

Early Identification and Intervention on Language Deficits and Behavioral Difficulties in Early Childhood Education

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ABSTRACT – This project had the aim of detecting and intervening in difficulties of language and behavior in children at the age of three and four. A hundred seventy-eight children were assessed in behavior, expressive and receptive vocabulary and in central auditory processing. 84 children constituted the experimental group and were engaged in an intervention for the development and refinement of language and management of behavior problems through activities developed in software used in tablets, concrete games and orientation provided to their parents and teachers by a professional team composed by speech therapists, psychologists and psycho pedagogues. Posttest analysis indicated significant difference between the vocabulary and language scores, suggesting that this model of early assessment and intervention can be a successful strategy in school environments.

KEYWORDS: child development, language development, child behavior, evaluation of results of preventive actions, early intervention

Identificação Precoce e Intervenção em Déficits de Linguagem e Dificuldades Comportamentais na Educação Infantil

RESUMO – Esta pesquisa objetivou detectar e intervir nas dificuldades de linguagem e comportamento em crianças de três e quatro anos de idade. Foram avaliadas 178 crianças nas áreas de comportamento, vocabulário expressivo e receptivo e processamento auditivo central. O grupo experimental, com 84 crianças, foi submetido à intervenção para o desenvolvimento e aprimoramento de linguagem e manejo de comportamentos-problema, por meio de atividades desenvolvidas em aplicativos usados em *tablets*, jogos concretos e orientações fornecidas a seus pais e professores por uma equipe de fonoaudiólogos, psicólogos e psicopedagogos. As análises do pós-teste indicaram diferença significativa entre os resultados dos testes de vocabulário e comportamento, sugerindo que esse modelo de avaliação e intervenção precoce pode ser uma estratégia bem-sucedida em ambiente escolar.

PALAVRAS-CHAVE: desenvolvimento infantil, desenvolvimento da linguagem, comportamento infantil, avaliação de resultado de ações preventivas, intervenção precoce

The good development of language and of an adaptive behavioral repertoire stands for two important milestones in child development that could enable the proper psychosocial and cognitive development. Thus, the possibility of early detection and intervention in difficulties of language and behavior, in order to flag and prevent potential problems

in the acquisition of academic and social skills, becomes essential.

The development of behavior problems in early childhood has been related, on one hand, to adolescent delinquency (Timmermans, van Lier, & Koot, 2009) and on the other hand to later difficulties in academic performance (D'Abreu

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& Marturano, 2010; Timmermans, van Lier, & Koot, 2009). Both juvenile delinquency and problems of academic performance during school years are related to externalizing behavior problems (Arnold, 1997; D'Abreu & Marturano, 2010; Timmermans et al., 2009). Child behavior problems may interfere on the external environment and are called externalizing problems, or may not directly interfere with the environment and are called internalizing ones. Internalizing behaviors are exemplified as withdrawal, somatic problems, sadness, fear, depression and anxiety; while externalizing agents have been described as aggressiveness, hyperactivity, disobedience and poor control of impulses (Achenbach & Rescorla, 2000; Moura, Marinho-Casanova, Meurer, & Campana, 2008). Externalizing behaviors are the most commonly detected and flagged by parents and teachers due to their significant interference with the environment. In fact, problems of externalizing behavior and academic difficulties have been significant challenges in child clinical psychology (Arnold, 1997).

Likewise, language is a core skill and a pillar to the cognitive and socio-emotional development, essential to fit and work in society (Bornstein, Hahn, & Suwalsky, 2013). Emotional and behavioral problems may result from language delays that interfere with peer and adult relationships. Similarly, behavioral and emotional problems may interfere with language development (Achenbach & Rescorla, 2000). In fact, some authors suggest the interdependence of language development and behavioral repertoire (McClelland et al. 2007; Vallotton & Ayoub, 2010; Varanda et al., 2015a).

McClelland et al. (2007) investigated predictive relationships between behavioral regulation and emerging literacy, vocabulary, and math skills among children from 54 American preschool classrooms. In this survey, behavioral regulation refers to paying attention, following instructions, and inhibiting inappropriate actions. The authors found a correlation between gains in behavioral regulation throughout preschool, directly measured through a task of observation, with greater vocabulary and improved math and literacy skills. Low inhibitory control, which does not allow children to inhibit inappropriate actions, is related to the expression of externalizing behavior problems.

In 1997 Arnold studied the co-occurrence of externalizing behaviors and academic difficulties among at-risk boys. Despite these findings, the topic has not received due attention in surveys about detection and prevention of school difficulties and their social components.

