Effectiveness of ENGAGE in Reducing Difficulties in Everyday Executive Functions among Finnish Preschoolers: A Randomized Controlled Trial

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Disclosure of interest: The authors report there are no competing interests to declare.

Funding: This work was supported by the Funding Centre for Social Welfare and Health Organizations (STEA), Finland, and the Finnish Cultural Foundation.

Word count: 8560

Abstract

Effective interventions applicable for young preschool-age children are needed to reduce the risk of widespread and sustained adversities that are linked to early executive function (EF) difficulties. This randomized controlled trial (RCT) examined the effectiveness of the play-based ENGAGE intervention in improving behavioral outcomes related to EFs among Finnish preschool-age children with hyperactivity and/or inattention problems.

95 children between 4 and 5 years of age and their parents were randomly assigned to the ENGAGE intervention or a waitlist control group. Parents and early childhood education (ECE) teachers rated the children's EF difficulties and problem behaviors at pre-intervention, post-intervention, and 5-month follow-up. Repeated measures linear mixed modeling was used to examine the effect of ENGAGE on child outcomes. Those receiving ENGAGE exhibited significantly greater decreases in parent-rated attentional problems, hyperactivity/impulsivity, and acting out behaviors than the control group did, with mostly moderate effect sizes. No consistent improvements in the teacher ratings of children's EF related difficulties were found in either group. Low dropout (8%) from the intervention and high acceptability ratings indicated that ENGAGE is a palatable intervention for parents.

The present study showed that findings from an earlier RCT on ENGAGE conducted in New Zealand could be generalized to a different cultural setting, as the intervention effectively reduced young Finnish children's EF difficulties in the home context. Extending ENGAGE and other play-based interventions into different everyday contexts of children, such as ECE, could further enhance the beneficial effects on children's EFs and behavior.

Keywords*:* executive functions, play-based intervention, preschool children, training, RCT

Introduction

Difficulties in executive functions (EFs) are a major concern for young children's development. EFs refer to the skills and capacities that are needed for successful self-regulation, goal directed behavior, and learning new skills (Hofmann et al., 2012; Nigg, 2017). The commonly recognized core EFs—inhibition, working memory, and shifting (Miyake et al., 2000) —serve the immediate adaptive purpose of self-regulation (Nigg, 2017). In everyday functioning, these core EFs appear as the abilities to withhold and control motor and emotional reactions; to stay focused; to hold and process information in the mind; and to shift flexibly from one activity to another when taking action. Difficulties in EFs typically manifest as problems of inattention, hyperactivity, and impulsive behavior and are linked to a host of negative developmental trajectories including attention deficit hyperactivity disorder (ADHD), conduct disorder (CD), and autism spectrum disorders (ASD), poor educational attainment and learning difficulties (Best et al., 2011; Biederman et al., 2004; Blair & Raver, C.C., 2015; Gathercole et al., 2004; Morgan et al., 2019: O'Hearn et al., 2008; Rubia, 2011; Willcutt et al., 2005). For promoting the development of EF skills and for reducing the risk of widespread and sustained adversities that are linked to early EF difficulties, effective interventions that are applicable for young preschool-age children are acutely needed (Moffitt et al., 2011).

EFs develop rapidly during the preschool years. Between 3 and 5 years of age, children become able to suppress natural inclinations according to situational demands and to focus attention and hold information in working memory (Carlson, 2005; Diamond, 2013; Garon et al., 2008; Pauli-Pott & Becker, 2015). Although based on individual differences in neurobiology and inherent early response tendencies, the development of EFs is greatly malleable and influenced by daily interactions and activities (Blair, 2016; Rueda et al., 2005). During the preschool years, children get countless opportunities for practicing EF skills (e.g.,

controlling the speed on actions, paying attention to instructions) when playing and interacting with others. Children with difficulties in EF skills (e.g., do not focus; impulsively break the rules) may lag behind because of disadvantages in genetic underpinnings or early environmental conditions (e.g., stress; see Blair, 2016) and, even more so, they may get less practice than other children from engaging in activities that support EF development (evocative and active effects in gene-environment interactions, see Knafo & Jaffee, 2013). Thus, interventions targeting EF skills at preschool age, a potential sensitive period for the development of EFs (Pauli-Pott & Becker, 2015; Thompson & Steinbeis, 2020), allow highly specific treatment for children who have a heightened risk for accumulated difficulties stemming from poor EF and self-regulation.

According to a vast amount of research, training can effectively support the development of EFs (e.g., Blair, 2016; Diamond & Ling, 2016). Still, less is known about what kind of training is most beneficial for preschool-age children who show early difficulties in EFs. A few recent meta-analytic studies have examined whether there are differences in the effectiveness of various training/cognitive interventions for children with and without EF difficulties. In a series of meta-analyses, Takacs and Kassai (2019) compared the efficacy of five different types of interventions: explicit practicing of EFs, programs providing new strategies of self-regulation, EF-specific curricula, physical activity, or art activities. Interventions that focused on learning new strategies seemed to be more effective while explicit practice was less effective for samples with EF difficulties (e.g., symptoms of ADHD, ASD, behavior problems) as compared to typically developing samples. The findings implicated that those interventions that implicitly foster EFs may be similarly or more effective as well as more feasible (e.g., more enjoyable, more easily embedded in everyday activities) than explicit training. Yet, as only a few studies with preschool-age children with

EF difficulties were included, these findings do not directly give evidence for interventions directed toward young children.

Two meta-analytic reviews that have focused on preschool-age children have not found differences in the effectiveness of different kinds of EF interventions. In a study involving 3- to 6-year-old children, Scionti et al. (2020) included interventions that aimed at explicitly training one or more EFs via computerized or non-computer games and play. Explicit training was found to be effective for preschool-age participants in general although children with developmental risk of EF difficulties (ADHD symptoms) benefited more than did children without developmental risk. No differences between computerized and non-computer training were found. According to moderation analyses, however, group training was more effective than individual training for improving EFs. In another study with a similar age range, Pauli-Pott et al. (2020) included a large variety of interventions involving either explicit training of EFs, training of attention-directing strategies, cognitive scaffolding, or training social skills and emotional regulation. Again, overall effects of interventions on EF outcomes were found for both children with and without EF difficulties (ADD/ODD symptoms), but no significant differences among interventions emerged. Notably, the number of studies including children with EF difficulties was very low in all three aforementioned meta-analyses, implying the need to assess the effectiveness of interventions particularly in samples of children presenting these difficulties.

Although the meta-analytic studies do not offer clear evidence for what kinds of interventions best serve young preschool-age children who are “at risk” for accumulated problems due to EF difficulties, they point to the direction of group-based interventions that are embedded in the everyday activities of the child and include some means of learning strategies related to EFs. With these preliminary guidelines in mind, a promising approach to improving young children’s EFs involves training through structured play. These

interventions include group sessions for children and parents while the main focus is on practicing EF skills during parent-guided play in everyday situations. Children's groups typically involve play activities targeting core EFs (e.g., inhibition, working memory) as well as metacognitive strategies and/or behavior modification to engage the children in the activities. Parents mainly receive EF-related psychoeducation and guidance for the activities and playing with their child at home.

