



Promoting Mental Health in Disadvantaged Preschoolers: A Cluster Randomized Controlled Trial of Teacher Training Effects

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Abstract

The literature provides solid documentation of the negative consequences of poor psychosocial functioning and behavioral problems in early childhood. Children facing economic disadvantage are at higher risk for poor socio-emotional development and problem behaviors, which draws attention to the need for prevention targeted at this risk group. The aim of our study was to analyze the impact of an evidence-based teacher-training program, the Incredible Years Teacher Classroom Management (IY-TCM), on the behavior of economically disadvantaged Portuguese children. Participants were 1030 children aged 3–6 years, from 65 preschool classrooms selected for their high percentage of children from economically disadvantaged backgrounds. The study followed an experimental randomized controlled between-group design, with pre- and post-intervention assessments. Teachers in the experimental group attended the IY-TCM program, implemented in six monthly workshops, and four sessions of individual in-class support. Children outcomes were evaluated with the Preschool and Kindergarten Behavior Scales—2nd Edition (Social Skills and Problem Behavior scales). After the intervention, preschoolers in the IY-TCM classrooms showed more improvements in their social skills and more decreases in problem behavior. Children with lower levels of social skills (high risk) at pre-intervention and those coming from families in economic need showed greater improvements in social skills, but these effects were not observed for problem behavior. Results support the growing evidence of the effectiveness of the IY-TCM as a stand-alone, non-adapted program in a Portuguese cultural context, which can play a protective role in children's lives and thus bridge the gap between children coming from different economic backgrounds.

Keywords Child behavior problems · Economic disadvantage · Incredible Years-TCM · Classroom intervention · Prevention in mental health.

Introduction

Preschool children have some characteristics that make them particularly endearing to adults such as their curiosity, spontaneity, and expression of ideas, feelings, and wishes with little fear of violating social norms. During the preschool period, in the context of a supportive family and school environment, the child will learn how to self-regulate and interact with peers and adults in a pro-social way. If these significant developmental processes are compromised, however, behavioral problems can arise that may have deleterious and long-lasting impact on the individual, the family, and society. The literature provides solid documentation of the negative consequences of poor psychosocial functioning and problematic conduct in early childhood. These include social rejection, school failure, mental health problems, substance abuse, and juvenile

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delinquency (Fergusson et al. 2005; National Scientific Council on the Developing Child, NSCDC 2015; Patterson 2002). This negative impact makes the case for viewing early disruptive conduct as a major mental health issue, justifying the need for early prevention and intervention (Fossum et al. 2017; Williford and Shelton 2008).

Against this background, children facing economic disadvantage may be at higher risk for developing behavioral problems (Raver et al. 2009; Webster-Stratton and Bywater 2015). Furthermore, research highlights that these children may greatly benefit from early psychosocial interventions targeted at promoting socio-emotional development (Raver et al. 2009; Tolan et al. 2004). In this context, the preschool environment, where children spend many hours a day, may be an optimal setting for increasing their social competence and emotional self-regulation and thus serve to counteract poverty-related risk factors by playing a protective role in the child's life and contributing to the interruption of deviant trajectories (Fossum et al. 2017; Hayes 2008; Heckman et al. 2013).

Consequently, it is essential that the preschool provide children with a supportive environment where they can learn basic social and problem-solving skills. These abilities will promote their readiness for schooling and positive cognitive and academic development (Hutchings et al. 2013; Webster-Stratton and Bywater 2015). Ultimately, they will aid in developing the children's positive citizenship. However, teachers often feel unprepared to deal with the multiple behavioral challenges in their classrooms (Hutchings et al. 2007; McGilloway et al. 2011). These difficulties draw attention to the need for professional training that promotes and reinforces teachers' skills to manage difficult and inappropriate child behavior, while promoting social, emotional, and academic competence, as well as strengthening the communication between the school and the home (Carlson et al. 2011; Hutchings et al. 2013).

Carolyn Webster-Stratton developed the Incredible Years Teacher Classroom Management (IY-TCM) IY-TCM program in 1995 and revised it in 2003, as a classroom-based intervention designed to promote 3–8-year-old children's socio-emotional skills and self-regulation and to reduce conduct problems by strengthening teacher strategies of classroom management and home-school communication. The program is implemented in monthly workshops, where the 1-month gap between sessions gives teachers the opportunity to put classroom assignments into practice by implementing the new classroom management strategies learned. Contents include: (a) promoting positive relationships with children and family and pro-active teaching; (b) the importance of positive attention, encouragement and praise; (c) using incentives to motivate children; (d) reduction of inappropriate behaviors; (e) negative

consequences; (f) promoting social skills and problem-solving (Webster-Stratton and Reid 2002). Facilitators who have a certified training lead the workshops, and they feature a collaborative approach as well as active and experiential methods, such as role-plays, group discussions triggered by vignettes of teacher–children interactions, and between-session assignments that include writing behavior plans for specific children.

The IY-TCM program is well established, as a number of studies have demonstrated its effectiveness in improving both important teachers' outcomes (e.g., increases in positive teaching techniques and reductions in negative teaching techniques) (Carlson et al. 2011; McGilloway et al. 2011; Raver et al. 2009), and children's outcomes (e.g., reductions in conduct problems and improvements in social skills and problem-solving) (Baker-Henningham et al. 2012; Fossum et al. 2017; Hutchings et al. 2013). With regard to children's outcomes, the effectiveness of the IY-TCM was evaluated in the United States by the program's developer in two selective prevention randomized controlled trials (RCTs) with children enrolled in Head Start (Webster-Stratton et al. 2001; Webster-Stratton et al. 2008) and a treatment RCT involving children with oppositional defiant disorder (Webster-Stratton et al. 2004). The three studies used the IY-TCM in combination with another program or programs from the IY series (either for parents, for children or both). Results showed that the IY-TCM was effective in improving children's social competence, self-regulation, on-task behavior and cooperative behavior with teachers, while decreasing conduct problems and aggressive behavior with peers.