There are some important conditions for a successful language development. One of these concerns the integrity of the central auditory system. Varanda et al. (2015a) investigated auditory processing skills - which are the mechanisms and processes of the auditory system responsible for the expression of sound localization and lateralization, discrimination and recognition of auditory

patterns, temporal aspects of hearing and auditory performance with degraded acoustic signals (American Speech-Language-Hearing Association [ASHA], 1996) – and internalizing and externalizing behaviors among 187 children with an average age of 3.8 years and their parents. Behaviors, described by parents as: “Behaves very childish for their age”, “Constantly seeks help”, “Doesn’t eat well”, “Doesn’t feel guilty after misbehaving”, “Easily gets frustrated”, “Has nervous movements or tics”, “Nervous, irritable or tense”, “Clumsy with poor motor coordination”, “Repeatedly shakes the body or the head”, “Stares or looks concerned”, “Gets sulky easily” and “Runs away” were correlated with difficulties in auditory processing.

Thus, tests that assess problems in the central auditory processing of children still in day care nursery could benefit future interventions in the kindergarten and preschool, to compensate or minimize those problems, mitigating the damage on the acquisition of reading and writing skills in elementary school. Toscano e Anastasio (2008, p. 2) state that “one of the ways to perform preventive work in school-age children would be to investigate auditory skills such as detection, sound localization and auditory memory in children of 4-6 years old”. To that, Capovilla and Salido (2011) propose the Simplified Assessment of Central Auditory Processing.

Vallotton and Ayoub (2011) used data collected longitudinally from 120 children aged 14, 24 and 36 months to assess the impact of expressive vocabulary and speech production on the improvement of self-regulation and to determine the existence of associations between these domains. The results revealed gender differences in self-regulation paths and the impact of language on self-regulation. Vocabulary was better predictor of self-regulation than speech production and both positively predicted children’s self-regulation levels. Results also revealed that in early development words are tools that can be applied to the self-regulatory task and may be more necessary for boys than for girls.

Wright and Neuman (2014) investigated how activities to develop vocabulary are approached in preschool activities in 55 schools of different socioeconomic levels in the United States. The authors found that preschool vocabulary teaching consisted of explanations of short words provided by teachers, and that explanations occurred intermittently and in different contexts throughout the day. However, they noted that these words discussed by teachers served to make children understand their surroundings, but tended to be simple words. Evidence suggested that vocabulary taught by teachers in more economically privileged schools was more consistent and included more challenging words than the vocabulary taught in schools with lower socioeconomic status.

In a study conducted in a different educational context, Whorral and Cabell (2016) report positive results of a program to improve preschool children’s oral language

(Whorral & Cabell, 2016) and its impact on reading skills. In this proposal, non-course activities such as meals and recreation were used as opportunities for the development of activities. to expand the vocabulary. The results suggested that children of this age group do not receive specific vocabulary stimulation, despite the relevant body of knowledge that indicates a relationship between this development and future academic performance.

Beyond the possibilities of intervention in school environment, Hancock, Kaiser and Delaney (2002) argue that routine parent-child interactions, language support, and behavior management are closely related. The authors suggest that parents less responsive to their children may not provide a language-rich environment and may have difficulty in managing behavior problems. Therefore, they investigated the effect of a proposed intervention aimed to teach parents of five children strategies for positively responding to their children's behavior in moments of play, both by decreasing negative verbalizations and increasing positive verbalizations. Parents attended 30 sessions lasting 30 to 45 minutes each. The results showed that children had positive changes in language and behavior, although the maintenance and generalization of these effects varied among children.

It is in this context, considering that educational needs in Brazil often require adjustments to fit into challenging contexts that this study is inserted. It is sought to identify feasible possibilities for early identification and intervention that allow young children to better use academic opportunities.

Still in day care nursery school, with 3 years old, children can be assessed regarding their understanding and production of speech, as such assessment is "of vital importance for the early detection of language delays and disorders and early intervention, taking advantage of neural plasticity to maximize efficacy." (Capovilla, Negrão, & Damázio, 2011, p. 5).

To assess the externalizing behaviors that are correlated with academic performance, according to Duarte and Bordin (2000), the most widely used instrument to identify mental health disorders in children and adolescents, based on parental information, is the Child Behavior Checklist (CBCL). The Brazilian version of the CBCL (4-18 years old) is called "Childhood and Adolescent Behaviors Inventory" and has preliminary validation data (Bordin, Mari, & Caeiro, 1995). This questionnaire is to be answered by the children's parents, providing information on social competence, depression and isolation, aggressiveness, antisocial behavior and anxiety. This research used the Behavior Inventory in the version for ages 1½ to 5 years (Achenbach, & Rescorla, 2000; Silveira, Rocha, & Linhares, 2010).

