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ABA program for parents and verbal development in children with ASD

Programa ABA para pais e o desenvolvimento verbal de crianças com TEA

Programa ABA para padres y el desarrollo verbal de niños con TEA

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Abstract: Applied Behavior Analysis (ABA) interventions for children with autism spectrum disorder (ASD) must be systematized and intensive, with guidance for parents. This study aimed to describe and evaluate the effects of a parenting program, based on ABA, on the verbal development of children with ASD. Using an experimental design, the sample included 12 mothers, five fathers, and their children with ASD, aged one to four years, divided into an experimental group (EG) and control group (CG). The children's verbal repertoire was assessed using the VB-MAPP before and after the parents participated in the 12-week program. The results showed that, after the intervention with parents, the EG exhibited a significantly greater increase in verbal behaviors (31 %) compared to the CG (6 %) in intragroup comparisons. No differences were observed between the groups in the post-test. The interventions with parents positively influenced the verbal repertoire of children with ASD, indicating the need for studies with larger samples.
Keywords: program for parents; applied behavior analysis; autism spectrum disorder; verbal behavior; VB-MAPP

Resumo: Intervenções em Análise do Comportamento Aplicada (ABA) para crianças com Transtorno do Espectro Autista (TEA) devem ser sistematizadas, intensivas e com orientações para pais. Este estudo objetivou descrever e avaliar os efeitos de um programa para pais, baseado em ABA, sobre o desenvolvimento verbal de crianças com TEA. Com delineamento experimental, a amostra incluiu 12 mães, cinco pais e seus filhos com TEA, de um a quatro anos, distribuídas em grupo experimental (GE) e controle (GC). O repertório verbal das crianças foi avaliado com o VB-MAPP antes e depois dos pais participarem do programa durante 12 semanas. Os resultados apontaram que, após a intervenção com pais, o GE apresentou significativamente mais comportamentos verbais (31%) do que o GC (6 %), em comparações intragrupos. Não foram observadas diferenças entre os grupos no pós-teste. Intervenções com pais alteraram positivamente o repertório verbal de crianças com TEA, sugerindo a necessidade de estudos com amostras maiores.
Palavras-chave: programa para pais; análise do comportamento aplicada; transtorno do espectro autista; comportamento verbal; VB-MAPP

Resumen: Las intervenciones del Análisis Aplicado de la Conducta (ABA) para niños con trastorno del espectro autista (TEA) deben ser sistematizadas e intensivas, con orientación para los padres. Este estudio tuvo como objetivo describir y evaluar los efectos de un programa parental, basado en ABA, sobre el desarrollo verbal de niños con TEA. Con un diseño experimental, la muestra estuvo compuesta por 12 madres, cinco padres y sus niños con TEA, de uno a cuatro años de edad, divididos en grupo experimental (GE) y control (GC). El repertorio verbal de los niños se evaluó con el VB-MAPP antes y después de que los padres participaran en el programa durante 12 semanas. Los resultados mostraron que, después de la intervención con los padres, el GE mostró significativamente más conductas verbales (31 %) que el GC (6 %), en las comparaciones intragrupo. No se observaron diferencias entre los grupos en el postest. Las intervenciones con los padres alteraron positivamente el repertorio verbal de los niños con TEA, lo que sugiere la necesidad de estudios con muestras más grandes.
Palabras clave: programa para padres; análisis aplicado de la conducta; trastorno del espectro autista; conducta verbal; VB-MAPP

Autism Spectrum Disorder (ASD) is a chronic neurodevelopmental condition present from early childhood, characterized by difficulties in communication and social interaction, as well as the presence of restricted interests and repetitive behaviors (American Psychiatric Association [APA], 2022). According to the DSM-5-TR (APA, 2022), the following deficits in the repertoire of social communication must be identified, across multiple contexts: limited use of language to communicate with other people, rarely responds when called, does not usually share interests or achievements with parents and family members, has difficulty understanding nonverbal language, does not develop facial expressions, exhibiting limited expressions to communicate, has little interest in interacting with other children, and shows limitations in engaging in creative play or activities requiring imagination, such as symbolic play. They may also exhibit repetitive behaviors during play or while performing an activity, engage in repetitive verbalizations, have peculiar or intense interests in certain subjects, require things to always happen in the same way, with rigid routines, and display sensory issues such as sensitivity to sounds, light, or certain environments (APA, 2022). Based on the impairments observed in social communication and in restricted and repetitive behavior patterns, it is possible to identify levels of support needs: level 1 – requiring support, level 2 – requiring substantial support, and level 3 – requiring very substantial support.

Recent estimates have identified ASD as one of the most prevalent neurodevelopmental disorders worldwide, estimated at 1 in every 31 children (Shaw et al., 2025). A study by Li et al. (2022) warned that this prevalence may reach 1 in 30. In Brazil, there are still few studies related to the prevalence of this disorder (Nogueira et al., 2022), however, it is estimated that at least two million Brazilians have been diagnosed with ASD (Araujo et al., 2019).

Among the various therapeutic and educational interventions directed at individuals with ASD, Applied Behavior Analysis (ABA) stands out as one of the most influential and growing approaches in the United States of America, particularly because it is considered a practice based on scientific evidence (Deochand & Fuqua, 2016; Fernandes & Amato, 2013). Applied Behavior Analysis refers to a subfield of Behavior Analysis, which cannot exist independently of two other areas: Experimental Analysis of Behavior (a basic science) and Radical Behaviorism (the philosophy that underpins this science) (Tourinho, 1999).

An ABA intervention involves identifying behaviors and skills that need to be developed or improved through the selection and description of teaching objectives and the design of an individualized teaching plan with strategies that have been proven effective for behavior modification in the individual's natural environments. The teaching programs are systematically analyzed based on their outcomes. Once the teaching objectives are achieved, the goal is for the learned or refined behaviors to be generalized across various people and daily contexts in the individual's life (Cartagenes et al., 2016).

