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Strengthening Socio-Cognitive and Emotional Skills in Early Education through a School-Based Program: Preliminary Study

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Abstract: This work has two objectives. The first is to describe a program to strengthen socio-cognitive abilities in initial education children (called PHSC), which is focused on training teachers on its implementation in the classroom. The second objective is to examine the effectiveness of the program when it is applied in schools with different socio-cultural contexts. It involved a total of 257 initial-level students attending two pre-primary schools in the province of Mendoza. One school was in an urban area of a more stable social environment, and the other in a socially-vulnerable area. The program was administered by teachers who had been trained for it. Pre- and post-assessments were conducted using socio-cognitive tests on the students. The teachers responded to the Executive Functioning Scale for initial education children before and after implementation of the PHSC program, and parents responded to an on-line survey to find out whether they had noticed any improvements or positive changes after the application of the program. The results suggest the possibility that this program, implemented by teachers, could improve the socio-cognitive abilities in children of both of the different social contexts, as well as being a driver to create conditions of equal opportunities and generate learning benefits in all their students.

Keywords: *Socio-cognitive functioning, early education, workshop for educators, Argentine students.*

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Introduction

Early childhood is a stage in which multiple changes occur in the cognitive, social and emotional development of boys and girls. It is described as a "sensitive period" of development, due to a combination of factors, such as relatively high brain plasticity, the rapid development of neurocognitive processes that are the basis of socio-cognitive and emotional functioning (Zelazo, 2015) and development contexts.

During the early years, the rudiments of socio-cognitive and emotional capacities emerge. Then, between the ages of 3 and 5, important achievements are recorded, characterized by a process of integration and coordination of these capacities. Consequently, it is observed that children begin to develop the skills to maintain more than one representation in their mind, to flexibly change the attention focus, to inhibit a dominant response tendency and to regulate their emotions (Diamond, 2013; Ison & Espósito, 2020; Zelazo et al., 2018).

What characterizes the development of socio-cognitive and emotional functioning during childhood is that different functions mature at different ages, and their internal relationships are modified through development, by virtue of interaction with the environment (Florez-Lázaro et al., 2014; Zelazo, et al., 2016; Zelazo et al., 2018). Meta-analysis studies have highlighted that three periods stand out, in which these processes develop more widely and that coincide with peaks of intense metabolic activation of the frontal lobes: from 4-to-8 years, from 10-to- 12 years and from 16- to-19 years (Portellano-Pérez, 2005; Romine & Reynolds, 2005; Hughes, 2011). In turn, the importance of cognitive control processes for obtaining academic achievement in learning contexts is well-documented (Diamond & Ling, 2016; Ison, 2015; Korzeniowski, 2015; Korzeniowski et al., 2016; Korzeniowski et al., 2017; Sulik et al., 2018; Traverso et al. 2019).

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Moreover, the socio-cognitive and emotional functions can be strengthened with practice, through the implementation of stimulation programs. When these interventions are early, intensive, systematic, and sustained over time, they generate notable benefits for children. Those that use different sensory channels, that stimulate various functions, that are articulated with daily activities and that train significant adults in the environment, generate results with greater ecological validity.

In this sense, family and school are two of the most important social institutions that involve the development of children (Gerrard & Soriano, 2019). Thus, there would be no socio-cognitive and emotional functioning in children that could unfold, independently of narrow interaction with significant developmental contexts. Therefore, socio-cognitive functioning in childhood must be understood as a dynamic, multifactorial process, and that depends, on a large part, on the situation in which its development occurs (Brizuela & Scheuer, 2016).

Considering the contextual and socio-cultural approaches to development, collaborative interactions that are established between children, their classmates and significant adults in the surrondings form a favourable environment for learning experiences (Vygotsky, 1988; Rogoff et al., 2011). This refers to the concept of Proximal Development Zone, widely studied, referring to a shared psychological place where the adult can interact with children that favors socio-cognitive and emotional development, through mediation (Casas-Miranda et al., 1999).

In Argentina, the formal educational system starts at 4 years. For younger boys and girls, this situation represents a challenge and an opportunity in terms of establishing new interpersonal relationships with peers and significant adults, generating a favourable place for the unfolding of socio-cognitive and emotional-cognitive performance.

It is in the framework of these socio-emotional interactions where children will develop their potential at the cognitive level, progressively internalising these experiences and working together with their peers and their teacher, whose role is to be a facilitator of learning.

The current challenge is to develop intervention proposals, adapted to the needs of children, that constitute tools to enhance and strengthen children's learning capacities and interpersonal skills, in order to contribute to their integral development.

Literature Review

Socio-cognitive and emotional functioning in early childhood: How is its development strengthened?

Socio-cognitive and emotional functioning is a broad and multidimensional construct that encompasses a series of highly-interrelated and interdependent cognitive and socio-affective processes, responsible for the self-regulation of behavior. They start to face the solution of problem situations, both in the interpersonal and academic order. Called executive functioning by many authors, this construct has been associated with academic achievement, especially in early and middle childhood (Blair & Raver, 2015; Shaul & Schwartz, 2014; Zelazo et al., 2018).