Recent studies not included in the previously covered meta-analyses have examined the efficacy of several play-based EF interventions (Halperin et al., 2013; 2020; Healey & Halperin, 2015; Healey & Healey, 2019; Tamm et al. 2015; 2019). In a randomized controlled trial (RCT) conducted in the U.S., Tamm et al. (2019) compared the Generating Attention, Inhibition and Memory (GAIM) intervention to an active control group (children playing without metacognition, parent guidance not related to EFs, and no activities at home) in a sample of 3- to 4-year-old children with parent- and teacher-rated EF difficulties. Parents participating in GAIM rated the functional ability related to children's problem behaviors as significantly less severe and less frequent after the intervention than parents participating in the control condition (Tamm et al., 2019). In another recent RCT from the U.S., Halperin et al. (2020) compared Training Executive, Attention and Motor Skills (TEAMS) to an active control group involving a parent education group focusing primarily on topics related to ADHD. Both interventions yielded statistically significant benefits for 4- to 5-year-old children with diagnosed ADHD on ADHD symptom severity (as assessed by parents, teachers and clinicians), ADHD-related impairment (as assessed by parents and teacher), parenting factors (parent self-report), and neuropsychological outcomes.

Finally, Healey et al. (2015, 2019) have investigated the effectiveness of Enhancing Neurobehavioural Gains with the Aid of Games and Exercise (ENGAGE) in New Zealand among 3- to 4-year-old children with parent-rated problem behaviors. In an initial open trial,

Healey and Halperin (2015) reported significant improvements in parent-rated hyperactivity, inattention, and aggression problems that were maintained throughout a 12-month follow-up. In a recent RCT, Healey and Healey (2019) compared ENGAGE to the strongly evidence-based behavior management program Positive Parenting Program (Triple P) that involved psychoeducation of child management procedures to promote positive development and to manage misbehavior for parents. At post-intervention and throughout the 6- and 12-month follow-ups, ENGAGE was found to be as effective as Triple P based on parent ratings, with both interventions reducing children's problem behaviors related to hyperactivity, inattention, and aggression to within the typical range for their age.

Together, these studies suggest that play-based interventions could be a viable option for preschool children who have difficulties in EFs. However, replications of the RCTs as well as extensions to different populations and cultural contexts, are needed to strengthen the evidence from previous studies and to find out whether these interventions can be implemented in diverse cultural settings.

The present study examined the effectiveness of ENGAGE in 4- to 5-year-old Finnish children with difficulties in EFs. We sought to find out whether the findings of the previous studies concerning ENGAGE conducted in New Zealand (Healey & Halperin, 2015; Healey & Healey, 2019) could be replicated and applied to another cultural context. Based on the previous studies of play-based interventions, we hypothesized that ENGAGE would be effective in reducing children's problems related to hyperactivity, impulsivity, inattention, and aggressive behavior, and improving their functional ability. These effects were expected to remain stable across a -month follow-up. We expected to find intervention effects in both parent and early childhood education (ECE) teacher ratings, but based on the findings from previous studies, we anticipated that the effect would be larger in parent ratings from the home context as compared to teacher ratings from the context of ECE.

Methods

Participants and Procedures

Initially, 95 children (79 boys and 16 girls), aged 4 to 5 years, were recruited and deemed eligible for the study. The flow of the participants through the study is detailed in the CONSORT diagram in Figure 1. Inclusion criteria were the following: (1) parent's evaluation in the initial phone call that the group form is suitable for the child; (2) parental rating of their child's problems at or above the 65th percentile on the Attention Deficit / Hyperactivity Problems subscale of the Child Behavior Checklist (CBCL); (3) child's age between 4 and 5 years during the second assessment; (4) child attending ECE; (5) no other intervention directed at EFs or self-regulation implemented during the assessment period of five months; (6) parents having sufficient Finnish skills for taking part in the group discussions and being able to fill out the questionnaires. The mean age of the children in the final sample was 4.7 years and the vast majority were boys (84.9%) and had Finnish as their native language (95.3%). The parents in the sample were somewhat more highly educated than the general population. Sample details by allocation group are detailed in Table 1.

[Figure 1 near here]

[Table 1 near here]

Prior to the study, ethical approval for the study was granted from the Human Sciences Ethics Committee of the University of Jyväskylä. Families were informed about the possibility of taking part in the study via workers in early childhood education, child and family services, or the media. Recruitment and data collection were conducted between October 2017 and November 2018. Participants were recruited through advertisements in local ECE centers, family service centers and newspapers from three urban locations across Finland: Helsinki, Jyväskylä, and Rovaniemi. Interested families were instructed to contact the research team by phone. The families passing the initial eligibility criteria based on the

phone call (as detailed in the previous paragraph, received the questionnaires (CBCL and background information questionnaire) needed for the screening, along with the information sheet and consent forms, via mail. Written informed consent was obtained from the parents prior to the study and parents were asked to inform their child and consider their opinion in a developmentally appropriate manner. Once a block of 5-10 families had returned the completed forms and had been deemed eligible, they were randomly allocated to either the intervention or the control group and sent the pre-intervention questionnaires. Altogether, 20 groups were carried out. More participants were allocated to the intervention than the control condition in order to ensure that the intervention group sessions would have enough participants (at least 3, preferably 4) even in the case of slow recruitment. In terms of the questionnaires for the ECE teachers to complete, parents delivered the questionnaires to the staff and the staff returned them directly to the research team. Pre-intervention assessment (T1) was conducted approximately one or two weeks prior to the beginning of the intervention. Post-intervention assessment was conducted approximately at two months (T2), followed by a follow-up at five months (T3). The wait-list group received the intervention after the five-month follow-up assessment, they were not assessed after the intervention.

Intervention Description

The ENGAGE intervention was carried out according to the original manual that was translated into Finnish. The eight-week intervention involved parents playing a set of games that target EF skills at home with their children in a structured way as well as separate group meetings for the parents and children. During the first five weeks, parents and children attended weekly 90-minute group sessions in adjacent rooms, simultaneously. Each week, parents were introduced to a set of new games and encouraged to play the games with their child for 30 minutes per day throughout the eight weeks. Each game targeted one or several core EF skills, such as inhibition, working memory, and sustained attention (a list and a brief

description of the games involved is provided in Healey & Healey, 2019). In addition to learning new games, parents' sessions consisted of parents sharing about their play experiences at home during the past week and group leaders providing support in how to individualize and modify the games to match the child's developing EF skills. Furthermore, each parents' group session included one pre-defined exercise/topic, such as problem solving, time management, and emotion regulation. Meanwhile, children were taught and played the set of new games in their group. By week 5, all of the games had been introduced to the parents and taught to the children, and parents were urged to keep playing them. During weeks 6 and 7, parents received weekly individual phone call that provided personal support in adapting the games for the child and to help with any problems the parents might have encountered while playing with their child. In week 8, during the final "booster" group sessions, parents were encouraged to keep playing the games and applying the principles learned during the program. The children played their favorite games and received diplomas. The desired number of families per group was five; however, the actual number of families per group was three to five depending on the rate of the recruitment process. The parents' group leaders were mainly psychologists (9 psychologists and 1 social worker), and the children's group leaders were mainly ECE teachers (7 ECE teachers, 2 special education teachers, 2 psychologists, and 1 psychology student). The group leaders received a one-day training for the program, arranged by the first and third author, who had been trained in ENGAGE by the last author. The children's group leaders did not participate in assessing the children in the study.

