

Running Head: SUSTAINED EFFECTS OF IY ON PRESCHOOLERS AD/HD BEHAVIOURS

A Parent-Based Intervention Programme involving Preschoolers with AD/HD  
Behaviours: Are Children's and Mothers' Effects Sustained over Time?

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### **Abstract**

To evaluate the 12-month efficacy of a parent-based intervention programme upon children's and mothers' outcomes in a sample of Portuguese preschoolers displaying early hyperactive and inattentive behaviours (AD/HD behaviours) 52 preschool children whose mothers had received the Incredible Years Basic Parent Training (IY) were followed from baseline to 12 months of follow-up. Reported and observational measures were used. Effects were found in the children's reported AD/HD behaviours at home and at school after 12 months. Large effect sizes were also found in mothers' variables: a decrease in self-reported dysfunctional parenting practices, and an improved sense of competence and observed positive parenting. However, the improvements in coaching skills that have been observed after six months of follow-up decreased over time. No other significant differences were found between six and 12 months follow-up, with small effect sizes indicating that the significant post-intervention changes in child and parenting measures were maintained. After 12 months of follow-up, there was a clinically important reduction of over 30% in reported AD/HD behaviours in 59% of children. The sustained effects observed both for children and their mothers suggest long-term benefits of IY. Therefore, efforts should be made by Portuguese policy makers and professionals to deliver IY as an early preventive intervention for children displaying early AD/HD behaviours.

*Keywords:* Incredible Years Basic Parent Training, AD/HD behaviours, follow-up effects, preschool

## Introduction

Attention-deficit/hyperactivity disorder (AD/HD) is one of the most diagnosed and pervasive disorders in childhood [1]. Hyperactivity, impulsivity and inattention symptoms can be manifested as early as the preschool years, causing significant long-term impairment in multiple domains of child functioning [2-3]. There is also increased risk of comorbid externalizing disorders, such as oppositional defiant disorder and conduct disorder [4], problems which tend to persist over time [5].

These circumstances have generated interest in the development of early intervention programmes designed to prevent the negative developmental trajectories usually associated with early AD/HD, in clinical and research contexts [6-7]. Psychosocial interventions such as behavioural parent training (PT) which address parenting behaviours, with potential consequences for children's outcomes, are considered the first-line treatment for preschoolers at risk of AD/HD [8-9], with pharmacological treatment being recommended only after a trial of behavioural intervention or when this first-line approach is not available. These guidelines have resulted mainly from a large-scale randomized study which evaluated the efficacy of methylphenidate pharmacological treatment on AD/HD symptoms in almost three hundred preschool children, the Preschool AD/HD Treatment Study (PATS) [10]. The PATS study revealed several limitations to the use of stimulants in the treatment of preschoolers compared with school-age children: it was found to be less effective, especially if three or more comorbidities were present; more side effects were reported, and there were more concerns about the long-term impact of medication [11-12].

Taking into account AD/HD chronicity [13], the negative outcomes associated with its early onset and the need to maximize PT benefits [14] from both a clinical and cost-effective perspective, more studies evaluating the long-term effects of such interventions in preschoolers displaying early AD/HD behaviours are imperative. In fact, a growing body of evidence suggests that parent-based programmes can improve parenting skills [e.g., 15-20] and reduce child reported AD/HD symptoms [e.g., 16-18, 20-23], and that these effects can be sustained over time [e.g., 15, 18-19, 21-25], reinforcing the value of PT as an early intervention strategy for AD/HD in preschool years. However, more research concerning the

long-term efficacy of this kind of treatment is still needed in order to clarify PT robustness and the maintenance of improvements over time [6] and give a clearer perspective of effective gains for children and their families [26]. Since the lasting effects of PT are not always consistent between studies [e.g., 27-29], additional research in this area such as the study presented in this paper will provide information about the maintenance of these gains or direction of change (increase or decrease) over time [26].

#### The Incredible Years Basic Parent Training

The IY [30] is one of the most researched and empirically supported psychosocial interventions for children (3-8 years old) with behaviour problems. Although IY was not specifically designed for AD/HD, the fact that many of the children with oppositional-defiant and conduct problems, included in IY randomized studies, also had comorbid inattentive and hyperactive symptoms has drawn researchers' attention to the possibility of changing these behaviour problems as well [e.g., 31]. In fact, recent research has shown that IY is also indicated as an effective intervention for preschoolers with AD/HD and comorbid conduct behaviours, since positive outcomes have been confirmed across multiple child functioning settings [17, 20]. IY directly targets family risk factors by enhancing positive supportive parenting approaches and parent-child interactions, thus contributing to the development of children's social-emotional regulation skills [20, 31]. Furthermore, recent studies have shown that, after the IY programme, improvements in the AD/HD behaviours of young children are maintained during follow-up. In a randomized controlled trial (RCT) using a 12-week IY intervention programme with parents of 50 preschoolers scoring above questionnaires' cut-offs on AD/HD and conduct problems [25], post-intervention effects were sustained, with improvements in the AD/HD outcome measure demonstrating statistical and clinical stability over a period of 12 and 18 months after baseline. More recently, a RCT trial of 49 preschoolers with a primary diagnosis of AD/HD treated with a multimodal intervention comprising Incredible Years parent and child programmes for approximately 20 weekly sessions [24] found that the effects on children's AD/HD symptoms and externalizing problems, and on parenting practices, were maintained after one year of follow-up.