Therefore, both language and behavioral difficulties can be early detected to flag potential problems in the acquisition of academic and social skills. To that, children should be evaluated with 3 years old regarding language and behavior, and reevaluated on the same skills at the age of 4 years, to prevent difficulties arising from such deficits. Therefore, a study aimed at early assessment of children to help teachers and parents to minimize and solve these problems, could ground efficient strategies to meet the needs of childhood care in family and institutionalized environments.

The purpose of this study was to evaluate three-year-old children in early education (*maternal II*), regarding language (expressive and receptive vocabulary) and central auditory processing skills and behaviors; perform an intervention for the development of language and adaptive behavioral repertoire in a group of children and reevaluate the same children, at the age of four years, in early education (kindergartens) regarding behaviors and central auditory processing, comparing the group submitted to the intervention and the control group.

METHOD

Participants

The research engaged 178 children (90 girls, 88 boys, with mean age of 3.7 years), students from four schools of the Santos Municipal School Network, divided into two groups: experimental and control. Their parents have also participated in the survey. Using the occupational scale proposed by Hollingshead (2011) and adopting the occupational factor of that scale, almost half of the parents (47%) are classified in the 3rd and 4th categories (machine operators, semi-skilled workers, skilled carpenters, electricians, machinists, plumbers), 11% are classified in the 6th category as technicians, semi-professionals, small

business owners, other 11% are classified in the 1st category as rural workers, manual workers and domestic workers, 9% of them are classified in the 2nd category as unskilled workers as messengers, waiters, bricklayers, 7% of them are in the 8th category as managers, mid-sized business owners and administrative officers, 6% of them are in the 5th category as sales professionals, administrative professionals, 4% of them in the 7th category as small business executives, farm owners, art professionals, managers, and other professionals, and only 2 of them rank in the 9th category as senior executives, big business owners, and graduate professionals. Two percent of the parents are unemployed and 1% of them did not answer the question about profession. This scale is

made up of nine categories, where the 9th is the highest, and includes the professions of people of higher socioeconomic compared to the professions of people in the categories below it (Hollingshead, 2011).

Instruments

Parents of all children were interviewed individually answering the CBCL questions (Achenbach & Rescorla, 2000; Bordin et al., 1995), for ages of 1½ to 5 years. The CBCL results encompass two different domains of behavior: internalizing (emotional reactivity, anxiety and depression, somatic complaints and withdrawal) and externalizing (attention problems and aggressive behavior). The behaviors present in a list of 100 specific behavioral situations are rated and scored by parents as “not true” with a score of “0”, “somewhat true or sometimes true” with a score of “1” and “very true or often true” with score 2. The higher the score, the greater the behavioral problems pointed out by parents. Jointly with the CBCL, parents responded the Language Development Questionnaire (LDS; Rescorla & Alley, 2001; Silvaes et al., 2010), a list of 310 words that parents of the children being assessed should identify as being produced or not by the children.

Children were also assessed in receptive vocabulary using the Usp Auditory Vocabulary Test - TVAud-A33o (Capovilla et al., 2011), which is a test that assesses receptive vocabulary since early stages, from the age of 1 year and 6 months on. In this test, the child listens to a word from a list spoken by the evaluator and, then, must choose from five different figures, one figure that corresponds to the word heard. There are 33 items and hits are summed to provide the raw hit score for the test.

Moreover, children were assessed regarding expressive vocabulary using the Expressive Vocabulary Test - TVExp-100r (Capovilla et al., 2011), which is a test that evaluates expressive vocabulary in the early stage. In this test, the evaluator presented a slide containing a figure, and the child being assessed should produce the name of the figure. There are 100 items that are summed up to get the gross score.

Children were also assessed regarding central auditory processing through the Simplified Auditory Processing Assessment (ASPA; Pereira & Schochat, 1997), as an instrument to detect potential changes in auditory processing. This instrument evaluates memory, auditory discrimination (verbal and nonverbal), spatial orientation related to sound localization and presence or absence of cochlear-eyelid reflex. The ASPA normality criteria for results are: (a) sound localization: hit at least four of the five directions presented, and the lateral localization must be present; (b) nonverbal sequential memory: understand the request and hit at least two sequences of four sounds in three presentations; (c) verbal sequential memory: hit at least two sequences of four syllables in three presentations. In this assessment, the

following answers were computed: with respect to the Sound Sequencing subtest, the correct answer to each sequence of instrumental sounds was computed with a value of 1, with three sequences in total. In addition, one point was computed to the adequate phonoarticulatory production of each syllable (total of three) and to each syllable sequence (total of three). As for the Sound Location subtest, one point was computed to each correct sound localization, totaling five items.

Procedures

The survey was approved by the Ethics Committee of the Medical School of the University of São Paulo under research protocol No. 381/14. The parents of the students involved in the research signed the Informed Consent Form.