Measures

Child Behavior Checklist/1.5-5 (CBCL)

The CBCL (Achenbach & Rescorla, 2000) was used as an inclusion criteria measure. The CBCL is a parent-report form used to assess children's emotional and behavioral

problems, containing altogether 99 problem items. The items group into different scales; both empirically-based syndrome scales as well as clinically informed DSM-oriented scales can be calculated. The items are rated on a three-point scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). The CBCL has good reliability and validity properties (Achenbach & Rescorla, 2000) and has shown generalizability across 23 societies (Ivanova et al., 2010). In the present study, the DSM-oriented subscale of Attention Deficit/Hyperactivity Problems was used to set the criteria for inclusion of participation.

Five-To-Fifteen—Revised (5-15R)

The 5-15R (Kadesjö et al., 2017) was used to obtain parent reports of children's problem behaviors related to EFs. The following subdomains were used as outcome measures: Attention and Concentration (9 items), Overactivity and Impulsivity (9 items), and Acting Out (13 items). The Acting Out subdomain includes items concerning aggressive and defiant behavior. The 5-15R statements are endorsed as "Does not apply" (=0), "Applies sometimes or to some extent" (=1) or "Definitely applies" (=2). Internal consistency coefficients for the subdomains have been found to range from 0.69 to 0.94, demonstrating acceptable to excellent internal consistency, and the test–retest reliability for subdomain scores has been found to range from 0.55 to 0.89 (Kadesjö et al., 2004). Significant correlations with corresponding scales of the CBCL and the neuropsychological assessment instrument NEPSY (Korkman et al., 1998) suggest good convergent validity for the total problems score and subdomain scores (Bohlin & Janols, 2004; Korkman et al., 2004). Mean scores of the subdomain items were used as outcome measures. Thus, the highest possible score for all the subdomains was 2.

Home and School Situations Questionnaire—Revised (HSQ-R and SSQ-R)

The HSQ-R and SSQ-R (DuPaul & Barkley, 1992) were used to obtain parents' and ECE teachers' reports of the functional ability and severity of children's problems in

attending and concentrating in the home and ECE environments. The HSQ-R includes 14 typical home situations (e.g., when the child is playing alone or when people are visiting), and the parent is instructed to choose whether the child has attentional difficulties in the situation (yes/no) and to rate the severity of these problems on a 9-point scale (1 = mild, 9 = severe). In the present study, one item ("When you are visiting someone else") was accidentally left out of the questionnaire, thus making the number of items 13. The SSQ-R is the teacher counterpart, including eight school situations. In the present study, one item ("During movies, filmstrips") was not included in the mean score used in the analyses, because it was missing information in many cases, probably due to not being a regular part of the program at the ECE centers. The wordings of one item in HSQ-R and two items in SSQ-R were slightly modified to make them appropriate for the young age group and Finnish culture. Both the HSQ-R and SSQ-R have shown good internal consistency (.93 and .95 for the total scores of the HSQ-R and SSQ-R, respectively) as well as test–retest reliability (.91 and .88 for the HSQ-R and SSQ-R mean severity scores, respectively) (DuPaul & Barkley, 1992). The outcome measure used in the analyses was the mean severity score (the mean severity of problems across the different situations). Thus, the highest possible score was 9.

The Attention and Executive Functions Rating Inventory—Preschool (ATTEX-P)

The ATTEX-P (Klenberg et al., 2017) was used to obtain ECE teacher's ratings of children's EF difficulties manifested in the ECE environment. The ATTEX-P is an adaptation of the ATTEX rating scale for school-age children (Klenberg et al., 2010) and consists of 44 items. The questionnaire yields scores for nine clinical subscales: Distractibility (5 items), Impulsivity (10 items), Motor hyperactivity (5 items), Directing attention (5 items), Sustaining attention (4 items), Shifting attention (4 items), Initiative (3 items), Planning (3 items), and Execution of action (5 items). The items include a three-point scale to assess the frequency of EF difficulties (0 = not a problem, 1 = sometimes a problem, 2 = often a

problem). The highest possible sum scores obtainable on the subscales range between 6 and 20 (the number of items times two), and for the total score the theoretical maximum is 88. The total score and the subscales have been found to have good internal consistency (ranging from .73 to .94), test–retest reliability (ranging from .81 to .94), and convergent validity (correlations with EF items in a school readiness questionnaire ranging from .49 to .75; Klenberg et. al., 2017).

Abbreviated Acceptability Rating Profile (AARP)

The AARP (Tarnowski & Simonian, 1992) was used to measure parents' and intervention providers' appraisal of intervention acceptability. The AARP is a simplified version of the Intervention Rating Profile (IRP-15), consisting of 8 items (e.g., "This was an acceptable treatment for the child's behavior", "I liked this treatment", "Overall, the treatment helped the child") that load onto a single latent factor describing overall intervention acceptability. The items were rated on a six-point scale, ranging from 1 ("strongly disagree") to 6 ("strongly agree"). The measure has been found to have a good to excellent internal consistency (Tarnowski & Simonian, 1992). The mean score of the eight items was used as the outcome measure of acceptability, with 6 being the highest possible score.

Fidelity Measures

Intervention fidelity at home was measured using daily play diaries. In the diaries, families reported the games played and the amount of time spent playing each day. Furthermore, checklists filled by the group leaders were used to obtain information about adherence to the program during the group sessions as well as the frequency with which each family participated in the sessions.

Calculation of the Sum and Mean Scores

The amount of missing information at the item level was minor, varying from 0.21% to 1.90% per outcome measure at any given time point. Little's MCAR test suggested that values at the item level were missing completely at random (p = .823). In order to create sum scores for ATTEX-P, we used scale-wise mean substitution for missing values. In case a participant had more than 50% of information missing within any given scale (three cases at T1 and two cases at T3), substitution was not performed. Sample sizes therefore differed slightly for different scales of the ATTEX-P at different time points. For HSQ-R, SSQ-R, and 5-15R, mean scores were calculated and used in the analyses. On the HSQ-R T1 form, one participant had missing data on all items except one, due to which the participant's T1 score was not included in the analyses.