#### IY: Research in Portugal

Although there has been some investment in parental intervention and positive parenting research in Portugal in recent years in an attempt to implement European guidelines (especially the Council of Europe recommendation on positive parenting), further efforts are required to scientifically evaluate and test evidence-based interventions [32-33] with a view informing policy makers about the most effective

programmes for specific populations, and making effective interventions available to all parents. The IY (specifically, the 2001 version) [30] has been translated and implemented in Portugal [33] and its effectiveness has been tested since 2009 [34] in a Portuguese longitudinal RCT with preschoolers at risk of disruptive behaviours. Preliminary data of this trial with a subsample of Portuguese preschoolers with early AD/HD behaviours showed significant short-term improvements in reported measures of children's hyperactive and inattentive behaviours and in mothers' observed and self-reported parenting practices and sense of competence after a 14-week IY intervention programme, when compared to a waiting-list control group (WLG) [35]. Nearly half the preschoolers in that pre-post study (43%) clinically improved in a reported AD/HD outcome measure compared with 11% in the WLG. Additionally, IY has demonstrated good acceptability among participants, with mothers having a good attendance rate and reporting high levels of satisfaction with the programme [35].

#### Study Aims

This paper's main goals are to evaluate the long-term efficacy of IY (12-month follow-up) on children AD/HD behaviours and on mothers' parenting practices, and the stability of the previously reported effects [35], from post- to follow-up assessment. Based on previous studies [24-25] we expect that the changes observed shortly after the intervention will be maintained after 12 months of follow-up.

### Methods

#### Study Participants

Participants were part of a larger longitudinal RCT [34] of 125 preschoolers from both clinical and community contexts in Portugal that were considered to be at risk of disruptive behaviours (see flowchart Figure 1). Of the 125 children involved in the main trial, 100 were included in a subsample at risk of developing AD/HD analyzed in this paper (AD/HD subsample). Only the longitudinal data from children in the intervention group (IYG) and their primary caregivers ( $N = 52$ ) are reported in this study, since IY was offered to participants in the waiting-list control group (WLG = 48) after post-intervention assessment, meaning that they could no longer be used as a control group. [Insert Figure 1]

The sociodemographic and clinical characteristics of the participants in the intervention group are reported in Table 1. Primary caregivers were mostly mothers (92%), and the remaining were adoptive mothers (4%) or grandmothers (4%). Primary caregivers (from now on referred to as mothers) were 36 years old on average, and mostly married or living as married (83%). Nearly half the mothers (60%) had

completed more than 12 years of education, 42% were from a middle socioeconomic background and most lived in an urban area (86%). Twenty-three percent of the mothers self-reported depressive symptoms on the Beck Depression Inventory [36] were above the clinical cut-off (17;  $M = 8.15$ ,  $SD = 7.51$ ) and 15% had AD/HD symptoms on the Adult AD/HD Rating Scale [37] above a clinical range ( $\geq 9$  symptoms score:  $M = 9.92$ ,  $SD = 7.29$ ). A mean of 2.70 stress events (in a list of 24;  $SD = 2.33$ ) on the Stressful Life Events subscale of the Parenting Stress Index [38] were reported. Most of the children were boys (71%), with a mean age of 4.19 ( $SD = 0.86$ ), with 56% being clinically referred, and 44% community referred. Half of the intervention children had a sibling whereas 40% were only children. The majority of children scored above the borderline cut-off on the Hyperactivity Scale ( $83\% \geq 7$ ) of the Strengths and Difficulties Questionnaire (SDQ) [39-40] and all of them scored above the defined cut-off for hyperactive behaviours on the Werry-Weiss-Peters Activity Scale ([WWPAS] cut-off = 21 corresponding to a score  $\geq 80^{\text{th}}$  percentile) [41-42]. The range of results observed in the WWPAS was wide (21 - 49). Additionally, 85% and 65% of the children (according to mothers' and pre-school teachers' perceptions, respectively) showed overactivity/inattention behaviours at or above the moderate-risk range on the Preschool and Kindergarten Behaviour Scales-2nd Edition (PKBS-2) [43]. Half of them (54%) also exhibited AD/HD behaviours in a clinical concern, when the Parental Account of Childhood Symptoms (PACS) was used to interview the mother. Furthermore, more than half the children had comorbid oppositional/aggressive behaviours (79% above the moderate-risk range on the PKBS-2. [Insert Table 1]

#### Eligibility

Eligible families for this subsample analysis had fulfilled the following inclusion criteria: i. children between three and six years old attending preschool; ii. children scoring equal or above the Portuguese borderline cut-off levels [39] on the Conduct Scale or on the Hyperactivity Scale of the SDQ [40], and children scoring equal or above the Portuguese at risk cut-off level [41] for AD/HD behaviours as assessed by the WWPAS [42]; iii. parents able to read Portuguese, interested in the intervention and having given written consent to take part in this RCT. Exclusion criteria were: i. children with a formal diagnosis of neurological or developmental disorder (e.g., autism) or severe developmental delay; ii. children undergoing pharmacological or psychotherapeutic treatment.

#### Ethics

This study was approved by the Portuguese National Committee of Data Protection and by the Medical Ethical Committee (for children referred by a mental health centre).

#### Procedures and Randomization

The trial took place at a university community service facility and in a mental health centre from January 2009 to December 2012. Information about the study was divulged in pre-schools, first care, pediatric and mental health institutions, and also disseminated through a blog and newspaper advertisement. Families were self-referred or referred by health professionals. After screening, families were interviewed for children's and parents' background, demographic and clinical data, and children found to be eligible for the main trial completed the baseline assessment comprising a multi-method protocol (<http://fpce.uc.pt/anosincriveis/protocolo.doc>). Eligible preschoolers were stratified by age and gender, and the parent-child unit was randomly assigned to an intervention or control group (IYG and WLG; approximately on a 2:1 basis) by the principal investigator using simple randomization procedures (see Figure 1). From the randomly allocated children, 52 in the IYG fulfilled criteria for the AD/HD subsample analyzed in this paper (see Figure 1). A priori sample size calculations based on power analysis revealed that for a power of .90, with  $p < 0.05$ , testing for repeated measures in one group, a minimum of 44 participants would be necessary to detect medium to large effects. The IY was delivered through 14 weekly sessions. Evaluations were repeated six months after the baseline for both groups (post-intervention assessment, T2), and 12 months after baseline (follow-up assessment, T3). The latter was only applied to the intervention group, as the WLG was offered IY soon after the completion of T2, for ethical reasons.