After the behavioral assessment, through the CBCL completed by the parents and in vocabulary through the LDS also completed by them, children of the experimental and control groups were evaluated in language through the Usp Auditory Vocabulary Test - TVAud-A33o. Expressive Vocabulary Test - TVExp-100r and ASPA.

In the intervention stage, 3-year old children from schools in the experimental group were subjected to a program of intervention in small groups of up to five students, for three months, in daily sessions lasting 50 minutes each. The intervention was carried out in the school classrooms, at school time, by a group of educators with degree in Psychology, Speech Therapy, specialization in Psychopedagogy and experience in the use of new information and communication technologies (NTICS), with the assistance of the students' teacher. Still in this same stage, parents and teachers received guidance, in three to four meetings throughout the research, regarding the management of problem behaviors.

Regarding the activities developed with the children in the intervention stage, it is important to have in mind that there were several activities focusing on the development and improvement of language skills, as well as on the development of social skills and anxiety and aggression control.

The intervention was developed by means of activities proposed with concrete material (games and toys), shared reading and image-based reading, and activities developed through application programs used on tablets. The proposal of reading stories was adapted from the research by Aram, Fine and Ziv (2013) where the authors tested the reading of shared stories in four different reading moments: (1) exploration of the topic and story of the book; (2) exploration of socio-cognitive topics; (3) correspondence to the children's life experiences, and (4) the children retell the story read. In this survey, the four readings were transformed into three: (1) exploration of the theme and story of the book; (2) exploration of socio-cognitive themes and correspondence to children's life experiences, and (3)

children retell the story read. The image-based reading of stories was adapted from Melo's (2011) proposal that develops the image-based reading of stories in three stages: (1) autonomous narrative to the researcher in which children observe the images and narrate what they understand about them; (2) assisted narrative in which the researcher asks the children to explain the identity of the narrative protagonists, paying attention and expressing key elements of the story to understand the reasons for some behaviors of the characters; and (3) autonomous narrative after assistance, in which the researcher asks children to narrate or tell the story, based on everything they have understood.

The intervention using games and applications was developed by the authors of the study. Some activities using concrete material were adapted from different authors (Adams, Foorman, Lundberg, & Beeler, 2006; Almeida, 2011; Aram et al., 2013; Araújo, Lima, Pereira, Dias, & Diniz, 2009; Mello, 2011; Nascimento, 2001; Navarro, 2008; Perez, 2011).

The games and toys used in the activities developed with concrete material were classified into games for improvement of: intrapersonal skills; interpersonal skills; perception, location, memory and auditory attention; identification of rhymes, alliterations, synthesis, segmentation and syllable manipulation and word awareness; expressive and receptive language and simple rules sung.

The decision for electronic devices called tablets was based on the aim of optimizing the use of resources, taking into consideration the wide range of programs and

possibilities offered by the application programs used and the functionality offered by these devices. Bottentuit Junior (2012) lists some of the many advantages offered by these devices to perform school tasks: accessibility, easiness to carry, and can be used in different environments; textbooks can be downloaded; offer connectivity in any geographic space, content portability; allow users to download a range of applications that make the device more complete and functional; allow a text or an image to be viewed in greater detail, that is, with the opening of the fingers over any area of the screen you can see everything you want in larger size. The applications used were categorized "by function: games; interactive books by touch; characters responding or repeating the child's speech; discriminating and classifying different sounds and tasks to deal with emotions and feelings" (Varanda et al. 2015b, p. 141). Tablet activities are similar to those of concrete material as they intended to focus on improving common skills. The only exceptions are touch-based interactive books and characters that respond to the child's speech, which are only possible with the use of this type of technology. The reading of stories on interactive books used on tablets can be compared to the reading of stories with or without directed play in the case of activities with concrete material.

The activities performed with concrete material and using tablets are described in Charts 1 and 2.

Data obtained in pre and post-intervention stages in both groups were treated through descriptive and inferential statistic.

RESULTS

Of the 178 subjects assessed, 90 were female and 88 male.

To assess potential language gains, the control group was divided into high-performance control group and low-performance control group in language tests (TvAud, TvExp, LDS and ASPA) as follows: after testing with all participants, before the intervention, the individual means of the participants of the control group were calculated based on the sum of all language tests. The 47 subjects with the best averages made up the high-performance control group. The other 47 subjects with lower averages made up the low-performance control group. Regarding the statistical analysis to verify differences between groups in language skills after intervention, three groups were used: high-performance control group (GCa), low-performance control group (GCb) and experimental group (GE). The experimental design with three groups allows the quantification of gains in the group exposed to the intervention and observe if gains in this group could match those of the high-performance control group or be at an intermediate level between the gains of

the control group below and above average (Capovilla & Capovilla, 2000).