Statistical Analyses

First, we used t tests and x^2 tests to examine the equivalence of the ENGAGE and control groups regarding key background and outcome variables to assess the success of randomization. To examine the effect of ENGAGE on child outcomes, we used a repeated-measures approach utilizing restricted maximum likelihood (REML) estimation, implemented in the SPSS Linear Mixed Models (LMM) procedure. Within-subject errors were modelled using an unstructured covariance pattern, and Satterthwaite approximation was used to estimate the degrees of freedom. REML estimates model parameters and standard errors using all available data, producing unbiased estimates when data is missing at random (Little et al., 2016). Due to some expected attrition, this was a more favorable approach than the more traditional repeated measures analysis of variance that only uses cases with complete datasets and poses more strict assumptions about the missingness of the data (data is assumed to be missing completely at random). Therefore, all participants with data on at least one measurement occasion, regardless of attrition or adherence to the program, were included in the analyses.

To answer the first research question, the effect of the intervention, as indicated by change from T1 to T2, was analyzed. Fixed categorical effects included time (with two levels: T1 and T2), group (ENGAGE or control) and the interaction between the two. The interaction effect was of particular interest as it directly tested whether the two groups differed significantly over time. To answer the second question concerning the maintenance of the intervention effects, we ran similar models with T2 and T3 as the time points. Overall, 30 unadjusted tests were run to examine the intervention effect, half concerning the immediate effects and half concerning maintenance. All analyses were adjusted for father's education level, child's age, and time between assessments. Seven participants were lacking information about father's education level, and in these cases, mother's education level was used instead.

Results

Attrition

Of the 111 candidates assessed for eligibility, 13 were excluded before randomization due to not meeting inclusion criteria (score lower than 65th percentile on the Attention Deficit/Hyperactive Problems scale of the CBCL or the group form was suspected not to be suitable for the child due to aggressive behavior). Of the 95 participants randomized, retention rate with regard to parent assessments was 90.53% at T1, 81.05% at T2, and 66.32% at T3. Those lost between T1 and T2 all belonged to the intervention group. Overall, those who completed all the assessment (n = 63) did not significantly differ from those who completed only one, two or none of the assessments (n = 32) in terms of group allocation status, $X^2(1, N = 95) = 1.18$, $p = .277$; mother's education level, $X^2(1, N = 95) = 1.50$, $p = .221$; father's education level, $X^2(1, N = 95) = 0.43$, $p = .513$; child's gender, $X^2(1, N = 95) = 2.29$, $p = .130$; child's age, (completers M =56.21, completers SD = 6.36, non-completers M = 54.81, non-completers SD = 7.19), $t(93) = -0.97$, $p = 0.335$, or CBCL Attention

Deficit/Hyperactivity Problems, (completers M =8.87, completers SD = 1.93, non-completers M = 8.53, non-completers SD = 1.74), $t(92) = -0.84$, $p = 0.406$; or CBCL Total Problems, (completers M =51.53, completers SD = 18.34, non-completers M = 52.19, non-completers SD = 20.60), $t(92) = 0.16$, $p = 0.875$.

There was a significant difference between the ENGAGE group and control group in time between assessments T1 and T2 with regard to both parent $t(75) = 3.28$, $p = .002$; and teacher questionnaires, $t(72) = 3.72$, $p < .001$, with the ENGAGE group having a shorter time period between the assessments than the control group. No group differences were found in time between assessments T2 and T3 with regard to parent, $t(61) = 0.14$, $p = .889$; or teacher questionnaires, $t(58) = -0.73$, $p = .469$. However, we included time between assessment points as a covariate in all analyses.

Intervention Fidelity and Acceptability

Of the 55 families allocated to the intervention group, 6 discontinued the study before the beginning of the intervention due to the group time schedule not being suitable (n = 2), parent no longer experiencing a need for the intervention (n = 1), family facing a sudden difficult situation in life (n = 1) and unknown reasons (n = 2). Two of them filled in and returned the pre-assessment questionnaires but no more. Of the 49 families that started the intervention, 4 (8.16%) discontinued the intervention due to either practical reasons (inability to fit the group sessions and playing into a tight schedule; 1 family), difficult life situation (death of a person close to them, health problems; 2 families) or feeling like the intervention did not fit the needs of the child (1 family). On average, parents attended 5.04 group sessions (range: 1–6), which was 84% of the maximum of 6 sessions. The mean number of days that parents reported having engaged in playing the games was 33.67 (range: 13–44 days), which was 69% of the maximum of 49 days (not including the group session days). The mean amount of

time spent playing per day was 28.32 minutes (range: 7.18–46.15 minutes), which was 94% of the targeted 30 minutes.

Adherence to the intervention program on the part of the group leaders was 96.86% in the parents' group sessions and 95.06% in the children's group sessions. The mean total score of the AARP, measuring intervention acceptability, was 5.33 for parents and 5.50 for the group leaders, with the maximum being 6.

Group Differences in Outcome and Background Variables

We examined group differences in background characteristics (child's age and gender, and parents' educational level separately for both parents), as well as in all 15 parent- and teacher-rated outcome variables measured pre-intervention (Table 1). Significant group differences were found in father's educational level, parent-rated Acting out, and parent-rated Attention and concentration. Due to the significant group difference in father's educational level and the known effect of parental educational level on the measures of interest, we included father's education level as a covariate in all analyses in addition to child's age and time between T1 and T2. Child's age was included as a covariate due to its known effect on the outcome measures.

In order to rule out the potential effect of the T1 group differences on the results, we ran a series of ANCOVAs for all outcome measures with the T2 score as the dependent variable and group (ENGAGE/control) as the independent variable (Table S1 in Supplementary material). Covariates included T1 score of Attention and Concentration and Acting out in addition to the T1 score of the outcome measure in question as well as father's education level, child's age and time between measurements. These analyses suggested that the T1 group differences were not a salient factor explaining the results.

Intervention Effects on Child Behavioral Outcomes

Mean scores and standard deviations of the ENGAGE and control groups on the outcome measures at each time point are shown in Table 2.

[Table 2 near here]

The results of the LMMs for parent-rated measures revealed that between pre- and post-interventions, the ENGAGE group showed significantly greater decreases in problem behaviors than the control group across all parent-rated measures (Table 3). Improvements due to intervention were found on Attention and Concentration, Hyperactivity and Impulsivity, and Acting out of the 5-15R, and in mean severity of attentional problems of the HSQ-R. Effect sizes (Cohen's *d)* were mainly in the moderate category, with a small effect for Hyperactivity and Impulsivity. With regard to teacher-ratings, the ENGAGE group showed significantly greater improvements than the control group on the Impulsivity scale in ATTEX-P (Table 3). This effect was mainly due to the nearly significant increase in symptoms in the control group and became evident only when including the covariates and, as such, may not be as robust as the other results. A similar pattern was found for Motor Hyperactivity, where a close-to-significant effect was found. Both effects were small in size.

[Table 3 near here]

There was no significant change from post-intervention to follow-up in the ENGAGE or control groups separately in terms of parent or teacher measures (Table 4), and the groups did not differ in terms of the change for any measure during the follow-up period (Table 3).