Other studies conducted by independent researchers in different countries replicated the evidence of effectiveness demonstrated by the developer. An RCT conducted in Ireland with preschoolers comparable in terms of low, medium, or high levels of behavioral problems, highlighted a number of changes in the experimental group, whose teachers had participated in the IY-TCM training (McGilloway et al. 2011). Those changes included a significant decrease in emotional symptoms and a reduction in conduct problems and total behavioral difficulties (although not statistically significant in the latter two cases). Some of the teachers involved in the RCT study also participated in a qualitative study that featured one-to-one interviews. These teachers experienced noteworthy changes in child behavior, such as demonstrating a greater ability to stay on task, engaging in less attention-seeking behavior, being more able to express their emotions verbally instead of acting them out, and independently managing conflict with their peers (McGilloway et al. 2011).

Following a successful pilot study (Baker-Henningham et al. 2009), Baker-Henningham et al. (2012) conducted an RCT using the IY-TCM in a sample of Jamaican teachers

and their preschool students. After the intervention, a significant reduction in conduct problems ($r = 0.42$) and an increase in friendship skills ($r = 0.74$) were observed in experimental children, as well as benefits in child behavior difficulties ($r = 0.47$) and social skills ($r = 0.59$) reported by teachers, and in child behavior difficulties ($r = 0.22$) reported by parents.

Hutchings et al. (2007) reported positive results of the first use of the IY-TCM in Wales, UK. A subsequent RCT study used the IY-TCM as a stand-alone intervention and selected children at low risk for behavior problems (75%) and children at high risk (25%) to evaluate children outcomes. They found a significant reduction in children's negative behavior towards the teacher ($d = 0.42$), and in children's off-task behavior ($d = 0.48$) (Hutchings et al. 2013).

Reinke et al. (2016) conducted an RCT to study the impact of the IY-TCM used as a stand-alone program in a sample of predominantly low-income African-American youth (kindergarten through 3rd grade) in a US urban context. They found a significant improvement in children, namely in teacher-reported pro-social behavior, emotional dysregulation and overall social competence, with d effect sizes ranging from 0.13 to 0.14, but not on teacher-reported disruptiveness or concentration problems.

A universal prevention study carried out in Norway showed positive effects of the stand-alone IY-TCM in kindergarten (Fossum et al. 2017). More specifically, the program proved to be effective both in the reduction of a child's aggression, internalizing and lack of attention problems and in the increase of social competence although the effects found were small (d values ranging from 0.12 to 0.21). For a subsample of children with behavior problems equal to or above the 90th percentile on aggressive behavior before the intervention, the change was also in the positive direction for the same variables although it was significant only for social skills, which the authors interpreted as a possible consequence of the small sample size. The d effect sizes ranged from 0.18 to 0.48.

Other studies have used adapted versions of the IY-TCM. Shernoff and Kratochwill (2007) conducted research that sought to evaluate the transportability of the IY-TCM to practice settings and examined the outcomes in preschoolers at low-risk for behavior problems. The program was implemented using training methods that were different from those proposed by the author: self-administered videotape modeling (VM) and VM plus consultation (VMC). Preschoolers in both conditions displayed reductions in disruptive behaviors, but no significant differences were observed between them. However, children in the VMC condition showed additional positive trends, including clinically significant increases in social competence and increased adaptation to the school environment.

Williford and Shelton (2008) also adapted the IY-TCM to use in poor community settings, while the parents were invited to participate in Incredible Years groups (although the attendance rate in this last program was low). Each teacher in the intervention group received individualized mental health consultation on the IY-TCM components that would be most effective to address specific challenges they faced with a certain child or classroom. Teachers in the IY-TCM group reported stable levels of child disruptive behavior throughout the school year, whereas teachers in the comparison group reported increasing levels.

Raver et al. (2009) used an adapted version of the IY-TCM as part of the Chicago School Readiness Project, which also included, among other components, individual coaching to assist teachers in the promotion of children's socio-emotional and behavioral development. They implemented the model in low-income, urban, community-based preschools and conducted the study following a cluster RCT design. The intervention had a large, statistically significant impact on reducing preschoolers' internalizing and externalizing problems (d values ranging from 0.62 to 0.89).

In Portugal, the IY-TCM was used in two studies, a universal prevention quasi-experimental study (Vale 2012), and a non-randomized selective prevention research of preschoolers at-risk for disruptive behavior (Seabra-Santos et al. 2016). In the second study, the parents also participated in an IY group. In both cases, there was a comparison condition, and evaluations were carried out before and after the intervention and 12 months after the initial evaluation. Although both studies had methodological limitations (small sample sizes, non-experimental design), results showed that preschoolers whose teachers participated in the IY-TCM significantly reduced externalizing behaviors and increased prosocial behaviors, with these positive changes maintained at follow-up.

The issue of whether certain children benefit more than others do when the IY-TCM was used as an intervention has rarely been explored to date. The children's behavior at baseline was the variable most consistently found to influence the impact of the intervention. Webster-Stratton et al. (2001) showed that children with the highest rates of non-compliance and aggressive behavior at baseline showed more clinically significant reductions in these behaviors than high-risk control children. McGilloway et al. (2011) also reported that children with the higher levels of socio-emotional and behavioral difficulties at baseline were the ones who benefited more from the IY-TCM, while there was a slight deterioration in behavior for children in the control group. In Hutchings et al.'s study (2013), children with high levels of behavioral problems in the intervention group showed greater changes from pre- to post- IY-TCM intervention, compared with children with identical characteristics in the control group. Likewise, Reinke et al.

(2016) found that social competence moderated the effect of the IY-TCM, as children in the experimental group who had lower levels of social competence at baseline improved more in these skills than their peers in control classrooms. Similarly, children with lower levels of academic competence at baseline improved more in these skills than their control peers. In a sample of low-income children exposed to a large number of poverty-related risks, Raver et al. (2009) found that the observed impact of the intervention in which the IY-TCM was included was stronger for children facing lower levels of poverty-related risk. In the same study, teachers' reports suggested that Hispanic girls showed the largest reductions in behavior problems when compared with other children in the sample.