#### Masking

Baseline assessment took place before randomization, and at T2 all possible efforts were made to keep the two independent trained evaluators blind to the participants' group. Masking was no longer possible in the subsequent T3 assessment, since only intervention families were evaluated.

#### Parent Training Intervention

The basic IY protocol [30] was delivered in groups of nine to 12 parents by two trained group facilitators, as in other similar studies [e.g., 17], over 14 consecutive weeks (the number of sessions previewed for the 2001 IY protocol was 12 to 14). Like other studies analysing the effects of IY on children behaviours, two booster sessions were carried out [44-45] for clinical and ethical reasons [27] (in

order to review parenting strategies, discuss new problems, relapse prevention, and reinforce parents' support): the first one nine months after baseline (between assessments T2 and T3); and the second one 15 months after baseline (after assessment T3). Sessions were run in the evening for about 2 hours in a university community service facility or mental health centre. Subjects such as play, descriptive comments, praise and rewards, household rules and routines, clear commands, parents' calming thoughts, ignoring, time-out, consequences and problem solving were addressed through the programme [30], with a special focus on contents covering social, emotional and persistence coaching, routines and effective limit setting. Sessions also promoted the development of social learning principles within a collaborative and problem-solving process, through different active strategies such as role play, video analysis, brainstorming and discussion of different topics. Issues regarding fidelity were strongly taken into account throughout the implementation of the programme. Group facilitators had a background in clinical child psychology or psychiatry, and had undertaken the IY certification process in order to deliver the programme with fidelity. They had attended the three-day accredited Incredible Years leader's training, had previously run at least one pilot group and were accredited as group leaders ( $N = 4$ ) or undergoing the certification process ( $N = 2$ ). Group facilitators received support and monitoring by an IY accredited trainer. A manualized protocol was followed, with weekly leader checklists, and self- and peer-evaluation questionnaires.

## Measures

All the measures selected for this AD/HD subsample are a part of the assessment protocol used in the main trial (<http://fpce.uc.pt/anosincriveis/protocolo.doc>) and were repeated at T2 and T3.

### *Child Behaviours: Mothers' and Teachers' Reported Measures*

The WWPAS [42] provides an overall rating of preschool hyperactivity behaviours in different daily life situations according to the mother's point of view. In the present subsample, internal consistency for the total scale was .82. The PKBS-2 [43] is an 80-item behaviour rating scale that assesses the social skills and problem behaviours of preschoolers. The Overactivity/Inattention subscale (PKBS-O/I: 8 items), the Oppositional/Aggressive subscale (PKBS-O/A: 9 items), and the Social Skills scale (PKBS-SS: 34 items) were specifically analyzed as dependent measures in this study analysis, from the perspective of both pre-school teachers and mothers. The Cronbach alpha coefficients for the PKBS scales ranged from .72 to .92.



### *Child Behaviours: Mother's Interview*

The PACS [46], modified for preschool years [47], was used. This semi-structured clinical interview evaluates the core symptoms of AD/HD and conduct problems across a wide range of situations and the impact of children's identified problems on their family functioning over the previous six months. In this sample the Hyperactivity scale was analyzed. The internal consistency for this subscale was .59, and the inter-rater reliability (between two raters based on 25 interviews) was high (intra-class correlations of .98).

### *Parenting Behaviours: Mothers' Self-reported Measures*

The Parenting Scale (PS) [48] evaluates dysfunctional discipline practices. The total score and the three sub-scales were analyzed: Laxness (11 items); Overreactivity (10 items) and Verbosity (7 items). In the present sample, internal consistency ranged from .50 to .70. The Parenting Sense of Competence Scale (PSOC) [49] measures the parents' perceptions of their competence through two subscales: Satisfaction (9 items) and Efficacy (7 items). Both scales had levels of internal consistency between .70 and .83.

### *Parent-child Interaction Behaviours: Observation Measure*

The Dyadic Parent-Child Interaction Coding System (DPICS) [50] evaluates the parent-child interaction quality through different observed parent and child behaviour categories, coded as present or absent during a 25-minute laboratory interaction task (playing with a standardized set of toys). In this study three parenting composites were analyzed [20, 51]: Positive Parenting (labelled and unlabelled praise, positive affect, physically positive behaviour and problem-solving); Coaching (descriptive/encouragement statements and questions, reflective statements and questions, and problem-solving); and Critical Parenting (critical statements and negative commands); and two children composites: Child Deviance (cry-whine-yell, physical negative, smart talk, destructive and noncompliance behaviours); and Child Pro-Social Behaviours (nonverbal and verbal positive affect and physical warmth). Twenty recorded DPICS were coded by another rater and an overall mean of 76% inter-rater agreement was found. Intraclass correlations ranged from .53 (for Child Pro-Social Behaviour) to .97 (for Positive Parenting).

### *Data Analysis Strategy*

The General Linear Model (GLM) for repeated measures analyses of variance (ANOVA) was conducted to examine time intervention effects (T1 to T3), and contrasts of results between T2 and T3 were carried to evaluate the maintenance of effects. Non-parametric tests were also performed: the Mann-Whitney test for group comparison and attrition; and the McNemar test for clinical change.

Clinically significant change was defined as a reduction of over 30% [52] from T1 to T3 in the children's AD/HD behaviours as assessed by WWPAS outcome screening measure; and by the percentage of children that moved from a moderate or high-risk range in the baseline to a normative range at follow-up, on one additional measure of child AD/HD behaviours (PKBS-O/I: mothers' and teachers' perceptions).

Results were considered to be statistically significant at an alpha level of  $p < 0.05$ . The Greenhouse-Geisser sphericity correction was performed and reported for multivariate analyses. Effect sizes (ES) were estimated using partial eta square ( $\eta^2$ ) and classified according to Cohens' principles [53]: 0.01 for a small effect, 0.06 for a medium effect and 0.14 for a large effect size. All analyses were performed with SPSS 19.0. Results were analyzed both per protocol (assessment completers  $N = 48$ ) and on an intention-to-treat basis (ITT) that included all allocated cases ( $N = 52$ ) and adopted a conservative approach of no change compared to the previous evaluation in the lost cases [54].