[Table 4 near here]

Discussion

In this randomized controlled trial, we examined the effectiveness of the play-based ENGAGE intervention in reducing young children's difficulties in everyday EFs and the suitability of the intervention when used within a new cultural context. Parent and teacher ratings of problem behaviors of 4- to 5-year-old Finnish children participating in ENGAGE

or a waitlist control group were compared, and acceptability and fidelity reports were obtained from both parents and group leaders. Across all parent ratings, children's EF-related problem behaviors diminished in the ENGAGE group while remaining mainly stable in the control group. The intervention effects were significant, with moderate effect sizes. Thus, as in the previous RCT of Healey and Healey (2019), the effectiveness of ENGAGE was evidenced in parent-reported behavior problems with inattention, hyperactivity, impulsivity, and acting out (aggressive and oppositional). Further, children's functioning in home situations was improved as shown in the reduction of the severity of attention-related problem behaviors that parents encountered across multiple everyday situations. As expected, no significant changes occurred in the parent ratings during the three-month follow-up period, suggesting that the gains were maintained.

Our findings on teacher ratings of EF difficulties showed group differences only for the impulsivity scale on the ATTEX-P. This difference was mainly due to the control group showing a trend for increase in problems at post-intervention rather than the ENGAGE group showing reduced problems. The finding could imply that the intervention in the home context may have had a preventive effect for the ECE context; that is, problems of impulsivity in ECE did not increase in the intervention group because parents were actively teaching these skills at home. Nevertheless, the relatively high number of analyses conducted can mean that this effect was due to type I error and, overall, the absence of consistent improvements in the teacher ratings indicates that the improvements evidenced in home situations were not fully transferred to the ECE environment. The situational demands on EFs at home and in ECE can be quite different. In the ECE context, children are often in large groups with other children and need to regulate their behavior in socially more challenging situations that at home. In order to yield benefits across settings, practice should take place across settings and in many different kinds of situations where a certain skill, for example, inhibitory control, might be

needed. Thus, interventions extending to both home and ECE environments should be preferred, in case the child's problems are evident in both environments.

Different outcomes from parent and teacher ratings may also indicate biases related to the raters (Gomez et al., 2003). As parents were active agents in the intervention and invested great effort to obtain positive change in the child's behavior, their ratings could be affected by the increased value they assigned to the outcome (Inzlicht et al., 2018). Parent ratings could therefore reflect their desire to see a positive outcome due to putting in high effort. In addition, it could be that the change in parent ratings reflects change in the way parents perceive their child rather than change in the child's behavior per se. For example, learning about EFs as developing skills and getting to know other parents with similar experiences may cause parents to perceive their child's behavior as less problematic. Teacher ratings, similarly, could be biased by the teacher's personal history related to the child (e.g., history of interactions, length of time observing the behavior of the child, tolerance for certain behaviors; DuPaul, 2003). Including other EF measures besides rating scales could help to clarify the relative contribution of these factors. As parental worry over the child's behavior was the main inclusion criterion in the present study, improved parent ratings can be seen as a particularly desirable outcome.

Regarding our aim related to the suitability of intervention in a new cultural context, ENGAGE proved to be a workable intervention for families in Finland. The low drop-out rate and high attendance for the weekly group sessions indicated high levels of fidelity, and, most importantly, families engaged in the daily playing at home. The parents also rated ENGAGE as a highly acceptable way of helping their child. Furthermore, acceptability and the adherence to the intervention program were also very good among the group leaders. As fidelity and social validity (indicated here by acceptability) are critical when implementing an

intervention, ENGAGE seems to have potential for spreading and taking root in the local health care system.

The results of the present study were remarkably similar with the previous RCT conducted in New Zealand (Healey & Healey, 2019), indicating that the beneficial effects of ENGAGE could be replicated and extended to a sample of Finnish preschoolers. When comparing these two studies, the similarities and differences should be kept in mind. The ENGAGE intervention was the same with similar group sessions, parent manual and set of games. The differences were related to the geographical and cultural setting as well as some features of the study design. First, a waitlist control group was used in the present study instead of an active control group. Second, there were some differences in the inclusion criteria. Children in the present study were somewhat older (4 to 5 vs. 3 to 4 years) and initially showed lower levels of hyperactivity (cut-off at or above the 65th percentile on the CBCL vs. the 84th percentile on the BASC-2). Thus, the present study extends the suitability of ENGAGE to a larger age group and indicates that it may be an effective preventive intervention for children with milder, subclinical problems of hyperactivity and inattention.

The findings of the present study further build up the evidence from earlier studies on play-based intervention. Previously, play-based practice of EF skills has been shown to be as effective as training behavior management and positive parenting skills (Healey & Healey, 2019) and ADHD-related psychoeducation (Halperin et al., 2020) in reducing aggressive behavior, functional impairment, and/or ADHD-symptoms in preschool-age children. Further, Tamm et al. (2019) showed that a play-based intervention was more effective than a control condition not including the main EF ingredients, thus indicating that the training of EFs may be an effective ingredient in these interventions. Together with the present study, these findings indicate that structured play conducted by parents at home is a viable way to

strengthen the EF skills of young preschool-age children with diagnosed ADHD or at risk of ADHD or other behavior problems.

The positive intervention effects can be understood in terms of ENGAGE including many important ingredients highlighted in recent meta-analyses (Pauli-Pott et al., 2021; Scionti et al., 2020; Takacs & Kassai, 2019): targeting children with difficulties in EFs, targeting multiple EFs at once, group delivery, and inclusion of strategy learning and scaffolding in addition to training skills in a fun and engaging way. Furthermore, although ENGAGE in not specifically a physical activity or a mindfulness intervention, it does include also these ingredients, known to be effective in improving EFs (Takacs & Kassai, 2019; Diamond & Lee, 2011). In ENGAGE, physical activity is included in games such as rope skipping and hopscotch, and mindfulness skills are enhanced in playful mental imagery and deep breathing exercises. Overall, it seems that ENGAGE combines many effective approaches to improving young children's EFs. The inclusion of several components into practical interventions is common, and in the future, identification of the most essential components will be critical for developing the most effective interventions.

Along with the limitations related to the lack of EF measures other than questionnaires, the present study leaves open the question of more specific mechanisms of the intervention. The main hypothesized mechanism of effect in play-based interventions is that training enhances EF skills, which results in improved behavioral outcomes. However, as the quality of the parent–child relationship is known to have a bearing on the child's level of externalizing symptoms (Burt et al., 2005; Lifford et al., 2008), it may be possible that the benefits were due to parents and children having more positive interaction together, resulting in improved parent–child relations and consequently reduced problem behaviors. Including an active control group with non-EF activities would have been more appropriate for finding

answers to these crucial questions. Certainly, the aforementioned hypothetical mechanisms do not have to be exclusive, and possibly both contribute to some extent.