There is a consensus in pointing out that the core of socio-cognitive functioning is composed of inhibitory control, cognitive flexibility and working memory, highly-interrelated processes that share a common denominator, that of an underlying executive attention factor (Collins & Koechlin 2012; Diamond, 2013; Miyake et al., 2000; Posner & Rothbarh, 2014). Their harmonious functioning forms the basis for high-order processes such as reasoning, problem solving, decision-making, functions that intervene in emotional self-regulation (Baggetta & Alexander, 2016; Best et al., 2011; Canet Juric et al., 2013; Clements et al., 2016; Collins & Koechlin, 2012; Diamond & Ling, 2016; Korzeniowski et al., 2016; Lipina & Evers, 2017; Nyroosa, et al, 2018).

Early childhood, approximately 2-to-6 years of age, is considered a “window of opportunity” for the development of socio-cognitive and emotional functioning (Traverso et al., 2019; Zelazo et al., 2016). Specifically, between 4 and 6 years of age, there is a progressive reorganization, both in inhibitory control and in working memory, functions that, although different, are interrelated (Miller et al., 2012).

Longitudinal studies provide consistent evidence of the interdependence between cognitive control processes and learning: good cognitive performance favors academic learning and the activities involved in school learning strengthen socio-cognitive functioning (Fuhs et al., 2014). Thus, socio-cognitive functioning is critical to performance in many of the types of learning activities that children participate in, in kindergarten and early elementary school. Several studies have shown that good performance in cognitive control functions favors academic achievement (Korzeniowski et al., 2016; Korzeniowski et al., 2017; Korzeniowski et al., 2020; Segretin et al., 2014; Zelazo et al., 2018). Although socio-cognitive functioning can be improved through training and practice, it can also be diminished by adverse experiences (Alam et al., 2017; Blair & Raver, 2014; Evans & Schamberg, 2009; Ison et al., 2015).

Throughout our work experience in marginalized urban schools, it has been usual to meet families in situations of psychosocial vulnerability, where boys and girls experience daily situations of socio-family stress, which are conditions that predispose to greater disorganization in family dynamics and in the establishment of an ambivalent socio-affective communication (Ison et al., 2015; Korzeniowski et al., 2020; Morelato et al., 2019). Thus, high levels of stress in childhood

are associated with low socio-cognitive performances, and, in turn, low socio-cognitive performances can lead to higher levels of stress manifested in learning situations (Evans & Schamberg, 2009).

One of the areas where the implementation of prevention strategies and actions is essential are socially-vulnerable school contexts. Social vulnerability is a condition that alludes to a certain fragility in the potentialities of some social groups as a result of the influence of risk factors (Giberti, 2005). It results from the dynamic relationship between the resources that facilitate the individual to function in society and the opportunities for access to well-being, an aspect provided by the market, the state and the community (Golovanevsky, 2007; Ison et al., 2015; Lenta & Zaldúa, 2020).

However, there is also evidence that good performance in these functions can protect against risks associated with social vulnerability (Korzeniowski et al., 2017; Morelato et al., 2019; Segretin et al., 2014) and the risk of academic failure (Masten et al. 2012). In this sense, school represents an area in which not only does educational work develop, but at the same time, significant interpersonal relationships are also generated and forms of social behavior are also learned. This dynamic teaching-learning process demands from the school certain cognitive, social and emotional skills to solve situations in the educational context (Ison, 2010), and the school plays a central role in modulating the processes involved in the emotional and cognitive self-regulation of young children (Nyroosa et al., 2018; Walk et al., 2018). Overall, recent research done with elementary school teachers emphasises the impact neuroscience has had on analysing learning, related to: the way students learn, the approach to learning, the effectiveness of teaching and the determination of teachers. In particular, one of the results obtained suggests that teachers may collectively feel more effective when they learn about and comprehend the enormous malleability and ability to learn that is present in each and every student (Gutshall, 2020).

Early childhood is a time of great richness and fecundity for interventions oriented towards the development of socio-cognitive and emotional skills, promoting psychosocial well-being during childhood and adult life. In summary, the cognitive and socio-emotional functions of schoolchildren can be strengthened with practice, through the implementation of stimulation program. Furthermore, various studies have emphasized that their implementation by teachers can contribute to significant improvements in the socio-cognitive functioning of their students, increasing the ecological validity of the intervention (Diamond & Ling, 2016; Traverso, et al., 2015, 2019).

Our research team has been working for years in the application of socio-cognitive and emotional intervention programs in schoolchildren aged 7-to-12 years (Ison, 2009, 2010, 2015; Korzeniowski et al., 2020). Based on this, in 2017, we were summoned by the Directorate of Initial Education, under the General Directorate of Schools (DGE), of the province of Mendoza, Argentina, to design and implement a program to strengthen socio-cognitive and emotional in early childhood. Thus, arose the Integral Initial Level Pilot Project (PINI), whose objective was to promote successful educational trajectories in boys and girls aged 4 and 5, through teacher training linking general "classroom" sessions with physical education, music education and English instruction

Methodology

Research Goal

This work has two objectives. The first is to describe a program to strengthen socio-cognitive and emotional abilities in initial education children (called PHSCE), which is focused on training teachers on its implementation in the classroom. The second objective is to examine the effectiveness of the program when it is applied in schools with different socio-cultural contexts.

Design

This study is descriptive, with a quantitative focus. The design was quasi-experimental, pre-post, in which there are intragroup and intergroup comparisons (Montero & León, 2007).

Participants

Initially, a total of 257 children of 4 and 5 years, 132 males and 125 females, from two early childhood education public schools from province of Mendoza (Argentina), participated in the study. A total of twenty-five children were excluded from the final sample: six of them left school during data collection, and nineteen children did not take part in the assessment at pre- or post-test evaluation.