## Results

### Parent Training Attendance

Mothers in this study had a high IY attendance rate: 88% of the mothers ( $N = 46$ ) attended nine or more group sessions (i.e., two thirds of the programme;  $M = 11.10$ ,  $SD = 3.2$ ). Only 11% of mothers ( $N = 6$ ) attended fewer than nine sessions, and of these, only four mothers (8%) dropped out of the programme altogether.

### Attrition

Nineteen-six percent of all participants ( $N = 50$ ) were retained at T2 and 85% ( $N = 44$ ) completed T3 (see Figure 1). Mothers lost to follow-up ( $N = 8$ ) did not differ from the retained mothers in any demographic or clinical variable. The retained children differed from those who were lost to follow-up with regard to the teachers' initial ratings of their social skills (completers  $M = 78.51$ ,  $SD = 11.75 >$  lost to follow-up  $M = 69.14$ ,  $SD = 8.29$ ;  $U = 74.00$ ,  $p = 0.042$ ). There were no statistical differences between the two groups in any other clinical or socio-demographic measure at baseline.

### Additional Support After 12 Months of Follow-Up

At T3, only 6% ( $N = 3$ ) of the intervention children were medicated and 21% ( $N = 10$ ) were receiving additional support from outpatient services. There were a few differences between the additional support (27%) and non-additional support (73%) groups: children who had additional support were mostly clinically referred (85%;  $\chi^2 = 5.83$ ;  $p = 0.022$ ) and mothers' ratings of their AD/HD behaviours were higher at the post-intervention assessment (PKBS-O/I:  $U = 125.00$ ,  $p = 0.034$ ; WWPAS:  $U = 109.00$ ,  $p = 0.031$ ). Moreover, mothers' observed critical parenting (CP) and reported number of stress events (stress) were higher in the additional support group at T1 and T2 (CP\_pre:  $U = 109.00$ ,  $p = 0.030$ ; CP\_post:  $U = 88.50$ ,  $p = 0.034$ ; stress\_pre:  $U = 113.00$ ,  $p = 0.016$ ; stress\_post:  $U = 127.00$ ,  $p = 0.031$ ). Since differences between groups were only observed in four outcome measures, additional support after 12 months of follow-up was not entered as a covariate in the following analysis.

### Twelve-Month Intervention Effects

Throughout the text we present results according to the ITT analysis; nevertheless results from both a per-protocol and ITT analysis were similar (see Table 2 and 3). The children's age and gender were not controlled for the intervention effects analysis, since children's gender was only significantly correlated with two of the childrens' measures reported by teachers.

Although a significant change from T1 to T3 was found in outcome variables other than those presented, only the outcome variables for which significant or marginally significant interaction effects (time X condition) had been found from T1 to T2 [35] are reported in this paper analysis, as the absence of a control group at T3 could have biased the interpretation of findings.

### *Child Behaviour Outcomes*

A significant time effect was found from T1 to T3 for most of the outcome measures analyzed (see Table 2). According to parents' and teachers' reports, children's AD/HD behaviours and oppositional problems significantly decreased from the pre- to 12-month follow-up assessment with results showing large effect sizes (between 0.17 to 0.44). Although the mothers' reports of children's social skills also showed a significant decrease ( $F [1, 51] = 24.23$ ,  $p < 0.001$ , partial  $\eta^2 = 0.32$ ), when these behaviours were observed (DPICS Pro-Social) only a trend toward statistical significance was found ( $F [1, 45] = 3.07$ ,  $p = 0.052$ , partial  $\eta^2 = 0.07$ ). Changes remained stable with regard to the children's variables, as no significant differences were found from T2 to T3. Overall, effect sizes ranged from  $< 0.01$  to 0.05, indicating small changes. The only exception was children's AD/HD behaviour (as reported in the

mothers' interview: PACS), which continued to decrease from T2 to T3 ( $F [1, 51] = 7.02, p = 0.011$ , partial  $\eta^2 = 0.12$ ). [Insert Table 2].

#### *Parenting Behaviour Outcomes*

A significant time effect was found in seven of the eight measures analyzed (see Table 3). From pre- to 12-month follow-up, the mothers' self-reported sense of competence and efficacy significantly increased, while self-rated dysfunctional practices (Laxness, Overreactivity and Verbosity) significantly decreased, with results indicating large effect sizes (between 0.15 to 0.49). Regarding observed parenting behaviours, a significant time effect was found for positive parenting ( $F [1, 45] = 12.65, p < 0.001$ , partial  $\eta^2 = 0.23$ ). No significant change was found for coaching ( $F [1, 45] = 0.89, p = 0.407$ , partial  $\eta^2 = 0.02$ ), as the post-intervention effect that had been observed on coaching (from T1 to T2) had faded out by the one-year follow-up assessment. Changes remained stable as regards the parental variables, where non-significant differences were found from T2 to T3. Overall, the effect sizes ranged from  $< 0.01$  to 0.02, indicating small changes from T2 to T3. [Insert Table 3]

#### *Clinically Significant Reduction of AD/HD Behaviours after 12 Months of Follow-up*

In the WWPAS outcome measure, 59% of children showed a clinically meaningful reduction of reported AD/HD behaviours at home of more than 30% from the initial baseline scores to T3. Sixty percent of children were above the at risk cut-off at T3 compared to the baseline, when all the participants (100%) were above it. In two additional AD/HD measures (reported AD/HD behaviours [PKBS-O/I] at home and at school), the results of the McNemar change test showed a significant difference in the number of children that changed from a moderate or high-risk to a non-risk range, compared to the number of participants who moved in the opposite direction, from T1 to T3 ( $p = 0.001$  and  $p = 0.002$ , respectively). Moreover, also according to parents' and teachers' reports, 58% and 45% of the children at the 12-month follow-up were above the clinical cut-off for AD/HD behaviours (PKBS-O/I), compared to 85% and 71% at baseline. The same analyses did not reveal any significant changes from T2 to T3 in any of the measures (PKBS-O/Iparents:  $p = 0.791$ ; PKBS-O/Iteachers:  $p = 0.774$ ; WWPAS:  $p = 0.508$ ), indicating the maintenance of a clinically important reduction of AD/HD behaviours [35] at 12 months of follow-up. Similar results were found when a per-protocol analysis was carried out.