In spite of the growing evidence on the effectiveness of the IY-TCM in several countries and with different types of populations (i.e., universal, clinical, social disadvantage) and with diverse levels of risk, not many studies have addressed the program as a stand-alone, non-adapted intervention in deprived areas. The purpose of this study was to determine the preventive effects of the IY-TCM as a stand-alone intervention among Portuguese preschoolers from low-income areas. Furthermore, our goal was to explore whether the program is more effective for some children with respect to their initial behavioral risk or the presence of economical need. In light of previous research with this intervention, we hypothesized that: (1) preschoolers in the intervention classrooms would exhibit higher increases in social skills and decreases in problem behavior; (2) benefits would be greater for children coming from families in economic need and for children at higher risk for problem behavior and low social skills.

Method

Participants

There were 65 preschool teachers ($N_{\text{Classrooms}} = 65$) from 52 public preschools recruited for our study. We recruited these teachers from 143 who were contacted, of whom 53 declined to participate and 25 were not eligible. The main reasons for declining participation were the long distances they would have to drive for the training, the fact that it was held on Saturdays, and their being a new teacher in that preschool. Reasons for non-eligibility were having classes with fewer than 10 children ($n = 9$), participating in another study involving teacher training ($n = 4$), having had previous training in IY-TCM ($n = 5$), and working in a preschool with a number of classrooms that did not match any other of the contacted schools ($n = 6$). One teacher had to be replaced in the school during the recruitment process due to health problems and was no longer eligible. Participating

Table 1 Participants' characteristics at baseline

Demographic characteristics	IY-TCM- Intervention	Control	All	<i>p</i>
Children				
<i>N</i>	538	492	1030	
Age, months: <i>M</i> (<i>SD</i>)	51.88 (10.13)	52.18 (9.90)	52.02 (10.02)	0.629 ^a
Gender, <i>n</i> (%)				0.383 ^b
Boys	274 (51)	264 (54)	538 (52)	
Girls	264 (49)	228 (46)	492 (48)	
Entitled to free lunch, <i>n</i> (%)				0.011 ^b
Yes	245 (46)	185 (38)	430 (42)	
No	293 (54)	307 (62)	600 (58)	
PKBS-2 Social Skills, <i>n</i> (%)				0.001 ^b
Low risk	382 (71)	398 (81)	780 (76)	
Moderate risk ^c	64 (12)	46 (9)	110 (11)	
High risk ^d	92 (17)	48 (10)	140 (14)	
PKBS-2 Problem Behavior, <i>n</i> (%)				0.034 ^b
Low risk	432 (80)	398 (81)	830 (81)	
Moderate risk ^c	53 (10)	64 (13)	117 (11)	
High risk ^d	53 (10)	30 (6)	83 (8)	
Teacher				
<i>N</i>	33	32	65	
Gender, <i>n</i> (%)				
Female	33 (100)	32 (100)	65 (100)	
Training, <i>n</i> (%)				0.816 ^b
Bachelor in education	6 (18)	4 (12)	10 (15)	
Bachelor in education with complementary training	23 (70)	24 (75)	47 (72)	
Degree in education	4 (12)	4 (12)	8 (12)	
No. years teaching (<i>M,SD</i>)	28.09 (4.34)	29.78 (4.27)	28.92 (4.36)	0.119 ^a
No. years at this preschool (<i>M,SD</i>)	5.03 (4.19)	5.06 (5.10)	5.05 (4.62)	0.978 ^a
Classroom				
<i>N</i>	33	32	65	
Class size (<i>M,SD</i>)	17.82 (4.73)	16.84 (3.53)	17.34 (4.18)	0.349 ^a
No. children in study (<i>M,SD</i>)	16.30 (4.89)	15.47 (3.38)	15.89 (4.20)	0.426 ^a
Urbanity, <i>n</i> (%)				.249 ^b
Urban	17 (52)	10 (31)	27 (42)	
Semi-urban	7 (21)	9 (28)	16 (25)	
Rural	9 (27)	13 (41)	22 (34)	

^aSignificant differences tested using independent samples *t*-test

^bSignificant differences tested using a chi-square test of independence

^cPercentiles 85 to 94

^dPercentiles ≥ 95

teachers were all female, ranging in age from 42 to 61 years ($M = 52.53$; $SD = 3.65$). Most of them (72%) had completed a Bachelor's degree in education followed by a complementary year of training also in education, and had worked as teachers for an average of 28.92 years ($SD = 4.36$), with an average of 5.05 years ($SD = 4.62$) at their current preschool. The two groups (IY-TCM and Control) were equivalent with regard to all the analyzed teacher variables (Table 1).

The number of preschool children participants was $N_{\text{Children}} = 1030$, of which 538 were boys and 492 were girls, 3–6 years old ($M = 52.02$; $SD = 10.02$; both in months). Forty-two percent were entitled to free lunch, while the national rate for the same period was 18%

(PORDATA 2018a, 2018b). The two groups were equivalent with regard to gender and age, but not to the percentage entitled to free lunch, which was higher among the IY-TCM children, $\chi^2(2, N = 1030) = 6.34, p < .05$. When compared to the national standards for the PKBS-2 (Major 2011), these children had low average scores on the Social Skills scale ($M = 79.69, SD = 17.92$), corresponding to a percentile of 32 (the descriptive statistics for the national sample are $M = 83.84, SD = 13.33$). As for the the Problem Behavior scale ($M = 36.25, SD = 27.37$), the average score was close to the national mean ($M = 36.78, SD = 24.34$), corresponding to a percentile of 52. The average score for Externalizing Problem Behaviors was higher than for Internalizing Problem Behaviors (percentiles of 59 and 48, respectively). Also in comparison to the national standards, where risk is defined as the 15% highest scores, this sample had a higher percentage of children at risk for low social skills (25%) and slightly higher for high problem behaviors (19%). The IY-TCM and the Control groups were not equivalent concerning the risk levels for Social Skills, $\chi^2(2, N = 1030) = 15.08, p < 0.01$, nor for Problem Behaviors, $\chi^2(2, N = 1030) = 6.76, p < 0.05$, with more children in the IY-TCM group being at risk (Table 1).