Although there is a growing number of studies demonstrating the effectiveness of ABA interventions for ASD, there is no known systematization in Portuguese on this topic to date (Sella & Ribeiro, 2018). However, several authors (Boyd et al., 2012; Cook & Odom, 2013; Foxx, 2008; Odom et al., 2010; Wong et al., 2015) have reviewed the results in the scientific literature, analyzing them with scientific rigor, and summarizing their findings on which procedures and outcomes have been most effective in modifying and developing specific behaviors in individuals with ASD. It should also be highlighted that the high prevalence of ASD and the enduring nature of this condition represent a

significant demand not only for the services that support these individuals (healthcare, education, and social assistance sectors) (Ferguson et al., 2019), but also place a burden on the parents of these children (Vilanova et al., 2022).

The deficit in verbal communication is a characteristic present in the repertoire of children with ASD. Among the instruments used to assess it is the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP), which aims to map the behavioral repertoire and learning barriers of children up to four years of age, based on the assumptions of verbal behavior proposed by Skinner (1957). According to Skinner (1957), verbal behavior is an operant behavior, selected and maintained by its consequences. What differentiates it from other operant behaviors is the mediation of its consequences by a listener, a member of a verbal community.

In this context, Lotfizadeh et al. (2018) conducted a study aimed at evaluating the effects of a low-intensity ABA intervention, based on the replication of previous studies, including direct observation measures proposed in the VB-MAPP. A regression analysis was conducted using data from 171 individuals with autism between one year and seven months and 30 years and four months of age, resulting in a mean sample age of five years and ten months. The independent variable in this study was the ABA intervention, which consisted of 1:1 therapy and supervision. Participants were divided into two groups, with 98 participants allocated to the treatment group and receiving between eight and 14.5 hours per week of intervention, while the 73 participants in the control group received between 1.4 and 8 hours per week of intervention. The VB-MAPP was used as the primary outcome measure. However, a subsample was constructed based on participants for whom data from the Vineland Adaptive Behavior Scale (VABS II) were available. Consequently, outcome measures from 17 individuals with autism in the treatment group were analyzed in comparison to 11 from the control group for this instrument. The results indicated that participants in the treatment group achieved greater gains in VB-MAPP scores, with a statistically significant difference between the groups. Regarding the VABS II results, greater gains were identified in the treatment group, although the difference between the groups was not statistically significant.

Saaybi et al. (2019) conducted a pilot study aimed at identifying white matter tract abnormalities in children and preschoolers with ASD using diffusion tensor imaging and correlating the imaging findings with clinical improvements following an ABA intervention. For this, 25 children, aged between 18 months and four years, were divided into a treatment group (n = 17) and a control group (n = 8). Magnetic resonance images were collected before and 12 months after the intervention for both groups, and at three time points in the study, the children were assessed using the VB-MAPP: before, six months after, and one year after the intervention. The treatment group underwent an ABA intervention five days per week, for six to 10 hours per week, in addition to one hour per week of speech therapy and occupational therapy. Tract-Based Spatial Statistics (TBSS) were used to measure medical variables such as fractional anisotropy, mean diffusivity, axial diffusivity, and radial diffusivity, allowing for comparison of imaging data from participants with ASD in relation to neurotypical participants. Consequently, two comparisons were made in this study: (1) the effect of ABA therapy on VB-MAPP scores for the ASD sample, that is, this variable was analyzed within-group, and (2) the comparison of white matter tracts in the images of the ASD sample in relation to the sample with typical neurodevelopment. The VB-MAPP results indicated improvement from baseline for the within-group data of the ASD sample, both in the assessment conducted at six months and the one conducted at twelve months after the intervention. Additionally, the diffusion tensor imaging findings indicated white matter tract abnormalities in patients with ASD compared to controls at the beginning of the intervention and confirmed the benefits of early intervention and ABA therapy in clinical and neuroimaging outcomes, as evidenced by the increase in fractional anisotropy in 21 tracts of the patients with ASD after treatment.

Involving parents and caregivers is just as important as providing early and effective interventions for children with ASD, as their participation makes them effective partners in the practices with their children. Gomes et al. (2021) used Information and Communication Technology to train caregivers of children with ASD to conduct intensive behavioral interventions. The results indicated positive changes in all areas of development assessed by the Operationalized Portage Inventory and the PEP-R (Psychoeducational Profile Revised). Stone-Heaberlin et al. (2023), considering the importance of early intervention, involved parents in the Bridge Skill Development program while the children awaited the start of intensive interventions. Using teaching techniques from Behavior Analysis (ABA) and discrete trial training (DTT), it was possible to observe improvements in target skills taught to all

participants (maintaining eye contact, imitating, matching objects, and following instructions). Tabatabaei et al. (2022) conducted a systematic literature review aimed at analyzing the characteristics and outcomes of interventions and training involving parents of children with ASD. A total of 53 articles were analyzed. Of the studies, 92% took place in high-income countries, with 36% conducted at home, 47% in institutions, and the remainder in mixed settings. Of the interventions, 57% were individual. The results indicated favorable effects for both parents and children. The literature confirms the need for early interventions with children with ASD, with the aim of promoting their overall and verbal development, increasing their likelihood of future independence, as well as interventions with parents to prepare them to be effective partners in this journey.

In this context, the need for early interventions is evident, which must be based on empirical evidence and aim to support the parents of children with ASD. These interventions should focus both on the behavioral management of their children, promoting the development of skills in which they show deficits, reducing interfering behaviors they present, and at the same time contributing to the physical and emotional well-being of these parents, enabling a more qualitative involvement in their child's development and expanding the possibilities of interventions with this population. The present study aimed to describe and assess the effects of a parent training program based on ABA on the verbal behavior of their children with ASD. The hypothesis was that parents' participation in the parent training program, combined with ABA interventions conducted with the child, would increase the frequency of verbal behaviors emitted by their children with ASD and lead to a decrease in the learning barriers assessed by the VB-MAPP.