### **Discussion**

This paper has analyzed the long-term effects of a parent-based intervention programme, the IY, on a sample of preschoolers at risk of developing AD/HD, whose mothers had received 14 weeks of group

intervention training. It was expected that the post-intervention changes in children's and mothers' outcomes would be maintained 12 months after baseline. Overall, large intervention effect sizes were found from baseline to 12-month follow-up; and the effects found in the post-intervention assessment [35] remained stable over time, as demonstrated by non-significant differences and small effect sizes between follow-ups at six and at 12 months. Thus, whatever the type of analysis performed (ITT or per protocol), the results were maintained after one year of follow-up.

Concerning our main findings, at the 12-month follow-up assessment, mothers continued to report a significant decrease in their children's AD/HD behaviours. This was also true for the mothers' interview, where a significant positive change from T2 to T3 was even found, with mothers reporting less hyperactivity and fewer inattention behaviours after 12 months of follow-up compared to the post-intervention assessment. These results indicate that changes in child behaviour could take more time to occur and become manifest only after changes in parenting skills become more consistent [21]. Some authors argue that with a longer period of follow-up some delayed intervention effects ('sleeping effects') may appear [55].

Additional data showed similar findings. Reported oppositional behaviours at home decreased over time, from baseline to 12 months of follow-up, showing that the intervention had sustained effects on comorbid behaviour symptoms as well. This finding is consistent with previous studies [e.g., 24] and is important, since AD/HD can predict the development of oppositional defiant disorder and subsequent conduct disorder [4], and these disorders are associated with a higher risk of having an ADHD diagnosis in subsequent years [13]. Also, the effects of the intervention on mothers' reports of children's social skills were also maintained after 12 months of follow-up and were in part consistent with observed child pro-social behaviour. In fact, although only a marginally significant effect was found from baseline to subsequent assessments with regard to these observed skills, they continued to increase over time. Given that social skills can play an important role in the prevention of secondary negative outcomes in AD/HD children, by enhancing positive relationships with adults and peers [4], this finding must be taken into account. After 12 months of follow-up, the reported treatment effects at school were also maintained, since, according to teachers' perceptions, the reduction in the children's AD/HD and oppositional behaviours found at T2 was sustained. Consequently, although evidence for the generalization of PT effects to a non-targeted setting (e.g., school context) has not been completely established [6], these results are encouraging.

Regarding other major findings, the impact of IY on parenting skills was also maintained after one year of follow-up, insofar as mothers continued at T3 to use positive parenting skills and less harsh and dysfunctional practices, and were feeling more effective in parenting. The fact that these changes were sustained after 12 months of follow-up is extremely relevant, since parents of children with these characteristics tend to feel less competent regarding their parenting skills [14]. Moreover, parenting skills, especially as regards positive parenting, are considered important mediators of treatment outcomes [56-57]. Preschoolers with early AD/HD difficulties may be more sensitive to negative parenting and there is an increased risk of the development of a negative cycle between comorbid behaviour problems, school failure and coercive parent-child interactions. Therefore, it is of great preventive value to invest in increasing parents' sense of effectiveness [7, 22]. Unfortunately, the initial changes observed in mothers' coaching skills decreased from T2 to T3. Some possible explanations can be proposed for this result. Firstly, the intervention programme was not successful enough in sustaining this parenting skill, which is very important for parents of AD/HD children [16] who are often characterized by self-regulation difficulties [37]. We could speculate that this version of the IY programme (14 weekly sessions, for children at risk for AD/HD) was not long enough, and that more time would be necessary to allow parents to practice these skills (i.e., descriptive persistence and social-emotional comments) more intensively like the longer version of IY used by Webster-Stratton et al. in a recent study (approximately 20 weekly sessions, for AD/HD diagnosed children) [20]. Nevertheless, this was the protocol used in other similar studies, even in a shorter 12-session version [17]. Secondly, it may also suggest the need for using more methods to reinforce parenting skills and maintain improvements (e.g., additional booster sessions; the establishment of a post-intervention support network for parents) [6].

To sum up, although a proportion of children were still within the range considered to be at risk of developing AD/HD (and in need of additional intervention), there was an important clinical reduction of children's AD/HD behaviours at home, with more than half the children showing a meaningful improvement of over 30% from baseline to 12 months of follow-up. This was higher than the previously reported clinical reduction of AD/HD behaviours that occurred from baseline to post-intervention assessment [35], meaning that clinical improvements in reported AD/HD behaviours were also sustained and even increased over time. Additionally, only a few children had sought additional help between T2 to T3, which may not have influenced the stability of effects over time endorsed to the IY programme. These children were clinically referred, had higher AD/HD behaviours at T2, their mothers reported more

stressful events and were more critical with their children. Furthermore, children who were lost for follow-up were seen by their pre-school teachers at baseline as less socially competent than children who completed T3. Therefore, these results highlight the need to pay special attention to families with higher risk factors at baseline, both in the assessment and in the intervention process, in order to completely meet these families' needs.