The average class size, which included children not participating in the study, was $M = 17.34 (SD = 4.18)$. The average cluster size (i.e., average number of participating students per class) was $M = 15.89 (SD = 4.20)$. Preschools were located in urban (42%), semi-urban (25%), or rural areas (34%) (Table 1).

Three teachers and 61 children were lost at post-intervention assessment. The comparison between children lost and retained revealed no significant differences in terms of age, $t(1028) = -1.47, p > 0.05$, gender, $\chi^2(1, N = 1030) = 0.001, p > 0.05$, or free lunch, $\chi^2(1, N = 103) = 0.89, p > 0.05$.

Procedure

The study used an experimental randomized controlled between-group design, with pre- and post-intervention assessments (see flow chart in Fig. 1). The Portuguese Data Protection Commission (CNPD, No.3953/2016) and the administration of all the participating schools authorized the research.

Power Calculation

The number of children recruited for the study was based on a power calculation adjusting for design effect, that is, children nested within classrooms. The power was set to 0.80, and the estimated expected effect sizes were small to moderate (e.g., Cohen's $d = 0.30$) based on results from a similar study in Norway. The design effect was estimated

using classroom sample sizes of 15 pupils per classroom on average. The formula for design effect, the adjustment made to the estimated sample size for independent participants at the within level, was $Deff = 1 + (k - 1) * ICC$, where k is the number of children per classroom. Based on these assumptions, the recruitment goal was 450 students per condition (IY and Control), or 30 classrooms with 15 students each per condition.

Recruitment

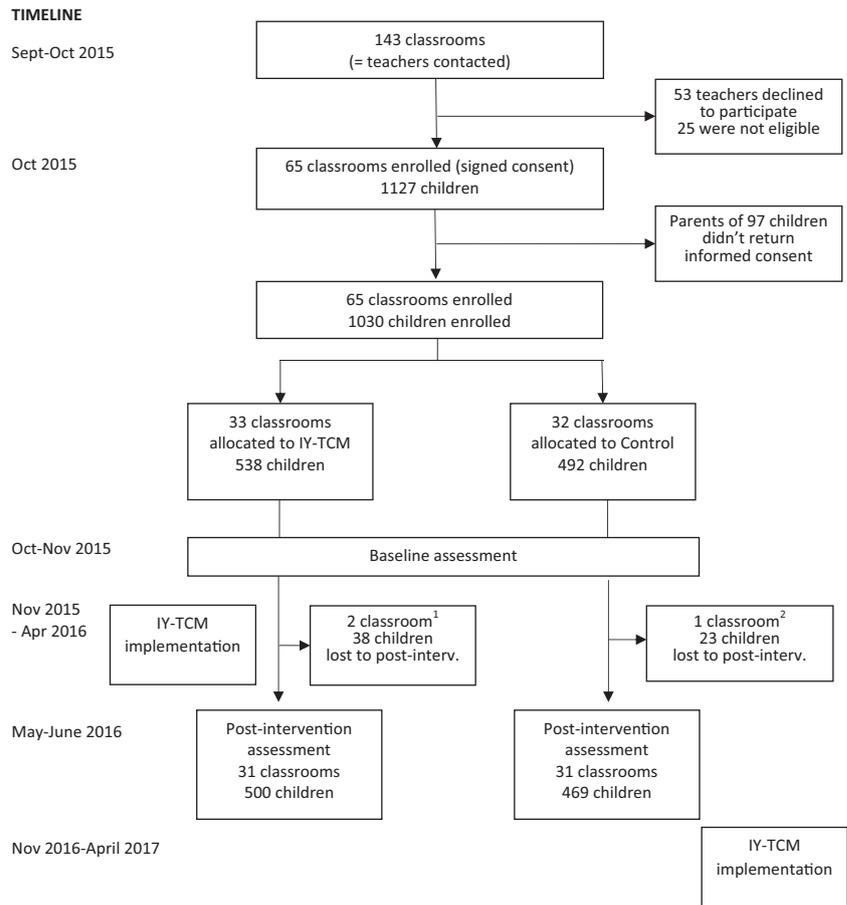
Having in mind the target population of disadvantaged children, we sorted a list of preschools in the Coimbra district by the percentage of children receiving free lunch as a proxy indicator of economic need. We then contacted preschool teachers to participate according to that list, starting with the first one, which corresponded to a classroom where 100% of children received free lunch, and following the list until we achieved the pre-defined number of classrooms. By following that procedure, the last classroom included had 28% of its children receiving free lunch. During the recruitment process (which took place at the beginning of the school year), the project was explained to the preschool teachers, including the possibility of starting the IY-TCM training within a month (for the experimental group) or only in the subsequent school year (for the control group). After preschool teachers were recruited and had signed an informed consent, we asked that the parents of all the children in their classrooms give individual consent for their children to participate in the study. Most of the parents contacted (91%) signed an informed consent and then completed a sociodemographic questionnaire.

Randomization

We were interested in analyzing whether the level of economic need within the preschools would interact with the intervention. Therefore, we randomized matched pairs of classrooms (based on economic need and classroom size) into each condition in order to have comparable groups (Diehr et al. 1995; Shadish et al. 2002). Several of the teachers were located in the same preschool or school cluster, so in order to avoid potential contamination effects, we randomized these classrooms as blocks, resulting in $N = 52$ randomized pairs; 26 intervention (33 teachers), 26 waiting-list control (32 teachers). Two independent researchers conducted and verified the randomization.