Descriptive statistical analyzes of the total scores were conducted in the TvAud, TvExp, ASPA and LDS tests in the high and low performance control groups and in the experimental group. Table 1 presents these results.

In order to check the statistical significance of the difference in language performance of the three groups in the post-test, we performed the Analysis of Variance of the effect of the types of group on the scores of language tests before and after the intervention. Table 2 summarizes these findings.

There was a significant difference among all groups in the post-intervention, except for the performance in the ASPA, indicating that the gains cannot be attributed to the intervention for the development of auditory processing skills.

Then, Bonferroni's multiple comparisons analysis was performed to identify significant differences between the high and low performance and experimental control groups

Chart 1.

Description of the activities developed with applications on tablets

Activity	Classification of applications (Varanda et al., 2015)
Doodlecast ^{a, b, c}	Tasks to manage emotions and feelings
Talking Larry ^{b, c, e}	Characters answering or repeating the child's discourse
Animal Face ^{a, b, c}	Tasks to manage emotions and feelings
Baby chords ^{b, c}	Discriminating and classifying different sounds
Millie, um livro de história ^{a, b, c}	Tasks to manage emotions and feelings/ interactive book through touch
Talking Tom ^{a, b, c, e}	Characters answering or repeating the child's discourse
Pip and Posy ^{a, b}	Tasks to manage emotions and feelings/ game with playful activities on topics in the domain of language and behavior
Checkup – Calilou ^{a, c}	Games with playful activities on topics in the domain of language and behavior
Galinha Pintadinha ^{c, e}	Discriminating and classifying different sounds
Dora aventureira ^{b, c}	Tasks to manage emotions and feelings
Quem soltou o Pum? ^{a, b, c}	Interactive books through touch/ tasks to manage emotions and feelings
ABC Palavras ^{c, d}	Discriminating and classifying different sounds
ABC Crianças ^{c, d, e}	Discriminating and classifying different sounds
Meu Tom ^{a, b, c, e}	Tasks to manage emotions and feelings/ characters answering or repeating the child's discourse
Os 10 amigos ^{a, b, c}	Games with playful activities on topics in the domain of language and behavior/ interactive book through touch
Timo Kids ^{b, c, e}	Games with playful activities on topics in the domain of language and behavior

Remark. Skills developed:

^a intrapersonal^b interpersonal^c perception, location, memory and auditory attention^d identification of rhymes, alliterations, synthesis, segmentation and handling of syllables and words awareness^e expressive and receptive language.

in post-intervention language tests. Table 3 summarizes the data.

Bonferroni's post hoc analysis showed statistically significant post-intervention differences in the *Language Development Questionnaire for Age 18-35 Months* between the low-performance control group (GCB) and the experimental group, indicating that the gains reported by the experimental group have even exceeded the gains of the high-performance control group, i.e., scores were above the average of the high-performance control group. There was significant difference between the low-performance control group and the experimental group in the post-intervention Usp Auditory Vocabulary Test (TVAud-A33o) and Post-Expressive Vocabulary Test (TVExp-100r) (Pos_int_TvExp), indicating, once again, that the proposed intervention is more effective when compared to the worst performing group, suggesting that the intervention could generate greater gains in populations with worse performances in auditory and expressive vocabulary. Regarding the *Simplified Auditory Processing Assessment* in the post-test, there was no statistical significance in the

comparison between any groups, indicating that, despite some gains observed in the averages of all groups, for the experimental group they may have not resulted from the intervention made.

For the assessment of potential behavioral gains, groups were further divided to generate a high-performance control group and a low-performance control group on the CBCL and the experimental group. After testing performed before the intervention, the individual total scores on the CBCL test were observed. The 47 subjects with the highest scores made up the low-performance control group, since in this test the higher the score, the greater the behavioral problems. The other 47 subjects with lower scores made up the high-performance control group, since the lower the score, the better the behavioral performance. Thus, for statistical analyzes to verify differences between behavioral groups after intervention, three groups were used: control group of high-performance in behavior (GCa_comp), control group of low-performance in behavior (GCB_comp) and experimental group in behavior (GE_comp).

Chart 2.