Materials and methods

Ethical aspects of the research

The present study was part of a larger study entitled: "Effects of a teaching program in Applied Behavior Analysis (ABA) on the development of children with autism spectrum disorder and the emotional health of their parents," approved by the Ethics Committee of the School of Sciences at UNESP-Bauru, Protocol No. 4.769.162, which complied with all the standards presented in Resolution No. 466/2012 of the National Research Ethics Commission. The participants were invited and informed about the objective of the study, and those who agreed to participate signed the consent form, which outlined the objectives of the study and safeguarded the participants' rights regarding the confidentiality of their personal information, emphasizing the voluntary nature of their participation and the possibility of withdrawing at any time. At the end of the parents' participation in the project, individual feedback sessions were conducted, providing guidance and appropriate referrals for each case.

Research design

The present study is characterized as an experimental study, with groups randomly assigned (Cozby, 2003). Initially, both groups underwent pre-test assessments. Subsequently, the children in both groups received ABA interventions, and the parents in the Experimental Group participated in the ABA-based orientation program, which also included information on ASD. At the end of the intervention, both groups (children and parents) underwent the same pre-test assessments. The performance of the children's verbal behavior, assessed based on scores in the developmental milestones and learning barriers in the VB-MAPP protocol, was considered the dependent variable of the study. The participation of the parents in the orientation program was the independent variable.

Participants

A total of 34 Brazilian families were invited to participate in this study. Seventeen mothers and ten fathers agreed and responded to the pre-test instruments. However, the total sample that participated in all stages of the study consisted of 12 mothers and five fathers and their children, who were randomly assigned to the experimental group (six mothers and three fathers) and the control group (six mothers and two fathers). Furthermore, among the participating parents, five were couples, of whom three were in the Experimental Group (EG) and two in the Control Group (CG). Among the mothers, seven participated individually, three in the EG and four in the CG. All participants were parents of children diagnosed or undergoing diagnostic evaluation for autism spectrum disorder, aged between one and four years.

Inclusion criteria: 1) Parents had to be at least 18 years of age, and 2) Children had to have a diagnosis of ASD through a report issued by a pediatric neurologist or child psychiatrist or be undergoing diagnostic evaluation. Exclusion criteria: 1) Parents with a history of or undergoing treatment for psychotic disorders, and 2) Children and their parents who had previously received ABA intervention. Criterion 2 was established as a means of controlling for possible effects of a previous intervention.

The sociodemographic characteristics of the participants are presented in Table 1. In general, mothers and fathers in both the experimental and control groups had similar profiles in terms of age range, marital status, paid employment, and number of children. Greater variability between the groups was observed in terms of educational level and socioeconomic status, particularly among the fathers.

Table 1

Sociodemographic characteristics of the mothers and fathers in the CG and EG

Sociodemographic variables	Mothers		Fathers	
	EG (*n* = 6)	CG (*n* = 6)	EG (*n* = 3)	CG (*n* = 2)
Age (years)				
19 ⊢ 25	1	1	0	0
26 ⊢ 35	3	5	3	2
36 or older	2	0	0	0
Marital status				
Single	0	2	0	0
Married/Stable union	6	4	3	2
Educational level				
Up to completed elementary school	0	1	0	1
Completed high school	3	3	0	1
Completed higher education or more	3	2	3	0
Employed outside the home				
Yes	3	5	3	2
No	3	1	0	0
Number of children				
1	3	5	2	2
2	3	1	1	
Socioeconomic level				
A and B	5	4	3	1
C	1	2	0	1

Note. EG: experimental group; CG: control group.

Regarding the sociodemographic characteristics of the children who comprised the sample, as shown in Table 2, six were part of the EG and six of the CG. Overall, the groups exhibited a similar distribution in terms of age and school attendance. Most of the children were male and were the firstborn in their families. In the experimental group, all had a diagnosis of ASD, while in the control group, some were still undergoing diagnostic evaluation. A diversity of communication modes was observed, with a greater predominance of both vocal and gestural difficulties in the control group.

Table 2

Characterization of the children in the EG and CG

	EG (*n* = 6)	CG (*n* = 6)
Age (years)		
1 ⊢ 2	3	4
3 ⊢ 4	3	2
Sex		
Male	5	4
Female	1	2
Birth order		
Firstborn	6	4
Second child	0	2
Has diagnosis		
Yes	6	4
Under diagnostic investigation	0	2
Communication		
Fluent vocal	2	0
Vocal, but not fluent	0	2
Primarily through gestures	2	1
Difficulties in both gestural and vocal communication	2	3
Attends school		
Yes	4	5
No	2	1

Note. EG: experimental group; CG: control group.

Setting

Data were collected in rooms specifically designated for psychotherapeutic services at a private clinic serving children with ASD, located in the municipality of Londrina/PR, Brazil. All types of noise or other stimuli that could interfere with the parents' privacy or with the proposed interventions for the children were controlled to the greatest extent possible in an attempt to minimize potential impacts on the completion of the instruments or during the intervention.

Instruments

To identify sociodemographic issues, a questionnaire was developed containing questions directed to the parents (age, marital status, educational level, type of delivery, and number of children), to the child (age, sex, birth conditions, age at which the diagnosis was made, types of interventions the child may have undergone, and their duration), and to the family (family configuration, number of residents in the household). For socioeconomic data, the scale organized by the *Associação Brasileira de Empresas de Pesquisa* (ABEP, 2019) was used, which contains questions about housing conditions (household appliances, number of rooms, etc.) and public services (running water, paved street).