In conclusion, the present study gives further support for the effectiveness of ENGAGE, indicating that young children's difficulties in everyday EFs are reduced after the intervention and that the findings from the earlier RCT conducted in New Zealand generalize to another population and to a different cultural setting. According to our findings, high intervention acceptability and fidelity with low drop-out rates in this study suggest that ENGAGE is a palatable intervention for parents who actively seek support for parenting. As an action-oriented intervention that focuses around more practical matters, such as how to engage the child in playing, rather than involving more general issues of parenting practices, ENGAGE may be easy to approach for parents. Consequently, ENGAGE may be particularly suitable as a low-threshold intervention for families with concerns related to a preschool-aged child's problem behaviors. From the perspective of training, ENGAGE allows children to practice EF skills in situations that are highly relevant for their everyday lives, yet still in a playful way where the stakes are perhaps not as high as in other everyday situations. In future studies, extending ENGAGE into different contexts, such as by applying similar play-based training in both home and ECE environments, could further enhance the beneficial effects on children's behavior. Indeed, there is already evidence that ENGAGE is also effective in the ECE context (Healey, Milne & Healey, 2022). Further, studies from other than occidental cultures are needed to learn more about the feasibility of play-based interventions. Finally, including different kinds of active control groups (e.g., non-EF play with equal amount of playing at home) as well as children with different kinds of EF difficulties (e.g., children with co-occurring psychiatric or social communication problems) could help to find out more about the critical mechanisms of ENGAGE and to whom it works.

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Figure captions

Figure 1. *Participant flow concerning study participation*

Table 1. *Sample characteristics by group*

	ENGAGE (*n* = 51)	Control (*n* = 35)	t/X^2 (*p*)
Age in months, *M* (*SD*)	57.16 (6.18)	54.62 (6.87)	1.79 (.077)
Gender, % male	86.3 %	82.9 %	0.19 (.664)
Native language Finnish, %	94.1 %	97.1 %	0.19 (.667)
Mother's education level			0.57 (.450)
Low	33.3 %	25.7 %	
High	66.7 %	74.3 %	
Father's education level			3.90 (.048)
Low	41.2 %	62.9 %	
High	56.9 %	37.1 %	
CBCL ADHD Problems, *M* (*SD*)	9.06 (1.89)	8.35 (1.81)	1.72 (.090)
5-15R Attention and concentration, *M* (*SD*)	1.21 (0.40)	1.00 (0.42)	2.36 (.020)
5-15R Hyperactivity and impulsivity, *M* (*SD*)	1.32 (0.43)	1.22 (0.37)	1.02 (.310)
5-15R Acting out, *M* (*SD*)	0.71 (0.29)	0.54 (0.35)	0.61 (.015)
HSQ-R mean severity of attentional problems (*SD*)	2.94 (1.47)	2.80 (1.43)	0.02 (.679)
ATTEX-P Distractibility, *M* (*SD*)	5.75 (2.70)	6.39 (2.30)	-1.13 (.261)
ATTEX-P Impulsivity, *M* (*SD*)	11.53 (5.72)	11.13 (5.59)	0.31 (.751)
ATTEX-P Motor hyperactivity, *M* (*SD*)	5.69 (3.26)	5.11 (3.15)	0.82 (.416)
ATTEX-P Directing attention, *M* (*SD*)	4.15 (2.90)	4.27 (2.38)	-0.20 (.844)
ATTEX-P Sustaining attention, *M* (*SD*)	3.60 (2.62)	3.76 (2.54)	-0.29 (.774)
ATTEX-P Shifting attention, *M* (*SD*)	3.67 (2.22)	4.06 (2.12)	-0.79 (.430)
ATTEX-P Initiative, *M* (*SD*)	2.58 (2.21)	2.32 (1.55)	0.59 (.559)
ATTEX-P Planning, *M* (*SD*)	2.67 (1.88)	2.45 (1.80)	0.53 (.599)
ATTEX-P Execution of action, *M* (*SD*)	4.75 (2.76)	4.58 (2.25)	0.30 (.762)
ATTEX-P Total score *M* (*SD*)	44.40 (21.15)	43.95 (19.33)	0.10 (.923)
SSQ-R mean severity of attentional problems (*SD*)	3.55 (2.28)	3.98 (2.23)	-0.85 (.395)

Table 2. *Ns and raw mean scores (standard deviation) for the outcome variables in the ENGAGE and control groups*

	Pre-intervention				Post-intervention				3-month follow-up			
	ENGAGE		Control		ENGAGE		Control		ENGAGE		Control	
	n	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)
Parent ratings												
Attention and concentration	51	1.21 (0.40)	35	1.00 (0.42)	42	1.03 (0.34)	35	1.01 (0.54)	34	1.08 (0.40)	29	1.01 (0.51)
Hyperactivity and impulsivity	51	1.32 (0.43)	35	1.22 (0.37)	42	1.13 (0.42)	35	1.17 (0.45)	34	1.12 (0.41)	29	1.10 (0.46)
Acting out	51	0.71 (0.29)	35	0.54 (0.35)	42	0.52 (0.32)	35	0.54 (0.40)	34	0.50 (0.35)	29	0.48 (0.43)
Severity of attentional problems in home situations	51	2.94 (1.47)	34	2.80 (1.43)	42	2.37 (1.32)	35	2.82 (1.58)	34	2.48 (1.47)	29	2.58 (1.48)
Teacher ratings												
Distractibility	52	5.75 (2.70)	33	6.39 (2.30)	42	5.86 (2.75)	33	6.03 (2.50)	34	6.28 (2.49)	27	6.32 (2.81)
Impulsivity	52	11.53 (5.72)	33	11.13 (5.59)	42	11.86 (5.89)	33	11.23 (6.27)	34	11.50 (5.41)	27	10.87 (6.52)
Motor hyperactivity	52	5.69 (3.26)	33	5.11 (3.15)	42	5.81 (2.82)	33	5.17 (3.22)	34	5.68 (2.66)	27	4.78 (2.97)
Directing attention	52	4.15 (2.90)	33	4.27 (2.38)	42	4.38 (3.08)	33	4.09 (2.59)	34	4.38 (3.04)	27	4.09 (2.83)
Sustaining attention	52	3.60 (2.62)	33	3.76 (2.54)	42	3.74 (2.79)	33	3.23 (2.55)	34	3.97 (2.66)	27	3.50 (2.86)
Shifting attention	52	3.67 (2.22)	32	4.06 (2.12)	42	3.83 (2.51)	33	3.86 (2.38)	34	4.02 (2.27)	27	3.93 (2.34)
Initiation	52	2.58 (2.21)	33	2.32 (1.55)	42	2.67 (2.14)	33	1.97 (1.69)	34	2.76 (1.93)	27	2.39 (2.14)
Planning	52	2.67 (1.88)	31	2.45 (1.80)	42	2.63 (1.86)	33	2.45 (1.95)	34	2.74 (1.60)	26	2.42 (2.14)
Execution	52	4.75 (2.76)	33	4.58 (2.25)	42	4.93 (2.32)	33	4.45 (2.65)	34	4.69 (2.46)	26	4.52 (2.51)
Total problems	52	44.40 (21.15)	33	43.95 (19.33)	42	45.71 (20.48)	33	42.49 (21.69)	34	46.01 (19.17)	27	42.79 (22.16)
Severity of attentional problems in ECE situations	52	3.55 (2.28)	33	3.98 (2.23)	42	3.53 (2.03)	33	3.73 (2.27)	34	3.73 (1.96)	27	3.89 (2.70)