Description of the activities developed with concrete material

Activity	Description
I am, I can ^{a,b,e}	The activity consists of drawing the self and making statements about personal characteristics.
Escravos de Jó ^{b, d, e}	Nursery rhyme of very simple rule that demands concentration and attention using different objects.
Statue of feelings ^a	Listening to a song that, when ended, the subjects must present facial expression related to a feeling.
Feelings memory game ^{a, c}	Cards with facial expressions referring to different feelings are used.
Body scheme ^{a, b, e}	Drawing of the human body by a subject as the model, discussing personal characteristics and those common with the fellows.
Family drawing ^a	Drawing of the family picture of each subject, with discussion and sharing of the production with the group.
Box of surprises ^b	Development of actions that favor skills in interpersonal relationships such as hugging the mate, for example, by raffling cards with images representing those actions.
Meaning of names ^a	Presentation of cards with the names and pictures of the children to build a panel. When the panel is exhibited, the reason for the selection of each name is discussed.
Feelings dice ^a	Giant dice that presents, on each side, uncompleted statements about the children's feelings and tastes. The children complete the statements after playing the dice.
Who tells a tale adds a tail ^{a,b,c}	Narration started by the mediator, complemented by the children and, by the end, interpreted by all.
Shared reading of stories ^{a,b,e}	Shared reading of stories according to Aram, Fine, e Ziv (2013).
Recognizing letters ^d	Recognition of the number of letters, initial and final phoneme, the final sound, number of vowels of the children's names written on cards decorated with illustrations with the same initial phoneme as the child's name.
Image-based reading of stories ^c	Image-based reading according to Mello (2011)
Monsters factory ^{a, b, e}	Use of play dough to build a monster factory. Debate about feelings and behaviors based on the features of the monsters.
Sound location ^c	Listening to different sounds that must be identified.
Blind man's bluff game and meow cat game ^c	Blinded children must recognize the other children's voices.
The wand of flowers ^{c,d}	Tales told by the mediator and children add sound using different materials: music instruments, acetate plates, objects in the surroundings, etc.
Sound bingo ^c	Use of cards with drawings and chips with words corresponding to the drawings whose names must start with the target phoneme.
Sound memory game ^c	Uses of boxes with different materials that produce different sounds.
Stories with activities of articulation ^{c, d, e}	Child tales emphasizing the target phoneme that is to be repeated by the children using several materials. The phoneme will be issued in isolate and then in syllables.

Remark. Skills developed:

^a intrapersonal^b interpersonal^c perception, location, memory and auditory attention^d identification of rhymes, alliterations, synthesis, segmentation and handling of syllables and words awareness^e expressive and receptive language.

Descriptive statistical analyses of the CBCL total scores were performed in the high and low performance control groups and the experimental group in the pre and post-test. Following is Table 4 with the results.

The results found show great dispersion of the subjects' scores in relation to the mean of the group pre and post-test, indicating the group heterogeneity regarding behavioral manifestations.

In order to verify the statistical significance of the difference in behavior performances in post-test of the high and low-performance and experimental control groups, we performed the Analysis of Variance of the effect of the types of group on the CBCL scores after the intervention. Table 5 summarizes these findings.

All subjects in all three groups reported gains in behavioral performance as the total score on the CBCL decreased after the intervention. After the analysis of variance, a significant difference between all groups in the post-intervention against the total score in the CBCL was found, indicating that the gains can be attributed to the intervention aimed to minimize behavioral difficulties.

Then Bonferroni's analysis of multiple comparisons was performed to identify significant differences between the high and low-performance and experimental control groups in the CBCL in post-intervention. Table 6 summarizes the data.

Bonferroni's post hoc analysis showed statistically significant differences between all groups. Regarding the

Table 1

Descriptive statistics of the language tests before and after the intervention of high and low-performance and experimental control groups

Tests	Groups	N	Mean	Standard deviation	Minimum	Maximum
Pre_int_LDS ^a	GCb ⁱ	47	224.8	52.7	82	293
	GCa ^j	47	288.8	14	255	310
	GE ^k	84	267.5	52.5	76	310
	Total	178	261.8	51.4	76	310
Pre_int_Tv_Aud ^b	GCb	47	24.2	4.8	12	32
	GCa	47	28	3.8	19	33
	GE	84	26.6	4.5	8	33
	Total	178	26.3	4.6	8	33
Pre_int_Tv_Exp ^c	GCb	47	52.9	15.2	3	73
	GCa	47	67.3	11	36	87
	GE	84	61.3	13.7	21	88
	Total	178	60.7	14.4	3	88
Pre_int_ASAP ^d	GCb	47	5.8	1.4	2	8
	GCa	47	6.7	1.5	4	10
	GE	84	6.1	1.8	3	11
	Total	178	6.2	1.7	2	11
Pos_int_LDS ^e	GCb	47	267.5	43.7	127	310
	GCa	47	284.6	33	165	310
	GE	84	290.7	29.6	107	310
	Total	178	283	35.8	107	310
Pos_int_Tv_Aud ^f	GCb	47	28.2	2.9	21	32
	GCa	47	30	2.3	24	33
	GE	84	30.5	2.2	24	33
	Total	178	29.8	2.6	21	33
Pos_int_ASAP ^g	GCb	47	7.3	1.6	5	11
	GCa	47	7.9	1.8	4	10
	GE	84	7.6	1.8	4	11
	Total	178	7.6	1.7	4	11
Pos_int_Tv_Exp ^h	GCb	47	66.4	10	45	88
	GCa	47	77.5	7.7	57	93
	GE	84	74	9.2	46	89
	Total	178	73	9.9	45	93