To assess the verbal repertoire, the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP), developed by Sundberg (2008), was used. It is based on Skinner's (1957) concepts of verbal behavior, was translated and adapted into Portuguese by Martone (2017), and has been widely used for mapping, planning, and implementing interventions related to the behavioral repertoire of children with ASD. The assessed developmental milestones are divided into three levels: 1) from zero to 18 months, with nine areas: mand, tact, listener, VP/MTS (visual perception and matching-to-sample), play, social, imitation, echoic, and vocal; 2) from 18 to 30 months, with 12 areas: mand, tact, listener, VP/MTS, play, social, imitation, echoic, listener responding by function, feature, and class (LRFFC), intraverbal, group activities, and linguistic structures; and 3) from 30 to 48 months, with 13 areas: mand, tact, listener, VP/MTS, play, social, imitation, echoic, LRFFC, intraverbal, group activities, linguistic structures, and early math skills. In each evaluative domain, the child can score from zero to five points. The protocol presents five components for assessment: 1) developmental milestones; 2) barriers assessment; 3) transition; 4) task analysis; and 5) interpretation and development of the Individualized Education Program (IEP). It is important to highlight that, for the present study, since the

objective was to map the child's behavioral repertoire, only the developmental milestones and learning barriers proposed in the protocol were investigated.

Procedures

The parents of children with ASD were identified at a private clinic in the city of Londrina/PR, Brazil, where they had sought care for their children, and were invited to participate in the present study. In cases of acceptance, participants were allocated to the EG and CG in order of arrival. The method of simple randomization by fixed blocks of two participants was used as a way to reduce bias and allocate participants into the groups in a balanced manner (Efird, 2010). An individual meeting was scheduled to present the objectives and phases of the research. After clarifying any doubts, the parents signed the consent form. On a previously scheduled date and time, the children were assessed using the VB-MAPP.

Regardless of the group randomization, based on the VB-MAPP data, a quarterly IEP was developed for each child. It included short-term, medium-term, and long-term goals aimed at developing the child's skills through the application of ABA teaching programs. These programs were applied and measured in each session conducted with the child, and were therefore continuously reviewed and systematically adjusted based on the child's performance throughout the 12 weeks of intervention. Consequently, as the intervention was conducted with children from both groups, it was treated as a constant variable in the study design.

Simultaneously with the ABA intervention for the children, the parents in the GE participated in the Parent Orientation and Teaching Program (*Programa de Orientação e Ensino para Pais* - PROEP), developed for this study, based on Analytic-Behavioral (ABA) principles and implemented by the first author. The guidance was provided individually and in person. The PROEP was not monitored by an external judge, but weekly external supervision sessions were conducted. The PROEP consisted of 12 weekly meetings, each lasting approximately 90 minutes, and addressed topics such as welcoming the parents' concerns regarding their child's diagnosis. The description of the PROEP is presented in Table 3.

Table 3

Description of the PROEP

No.	Session objectives	Content covered	Tasks for parents
1	Welcoming the parents' requirements and presenting the proposal.	Presentation of the meeting schedule. Importance of active participation of parents in the child's therapeutic process.	Prepare a checklist of positive behaviors (strengths) and negative behaviors (deficits or excesses) presented by the child.
2	Describing the main characteristics of ASD. Presenting principles of ABA.	Resumption of the task. Definition and main characteristics of ASD. Presentation of the principles of Behavior Analysis.	Record a video of a characteristic behavior of the child.
3	Considering the importance of the environment for the child's learning.	Based on the recording, reflect on the importance of organizing teaching conditions, creating motivating/establishing operations.	Photograph a structured environment for interactions with the child, based on what was presented during the meeting.
4	Describing the main teaching strategies in ABA.	Resumption of the task. How to establish and maintain appropriate behaviors. Discrete Trial Training (DTT).	Training for the establishment of a new behavior in the child – reinforcement and the use of DTT.
5	Presenting the concepts of the three-term contingency.	Based on the task and a session with the child's therapist, parents reflect on the three-term contingency. Importance of consistency in teaching opportunities.	Record and functionally analyze at least three behaviors of the child observed at home, in a table using the three-term contingency.
6	Describing what functional analysis (FA) is.	Reflection on FA based on the homework task. Importance of identifying possibilities of behavioral management.	Record the occurrence of an appropriate behavior and complete the FA chart.
7	Contingency and contiguity of reinforcement. Positive effects of reinforcement and negative effects of punishment.	Resumption of the task. Consequences of responding and the role of a reinforcer for acquisition and/or maintenance of a behavior. Role-play performance.	Parents should analyze a video and answer: 1) which target skill was taught, and 2) which of the videos referred to the immediacy of reinforcement.

8	Describing to parents the importance of developing the child's social skills.	Social skills in the child's repertoire. Teaching strategies: shaping, modeling, contingent reinforcement, CRF, intermittent reinforcement, prompt fading, token economy, and task analysis.	List the social skills presented by the child and perceived by the parents in the family context. If possible, record these behaviors on video.
9	Describing levels of assistance that favor the child's learning.	Errors and omissions in responses to a demand. The difference between correcting and doing for the child. Different types of support that can be offered to the child.	Describe or record a video of a correction or help that the parents provided to the child in response to a daily family demand.
10	Teaching the parents ways to record a behavior.	Recording behaviors that guide objectives for measuring children's learning.	Teach at home a skill already presented in the clinic, recording it for later analysis with the therapist.
11	Assisting parents in identifying possibilities to promote the child's independence and autonomy.	Discussion on independence and autonomy. Reflection on which behaviors were observed and strategies to increase the child's autonomy.	Prepare a brief report on the guidance received, its evaluation, and the applicability of what was learned.
12	Assisting parents in reducing problem behavior and increasing socially acceptable behavior.	Socially acceptable and inappropriate behaviors: redirection of behaviors (illustrative videos). Program evaluation.	

In each meeting, the content was described and addressed in an explanatory and dialogical manner with the parents, including scheduled observations during the child's sessions and small homework tasks (reports, records, or videos on topics relevant to the theme worked on in the meeting and related to the items in the child's IEP). Doubts regarding the challenges experienced during the week with the child and the tasks requested in the previous meeting were also resolved (Ferreira, 2023).

Since it is an ABA program involving mothers, fathers, and their children with ASD, in some clinical sessions, behavioral management videos that they could practice at home (video modeling) were recorded, and in others, they were able to participate in the session in person, receiving guidance and feedback. The type of conduct adopted (video modeling or in-person feedback) was determined by the short-term, medium-term, and long-term goals described in the child's IEP and the results presented by the child in each session. At the end of the trimester, the children were reassessed using the VB-MAPP.

