-1.85 (-4.23; 0.54)	0.1290	0.32 (-1.30; 1.94)		

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; CI: Confidence Interval; ADHD-RS: ADHD-RS Difficulties Questionnaire; ; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of

^a Adjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child

^b Total number of observations including imputed values

Table S10: Adjusted^a mean changes among 88 children randomized to New Forest Parenting Programme Treatment as Usual (TAU)

Sensitivity analysis 4	NFPP as predicted				TAU	
	Change from T1 to T2				CI	
Measure	NFPP	TAU	NFPP vs TAU	p-value	NFPP	TAU
	Adjusted mean (95% CI)				Adjusted mean (95% CI)	
Primary outcome ADHD-RS-Parent						
Total	-4.31 (-5.61; -3.00)	-1.57 (-2.98; -0.17)	-2.73 (-4.65; -0.82)	0.0052	-4.57 (-5.87; -3.27)	-2.00 (-3.30; -0.70)
Secondary outcome ADHD-RS-Teacher						
Total	-2.22 (-4.05; -0.40)	-1.08 (-3.04; 0.89)	-1.15 (-3.83; 1.54)	0.4024	-1.85 (-3.68; 0.03)	-2.00 (-3.83; -0.17)
SDQ-Parent						
Conduct	-0.75 (-1.10; -0.40)	-0.41 (-0.79; -0.04)	-0.33 (-0.85; 0.18)	0.2061	-0.77 (-1.13; -0.42)	-0.40 (-0.76; -0.04)
SDQ-Teacher						
Conduct	-0.72 (-1.19; -0.26)	-0.23 (-0.73; 0.27)	-0.49 (-1.17; 0.20)	0.1624	-0.58 (-1.05; -0.12)	-0.20 (-0.66; 0.26)
GIPCI-Parent						
Average per item	0.07 (0.01; 0.13)	0.03 (-0.03; 0.10)	0.04 (-0.05; 0.13)	0.3764	0.07 (0.01; 0.13)	0.03 (-0.03; 0.10)
GIPCI-Child						
Average per item	0.00 (-0.07; 0.07)	-0.05 (-0.13; 0.02)	0.06 (-0.05; 0.16)	0.2878	0.04 (-0.03; 0.11)	0.00 (-0.07; 0.07)
PSOC						
Efficacy	1.66 (0.91; 2.41)	-0.23 (-1.04; 0.58)	1.89 (0.79; 2.99)	0.0008	2.04 (1.29; 2.79)	0.59 (0.13; 1.05)
Satisfaction	1.50 (0.34; 2.65)	-0.49 (-1.73; 0.75)	1.98 (0.29; 3.68)	0.0218	1.28 (0.12; 2.43)	0.40 (-0.76; 1.76)
FSI						
Total	-1.44 (-2.16; -0.73)	-0.08 (-0.84; 0.69)	-1.37 (-2.41; -0.32)	0.0106	-1.35 (-2.06; -0.63)	0.13 (-0.58; 0.83)
Child solo play						
Switches	-0.02 (-1.64; 1.60)	1.43 (-0.32; 3.17)	-1.45 (-3.83; 0.93)	0.2328	0.32 (-1.30; 1.94)	0.17 (-1.45; 1.51)

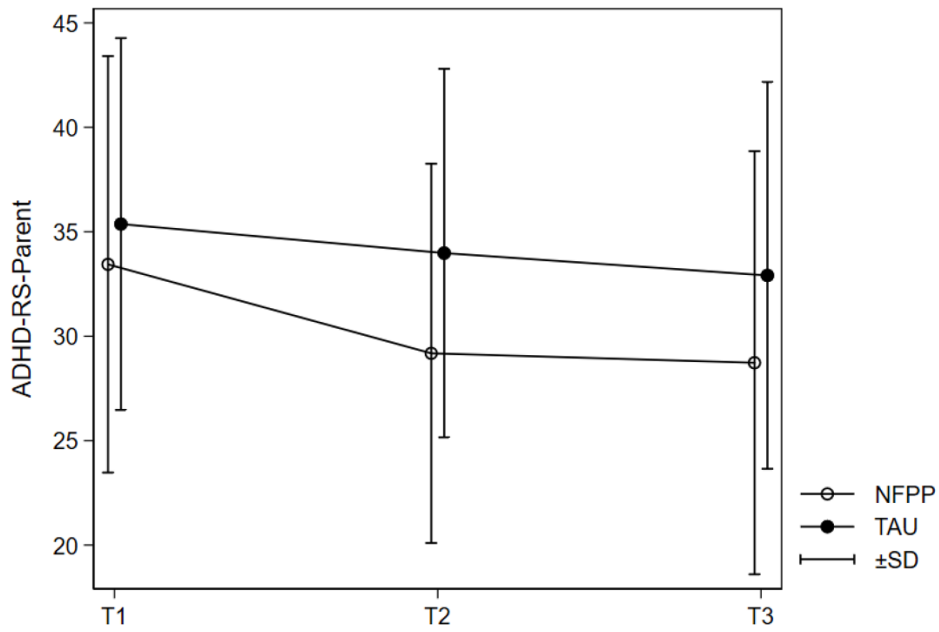
Tabel S11: Study effect sizes

			Adjusted estimates / Standard deviation at T1			
			Change from T1 to T2		Change from T1 to T3	
			NFPP vs TAU		NFPP vs TAU	
Primary outcome			Mean (95% CI)	p-value	Mean (95% CI)	p-value
	ADHD-RS-Parent					
		Total	-0.30(-0.53; -0.08)	0.009	-0.25(-0.47; -0.02)	0.03
	Secondary outcome					
	ADHD-RS-Teacher					
		Total	-0.10(-0.37; 0.17)	0.457	0.06(-0.22; 0.35)	0.66
	SDQ-Parent					
		Conduct	-0.15(-0.38; 0.09)	0.212	-0.13(-0.36; 0.10)	0.26
	SDQ-Teacher					
		Conduct	-0.17(-0.43; 0.10)	0.219	0.01(-0.27; 0.29)	0.95
	GIPCI-Parent					
		Average score per item	0.10(-0.24; 0.44)	0.517	0.10(-0.24; 0.44)	0.58
	GIPCI-Child					
		Average score per item	0.15(-0.22; 0.50)	0.420	0.00(-0.37; 0.34)	0.95
	PSOC					
		Efficacy	0.32(0.10; 0.53)	0.004	0.24(0.03; 0.45)	0.02
		Satisfaction	0.27(0.00; 0.54)	0.051	0.10(-0.17; 0.37)	0.45
	FSI					
		Total	-0.29(-0.53; -0.05)	0.017	-0.31(-0.55; -0.07)	0.01
	Child solo play					
		Switches	-0.30(-0.78; 0.19)	0.230	-0.01(-0.49; 0.47)	0.97

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; ADHD-RS: ADHD Rating Scale; SDQ: Strength and Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence; FSI: Family Strain Index

Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual; CI: Confidence Interval; ADHD-RS: ADHD Rating Scale; SDQ: Strength and Difficulties Questionnaire; GIPCI: Global Impressions of Parent-Child Interactions; PSOC: Parenting Sense of Competence; FSI: Family Strain Index
^aAdjusted for gender, center, age, and year of inclusion using a mixed model with a random level for each child and missing values imputed

Supplementary figure 1: Changes in parent-rated mean scores for New Forest Parenting Programme (NFPP) and Treatment as Usual (TAU)



Note: NFPP: New Forest Parenting Programme; TAU: Treatment as Usual