Table 3. *Results of the linear mixed models predicting child outcomes.*

	T1–T2 (Time x Condition)						T2– T3 (Time x Condition)					
	Estimate	*SE*	*df*	*t*	*p*	*d*[a]	Estimate	*SE*	*df*	*t*	*p*	*d*[b]
Parent assessments												
Attention problems	-0.22	0.09	72.30	-2.51	.014	-0.52	0.01	0.09	60.56	0.15	.882	0.02
Hyperactivity and impulsivity	-0.16	0.08	72.14	-2.03	.046	-0.38	0.06	0.09	60.39	0.68	.497	0.13
Acting out	-0.22	0.06	73.13	-3.60	.001	-0.65	0.09	0.06	58.10	1.33	.188	0.24
Severity of attentional problems in home situations	-0.71	0.23	71.97	-3.10	.003	-0.48	0.28	0.33	59.28	0.84	.402	0.19
Teacher assessments												
Distractibility	-0.21	0.39	69.04	-0.54	.592	-0.08	0.55	0.55	55.94	1.00	.320	0.20
Impulsivity	-1.94	0.92	69.13	-2.11	.038	-0.32	1.31	1.16	57.39	1.13	.264	0.21
Motor hyperactivity	-0.90	0.49	71.15	-1.82	.072	-0.28	0.62	0.58	58.92	1.08	.284	0.20
Directing attention	-0.39	0.56	69.88	-0.69	.491	-0.14	0.29	0.68	58.20	0.43	.672	0.10
Sustaining attention	0.23	0.50	71.24	0.47	.638	0.09	0.46	0.63	56.83	0.73	.466	0.16
Shifting attention	0.04	0.51	69.34	0.07	.943	0.02	0.51	0.56	57.31	0.91	.369	0.20
Initiative	0.01	0.37	71.41	0.03	.973	0.00	-0.17	0.40	57.43	-0.42	.677	-0.08
Planning	-0.50	0.45	71.25	-1.12	.268	-0.26	0.23	0.47	59.38	0.50	.618	0.11
Execution	-0.66	0.45	69.59	-1.48	.144	-0.24	0.25	0.55	55.95	0.45	.654	0.10
Total problems	-5.06	2.98	69.10	-1.69	.095	-0.23	4.33	4.09	56.67	1.06	.294	0.20
Severity of attentional problems in ECE situations	-0.45	0.47	71.64	-0.97	.336	-0.18	0.36	0.54	56.44	0.66	.509	0.17

Note. Negative estimates represent a decrease in the outcome (e.g. reduction in problems) in the ENGAGE group as compared to the control group at T2 (with T1 as reference) or T3 (with T2 as reference), and vice versa for positive estimates.

[a] Cohen's *d* was calculated by dividing the estimates by the pooled standard deviation at pre-intervention.

[b] Cohen's *d* was calculated by dividing the estimates by the pooled standard deviation at post-intervention.

Table 4. *Change from pre-intervention to post-intervention (T1-T2) and from post-intervention to follow-up (T2-T3) in the ENGAGE and control groups separately.*

	T1-T2						T2-T3					
	ENGAGE			Control			ENGAGE			Control		
	Mean change (*SE*)	*p*	*d*	Mean change (*SE*)	*p*	*d*	Mean change (*SE*)	*p*	*d*	Mean change (*SE*)	*p*	*d*
Parent assessments												
Attention problems	-0.19 (0.06)	.001	-0.44	0.03 (0.06)	.635	0.07	0.04 (0.06)	.555	0.09	0.02 (0.06)	.735	0.04
Hyperactivity and impulsivity	-0.19 (0.05)	< .001	-0.44	-0.03 (0.05)	.527	-0.07	0.01 (0.06)	.930	0.02	-0.06 (0.07)	.379	-0.13
Acting out	-0.21(0.04)	< .001	-0.61	0.01 (0.04)	.784	0.03	0.05 (0.04)	.285	0.13	-0.04 (0.05)	.635	-0.1
Severity of attentional problems in home situations	-0.64 (0.14)	< .001	-0.44	0.08 (0.16)	.643	0.05	0.14 (0.22)	.508	0.1	-0.13 (0.23)	.566	-0.09
Teacher assessments												
Distractibility	-0.26 (0.24)	.280	-0.10	-0.05 (0.28)	.858	-0.02	0.43 (0.35)	.226	0.16	-0.12 (0.40)	.771	-0.04
Impulsivity	-0.71 (0.56)	.210	-0.12	1.23 (0.65)	.063	0.19	0.19 (0.75)	.802	0.03	-1.12 (0.84)	.188	-0.19
Motor hyperactivity	-0.27 (0.30)	.362	-0.09	0.63 (0.35)	.081	0.20	-0.02 (0.37)	.952	-0.01	-0.65 (0.42)	.128	-0.22
Directing attention	-0.18 (0.34)	.593	-0.06	0.21 (0.40)	.610	0.07	0.01 (0.44)	.983	0.00	-0.28 (0.49)	.571	-0.09
Sustaining attention	-0.20 (0.30)	.504	-0.07	-0.44 (0.35)	.222	-0.15	0.42 (0.40)	.304	0.15	-0.04 (0.45)	.930	-0.01
Shifting attention	-0.01 (0.31)	.978	0.00	-0.04 (0.37)	.902	-0.02	0.23 (0.36)	.534	0.09	-0.28 (0.41)	.490	-0.11
Initiative	-0.17 (0.22)	.447	-0.08	-0.18 (0.26)	.488	-0.09	0.00 (0.26)	.994	0.00	0.17 (0.29)	.560	0.08
Planning	-0.32 (0.27)	.233	-0.16	0.18 (0.32)	.585	0.09	0.11 (0.30)	.707	0.06	-0.12 (0.34)	.723	-0.06
Execution	-0.44 (0.27)	.107	-0.17	0.22 (0.32)	.499	0.08	-0.08 (0.35)	.830	-0.03	-0.32 (0.40)	.423	-0.13
Total problems	-2.98 (1.82)	.106	-0.14	2.07 (2.12)	.332	0.09	1.36 (2.64)	.608	0.06	-2.97 (2.96)	.319	-0.14
Severity of attentional problems in ECE situations	-0.38 (0.28)	.178	-0.17	0.07 (0.34)	.838	0.03	.28 (0.35)	.415	0.13	-0.07 (0.39)	.853	-0.03

Note. Cohen's *d* was calculated by dividing the estimate by the pooled standard deviation of the two measurement points.