Data analysis

Data collected with the VB-MAPP were analyzed and categorized according to its manual. For statistical analyses, the IBM SPSS version 23 software was used. All data were analyzed using descriptive statistics, calculating the mean and standard deviation for quantitative data and relative and absolute frequencies for qualitative data. The data did not present a normal distribution; therefore, for inter- and intragroup comparisons related to verbal behavior and learning barriers, the Mann-Whitney and Wilcoxon tests were used.

Results

Table 4 presents the comparisons of the verbal repertoire of the children in the EG in relation to those in the CG based on the VB-MAPP in the pre- and post-test phases. In the pre-test, the children in the EG presented higher means than those in the CG in nine of the 15 evaluated dimensions, namely: mand, tact, listener, play, imitation, echoic, LRFFC, intraverbal, and language; however, there were no statistically significant differences between the groups. The group dimension was not evaluated in either group due to precautions related to the COVID-19 pandemic, which was ongoing at the time of data collection.

In the post-test, the comparisons of the verbal repertoire of the children in the EG in relation to those in the CG based on the VB-MAPP showed that the children in the EG performed better in all evaluated repertoires. However, the differences were not significant (Table 4).

Table 4

Comparisons between the verbal repertoires of the children in the EG and CG in the pre- and post-test

VB-MAPP*	EG Pre (*n* = 6) *M* (*SD*)	CG Pre (*n* = 6) *M* (SD)	*p*	EG Post (*n* = 6) *M* (SD)	CG Posts (*n* = 6) *M* (*SD*)	*p*
Mand	1.8 (2.9)	1.3 (1.9)	0.849	2.8 (4.5)	2.0 (3.0)	0.929
Tact	2.1 (3.4)	1.9 (2.9)	1.000	3.3 (5.1)	2.4 (3.6)	1.000
Listener	3.2 (4.7)	2.4 (2.0)	0.629	4.6 (5.2)	3.3 (2.9)	0.871
VP/MTS	3.7 (1.3)	3.7 (1.2)	0.933	5.6 (3.6)	4.5 (2.3)	0.806
Play	3.2 (2.2)	2.8 (1.4)	0.871	5.9 (4.1)	5.0 (2.5)	0.872
Social	2.2 (1.6)	2.7 (2.2)	0.675	4.3 (2.6)	2.9 (1.5)	0.367
Imitation	2.4 (0.0)	2.0 (1.6)	1.000	4.1 (3.7)	3.3 (2.7)	0.517
Echoic	2.2 (4.0)	1.2 (2.4)	0.858	2.9 (4.4)	2.8 (3.4)	0.566
Vocal	3.2 (1.2)	3.6 (1.1)	0.557	3.6 (1.1)	3.2 (1.8)	0.930
LRFFC	0.7 (1.6)	0.1 (0.2)	0.902	1.5 (2.8)	0.5 (1.2)	0.528
Intraverbal	0.6 (1.4)	0.2 (0.4)	0.902	1.4 (2.3)	0.5 (1.2)	0.461
Language	1.0 (2.0)	0.3 (0.8)	0.528	1.7 (2.9)	0.6 (1.4)	0.528
Reading	0.0 (0.0)	0.0 (0.0)	1.000	0.5 (1.2)	0.0 (0.0)	0.317
Writing	0.0 (0.0)	0.0 (0.0)	1.000	0.3 (0.6)	0.0 (0.0)	0.317
Mathematics	0.0 (0.0)	0.0 (0.0)	1.000	0.3 (0.8)	0.0 (0.0)	0.317

Notes. M: mean; *SD*: standard deviation; EG: experimental group; CG: control group; Pre: pre-test; Post: post-test; VB-MAPP: Verbal Behavior Milestones Assessment and Placement Program; VB-MAPP*: Only the categories that were scored in developmental milestones in the instrument were presented; Significance level: $p < .05$; Mann-Whitney test.

Table 5 presents the intragroup comparisons of the verbal repertoire of the children in the EG and CG based on the VB-MAPP in the pre-test and post-test. It was observed that in all dimensions evaluated in the EG, the means were higher in the post-test, with five dimensions showing statistically significant differences: listener ($p = .041$), VP/MTS ($p = .042$), play ($p = .027$), social ($p = .042$), and imitation ($p = .027$). In the CG, the difference was significant for play ($p = .026$). For the CG, higher means were also observed in the post-test for the evaluated dimensions, except for the vocal repertoire.

Comparisons were made between the learning barriers of the children in the EG in relation to the CG at the pre-test moment based on the VB-MAPP. The EG presented higher scores in seven of the 18 evaluated barriers, and the CG in seven of them. In five of the barriers, performance was equal for both groups. Significant differences were observed only in eye contact, which was higher for the CG ($p = .003$), as shown in Table 6.

Considering the post-test of the comparisons between the learning barriers of the children in the EG in relation to the CG based on the VB-MAPP, it can be seen that the EG presented higher means in seven barriers, while the CG presented higher means in nine of them. In only two, the result was the same for both groups. However, the difference was significant only for eye contact, with lower performance for the CG ($p = .013$). The data are presented in Table 6.