This study therefore offers preliminary support for the stability of the benefits of IY intervention in a sample of Portuguese preschoolers displaying AD/HD behaviours. Using a 14-weekly-session version of IY plus two booster sessions (the first of which might also have contributed to the reported outcomes), our results are consistent with other comparable long-term trials that used a different IY dosage [24-25], and provide additional evidence for the effectiveness of a specific parent training (the IY), for young children with early AD/HD-related behaviours. Besides, the high engagement in the programme (low drop-out rate) and high attendance rate, key elements for long-term benefits [6] reinforces the programme's acceptability within different countries. Indeed, the IY model is highly effective in preventing drop-out (e.g., through make-up sessions, weekly phone-calls, a highly demanding leaders' accreditation process), enhancing family participation (e.g., collaborative process) and in reducing attendance barriers (e.g., through the provision of childcare or a post-labour schedule) [33]. Furthermore, the study is part of a broader longitudinal RCT, benefiting from a multi-method (e.g., questionnaires, interview, observation) and multi-informant (e.g., parents, teachers, child) comprehensive approach which increases its validity and reduces potential parent rating bias.

As previously mentioned, the findings should be interpreted cautiously and some weaknesses should be considered. For example, the fact that this subsample was defined based on the top 20% of an AD/HD screening measure (the WWPAS was chosen to identify preschool children presenting AD/HD related behaviours) should be considered when comparing these results (at risk AD/HD subsample) to other studies using AD/HD diagnosed samples. The absence of a control group at the 12-month assessment is another weakness of this study. We tried to minimize this by analyzing only the variables that had shown significant or marginal intervention effects at T2 when compared to the WLK; nevertheless we cannot firmly conclude whether the sustained changes are due to the intervention or if they result from other factors, such as the development process. Additionally, the small sample size at follow-up could have limited the power of the analysis to detect small effects and, consequently, the possibility to generalize results. Moreover, due to the lack of instruments for this age group in Portugal, and despite the careful

selection of these measures based in similar effectiveness studies [17, 22-23, 51] and in previous data from Portuguese samples (<http://fpce.uc.pt/anosincriveis/protocolo.doc>), psychometric properties of some of the measures are concerning (e.g., low internal consistency on PACS and PS) as they may reduce the scope of some results, calling attention to the need of future psychometric studies. Furthermore, biases were less controlled at follow-up, since evaluators were no longer blind to the participants' group. Finally, other ways of collecting data from parents and teachers (e.g., collecting the questionnaires in the mothers' and teachers' own settings; presenting the study to pre-school teachers before baseline assessment) should be considered in order to reduce the attrition rate and overcome difficulty in retrieving completed questionnaires. Besides, the 22% rate of missing data among pre-school teachers may compromise the generalization of these results.

This study should be replicated with further Portuguese samples, within different contexts (e.g., a clinically based context) to investigate the possibility of generalizing these results; and to identify the most cost-effective practices [58], when IY is compared with routine care, usual interventions. In general, future studies must clarify the maintenance of the IY effects for longer periods and with larger samples of AD/HD preschoolers. Secondly, the primary outcome measures of AD/HD and the evaluation of clinical significance should also comprise observational measures, in order to minimize possible reporting biases [59]. Despite the pattern of improvement maintenance observed in this study, a proportion of participants did not achieve significant clinical changes. Future analysis of this sample and of the effectiveness of IY in similar samples should study predictors and moderators of change, exploring the characteristics of participants for whom this intervention has worked better [e.g., 22-23, 31, 60], participants who may need further types of support (e.g., a combination with other programmes directly targeting the child or the school; higher number of booster sessions) or a longer period of intervention [24].

Finally, future studies should compare PT effects to PT plus other components, in order to analyze possible additional intervention benefits. Also, research should be able to clarify if a general parental training programme like the IY, implemented in the early years, is more effective in the long run and more able to improve impairment in different areas of the child's functioning beyond AD/HD symptoms [6] than a specifically designed AD/HD intervention programme [23].

This paper has highlighted the sustained benefits of a parent-based intervention programme in preschool-age children with AD/HD behaviours, and adds support to the use of PT, especially when implemented with fidelity [61] in the early years, and targets a specific group of Portuguese children at



risk of developing future AD/HD problems and their parents. This work also contributes to the growing literature on parenting interventions for Portuguese families, making available in Portugal a well-researched programme targeting preschoolers with early ADHD behaviours, and their parents. Since AD/HD at preschool age involves an increased risk of a further chronic and negative developmental trajectory, early identification, intervention and continuous monitoring are required in order to reduce risk and reinforce the children's and parents' protective factors, at such a challenging stage of development.

### **Declaration of Conflicting Interests**

The authors declare that they have no conflict of interest with respect to the present research, authorship, and publication of this paper.

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Table 1. *Sample characteristics at baseline for the intervention condition (IYG)*

Variable	IYG
<i>Primary caregiver: no (%)</i>	<i>(N = 52)</i>
Mother	48 (92%)
Adoptive mother	2 (4%)
Grandmother	2 (4%)
Age (years): mean $\pm$ SD	36.37 $\pm$ 5.66
Years of Education: mean $\pm$ SD	13.90 $\pm$ 3.89
Marital Status: no (%) Married/as married	43 (83%)
Divorced/separated	8 (15%)
Single	1 (2%)
Family SES*: no (%) Low	16 (31%)
Medium	22 (42%)
High	14 (27%)
Geographical zone: no (%) Urban	45 (86%)
Mother's depressive symptoms (BDI): mean $\pm$ SD	8.15 $\pm$ 7.51
Mother's AD/HD symptoms (AARS): mean $\pm$ SD	9.92 $\pm$ 7.29
Stressful life events (PSI): mean $\pm$ SD	2.69 $\pm$ 2.33
<i>Child</i>	
Age (months): mean $\pm$ SD	55.92 $\pm$ 10.9
Sex (male): no (%)	37 (71%)
Siblings: mean $\pm$ SD	0.71 $\pm$ 0.69
Reference: no (%) Clinically referred	29 (56%)
Community referred	23 (44%)
AD/HD behaviours: (WWPAS): mean $\pm$ SD	32.36 $\pm$ 7.90
(SDQ-Hyperactivity): no (%) $\geq 7$	43 (83%)
(PACS-HP): no (%) $\geq 16$	28 (54%)
(PKBS-O/I_mother): no (%) $\geq 16$	44 (85%)
(PKBS-O/I_teacher): no (%) $\geq 15$	34 (65%)