The final sample included a total of 232 children of 4 and 5 years, 112 males and 120 females, and 11 pre-school teachers from both public schools. At the time of first testing, children had an average age of 62 months (SD = 7.02 months). We worked in 2 public primary schools, with different socio-contextual characteristics. The first school was urban, in Mendoza Capital, involving 3 teachers and 111 schoolchildren, 56 males and 55 females (M_{age} = 63 months, SD = 7.06 months). However, the second was located in a socially-vulnerable area of a municipality near Mendoza Capital, involving 8 teachers and 121 schoolchildren, 56 males and 65 females (M_{age} = 62 months, SD = 6.27). Table 1 shows the age distribution.

In the province of Mendoza, public schools are classified according to areas: urban, urban-marginalized, rural, rural-marginalized and rural-border (General Directorate of Schools, 2014). The classification takes into account factors such as: habitat conditions and services, environmental conditions with or without limitations to access to goods and services, and some social aspects, like schooling and occupation of parents or caregiver.

Table 1. Age distribution of the children, for both pre-primary schools

	Urban Environment	**Vulnerable Environment**	**Total**
	f **(%)**	***f*** **(%)**	***f*** **(%)**
Classes, 4 years	49 (44.1)	57 (47.1)	106 (45.7)
Classes, 5 years	62 (55.9)	64 (52.9)	126 (54.3)
n Total	111	121	232

Instruments:

Maturity indicators: evaluated through of the Human Figure Drawing (HFD) test. This graphic test was proposed by Goodenough-Harris (1950), and updated to Argentine norms by Fernández Liporace et al., (2017). Due to drawing being one of the favourite activities in early childhood, it is used to evaluate indicators of conceptual maturity, in which 62 maturational items are analysed based on the presence or absence of attributes in the drawing of the human figure. The score consists of assigning 1 point to each item present in the drawing, then a total score is obtained, which is transformed by percentile norms for its interpretation. HDF has been found to be internally consistent with Cronbach's α coefficient being above .90 (Fernández Liporace et al., 2017).

Sustained attention: evaluated with the CUMANIN figure cancellation test (Portellano et al., 2006). This assesses the ability to sustain attention for a period of time and the ability to encode simple visual stimuli. It consists of a visual search task, through which the child must identify and cross-out a simple figure (square), proposed as a model, selecting it from a total of 100 simple figures (triangles, rhombuses, rectangles and circles), of which 80 are distracting. Therefore, a total of 20 squares equal to the model must be identified. It has the advantage of being a version free of linguistic and cultural influence. This technique has an internal consistency of .59 Cronbach's α. (Portellano et al., 2006).

Visomotor perception, visuo-spatial skills and working memory: analyzed using the Rey Complex Figure Copy and Memory Reproduction test (Figure B- Rey, 1987; Lozada & Espósito, 2018). The stimulus consists of simple geometric figures that, when assembled, form a complex overall structure. Its administration consists of two phases: the first, the copy phase, involves copying of the stimulus with the original figure present; and second, after a few minutes, the memory phase, which is performed without the original copy present. The child, after a few minutes, must evoke the previously-copied figure; that is, the child must temporarily retain the visual characteristics of the object, and then draw what is remembered from the copy phase. Due to this complexity, the child is required to have an analytical and organizing activity with the elements that compose the test. These results have percentile norms for students from Mendoza aged 4 to 5 (Lozada & Espósito, 2018). The reliability was α = 0.765 for copy and α = 0.664 for memory. The factor analysis showed that the 9 perceptual units form one consistent factor that explains the 20.7 % of the total variance for the copy trial and 29.3 % of the total variance for memory. These results can be considered a valid and reliable standard parameter for 4-to-8-year-old children (Cortez et al., 1997).

Recognition of emotions. This instrument consists of 6 cards, each of which contains a drawing of a child's face representing an emotion. The evaluated emotions are: joy, anger, fear, surprise, displeasure and sadness tristeza (Ison & González, 2018). The administration of this technique is individual and the cards are presented one at a time, in the previously- indicated sequence. When asked, "What is this baby feeling?" and "What's happening with the baby?", the child's response is recorded on a form. Then, the number of emotions the child could correctly recognize are counted. This technique has shown an internal consistency of .63 Cronbach's α. Regarding the validity of the criteria, significant positive correlations were observed between performance in recognition of emotions and maturity indicators (Ison & González, 2018).

Executive Function Scale of students (EFS, Korzeniowski & Ison, 2019) was answered by the teachers. The internal consistency of the scale was .95- IC 95% [.94, .96]. The EFS assesses the teacher`s perception of behaviors in students that denote: attention, metacognition, inhibitory control, organizing, planning, cognitive flexibility and working memory. For the correct interpretation of the EFS, it is necessary to take into account that, a higher score in Attention, Inhibitory Control, Organizing, and Cognitive Flexibility signifies a lower level performance in these functions. On the contrary, for the Metacognition, Planning, and Working Memory factors, a higher score implies a better level of performance.

Program for the strengthening of socio-cognitive and emotional skills (PHSCE)

The program described has the purpose of strengthening the socio-cognitive and emotional functioning in children aged 4 and 5 (Ison & Espósito, 2020), directly involving teachers and indirectly engaging parents. Previous research carried out by our group and the experience of the initial education teachers contributed to its development (Ison, 2009, 2010, 2015; Korzeniowski et al., 2017; Morelato et al., 2019).