Table 5

Intragroup comparisons between the verbal repertoires of the children in the EG and CG in the pre-test and post-test

VB-MAPP*	EG Pre-test (*n* = 6)				EG Post-test (*n* = 6)				*p*
	M	***SD***	**Min**	**Max**	***M***	***SD***	**Min**	**Max**	
Mand	1.8	2.99	0.0	7.0	2.8	4.49	0.0	10.0	0.157
Tact	2.1	3.41	0.0	8.0	3.3	5.10	0.0	11.0	0.180
Listener	3.2	4.73	0.0	12.5	4.6	5.19	0.5	13.0	0.041*
VP/MTS	3.7	1.29	2.5	6.0	5.6	3.57	2.5	12.0	0.042*
Play	3.2	2.21	1.0	7.0	5.9	4.10	2.5	13.5	0.027*
Social	2.2	1.60	1.0	5.0	4.3	2.60	2.0	9.0	0.042*
Imitation	2.4	2.54	0.0	7.0	4.1	3.71	0.5	11.0	0.027*
Echoic	2.2	4.02	0.0	10.0	2.9	4.43	0.0	10.0	0.180
Vocal	3.2	1.21	1.5	5.0	3.6	1.11	2.5	5.0	0.180
LRFFC	0.7	1.63	0.0	4.0	1.5	2.81	0.0	7.0	0.180
Intraverbal	0.6	1.43	0.0	3.5	1.4	2.33	0.0	5.5	0.180
Language	1.0	2.00	0.0	5.0	1.7	2.88	0.0	7.0	0.157
Reading	0.0	0.00	0.0	0.0	0.5	1.22	0.0	3.0	0.317
Writing	0.0	0.00	0.0	0.0	0.3	0.61	0.0	1.5	0.317
Mathematics	0.0	0.00	0.0	0.0	0.3	0.82	0.0	2.0	0.317
VB-MAPP*	**CG Pre-test (*n* = 6)**				**CG Post-test (*n* = 6)**				***p***
	M	***SD***	**Min**	**Max**	***M***	***SD***	**Min**	**Max**	
Mand	1.3	1.99	0.0	4.5	2.0	3.02	0.0	7.0	0.109
Tact	1.9	2.97	0.0	6.0	2.4	3.61	0.0	8.0	0.180
Listener	2.4	2.04	0.5	6.0	3.3	2.96	1.0	8.5	0.066
VP/MTS	3.7	1.21	2.5	6.0	4.5	2.32	2.5	9.0	0.066
Play	2.8	1.37	1.5	5.0	5.0	2.51	3.5	10.0	0.026*
Social	2.7	2.25	1.0	7.0	2.9	1.50	1.0	5.0	0.713
Imitation	2.0	1.61	0.5	5.0	3.3	2.70	1.5	8.0	0.068
Echoic	1.2	2.38	0.0	6.0	2.8	3.42	0.0	9.0	0.066
Vocal	3.6	1.11	2.5	5.0	3.2	1.83	0.0	5.0	0.317
LRFFC	0.1	0.20	0.0	0.5	0.5	1.22	0.0	3.0	0.317
Intraverbal	0.2	0.41	0.0	1.0	0.5	1.22	0.0	3.0	0.317
Language	0.3	0.82	0.0	2.0	0.6	1.43	0.0	3.5	0.317
Reading	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.0	1.000
Writing	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.0	1.000
Mathematics	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.0	1.000

Notes. M: mean; *SD*: standard deviation; EG: experimental group; CG: control group; VB-MAPP: Verbal Behavior Milestones Assessment and Placement Program; VB-MAPP*: Only the categories that were scored in developmental milestones in the instrument were presented; Significance level: $p < .05$; Wilcoxon test.

Table 6

Comparisons between the learning barriers of the children in the EG and CG in the pre- and post-test

VB-MAPP*	EG Pre (*n* = 6) *M* (*SD*)	CG Pre (*n* = 6) *M* (*SD*)	*p*	EG Post (*n* = 6) *M* (*SD*)	CG Post (*n* = 6) *M* (*SD*)	*p*
Behavior problems	2.2 (1.2)	1.5 (1.0)	0.360	0.7 (0.8)	0.8 (0.9)	0.312
Instructional control	2.0 (1.4)	2.3 (1.5)	0.675	1.7 (0.5)	1.7 (1.4)	0.604
Weak mand	2.7 (2.1)	2.7 (2.1)	1.000	2.7 (2.1)	1.8 (2.0)	0.715
Weak tact	2.7 (2.1)	2.7 (2.1)	1.000	2.7 (2.1)	2.0 (2.2)	1.000
Weak echoic	2.3 (1.9)	3.2 (1.6)	0.471	2.7 (2.1)	1.7 (1.9)	0.485
Weak imitation	1.5 (1.9)	1.7 (1.6)	0.801	0.5 (0.8)	1.3 (2.1)	0.324
Weak VP-MTS	1.0 (1.7)	1.2 (1.3)	0.719	0.3 (0.8)	1.0 (1.1)	0.241
Weak listener	1.8 (2.0)	1.8 (1.6)	0.933	1.5 (1.8)	1.5 (1.8)	0.737
Weak intraverbal	1.3 (2.1)	0.0 (0.0)	0.138	1.3 (2.1)	0.0 (0.0)	0.138
Weak social skills	1.2 (1.8)	1.0 (1.7)	0.924	0.5 (1.2)	0.7 (1.6)	0.528
Impaired tracking skills	1.3 (2.1)	0.7 (1.6)	0.523	0.3 (0.8)	0.0 (0.0)	0.317
Weak conditional discrimination	2.5 (1.9)	2.5 (1.9)	1.000	2.2 (1.8)	1.7 (1.9)	0.867
Weak motivators	1.0 (1.5)	1.0 (1.7)	0.788	0.3 (0.5)	0.7 (1.0)	0.702
Response cost weakens motivation	1.5 (1.9)	0.5 (0.8)	0.420	0.0 (0.0)	0.5 (0.8)	0.140
Reinforcer dependency	0.2 (0.4)	0.5 (0.8)	0.317	0.0 (0.0)	0.2 (0.4)	1.000
Self-stimulation	0.3 (0.5)	3.0 (1.5)	0.847	0.5 (0.5)	2.3 (1.9)	0.784
Articulation difficulties	3.0 (1.7)	0.5 (1.2)	1.000	2.7 (1.7)	0.2 (0.4)	0.589
Difficulties making eye contact	1.0 (1.5)	26.7 (15.2)	0.003	0.2 (0.4)	17.7 (18.2)	0.013*

Notes. M: mean; *SD*: standard deviation; EG: experimental group; CG: control group; Pre: pre-test; Post: post-test; VB-MAPP: Verbal Behavior Milestones Assessment and Placement Program; VB-MAPP*: Only the categories that were scored in developmental learning barriers in the instrument were presented; Significance level: $p < .05$; Mann-Whitney test.