*Notes: SD* Standard deviation; *SES* Socioeconomic Status; *BDI* Beck Depression Inventory; *AARS* Adult AD/HD Rating Scale; *PSI* Parenting Stress Index; *WWPAS* Werry-Weiss-Peters Activity Scale; *SDQ* Strengths and Difficulties Questionnaire; *PACS-HP* Parental Account of Childhood Symptoms-Hyperactivity Scale; *PKBS-O/I* Overactivity/Inattention subscale of the *Preschool and Kindergarten Behaviour Scales*; \* SES was defined using a standardized classification developed for Portuguese population [62]

Table 2. Differences from baseline to follow-up and from post-intervention assessment to follow-up assessment in the intervention condition: children outcome measures

Variable	ITT							Per protocol analysis			
	Baseline	Post	Follow-up	T1 - T3 ( <i>F, p</i> )	ES	T2 - T3 ( <i>F, p</i> )	ES	T1 - T3 ( <i>F, p</i> )	ES	T2 - T3 ( <i>F, p</i> )	ES
<i>Mother reports</i>	T1	T2	T3	( <i>N</i> = 52)		( <i>N</i> = 52)		( <i>N</i> = 44)		( <i>N</i> = 44)	
WWPAS (21) <sup>a</sup>	32.52±7.87	23.92±9.25	23.32±9.42	38.91 (<0.001)	0.44	0.38 (0.536)	<.01	32.40 (<0.001)	0.44	0.08 (0.769)	<0.01
PKBS: O/I (16) <sup>b</sup>	18.78±3.44	16.30±3.95	15.96±4.14	20.67 (<0.001)	0.29	0.65 (0.422)	.01	16.61 (<0.001)	0.28	0.18 (0.673)	<0.01
PKBS:O/A (19) <sup>b</sup>	20.67±4.31	17.69±5.17	17.40±5.90	19.25 (<0.001)	0.27	0.40 (0.528)	<.01	20.68 (<0.001)	0.33	0.26 (0.612)	<0.01
PKBS: SS (76) <sup>b</sup>	72.23±10.89	79.11±8.56	80.92±9.37	24.23 (<0.001)	0.32	2.62 (0.111)	.05	18.56 (<0.001)	0.32	2.78 (0.103)	0.06
PACS-HP (16) <sup>c</sup>	16.02±6.44	12.08±6.23	10.62±5.67	27.65 (<0.001)	0.35	7.02 (0.011)	.12	24.09 (<0.001)	0.36	7.92 (0.007)	0.15
<i>Teacher reports<sup>1</sup></i>				( <i>N</i> = 46)		( <i>N</i> = 46)		( <i>N</i> = 36)		( <i>N</i> = 36)	
PKBS: O/I (15) <sup>b</sup>	16.62±5.48	13.95±5.56	13.91±6.34	9.52 (< 0.001)	0.17	0.004 (0.948)	<.01	7.84 (0.001)	0.20	0.006 (0.939)	<0.01
PKBS: O/A (15) <sup>b</sup>	15.22±6.61	12.85±6.31	12.47±7.39	11.54 (< 0.001)	0.20	0.42 (0.519)	<.01	8.06 (0.001)	0.20	0.12 (0.735)	<0.01
<i>Lab observed behaviours: DPICS (Child)<sup>2</sup></i>				( <i>N</i> = 46)		( <i>N</i> = 46)		( <i>N</i> = 34)		( <i>N</i> = 34)	
Child Pro-social	7.27±6.05	8.97±7.25	9.83±6.27	3.07 (0.052)	0.07	0.71 (0.406)	.02	2.17 (0.123)	0.07	0.65 (0.428)	0.02