This proposal, developed for the schools that participated in the PINI, has 3 lines of action: children, teachers and parents, with the purpose of:

a) Optimizing the socio-cognitive-affective performance of schoolchildren;

b) Promoting cooperative work between classroom, physical education, English and music education teachers in order to articulate activities to promote socio-cognitive and emotional functioning in early childhood; and,

c) Promoting teamwork among professionals, teachers and parents in order to foster an interpersonal climate favoring cooperative relationships in the school context.

PHSCE consists of 8 theoretical-practical modules, each of which addresses different themes: 1- Perceptual organization, 2- Attention, 3- Inhibitory Control, 4- Cognitive Flexibility, 5-Working Memory, 6- Recognition of emotions, 7- Resilient attitude and 8- Strengthening socio-emotional resources in school contexts.

Each module has a theoretical foundation that supports a series of practical activities described in a stimulation booklet entitled “Strategies to strengthen cognitive and socio-emotional functioning in initial education” (Ison & Espósito, 2020). This booklet works as a work guide for the teacher, in order to stimulate the socio-cognitive and emotional functions in their students through playful activities.

The preschool teachers learned about the development of socio-cognitive and emotional function of children and their importance for social and academic abilities.

In the modules of Perceptual Organization, Attention, Inhibitory Control, Cognitive Flexibility and Working Memory, the activities were organized in an order of increasing difficulty, from level A to level C. The intention was to generate cognitive challenges in the children, but at the same time, respect the development of individual trajectories in each of them.

*Table 2. S*timulation Program: *degrees of the difficulty of the activity*

Level	Degrees of the Difficulty of the Activity
A	Low
B	Medium
C	High

Level A refers to any activity that is easy and known for the child, being able to perform this task.

Level B requires greater cognitive effort for the age, but still able to perform the activity with minimal outside help.

At level C, the child may require the teacher's assistance and help to achieve the proposed task.

The teachers began to work with the activities of level A, a low degree of difficulty, and once the child had successfully carried out these activities, they went to the next level, and so on. If for some reason the child could not perform an exercise, in any of the proposed levels, the teacher helped the child to understand and later perform it.

The activities of the modules on Recognition of emotions, Resilient attitude and Strengthening socio-emotional resources in school contexts, were organized by the teachers, taking as a guide the activities proposed in the booklet, but creatively incorporating activities according to the characteristics of their groups of students.

The program lasted 4 months, and was incorporated as part of the activities of the school curriculum, working on the socio-cognitive and emotional functions daily through recreational activities based on the activities described in a stimulation booklet. For their part, the teachers guided and monitored the development of the activities, "scaffolding that knowledge", giving positive feedback, trying to maintain the motivation of the group and promoting emotional self-regulation in their students. The teachers functioned as a support structure, or guide, for the execution of the children's tasks, such as helping them to think about how they did the activities, why they did them that way, and what other activities they could think about or do. Although the teacher training program had a defined structure with specific content, the teachers could creatively incorporate other activities, allowing their work to be adjusted to the characteristics of the group of children. The focus was on stimulating group function for strengthening effective action.

Procedures

The work was developed in 3 stages:

Stage 1 - Teacher Training: In 2017, we were summoned by the Directorate of Initial Education of the province of Mendoza, Argentina, to train teachers in socio-cognitive functioning for children in initial education to optimize these functions in their students. In August, the training for kindergarten teachers began. It consisted of 8 theoretical-practical meetings of 2 hours each. The themes of perceptual organization, attention, inhibitory control, cognitive flexibility, working memory, recognition of emotions, resilient attitude and strengthening of socio-emotional resources in school contexts were addressed.

In each meeting, each of the functions and skills involved was analyzed, as well as their evolutionary development and why it was important to promote their development. Thus, teachers learned about children's cognitive and social-emotional development, and its importance for social and academic skills. They also learned to find creative solutions to exercise social-cognitive and emotional functions. In the meetings, ideas were proposed on how to incorporate the contents of the stimulation program into the school curriculum and into the daily routines of the grade. With the Physical Education teachers, English teachers and Music teachers, different activities to implement in their classes were discussed and practiced, to promote the development of socio-cognitive and emotional functions in their students. Associated with these training sessions, our research team developed a booklet with different exercises and strategies to be consulted by teachers and thus to provide ideas on how to transfer what they have learned to practice in their school groups.

Stage 2 - Pre-assessment: In 2018, work began in both schools. The stimulation program was administered by teachers to achieve its ecological validity. All children were assessed before and after the stimulation program. Children were tested individually in four separate sessions, each lasting approximately 20-25 minutes. The assessments took place at school in a silent room during the kindergarten day. The following functions were evaluated in children in a fixed order: maturity indicators, sustained attention, perceptual organization, visuo-spatial skills, working memory and identification of emotions. A fixed order allows better control of the duration of the session and the variation of the tasks, according to individual performances (Traverso et al., 2015).

All children were assessed by psychologists and advanced psychology students, duly-trained for this purpose.

On the other hand, teachers responded to the Executive Function Scale of students for Initial Level (EFS, Korzeniowski & Ison, 2019). The EFs assess the teacher`s perception of behaviors in students that denote: attention, metacognition, inhibitory control, organizing, planning, cognitive flexibility and working memory.

Once the evaluation stage was completed, the implementation of the stimulation program designed to strengthen the socio-cognitive and emotional functioning in kindergarten children began. This program was applied by the teachers for 4 months, working daily on the socio-cognitive and emotional functions with playful activities based on the activities described in the stimulation booklet (Ison & Espósito, 2020).