Table 7 demonstrates the comparisons between the learning barriers of the children in the EG at the pre- and post-test moments based on the VB-MAPP. It can be observed that the children in the EG presented a reduction in the mean in thirteen of the eighteen evaluated learning barriers in the post-test; however, this difference was not significant.

Table 7 also presents the pre- and post-test data of the CG in the comparison of learning barriers. It can be seen that there was a decrease in the mean in sixteen of the evaluated dimensions, with this difference being significant in difficulties making eye contact ($p = .046$).

Table 7

Intragroup comparisons between the learning barriers of the children in the EG and CG in the pre- and post-test

VB-MAPP*	EG Pre (*n* = 6) *M* (*SD*)	EG Post (*n* = 6) *M* (*SD*)	*p*	CG Pre (*n* = 6) *M* (*SD*)	CG Pro (*n* = 6) *M* (*SD*)	*p*
Behavior problems	2.2 (1.2)	0.7 (0.8)	0.071	1.5 (1.0)	0.8 (0.9)	1.000
Instructional control	2.0 (1.4)	1.7 (0.5)	0.593	2.3 (1.5)	1.7 (1.4)	0.785
Weak mand	2.7 (2.1)	2.7 (2.1)	1.000	2.7 (2.1)	1.8 (2.0)	0.317
Weak tact	2.7 (2.1)	2.7 (2.1)	1.000	2.7 (2.1)	2.0 (2.2)	1.000
Weak echoic	2.3 (1.9)	2.7 (2.1)	0.317	3.2 (1.6)	1.7 (1.9)	0.180
Weak imitation	1.5 (1.9)	0.5 (0.8)	0.109	1.7 (1.6)	1.3 (2.1)	1.000
Weak VP-MTS	1.0 (1.7)	0.3 (0.8)	0.317	1.2 (1.3)	1.0 (1.1)	0.317
Weak listener	1.8 (2.0)	1.5 (1.8)	0.317	1.8 (1.6)	1.5 (1.8)	1.000
Weak intraverbal	1.3 (2.1)	1.3 (2.1)	1.000	0.0 (0.0)	0.0 (0.0)	1.000
Weak social skills	1.2 (1.8)	0.5 (1.2)	0.180	1.0 (1.7)	0.7 (1.6)	1.000
Impaired tracking skills	1.3 (2.1)	0.3 (0.8)	0.180	0.7 (1.6)	0.0 (0.0)	0.317
Weak conditional discrimination	2.5 (1.9)	2.2 (1.8)	0.317	2.5 (1.9)	1.7 (1.9)	0.317
Weak motivators	1.0 (1.5)	0.3 (0.5)	0.180	1.0 (1.7)	0.7 (1.0)	0.317
Response cost weakens motivation	1.5 (1.9)	0.0 (0.0)	0.102	0.5 (0.8)	0.5 (0.8)	1.000
Reinforcer dependency	0.2 (0.4)	0.0 (0.0)	0.317	0.5 (0.8)	0.2 (0.4)	1.000
Self-stimulation	0.3 (0.5)	0.5 (0.5)	0.317	3.0 (1.5)	2.3 (1.9)	1.000
Articulation difficulties	3.0 (1.7)	2.7 (1.7)	0.157	0.5 (1.2)	0.2 (0.4)	1.000
Difficulties making eye contact	1.0 (1.5)	0.2 (0.4)	0.180	26.7 (15.2)	17.7 (18.2)	0.046*

Note. M: mean; *SD*: standard deviation; EG: experimental group; CG: control group; Pre: pre-test; Post: post-test; VB-MAPP: Verbal Behavior Milestones Assessment and Placement Program; VB-MAPP*: Only the categories that were scored in developmental learning barriers in the instrument were presented; Significance level: $p < .05$; Wilcoxon test.

Discussion

The application of ABA science for children with ASD involves direct work with the child, beginning with an assessment of the child's behavioral repertoire. Based on this data, an individualized teaching curriculum is developed with the objective of promoting the development of motor, social, communicational, academic, and daily living skills, in addition to reducing behaviors considered dysfunctional (Farias & Elias, 2020). This process must be monitored through continuous evaluations regarding the effectiveness of the teaching procedures employed, so that, if necessary, the proposed teaching contingencies can be adjusted and rearranged (Barcelos et al., 2020). Being considered an intensive therapy, intervention periods may vary from four to 40 hours weekly, defined according to the child's needs and the availability, including financial, of the parents. Accordingly, due to the high cost generated by the intensity required in ABA interventions and the scarcity of qualified professionals to apply them, parental training has been considered a viable alternative to intensify children's learning and to generalize the repertoires developed in therapy to family life (Romano & Bagaiolo, 2022).

Parental guidance that provides information about ASD, reinforcing the importance of parental involvement in child development, can contribute to a more consistent support network, resulting in parents who are more committed to the interventions (Ang & Loh, 2019; Crowell et al., 2019). The present study evaluated the effects of a parent guidance program, based on ABA, on the verbal behavior of children with ASD. For this purpose, comparisons were made between the EG and CG. The initial hypothesis was that the parent program, combined with ABA interventions conducted with the child, would result in superior verbal behavior performance for the EG and a decrease in learning barriers evaluated by the VB-MAPP.

Comparisons regarding children's verbal repertoire showed that, at pre-test, the groups were equivalent, although the EG presented higher means in a larger number of developmental milestones assessed; however, the differences were not significant. Comparing the two groups at post-test, superior performance was observed in the EG across all constructs investigated, suggesting a possible relation to the parent program, although the differences were not significant. In the systematic review and meta-analysis conducted by Deb et al. (2020), all studies included showed a positive effect of interventions performed with parents on behaviors of children with ASD, although not all studies found significant

differences. The lack of statistical significance in between-group comparisons may be related to the small sample size and the individual ABA interventions that children in both groups were undergoing, which may also have limited the identification of differences produced by the parent intervention. Among the VB-MAPP dimensions showing increase at post-test for the EG compared to the CG, notable were the verbal operants: tact, echoic, and intraverbal, as well as listener skills and LRFFC. Although without statistical differences, these results highlight the importance of parental involvement in interventions, which can increase the likelihood of successful outcomes (Burrell & Borrego Jr, 2012).