Assessment

Teachers were asked to complete behavior rating scales (see Measures section) for all the children in their classroom whose parents had given their consent, and to complete a

Fig. 1 Flow chart of participants through the trial

¹ One teacher completed the baseline assessment but could not participate in the IY-TCM workshops for personal reasons; another teacher was on sick leave at the time of post-intervention assessment.

² Teacher moved to a different preschool.

sociodemographic questionnaire about themselves. Children were evaluated before the beginning of the IY-TCM training and 1–2 months after the end of the training, i.e., 7 months after the first assessment. Psychologists who were unaware of the classroom allocation to the experimental/control condition conducted all the evaluation process. Teachers from the control group were offered the IY-TCM training during the subsequent school year.

Intervention

The IY-TCM training took place between November 2015 and April 2016, in six monthly 6-hour workshops held on Saturdays. We randomly distributed teachers in the experimental group by two IY-TCM groups, each one led by a facilitator with experience in leading IY-TCM groups, with the help of a less experienced co-leader who had also completed a 3-day training workshop for

IY-TCM group leaders. Integrity was also assured by following the detailed training manual and session protocols for each session. The training and all the materials for trainees were free, as was the lunch on training days, and as a further incentive to participate, professionals could obtain academic credits. The average attendance rate was 5.5 days ($SD = 0.70$). Both between workshops and after the final workshop, there were four sessions of individual in-class support (Reinke et al. 2012). They consisted of co-leaders going to each class for one hour on average to assist teachers with the implementation of strategies learned in the workshops and to support them with problem-solving and goal-setting, or to make-up sessions for those who had missed a workshop. Between sessions 2–3 and 5–6, individualized coaching was done via email. Teachers from the control group were offered the training in the subsequent school year (cf. Fig. 1), also organized into two training groups.

Measures

Sociodemographic questionnaire—children and parents

This questionnaire was developed for our study in order to collect children's data (e.g., age, gender) and parents' data (e.g., marital status, job).

Sociodemographic questionnaire—teachers

This questionnaire was also developed for our study and allowed data collection of teachers' characteristics (e.g., age, gender), training (e.g., type and level of training), and professional background (e.g., number of years in the job), as well as information about the respective group of children (e.g., number of boys and girls).

Preschool and Kindergarten Behavior Scales—2nd edition (PKBS-2)

The PKBS-2 is a behavior rating scale that may be completed by parents, teachers or other caregivers to evaluate social skills and behavioral problems of 3 to 6 year-old children (Merrell 2002). In our study, teachers completed the Portuguese version of the scales (Major 2011; Major and Seabra-Santos 2014). It comprises 80 items (all the α values that follow were obtained from our study): 34 in a Social Skills scale ($\alpha = 0.96$), distributed over three subscales— Cooperation/Social Adjustment (11 items, e.g., "Follows rules"; $\alpha = 0.93$), Social Interaction/Empathy (10 items, e.g., "Comforts other children who are upset"; $\alpha = 0.94$) and Social Independence/Assertiveness (13 items, e.g., "Makes friends easily"; $\alpha = 0.92$)—and 46 items in a Problem Behavior scale ($\alpha = 0.97$), which scores on two subscales—Externalizing (with 29 items; $\alpha = 0.97$), and Internalizing (with 17 items; $\alpha = 0.92$). The Problem Behavior subscales are, in turn, divided into five supplementary subscales derived from second order factor analysis studies: three for the Externalizing subscale—Anti-Social/Aggressive (e.g., "Gets into many fights"; $\alpha = 0.95$), Opposition/Explosive (e.g., "Has temper outbursts or tantrums"; $\alpha = 0.92$), and Over-Activity/Lack of Attention (e.g., "Is restless and fidgety"; $\alpha = 0.94$); and two for the Internalizing subscale—Social Withdrawal (e.g., "Has problems making friends"; $\alpha = 0.88$), and Anxiety/Somatic Complaints (e.g., "Is anxious or tense"; $\alpha = 0.87$). Lower scores on the Social Skills scale reflect lower levels of social skills, whereas higher scores on the Problem Behavior scale mean higher levels of behavior problems. Risk levels were determined, both in the original version and in the validation for Portuguese children, based on the 15 or 5% lowest results for the Social Skills scale, and on the 15 or 5%

highest results for the Problem Behavior scale (defining moderate-risk or high-risk, respectively).

Data Analyses

We conducted the analyses in our study using linear mixed models (LMM) with random intercepts with SPSS software version 24. The time by condition interaction was used to assess differences in change from pre- to post-intervention for children in the two conditions. The time component was used as a fixed factor and controlled for the children's pre-intervention scores. Random intercepts were modeled at the individual (child) and group (class) level to account for non-independence in the sample, that is, children nested within classrooms (Shek and Ma 2011). The percentage of students receiving free lunch was included as a covariate in all of the analyses in order to control for the variable used in the matching randomization procedure (Kahan and Morris 2012). The effect sizes that we report in the present study are based on adjusted Hedges' g values (Hedges 2007). The adjustment is made to allow for the multi-level nature of the data, so that the variance of the between-level data (at the classroom level) is portioned out of the calculation. Therefore, only the within-level variance (at the student level) is used to calculate the effect size. The effect sizes were evaluated using Cohen's criteria (Cohen 1988): 0.2 is small, 0.50 is medium, 0.80 is large, and 1.30 is very large.

The analyses were conducted using an intention to treat (ITT) approach, where all children with a completed pre-intervention questionnaire were included in the analyses unless they specifically requested to be removed from the study ($n = 0$). Prior to analyses, Little's MCAR test was conducted to assess missing value patterns at post-intervention assessment, $\chi^2(2) = 0.06$, $p = 0.97$. Missing values at post-intervention were then imputed using the multiple imputation (MI) procedure, which produces replacement values for missing data based on available data (Graham 2009). The linear mixed models analyses reported in the Results section are pooled results based on 30 datasets ($m = 30$), where the number of imputed datasets are equal to or greater than the proportion of missing data (White et al. 2011).