Remark.^a Questionnaire of Language Development to the Age of 18 to 35 months in pre-intervention^b Usp Auditory Vocabulary Test in pre-intervention^c Test of Expressive Vocabulary in pre-intervention^d Simplified Assessment of the Auditory Processing in pre-intervention^e Questionnaire of Language Development to the Age of 18 to 35 months in post-intervention^f Usp Auditory Vocabulary Test in post-intervention^g Simplified Assessment of the Auditory Processing in post-intervention^h Test of Expressive Vocabulary in post-interventionⁱ Low-performance control group^j High-performance control group^k Experimental group

Table 2

Results of the ANOVA having type of group as factor and total performances in language tests as dependent variables, including F, p

Test	F	p
Pos_int_LDS ^a	6.8	0.001**
Pos_int_Tv_Aud ^b	13.7	0.000**
Pos_int_ASAP ^c	1.2	0.297
Pos_int_Tv_Exp ^d	18.5	0.000**

Remark. * p < .05; ** p < .01

^a Questionnaire of Language Development to the Age of 18 to 35 months in post-intervention^b Usp Auditory Vocabulary Test in post-intervention^c Simplified Assessment of the Auditory Processing in post-intervention^d Test of Expressive Vocabulary in post-intervention

Table 3

Results of the Bonferroni's analysis of multiple comparisons among the performance of the three groups

Tests	group	group	Standard error	p
Pos_int_LDS ^a	GCB ^e	GCa	7.2	0.055*
		GE	6.3	0.001**
	GCa ^f	GCB	7.2	0.055*
		GE	6.3	0.988
	GE ^g	GCB	6.3	0.001**
		GCa	6.3	0.988
Pos_int_Tv_Aud ^b	GCB	GCa	0.5	0.002*
		GE	0.4	0.000**
	GCa	GCB	0.5	0.002*
		GE	0.4	0.607
	GE	GCB	0.4	0.000**
		GCa	0.4	0.607
Pos_int_ASAP ^c	GCB	GCa	0.4	0.364
		GE	0.3	0.965
	GCa	GCB	0.4	0.364
		GE	0.3	1.000
	GE	GCB	0.3	0.965
		GCa	0.3	1.000
Pos_int_Tv_Exp ^d	GCB	GCa	1.9	0.000**
		GE	1.7	0.000**
	GCa	GCB	1.9	0.000**
		GE	1.7	0.102
	GE	GCB	1.7	0.000**
		GCa	1.7	0.102

Remark. * p < .05; ** p < .01

^a Questionnaire of Language Development to the Age of 18 to 35 months in post-intervention^b Usp Auditory Vocabulary Test in post-intervention^c Simplified Assessment of the Auditory Processing in post-intervention^d Test of Expressive Vocabulary in post-intervention^e Low-performance control group^f High-performance control group^g Experimental group

Table 4

Descriptive analysis of the CBCL total scores in all the three groups before and after the intervention

Test	Groups	N	Mean	Standard deviation	Minimum	Maximum
Pre_int_CBCL ^a	GCb_comp ^c	47	62.4	13	48	99
	GCa_comp ^d	47	31.2	10.4	13	47
	GE_comp ^e	84	51.5	21.5	8	109
	Total	178	49	20.6	8	109
Pos_int_CBCL ^b	GCb_comp	47	53.4	17.7	23	91
	GCa_comp	47	29.5	16	4	76
	GE_comp	84	41.1	17.9	9	92
	Total	178	41.3	19.4	4	92

Nota.

^a Child Behavior Checklist in pre-intervention^b Child Behavior Checklist in post-intervention^c Low-performance control group in the CBCL^d High-performance control group in the CBCL^e Experimental group in the CBCL

Table 5

Results of the ANOVA having type of group as factor and total performances in the CBCL as dependent variables, including F, p

Teste	F	p
Pos_int_CBCL ^a	22.1	0,000**

Nota. * p < .05; ** p < .01

^a Child Behavior Checklist in post-intervention.

Table 6

Results of Bonferroni's analysis of multiple comparisons among the performances of the three groups in behavior

Test	group	Group	Standard error	p
Pos_int_CBCL ^a	GCb_comp ^b	GCa_comp	3.6	0.000**
		GE_comp	3.2	0.000**
	GCa_comp ^c	GCb_comp	3.6	0.000**
		GE_comp	3.2	0.001**
	GE_comp ^d	GCb_comp	3.2	0.000**
		GCa_comp	3.2	0.001**

Nota. * p < .05; ** p < .01

^a Child Behavior Checklist in post-intervention^b Low-performance control group in the CBCL^c High-performance control group in the CBCL^d Experimental group in the CBCL.

post-intervention, the experimental group, when compared to the control groups, showed statistically significant

difference suggesting the effects of the intervention on the experimental group.