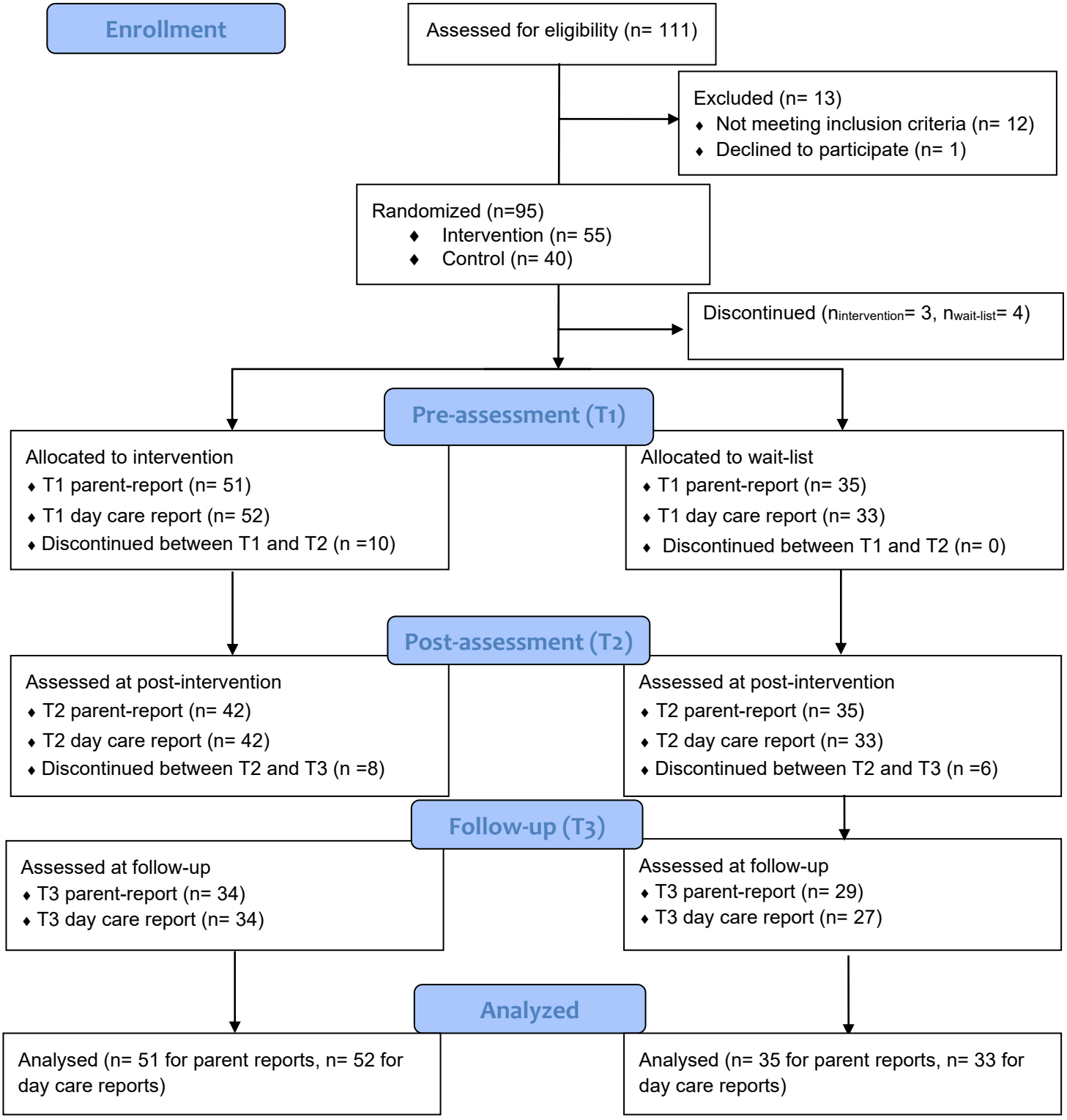
Supplementary data

Effectiveness of ENGAGE in Reducing Difficulties in Everyday Executive Functions among Finnish Preschoolers: A Randomized Controlled Trial

Table S1. *ANCOVAs predicting child outcomes at T2 while controlling for group differences at T1.*

	N	*F*	*df*	*p*	n_p^2
Parent assessments					
Attention problems	77	4.60	1,70	.035	0.06
Hyperactivity and impulsivity	77	4.54	1,69	.037	0.06
Acting out	77	8.72	1,70	.004	0.11
Severity of attentional problems in home situations	76	11.94	1,68	< .001	0.15
Teacher assessments					
Distractibility	74	1.10	1,66	.297	0.02
Impulsivity	74	5.10	1,66	0.027	0.07
Motor hyperactivity	74	3.11	1,66	0.082	0.05
Directing attention	74	1.01	1,66	0.317	0.02
Sustaining attention	74	0.01	1,66	0.925	0.00
Shifting attention	73	0.18	1,65	0.677	0.00
Initiative	74	0.15	1,66	0.696	0.00
Planning	72	1.03	1,64	0.314	0.12
Execution	74	2.11	1,66	0.151	0.03
Total problems	74	3.63	1,66	0.061	0.05
Severity of attentional problems in ECE situations	74	2.34	1,66	0.131	0.03

Note. All models included the following covariates: Attention problems and Acting out scores at T1 as well as the T1 score of the outcome variable (in case not Attention problems or Acting out), child's age, father's education level, and the time difference between assessment points


Enrollment
Assessed for eligibility (n= 111)
Excluded (n= 13)
♦ Not meeting inclusion criteria (n= 12)
♦ Declined to participate (n= 1)
Randomized (n=95)
♦ Intervention (n= 55)
♦ Control (n= 40)
Discontinued ($n_{intervention}$= 3, $n_{wait-list}$= 4)
Pre-assessment (T1)
Allocated to intervention
♦ T1 parent-report (n= 51)
♦ T1 day care report (n= 52)
♦ Discontinued between T1 and T2 (n =10)
Allocated to wait-list
♦ T1 parent-report (n= 35)
♦ T1 day care report (n= 33)
♦ Discontinued between T1 and T2 (n= 0)
Post-assessment (T2)
Assessed at post-intervention
♦ T2 parent-report (n= 42)
♦ T2 day care report (n= 42)
♦ Discontinued between T2 and T3 (n =8)
Assessed at post-intervention
♦ T2 parent-report (n= 35)
♦ T2 day care report (n= 33)
♦ Discontinued between T2 and T3 (n =6)
Follow-up (T3)
Assessed at follow-up
♦ T3 parent-report (n= 34)
♦ T3 day care report (n= 34)
Assessed at follow-up
♦ T3 parent-report (n= 29)
♦ T3 day care report (n= 27)
Analyzed
Analysed (n= 51 for parent reports, n= 52 for day care reports)
Analysed (n= 35 for parent reports, n= 33 for day care reports)