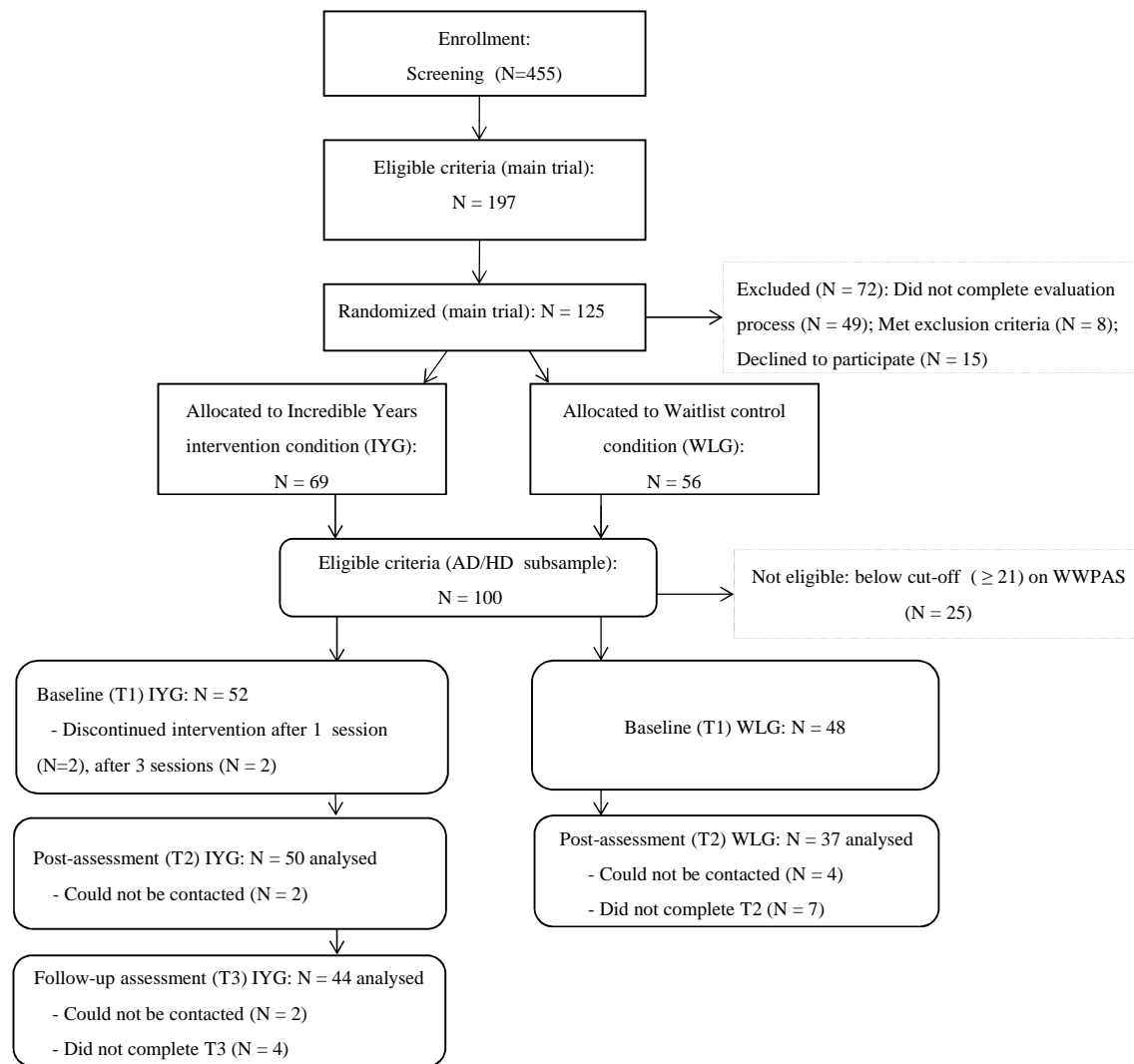
*Notes:* Results are expressed as mean  $\pm$  standard deviation. <sup>a</sup>Portuguese cut-off [41]. <sup>b</sup> Portuguese cut-off [63]. <sup>c</sup>Cut-off [23]. <sup>1</sup> *N* differ due to missing data and informant (from T1 to T3 78% of pre-school teachers completed assessment). <sup>2</sup> Technical problems in video registration contributed for available DPICS outcomes. *ITT* Intention to treat analysis; *ES* Effect size partial  $\eta^2$ ; *WWPAS* Werry-Weiss-Peters Activity Scale; *PKBS* Preschool and Kindergarten Behaviour Scales; *O/I* Overactivity/Inattention; *O/A* Oppositional/Aggressive; *SS* Social Skills; *PACS-HP* Parental Account of Childhood Symptoms-Hyperactivity Scale; *DPICS* Dyadic Parent-Child Interaction Coding System

Table 3. Differences from baseline to follow-up and from post-intervention assessment to follow-up assessment in the intervention condition: parent outcome measures

	ITT							Per protocol analysis <sup>1</sup>			
Variable	Baseline	Post	Follow-up	T1-T3 ( <i>F, p</i> )	ES	T2-T3 ( <i>F, p</i> )	ES	T1-T3 ( <i>F, p</i> )	ES	T2-T3 ( <i>F, p</i> )	ES
<i>Mothers reports</i>	T1	T2	T3	( <i>N</i> = 52)		( <i>N</i> = 52)		( <i>N</i> = 44)		( <i>N</i> = 44)	
PS Total	3.60±0.42	3.08±0.48	3.04±0.46	48.21 (<0.001)	0.49	0.79 (0.337)	0.02	41.65 (<0.001)	0.51	0.27 (0.606)	<0.01
Laxness	2.96±0.70	2.57±0.64	2.54±0.67	13.98 (<0.001)	0.22	0.13 (0.717)	<0.01	15.62 (<0.001)	0.28	0.13 (0.720)	<0.01
Overreactivity	3.65±0.72	3.18±0.76	3.13±0.66	16.53 (<0.001)	0.25	0.43 (0.513)	0.01	9.28 (0.001)	0.18	0.001(0.997)	<0.01
Verbosity	4.28±0.88	3.47±0.77	3.38±0.81	35.09 (<0.001)	0.41	0.77 (0.385)	0.01	31.78 (<0.001)	0.44	0.29 (0.590)	<0.01
				( <i>N</i> = 52)		( <i>N</i> = 52)		( <i>N</i> = 42)		( <i>N</i> = 42)	
PSOC Total	55.79±7.61	59.24±7.06	59.32±6.98	12.14 (<0.001)	0.20	0.02 (0.900)	<0.01	8.51 (0.001)	0.18	0.04 (0.843)	<0.01
Efficacy	24.20±4.63	25.95±3.95	25.64±3.76	8.42 (0.001)	0.15	0.88 (0.351)	0.02	8.45 (0.001)	0.18	0.88 (0.352)	0.02
<i>Lab observed behaviours: DPICS (Mother)<sup>2</sup></i>				( <i>N</i> = 46)		( <i>N</i> = 46)		( <i>N</i> = 34)		( <i>N</i> = 34)	
Positive Parent.	19.09±11.81	27.50±11.32	27.06±11.97	12.65 (<0.001)	0.23	0.06 (0.813)	<0.01	11.84 (<0.001)	0.28	0.48 (0.495)	0.02
Coaching	24.02±12.69	25.52±13.39	22.65±13.56	0.89 (0.407)	0.02	2.29 (0.137)	0.05	0.78 (0.458)	0.02	1.66 (0.208)	0.05

Notes: Results are expressed as mean ± standard deviation.<sup>1</sup> *N* between measures differ due to missing data.<sup>2</sup> *N* differ to technical problems in video registration. *ITT* Intention

to treat analysis; *ES* Effect size partial  $\eta^2$ ; *PS* Parenting Scale; *PSOC* Parenting Sense of Competence Scale; *DPICS* Dyadic Parent-Child Interaction Coding System.



**Fig. 1** Participants' flowchart