Stage 3 - Post-evaluation: Subsequent to the application of the intervention program, the researchers proceeded to the re-evaluation of the socio-cognitive and emotional functions in the children. The teachers responded again to the Executive Function Scale of Students for Initial Level (EFS, Korzeniowski & Ison, 2019), in order to investigate if there were changes in the stimulated cognitive functions. Likewise, an online survey was prepared for parents, in order to find out if the stimulation program applied helped to strengthen the socio-cognitive and emotional functions in their children. Parents were asked to rate their level of satisfaction with the stimulation program. The survey consisted of 7 items, each of which was evaluated on a scale from 1 to 5 (1 = 'not satisfied at all', to 5= 'very satisfied'). For example, the survey items made reference to whether the PHSCE program helped the development of socio-cognitive and emotional functions in their children, whether the work material was motivating and interesting for their children, whether the information about the program and its implementation was clear and accurate, whether they had noticed positive changes in the children after the application of the program, and on what processes or aspects they observed these improvements.

Analyzing of Data

To begin, the Kolmogorov-Smirnov (K-S) test was applied. It indicated the studied variables did not adjust to the model of normal distribution. Then, to respond to the objective of the work, descriptive analyses (mean ± standard deviation) and pre-test comparisons with non-parametric tests (Mann Whitney U) were conducted to investigate differences between groups at baseline in relation to maturity indicators, cognitive processes, identification of emotions scores and teacher`s perception of socio-cognitive functioning in their students. After that, to evaluate the effectiveness of the training program, intragroup comparisons with Wilcoxon signed rank test for related samples were made, with a significance level of .05. The magnitude of the differences was estimated using the bi-serial correlation index (Dominguez-Lara, 2017), and Cohen's criteria (Cohen, 1988) was employed to interpreted them.

Ethics statement

All investigation procedures and the evaluation instruments applied were reviewed and approved by the DGE. Parents of participating children were informed about the objectives and procedures of the study before giving their written consent and prior to the administration of any assessment tools on children. Participating children were given verbal information about the procedure, and they could interrupt their participation if they so desired. The informed consent notice, as well as the administration of this study, complied with CONICET guidelines on ethical behaviour in the Social Sciences and Humanities (2857/06), as well as the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and the ethical norms of the participating institutions.

Results

Baseline Level: comparative study for both pre-primary schools

First, descriptive statistics (mean ± standard deviation) were obtained for each of the socio-cognitive functions evaluated in children from both socio-cultural contexts, in order to analyze whether there were differences in the baseline. The same was done with the variables of the Executive Functioning Scale answered by the teachers. Subsequently, to find out if there were significant differences in the performance of students according to the educational environment prior to the application of the stimulation program, the non-parametric hypothesis test for independent samples *U* of Mann-Whitney was applied. As Table 2 shows, there are differences between both groups in the baseline in Maturity indicators (U = 3970.50, p = .001), Attention (U = 6484, p = .012) and Recognition of emotions (U = 5464, p = .001), all in favour of the urban school children. In turn, when analyzing the teachers' perception regarding the cognitive functioning of their students, only significant differences were observed in the planning area, in favour of the socially-vulnerable school children (p <0.003) (see Table 3).

Table 3. Pre-intervention: descriptive statistics of indicators of maturity, socio-cognitive functions and Teachers' perception, according to each school (N = 111)

Socio-cognitive Functioning		Urban Environment M (SD)	Vulnerable Environment M (SD)	U	p
Children	Maturity indicators	16.23(7.83)	11.2(5.77)	3970.5	**0.001**
	Attention	6.08(3.52)	4.98(3.35)	6484	**0.012**
	Visuomotor perception	12.38(7.36)	11,44(7.65)	6089.5	0.370
	Visuo-spatial skills	23.03(9.19)	20.91(10.17)	5714	0.101
	Working memory	18.13(8.58)	16.4(9.82)	5613	0.083
	Emotion recognition	1.63(1.04)	1.06(0.99)	5464	**0.001**
Teachers' perception (EFS *)	Attention	3.17(3.25)	3.07 (2.65)	7865.5	0.759
	Metacognition	4.74(2.01)	4.95(1.21)	7349.5	0.239
	Inhibitory control	4.13(5.11)	3.95(3.64)	7575.5	0.412
	Organizing	2.77(3.29)	2.79(2.73)	7861.5	0.749
	Planning	3.13(1.34)	3.42(1.16)	6401	**0.003**
	Cognitive flexibility	2.29(2.15)	2.42(2.25)	7789.5	0.638
	Working memory	9.52(2.8)	9.34(2.81)	7811.5	0.686

** Explanatory note*: For the correct interpretation of the EFS, it is necessary to take into account that a higher score in Attention, Inhibitory Control, Organizing, and Cognitive Flexibility signifies a lower level performance in these functions. On the contrary, in Metacognition, Planning, and Working Memory factors, a higher score implies a better level of performance.

Training Effects on Socio-Cognitive Functioning in initial-level children: comparative study

To analyze whether the stimulation given by the teachers managed to increase the socio-cognitive performance in their students, intra-group comparisons (pre-post assessments) were made for each of the pre-primary schools. In addition, the teachers' perception of socio-cognitive functioning in their students was analyzed.