Results

Social Skills

The IY-TCM group was significantly lower than the control group in the Social Skills scale prior to intervention, $t(1028) = 3.61$, $p < 0.001$. At post-intervention, the children in the IY-TCM group had higher ratings of social skills than the

children in the control group ($M = 87.82$ vs. $M = 86.99$, respectively). Change from pre- to post-intervention was greater among the IY-TCM group who showed significant increases in social skills from pre- to post-intervention when compared with the control group, $t(1030) = 5.32$, $p < 0.001$. We also observed the same effect for the three Social Skills subscales: Cooperation/Social Adjustment, Social Interaction/Empathy and Social Independence/Assertiveness. For details about changes from pre- to post-intervention and effect sizes, see Table 2. In the IY-TCM group, the number of children who moved from the moderate or high-risk range in the Social Skills scale to the low-risk range was 8.7 times the number of children who moved in the opposite direction (6.0 times in the control group).

Problem Behavior

The IY-TCM group began with similar, non-statistically different rates of mean problem behavior as the control group, $t(1027) = 0.33$, $p = 0.745$. Change from pre- to post-intervention was greater among the IY-TCM group, who showed significant decreases in problem behavior from pre- to post-intervention when compared with the control group, $t(1030) = -4.28$, $p < 0.001$. The same effect was also observed for the two Problem Behavior subscales and their five supplementary subscales: Externalizing (Anti-Social/Aggressive, Opposition/Explosive, and Over-Activity/Lack of Attention), and Internalizing (Social Withdrawal, and Anxiety/Somatic Complaints). For details about changes from pre- to post-intervention and effect sizes, see Table 2. In the IY-TCM group, the number of children who moved from the moderate or high-risk range to the low-risk range was 3.3 times the number who moved in the opposite direction, for the Problem Behavior scale (1.6 times in the control group).

Interactions

Overall, children receiving free lunch had the lowest scores for social skills and the highest levels of problem behaviors in both the IY-TCM and control groups. There was a significant interaction between the status of free lunch and the intervention for social skills, $t(1027) = 2.20$, $p < 0.05$, but not for problem behaviors, $t(1027) = 0.54$, $p = 0.59$. The children in the IY-TCM group receiving free lunch showed a greater improvement in social skills from pre- to post-intervention, $\Delta M = 11.79$, related to IY-TCM children not receiving free lunch, $\Delta M = 9.76$. The final mean scores of social skills for children receiving free lunch, however, remained statistically lower at post-intervention than their non-free lunch counterparts in the IY-TCM group, $t(498) = 4.50$, $p < 0.001$.

Table 2 Estimated marginal means, standard deviations, and group differences from pre to post

	IY-TCM group		Control group		Pre-Post <i>t</i> (<i>g</i>)
	Pre <i>M</i> (SD)	Post <i>M</i> (SD)	Pre <i>M</i> (SD)	Post <i>M</i> (SD)	
Social Skills	77.49 (31.06)	87.82 (31.30)	81.49 (30.26)	86.99 (30.45)	5.32*** (0.21)
Social Independence	31.22 (11.78)	34.57 (11.82)	32.48 (11.48)	34.35 (11.52)	4.21*** (0.16)
Social Cooperation	25.56 (10.07)	28.45 (10.09)	26.92 (9.81)	28.46 (9.85)	4.41*** (0.18)
Social Interaction	20.71 (12.87)	24.65 (12.92)	22.09 (12.53)	24.29 (12.59)	4.99*** (0.18)
Problem Behavior	38.87 (73.25)	31.65 (73.62)	36.92 (71.21)	35.56 (71.44)	-4.28*** (-0.10)
Externalizing	25.84 (47.96)	21.35 (47.98)	25.02 (46.64)	23.94 (46.66)	-3.64*** (-0.09)
Anti-Social	8.10 (19.05)	7.02 (19.07)	7.64 (18.53)	7.59 (18.55)	-2.64** (-0.07)
Opposition	8.50 (16.11)	7.04 (16.13)	8.08 (15.67)	7.65 (15.68)	-3.23** (-0.08)
Over-Activity	9.22 (14.26)	7.28 (14.27)	9.30 (13.87)	8.70 (13.89)	-4.16*** (-0.13)
Internalizing	13.02 (27.69)	10.21 (27.72)	11.89 (26.91)	11.42 (26.93)	-5.02*** (-0.10)
Social Withdrawal	5.62 (13.22)	4.40 (13.25)	5.19 (12.85)	4.73 (12.86)	-3.19** (-0.07)
Anxiety	7.39 (14.70)	5.82 (14.71)	6.70 (14.29)	6.68 (14.30)	-5.43*** (-0.12)

M and SD are reported from pooled results from $m = 30$ datasets. Hedge's *g* is computed from changes in *M* scores from pre- to post-intervention

** $p < 0.01$; *** $p < 0.001$

There was a significant interaction effect for children who were at lower levels of social skills (high-risk) at pre-intervention when compared with children in the low-risk range (i.e., risk by intervention interaction), $t(1030) = -2.36$, $p < 0.05$. This means that children at high risk benefited more from the intervention than children at low risk. There was no statistically significant difference between children at moderate risk for social skills and low-risk children, $t(1030) = 0.78$, $p = 0.43$. There were no significant interactions for children with high risk or moderate risk of problem behaviors at pre-intervention, $t(1030) = -0.75$, $p = 0.45$, and $t(1030) = -0.93$, $p = 0.35$, respectively.

Discussion

The main purpose of our study was to evaluate the effects of the IY-TCM as a stand-alone intervention among

Portuguese preschoolers from low-income areas. Having this goal in mind, we recruited the participating preschools according to the percentage of children who received free lunch as a proxy indicator of economic need.