DISCUSSION

In general, the results found indicate that children in kindergarten, who present some difficulties in language development as well as in behaviors, improve in the areas

approached, mainly when submitted to the intervention for improvement and development of these skills.

Of the survey subjects, 50.6% are female and 49.4% male. Although the equitable distribution of gender was

not a methodological criterion, the percentages found in the study group depict the demographic reality of the kindergarten students of the Santos Municipal Schools Network that in 2015 had 3768 boys (50.1%) and 3748 girls (49.9%), supporting the gender representation of this group.

The parents' responses in the *Language Development Questionnaire for Age 18-35 Months* showed gains in post-intervention in the experimental and low-performance control groups. This result seems to indicate that children with greater difficulties benefit from schooling (low-performance control group) and even more from interventions that focus on vocabulary improvement and expansion. This also occurred in relation to auditory and receptive vocabulary, through the test answered by the children. In this case, however, there was gain in all groups after the intervention. These results show, on one hand, that results for the instruments completed by parents and children had similar results; on the other hand, instruments completed by children showed greater sensitivity to detect the post-intervention change, since the high-performance control group also reported post-test gains.

Regarding the behaviors assessed, all groups scored lower (fewer behavioral problems) in the post-test, especially in the experimental and low-performance control groups. This suggests that, also in this case, children with greatest difficulties are those that benefit most from specific interventions to improve adaptive behavioral repertoire.

It is worth emphasizing that the interventions made focused on all students in the classrooms involved in the survey, in a preventive and interventional way. This prevention model, according to Powell, Dunlap, and Fox (2006), involves broader yet more specialized services and strategies, focusing on young children at risk for behavioral and other problems. Thus, this model could be suitable to

the school environment, since it does not propose actions by professionals in the areas of speech therapy and psychology with a clinical focus. In addition, it supports the role and function of professionals who can act at institutional level in a preventive and interventional manner, based on guidance to teachers and professionals directly involved in the teaching and learning processes.

Based on the finding that the intervention proved to be more effective in low-performance experimental groups and considering that 76% of families are in categories 1 to 5 of Hollingshead's (2011) occupational scale, we conclude that this intervention proposal can benefit children in socioeconomic disadvantage. On the one hand, vocabulary teaching and the systematic provision of language stimulation situations in the school environment favors the development and refinement of skills that can prepare children to start writing. On the other hand, the opportunity to discuss and learn about different ways of speaking and dealing with feelings may also prevent further social and behavioral difficulties.

Similarly, the specific knowledge of professionals in the field of psychology and language justifies, among teachers, the suggestion of systematically including activities that prioritize the refinement of these skills, and could suggest the use of everyday situations to that purpose, as proposed by Whorral and Cabell (2016).

However, there were only three to four meetings with parents scheduled by the school board, and not all parents attended those meetings. Systematic education to parents about the best ways to promote interactive situations that could benefit language development and pro-social behavioral repertoire did not happen with the consistency planned by the researchers mainly because of the parents' alleged lack of availability and time.

FINAL REMARKS

Having in mind a preventive and interventional model for problems related to language development and adaptive behavior repertoire, both language and behavioral difficulties should be detected early, in order to flag potential problems in the acquisition of academic and social skills in children at preschool age. Therefore, children need to be assessed in their early years to prevent difficulties resulting from such deficits.

This preventive and interventional model can support teachers and parents to minimize and solve problems at early stage, being an efficient strategy to meet the needs of childcare in the family and institutionalized environment, significantly reducing the costs with later intervention processes and the resulting problems (such as literacy difficulties, attention

problems, bullying) and their consequences (such as social mismatch, school underperformance).

These results lead to the conclusion that an intervention model, in which professionals in the field of speech therapy and psychology instruct the kindergarten teachers on the use of activities to the successful development of language and to the construction of appropriate behavioral repertoire, could significantly contribute to the improvement of performance and adaptation in these skills for children of 3 to 4 years old.

However, some children remain feeling difficulties or worsen their performance. Thus, after the intervention, it is easier to identify and select more accurately the children who are likely to need specialized attention or referral to health

professionals. This is yet another possibility for optimizing the use of health and education resources.

One of the most relevant limitations of this study was the fact that parents were not as active as envisaged in the intervention proposal. Further research should suggest

more strategies more suitable to the inclusion and active participation of parents, not only in terms of their knowledge about their children's language and socio-emotional skills development, but also in relation to habits and strategies they could develop at home to that purpose.

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