Urban schools: Intragroup comparative study

As Table 3 shows, in the post-test, urban school children showed improvements in all the variables analysed. But, when analysing the teachers' perception regarding the cognitive functioning of their students, in the post-test, the teachers observed improvements in Metacognition (Z = -3.29, p = .001, r = .31), and Working memory (Z = -2.88, p = .004, r = .27). But they note that performance worsens in Inhibitory control (Z = -3.15, p = .002, r = .30) and Cognitive flexibility (Z = -4.58, p = .001, r = .43).

Table 4. Pre-test and post-test differences in functions evaluated in children and teachers' perception, for the urban environment

Variable		Urban Environment					
			Pre	Post			
		n	*M (SD)*	*M (SD)*	*Z*	*p*	*r*
Children	Maturity indicators	111	16.23 (7.83)	18.06 (7.61)	-3.62	**<.001**	**.35**
	Attention	111	6.08 (3.52)	9.40 (4.14)	-6.55	**<.001**	**.63**
	Visuomotor perception	111	12.38(7.36)	17.88(7.21)	-4.28	**<.001**	**.41**
	Visuospatial skills	111	23.03(9.19)	29.78 (9.00)	-5.20	**<.001**	**.50**
	Working memory	111	18.13(8,58)	25.49(9.41)	-5.60	**<.001**	**.54**
	Emotion recognition	111	1.63 (1.04)	2.50 (0.89)	-6.35	**<.001**	**.61**
Teachers' perception (EFS)	Attention	111	3.17 (3.25)	2.86 (2.75)	-1.33	.183	.13
	Metacognition	111	4.74 (2.01)	5.49 (1.98)	-3.29	**.001**	**.31**
	Inhibitory control	111	4.13 (5.11)	5.38 (4.56)	-3.15	**.002**	**.30**
	Organizing	111	2.77 (3.29)	2.97 (3.01)	-.91	.361	.09
	Planning	111	3.13 (1.34)	3.08 (0.68)	-.15	.883	.01
	Cognitive flexibility	111	2.29 (2.15)	3.37 (1.93)	-4.58	**<.001**	**.43**
	Working memory	111	9.52 (2.8)	10.16 (2.27)	-2.88	**.004**	**.27**

EFS: take into account the explanatory note in Table 3.

Vulnerable schools: intragroup comparative study

In the post-test, vulnerable school children showed improvements in all the analysed variables, equal to the previous group.

When analyzing the teachers' perception regarding the cognitive functioning of their students, in the post-test, the teachers observed improvements in Attention (Z = -2.61, p = .009, *r* = .22), Organizing (Z = -4.13, p =< .001, r = .34), Planning (Z = -3.16, p = .002, *r* = .26) and Working memory (Z = -2.88, p = .004, *r* = .27) (See Table 5).

Table 5. Pre-test and post-test differences in functions evaluated in children and teachers' perception, for the vulnerable environment

Variable		Vulnerable Environment					
			Pre	Post			
		n	M (SD)	M (SD)	Z	p	r
Children	Maturity indicators	121	11.2 (5.77)	17.15 (6.34)	-7.43	**.001**	**.71**
	Attention	121	4.98 (3.35)	6.99 (2.65)	-4.18	**<.001**	**.38**
	Visuomotor perception	121	11,44(7.65)	15.39(9.01)	-5.62	**<.001**	**.51**
	Visuospatial skills	121	20.91(10.17)	24.9(10.51)	-3.60	**<.001**	**.33**
	Working memory	121	16,4(9.82)	19.17(10.99)	-3.04	**.002**	**.28**
	Emotion recognition	121	1.06 (0.99)	1.90 (0.91)	-5.36	**<.001**	**.53**
Teachers' perception (EFS)	Attention	121	3.07 (2.65)	2.67 (2.81)	-2.78	**.005**	**.24**
	Metacognition	121	4.95 (1.21)	5.28 (2.02)	-1.89	.059	.09
	Inhibitory control	121	3.95 (3.64)	3.65 (4.03)	-1.68	.093	.15
	Organizing	121	2.79 (2.73)	2.23 (2.72)	-3.68	**<.001**	**.34**
	Planning	121	3.42 (1.16)	3.79 (1.41)	-2,92	**.003**	**.26**
	Cognitive flexibility	121	2.42 (2.25)	2.16 (2.18)	-1.38	.167	.28
	Working memory	121	9.34 (2.81)	9.90 (2.42)	-2.55	**.011**	**.20**

EFS: take into account the explanatory note in Table 3.

Post-assessment comparisons between groups

We observed that the two groups showed improvements, and those gains were from moderate-to-very-large in relation to their baseline (Urban School group: *r* = from .35 to .63; Vulnerable School group: *r* = .28 to .71). The Mann Whitney U test was applied to compare the performances obtained by the children of both educational areas in the studied variables after the stimulation program (see Table 5). When analyzing which group obtained better performance in the variables under study after the stimulation program, it was observed that the children from the urban school achieved mayor improvement in attention (*U*=12116.5, *p*<.001), in visuospatial skills (*U*=9751, *p*<.001), in working memory (*U*=9811.5, *p*<.001), and in emotion recognition (*U*=9097.5, *p*<.001), compared to the children from the vulnerable school. In contrast, when analyzing the teachers' perception regarding the cognitive functioning of their students, in the post-test, the teachers observed improvements in inhibitory control (*U*=16000.5, *p*=.003), organizing (*U*=15755, *p*=.009), planning (*U*=11686.5, *p*<.001) and cognitive flexibility (*U*=15323, *p*<.001), in favour of the vulnerable school children.