Taken as a whole, the sample had a high proportion of children who were entitled to free lunch, when compared with the Portuguese population of school age children attending public schools. In comparison with the national standards, these children scored lower in social skills and slightly higher in externalizing behavior problems (although not in internalizing ones). These characteristics draw attention to the fact that children from a disadvantaged socio-economical background may be at a higher risk for a poor behavioral and emotional development, as it is highly reflected in literature (Raver et al. 2009; Webster-Stratton et al. 2015).

Results confirm our first hypothesis, according to which preschoolers in the IY-TCM classrooms would show higher increases in social skills and decreases in problem behavior. In fact, although the observed effect sizes were small, according to Cohen's criteria (Cohen 1988), they consistently indicated better outcomes in the IY-TCM group. In line with previous research children in the IY-TCM group improved their social skills more, as reflected by significantly higher increases than the Control group in the Social Skills scale and all its subscales (Baker-Henningham et al. 2012; Fossum et al. 2017; Reinke et al. 2016; Webster-Stratton et al. 2001, 2004, 2008). Also, in accordance with other studies, the IY-TCM group showed a significantly higher reduction of problem behavior (Baker-Henningham et al. 2012; Fossum et al. 2017; Hutchings et al. 2013; McGilloway et al. 2011; Raver et al. 2009; Webster-Stratton et al. 2001, 2004, 2008). This improvement was observed both in externalizing and internalizing problem behavior, and in all the supplementary subscales evaluating problem behavior. The percentage of children at risk for low social skills and high problem behavior decreased more in the experimental group than in the control group.

The relevance of these outcomes should be understood in light of the evidence that supports the importance of developing socio-emotional competence in the first 5 years, given the impact that those skills have on the well-being and later ability to adapt in school and to form successful relationships throughout life (NSCDC 2004; Pinto and Raimundo 2016). Our results also have significant implications for the classroom environment, as research shows that negative behaviors in the preschool context do not only affect the child who exhibits them, but they also have an important negative impact on peers and teachers (Carlson et al. 2011; McGilloway et al. 2011). On the contrary, the IY-TCM may help create a classroom environment more favorable to positive child development (Reinke et al. 2016)

and ultimately increase children's engagement with school and enhance their academic abilities (McGilloway et al. 2011).

The efficacy of the IY-TCM program had already been supported in different countries, such as Norway, Ireland, the UK or Jamaica. Our study extends the demonstration of transportability of the program, in this case to the Portuguese context. The idea highlighted in meta-analytic studies, suggesting that parenting interventions appear to be as effective when transported to countries different from those in which they were developed, without the need of extensive adaptations (Gardner et al. 2016; Leijten et al. 2016), seems to apply also to the IY-TCM teacher's intervention. Nevertheless, a further systematic review and meta-analysis of the IY-TCM impact in different countries is necessary in order to demonstrate its transportability more consistently.

The positive results of our study, while confirming previous research with the IY-TCM, may reflect the way the program gives teachers adequate tools to address the children's needs by recognizing that positively focused processes are critical to change and integrating them as core components of the program (Kazdin 2008). Another component of the program that may have contributed to the positive changes observed is the strong emphasis on social and emotional coaching and problem-solving (Reinke et al. 2016). Still other characteristics that seem to aid in obtaining good results are its flexibility, its level of ease in adapting to the individual children and classroom needs, and its way of both respecting and dealing with differences (Hutchings et al. 2013; Weisz et al. 2005).

Another goal of our study was to explore whether the program is more effective for some children than for others in terms of their initial behavioral risk or the presence of economical need. Our results confirm the second hypothesis of larger benefits for social skills but not for problem behavior. Children who show greater improvements are those with lower levels of social skills (high risk) at pre-intervention, which is consistent with others studies (McGilloway et al. 2011; Reinke et al. 2016; Webster-Stratton et al. 2001), and those coming from families in economic need. Therefore, as noted in the study by Reinke et al. (2016), these results indicate that the IY-TCM can greatly reduce the gap between children with and without behavioral or economic challenges on important social behavioral outcomes by enhancing the protective role of the preschool environment and thus contributing to lowering the risk associated with these conditions. However, it is noteworthy that children entitled to free lunch in the IY-TCM group remained statistically lower in social skills at post-intervention than their non-free lunch counterparts did, which draws attention to the need for additional intervention in order to counterbalance the effects of economic disadvantage.

The fact that we did not find similar effects for the Problem Behavior scale may be a consequence of the characteristics of those children who participated in the study, who had close to average results on that scale at baseline. In fact, the percentage of children at risk (19%) was not very different from the expected value according to the national standards (15%) (i.e., there were relatively few children in risk groups at baseline). A possible explanation is that, in a sample with such characteristics, the exposure to the preschool environment per se may make a difference in reducing problem behavior in children with higher levels of these problems, thus buffering possible moderating effects of the analyzed variables (Hayes 2008; Heckman et al. 2013). Further studies may explore whether these effects may appear in more deprived samples (with a higher percentage of free lunch eligible children) and/or ones with lower scores at baseline. Furthermore, although the children in moderate- and high-risk groups for problem behavior did not show a statistically significant interaction with the intervention, the direction of change was as expected; children in the moderate- and high-risk groups showed positive reactions to the IY-TCM intervention over and above their counterparts in the control group.

Limitations and Strengths

This study has several limitations that are worthy of note. The first concerns the fact that only 55% of the teachers eligible to participate in the study actually agreed to participate. This may call into question to what extent the findings may be generalizable, as it is possible that the participants in the study were more motivated to learn new strategies and to change their classroom practices than were teachers in general. This issue has to do with the difficulties of transporting good practices to real life conditions under which we conducted our study, where hiring substitute teachers to allow regular ones to participate in a training during the working hours was not feasible (Carlson et al. 2011). The low enrollment numbers may also have influenced the results in another way. Following the recruitment procedure (as described in the Methods section), the last preschool included in the study had only 28% of its children receiving free lunch. Given the stronger impact of the IY-TCM intervention on children receiving free lunch, one may speculate that if a higher percentage of children with these characteristics were included in the study, the evaluated impact could be stronger.

A second limitation is the non-equivalence of the experimental and control groups. Despite the randomization procedures based on economic need and classroom size, the groups were different with respect to the percentage of children entitled to free lunch, as well as the scores on social skills at baseline. This circumstance has limited the

possibility of comparing the two groups according to the evolution in the percentage of children at different risk levels. The non-equivalence of groups at baseline also restricts the generalizability of results since the lower scores of children in the IY-TCM group, prior to the intervention, may have given them more room for improvement, thus amplifying the impact (Hutchings et al. 2013; McGilloway et al. 2011; Reinke et al. 2016; Webster-Stratton et al. 2001).

A third limitation concerns the fact that results were obtained based on rating scales completed by teachers. Teachers are considered as reliable raters of children's behavior due to the extended periods of time they spend with them in different situations (e.g., interacting with peers, playing, performing structured tasks), and the normative perspective they have on youth behaviors in which to anchor their evaluations (Major et al. 2015; Reinke et al. 2016). Nonetheless, the fact that experimental teachers were directly involved in the training and the additional attention they received from the workshop leaders may have biased their assessments. In contrast, the use of observation measures could have improved the validity of results, and its inclusion in future studies may, therefore, be relevant.

Finally, we evaluated the impact shortly after the end of the intervention, which could have masked some of the effects that may not be immediately visible after an intervention. A long-term follow-up of this sample may clarify the feasible presence of these "sleeping effects" (De Los Reyes and Kazdin 2006). Also, as suggested by Hutchings et al. (2013), a longitudinal study that tracks children throughout the transition to school may also clarify the effectiveness of the IY-TCM in supporting children in a period of life when they may face considerable challenges.

Despite these limitations, our study has several strengths that make it a relevant contribution to the existing research. First, our results add to the growing evidence, which supports the effectiveness of the IY-TCM as a stand-alone, non-adapted program in a Portuguese cultural context (Fossum et al. 2017; Reinke et al. 2016). These findings add to our knowledge of effective promising interventions for reducing behavior problems and strengthening preschoolers' behavioral skills that are known to be protective and have enormous impact over the course of a lifetime (NSCDC 2004). Our study also points out that positive effects may be achieved without delivering the intervention directly to the children (Hutchings et al. 2013). Additionally, the new skills learned by teachers may be used not only with all the children in their class, but also in the coming years with new cohorts of children, thus creating a "snowball effect" that may enhance sustainability of the training effects over time (Baker-Henningham et al. 2012; Webster-Stratton et al. 2001). This circumstance may contribute to the cost-effectiveness of the program, verified in other studies (Longdon et al. 2017; McGilloway et al. 2011).

Second, by verifying that the impact was greater in preschoolers who initially were at higher behavioral risk and preschoolers coming from families in economic need, the study identifies an area for future research regarding the characteristics of children who may benefit the most from the intervention, and to whom society should direct its efforts first. Future research may further clarify whether the program is effective as a way of reducing child risk factors and the consequent gaps observed between children coming from different economic backgrounds (Reinke et al. 2016; Webster-Stratton et al. 2001).

Third, our study also has several methodological strengths. It is a randomized controlled trial grounded on a large sample, which uses analyses controlling for clustering effects. In addition, it uses the “pre-school” as the unit of randomization to prevent contamination among teachers. Finally, all the evaluations were conducted by psychologists who were unaware of the classroom allocation to the condition of the preschool teachers/students, which reduces the potential of reporting bias influencing the results.

The importance of learning socio-emotional skills early in life is well established in the Portuguese legislation and guidelines, both in the education and in the health sectors. The Curricular Guidelines for Pre-School Education highlight the area of personal and social training as one of its content areas, “considered as transversal since, although it has specific purposes and contents, is present in all the educational work carried out in preschool” (Silva et al. 2016, p. 33). The Ministry of Education defines socio-emotional and interpersonal skills as a key cluster of skills that students must train during compulsory education (Martins et al. 2017). The National Plan for Mental Health 2007–2016 also stresses the need to implement internationally validated prevention programs focused on risk areas and groups, with a special emphasis on early childhood programs (Coordenação Nacional para a Saúde Mental 2008). The Ministry of Health reinforces these guidelines, namely with regard to the strengthening of evidence-based knowledge, sharing of best practices in mental health, and cooperation between sectors (Direção Geral de Saúde 2016). Future research should focus on clarifying the specific conditions where implementing the IY-TCM training may be most effective in achieving these goals (see Hutchings and Williams 2017, for a good example of a successful implementation process).

Author Contributions M.J.S.S. was Principal Investigator, conceived the study, wrote the grant, designed the study, conducted the analyses, interpreted the findings and drafted the paper. M.F.G. conceived the study, wrote the grant, designed the study, implemented the IY-TCM and interpreted the findings. S.M. designed the study, conducted the evaluations, interpreted the findings, and assisted the data analysis and editing of the final manuscript. J.P. conducted the analyses and

contributed to the design and writing. A.F.A., T.C.H., designed the study, implemented the IY-TCM and interpreted the findings. M.P. conducted the evaluations, managed the study and data, and contributed to the design and writing. E.B. managed the study and data, and contributed to the design and writing. V.V. implemented the IY-TCM. S.K. was expert advisor for the grant. All authors commented upon and approved the final manuscript.

Compliance with Ethical Standards

Conflict of Interest The Incredible Years is a trademark owned by The Incredible Years, Inc. The second author may receive occasional payments for training leaders in the Incredible Years TCM program. The other authors declare that they have no other competing interests.

Ethical Approval The main Portuguese authority in ethical issues, the Portuguese Data Protection Commission (CNPD, No.3953/2016), and the Ethics Commission of the Faculty of Psychology and Educational Sciences of the University of Coimbra provided approval for the research. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all the teachers who participated in the study, as well as from the parents or legal caregivers of all the participating children.

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