Table 6. Post-intervention: descriptive statistics of indicators of maturity, socio-cognitive functions and teachers' perception, according to each school (N = 111)

Socio-cognitive Functioning		Urban Environment	Vulnerable Environment		
		M (SD)	M (SD)	U	p
Children	Maturity indicators	18.06(7.61)	17.5(6.34)	12116.5	.783
	Attention	9.4(4.14)	6.99(2.65)	11530	**<.001**
	Visuomotor perception	17.88(7.21)	15.39(9.01)	8973.5	.053
	Visuo-spatial skills	29.78(9)	24.09(10.51)	9751	**<.001**
	Working memory	25.49(9.41)	19.17(10.99)	9811.5	**<.001**
	Emotion recognition	2.5(0.89)	1.9(0.91)	9097.5	**<.001**
Teachers' perception (EFS *)	Attention	2.86(2.75)	2.67 (2,81)	14903	.265
	Metacognition	5.49(1.98)	5.28 (2.02)	14913	.262
	Inhibitory control	5.38(4.56)	3.65 (4.03)	16000.5	**.003**
	Organizing	2.97(3.01)	2.23 (2.72)	15755	**.009**
	Planning	3.08(0.68)	3.79 (1.41)	11686.5	**<.001**
	Cognitive flexibility	3.37(1.93)	2.16 (2.18)	15323	**<.001**
	Working memory	10.16(2.29)	9.90 (2.42)	14383	.831

Parents' perception of the stimulation program

After the stimulation program, one online survey was carried out for parents, in order to find out if the stimulation program contributed to the strengthening of socio-cognitive and emotional functions in children.

A total of 97 parents responded to the online survey, of which 77 parents (79.39%) considered that the PINI contributed to improving the socio-cognitive and emotional performance in their children. The positive changes observed were, for example to mention the most frequent, that their children shared their things with siblings and peers, had a greater desire to write and do homework, paid more attention to daily activities and were more motivated to want to learn. Likewise, they considered it extremely beneficial for their children to continue the stimulation program. However, 17 parents (17.52 %) neither agreed nor disagreed as to improvement, and only 3 parents (3.09 %) disagreed with the implementation of this program.

Discussion

The discussion of the results is organized into three parts: the teachers' assessment, the assessment of the children to measure socio-cognitive functioning, and the perception of the parents respecting the stimulation program applied to the children.

Teacher´s assessment

Before the implementation of the program for the strengthening of socio-cognitive and emotional skills (PHSCE), the teachers of both educational fields did not observe differences in the socio-cognitive functioning of their students, with the exception of Planning. The teachers of the vulnerable school reported higher scores for this function, compared to the scores of the teachers of the urban school. That is, they observed that their students, when faced with a task, such as a drawing or putting together a puzzle, first thought about how to do it and then did it.

During the application of the PHSCE, the teachers were able to integrate the activities proposed in the program with the curricular contents, adapting the proposal to the needs of the children and to the organizational structure of each school.

Thus, classroom teachers, Physical Education, English and Music teachers worked in an articulated way to carry out recreational activities that led to improving the socio-cognitive functions of their students. Different children face different challenges and, therefore, the teachers were encouraged to apply the new knowledge according to the particularities and needs of their own group, setting realistic goals for improvement. Additionally, teachers were encouraged to focus on the strengths and resources of their group of students, rather than on weaknesses. This task was monitored by researchers on our team who helped teachers focus on their students' achievements and resources.

After the stimulation program, the teachers of the urban school observed improvements in metacognition and working memory functions. That is, the teachers perceived that their students achieved improvements in the ability to realize both mistakes, asking how to correct them, and their successes in carrying out an activity. For example, the children made statements such as: "my drawing came out nice", "I think I was wrong", "I don't like what I did". For their part, they improved the ability to remember a slogan when performing a task, remembering parts of a story or a story told after a short period of time. However, they also observed that there were no improvements in either inhibitory control or cognitive flexibility. Possible explanations for these results could be related to the fact that, between 4 and 6 years, there

is a progressive reorganization in these executive functions, both behaviorally and cognitively, achieving a plateau in performance between 10-12 years of age (Diamond & Ling, 2016; Diamond et al., 2019; Flores Lázaro et al., 2014; Miller et al., 2012; Traverso et al., 2019). Probable aspects to consider in future research would be evaluating both the high expectation of change in their students on the part of the teachers and, in the same way, the self-efficacy of teachers in relation to their teaching effectiveness (Gutshall, 2020).

For their part, the teachers of the vulnerable school also reported improvements in the performance of socio-cognitive skills in their students after the stimulation program. This group of teachers reported improvements in a greater number of cognitive functions. They observed progress in attention, organization, planning and working memory.

After the PHSCE, the teachers of both schools observed improvements in working memory in their students. As argued by Zelazo et al., (2016), working memory training is potentially promising. However, more research is needed to analyse the transfer of this training to other cognitive domains and academic skills, taking into account the conditions in which such training is or is not effective.

A question by these results is: was the stimulation program more effective in this group of children, or did the teachers positively value the small changes or advances in their students? Future research should investigate this aspect in greater depth.

Child Assessment

Before the stimulation program, both groups started from a different baseline regarding the performance of their social-cognitive and emotional skills. Thus, children from urban schools presented a better performance in three of the six skills evaluated: Maturity indicators, Sustained attention and Emotion recognition, compared to children from schools with a vulnerable context. However, after the application of the stimulation program, both groups obtained improvements in the performance of all the variables evaluated, and the magnitude of these improvements ranged from moderate to very large. It is to be expected that these functions have improved as a result of maturation, and not only as a result of the stimulation program. This aspect may be collated in future works when control groups are incorporated; however, results obtained in this study coincide with other investigations with control groups that have shown that the intervention continues to be effective in promoting cognitive skills even when administered by a teacher (Traverso et al., 2019; Diamond et al., 2019; Zelazo et al., 2016).

However, when conducting an inter-group analysis, we observed that children from the urban school obtained greater gains in sustained attention, visuospatial perception, working memory and recognition of emotions, compared to the group of children from the vulnerable context school. On the contrary, the vulnerable school group obtained greater gains in indicators of maturity and visual-motor perception. That is, if we compare the performances of both groups after the PHSCE, we could say that the urban school children obtained greater benefits at the socio-cognitive level after the stimulation program. These results coincide with other research that has documented that training gains depend on children's prior development level (Diamond, 2016; Diamond & Ling, 2016; Korzeniowski & Ison, 2017; Korzeniowski et al., in press; Miyake & Friedman, 2012; Nyroosa et al., 2018; Ullman et al., 2014). Even so, the training of these processes can favor the development of socio-cognitive and emotional functioning in early childhood, especially in children under conditions of psychosocial vulnerability.

The variability of the results observed in the children of both pre-primary schools could also indicate that the stimulation program should be further adjusted, taking into account the specific needs of each group, making the necessary adaptations for its greater effectiveness, taking into account to the different socio-contextual conditions.

Parent's evaluation

Most of the parents perceived improvements in their children's school performance, and considered that the stimulation program was beneficial for their children. They considered that it was very important to give continuity to this project since they observed, in their children, greater motivation to attend classes, better psychomotor skills, greater attention and concentration when carrying out the activities, greater openness to music and to the learning of another language such as English, greater ability to memorize, better relationship with their peers by wanting to share their things or their snack, and better desire to read and write. Research shows that parents' favourable perception of stimulation programs applied by teachers could improve academic performance in their children by increasing their participation in school activities (Caligiore Gei & Ison, 2018).

Conclusion

These results, although preliminary, are encouraging, since both teachers and parents observed advances in the socio-cognitive and emotional skills of children after the stimulation program was applied in the classroom. Several studies have shown that programs to stimulate cognitive and socio-emotional functions in children can contribute to favoring the trajectories of academic functioning development, especially when they are applied by their teachers and their content is

included within the school curriculum (Gutshall, 2020; Korzeniowski & Ison, 2017; Traverso et al., 2019; Walk et al., 2018).

When comparing performance in socio-cognitive functioning, both groups showed improvements, whose gains ranged from moderate to very relative to their baseline. However, the urban school children obtained gains in a greater number of functions, when compared to the group of school children from the vulnerable school. Obviously, greater adaptations and modifications should be made to the stimulation program, so that it can achieve higher levels of effectiveness in the deployment of socio-cognitive and emotional capacities, according to the characteristics of the development contexts. It is desirable that these programs are motivating for children, using different sensory channels to stimulate the various functions, that they are sustained over time and that they are articulated with the daily activities of the classroom, giving ecological validity to these interventions.

In turn, teacher training in the promotion of resources can lead to reducing disparities in entry to the first grade, creating conditions of equal opportunities and generating benefits in the learning of all students. One of the areas where the implementation of prevention strategies and actions is essential are socially-vulnerable school contexts.

The training of teachers in strengthening socio-cognitive and emotional skills, curricular adaptations and parental involvement should be a priority in educational settings, in order to strengthen resources in childhood, from a preventive approach and in the framework for promoting children's health.

In summary, taking into account the limitations that this study presents, it could be said that the main contribution of this work is to increase the evidence of the importance of teacher training for the development of strategies that can be used to scaffold the socio-cognitive and affective processes in the teaching-learning context.

The future challenge for this type of research in early childhood is to specify in greater detail in which specific domains such training is most effective. Although some research has been carried out (Diamond et al., 2019; González-Valenzuela & Martín-Ruiz, 2020; Korzeniowski et al., 2020; Traverso et al., 2019), future studies should be proposed and done to consider the different socio-cultural contexts.

Suggestions

For future studies, it is suggested that there should be a study on the transfer of the gains obtained in socio-cognitive and emotional skills to other non-stimulated domains, once the intervention program is finished, whether in the medium- or long-term.

A central aspect of the proposed program was its implementation through teacher training. It could be interesting to incorporate and analyze the variable "expectation of change" of teachers in relation to their group of students.

A third suggestion, but at the same time a great challenge, is to involve parents in the strengthening of the skills stimulated here, and which could also be strengthened from the daily activities in the home.

Limitations

Certainly, this work has limitations that must be taken into account when interpreting the results. The first is not having had a control group in order to investigate the weight of the maturation factor. This was due to the fact that, from the Directorate of Initial Education, they required application of the program to all children, in both schools. The inclusion of control groups will be carried out when the face-to-face classes, suspended by the COVID-19 pandemic, are resumed. Second, the results obtained should be circumscribed to the sample of Argentine children under study, and should not be generalized to other populations. Third, it was not evaluated whether the gains in socio-cognitive functions observed in both groups lasted over time, or whether they were associated with academic performance in the first grade. Fourth, the stimulation program probably needs a greater integration and balance between the activities proposed for socio-cognitive strengthening in relation to emotional aspects. Fifth, the techniques for the evaluation of socio-cognitive and emotional functions should have greater ecological validity, especially in young children.

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