Considering the intragroup comparison results, this hypothesis can be reconsidered, since the five dimensions in which the EG showed statistically significant results (listener; VP/MTS; play; social; and imitation) are considered prerequisites for vocal verbal operants. Given that the fourth session of the PROEP addressed teaching skills to the child, parents participating in the PROEP began to encourage generalization of the child's learning at home, which may suggest the program's influence on optimizing the target skills mentioned. Furthermore, it is known that with the acquisition of new skills, interfering behaviors tend to decrease in frequency and intensity, which may also have contributed to the result, since in the sixth session parents were taught to functionally analyze their children's behavioral responses. Studies such as Andrade et al. (2024) and Bradshaw et al. (2022) reinforce the importance of parental involvement to promote development, social skills, and communication in children with ASD.

Andrade et al. (2024) reviewed studies on distance educational programs for parents of children with ASD and found positive results in daily routines, behavioral flexibility, and children's communication. In the present study, the gains observed in the behavioral repertoire of the children in the EG in intragroup comparisons may indicate greater comprehension of instructions, improved participation in group and school activities, and expanded interactions with parents, siblings, teachers, peers, and other significant adults. These improvements contribute to the children's development, support their school inclusion, and enhance their daily lives and those of their families. Although the results did not achieve statistical significance between groups, the advances obtained by the children in the EG may contribute to family relationships and quality of life for children and their families, presenting a clinically significant impact.

O'Donovan et al. (2019) highlighted that individual parental training interventions improve the child's repertoire and management of dysfunctional behaviors; however, for these to be effective, they should last an average of 10 to 12 weeks. Although time-consuming and demanding for both healthcare providers and parents, the PROEP adhered to this recommendation by offering 12 weekly sessions conducted with parents.

Anjos and Morais (2021) noted that establishing a bond between the therapeutic team, the child, and the parents can positively influence challenges faced from the diagnosis onward. This relationship allows professionals to understand how family interactions occur in response to the new condition and to develop strategies that may alleviate difficulties parents face during this process. According to the authors, the problem-focused strategy is the most adopted by parents of children with ASD, which consists of sharing fears and doubts related to the diagnosis with healthcare providers and people in their environment, exchanging experiences, and combining efforts. The authors also highlighted that parents with higher educational and socioeconomic levels tend to hold more favorable beliefs about developmental difficulties based on therapeutic possibilities available to them, even acknowledging that ASD is a lifelong condition. Considering that families in this study's sample were attended in a private clinic and predominantly belonged to socioeconomic class AB among mothers and fathers, this may have influenced the results obtained.

The intragroup comparison results indicated higher means in all developmental milestones at post-test for both groups, with statistical significance in five dimensions for the EG and one for the CG. This result suggests greater effectiveness for an ABA science application associating child intervention and parental training in acquiring new skills, especially those considered prerequisites for vocal behaviors, compared to an ABA intervention focused only on the child. Cavalcante et al. (2023), in their literature review, presented several studies demonstrating benefits of early intervention based on Applied Behavior Analysis principles for ASD. More specifically, Farias and Elias (2020) reported the effectiveness of an ABA intervention, using the VB-MAPP, for teaching multiple verbal operants to triplets, three years and six months of age, with ASD. However, in the present study, the superior performances of the children in the EG indicate the importance of systematic intervention with parents.

Evaluating learning barriers allows identification of behavioral repertoires that may negatively influence or even prevent children's learning (Montallana et al., 2019). Considering the 24 learning barriers investigated, 18 were presented by children in this study.

In a comparison between the two groups at pre-test, equivalence was observed in the barriers with higher means, seven for each group, with difficulty making eye contact being significantly greater in the CG. This significance remained unchanged at post-test; however, there was an increase in the dimensions where higher means were observed in the CG and a reduction in the number of barriers with higher means in the EG.

Comparing the mean score of each group before and after intervention, the EG showed lower means in more constructs assessed, although this difference was not significant. Although the CG's decrease occurred in fewer learning barriers, there was a significant reduction in difficulty making eye contact. This finding suggests that the PROEP carried out with parents may have facilitated the management of challenging behaviors that impaired the children's learning. Bagaiolo et al. (2019) assessed the impact of parent training on the management of challenging behaviors of their children with ASD and found a reduction of more than 70 % of this repertoire in the final two weeks of the intervention.

Final Considerations

This study made it possible to evaluate the effects of an ABA program combined with a specific parental guidance program on the verbal repertoire of their children with ASD. The results were consistent with the literature regarding the effectiveness of evidence-based practices, particularly ABA, for the development of the verbal repertoire of children with ASD. The gains of the EG were greater than those of the CG in verbal performance, as assessed by the VB-MAPP. This result suggests a positive impact on 31% of the behaviors evaluated for the EG. For the CG, improvement occurred in 6% of the behaviors evaluated by the VB-MAPP. However, the intervention with ABA and parents did not result in significant improvement in learning barriers. Although no statistically significant differences were observed between the groups, the advances obtained by the children in the EG suggest clinically relevant gains, especially in skills related to functional communication and social interaction. Such advances may produce improvements in family routines and the inclusion of children with ASD.

Some limitations of the study may have influenced these findings, among them, the difficulty of adherence to the program by the parents, especially due to excessive absences from the sessions, the failure to complete the proposed tasks, the difficulty in engaging in the suggested activities with the child, and the work overload to cover the costs of the child's interventions, which resulted in a limited sample. The intervention having sessions related to the characteristics of ASD, ABA concepts, and procedures exclusively focused on child development may have contributed to parental overload, highlighting the need for a space for more directed listening to the parents.

The fact that the sample was predominantly composed of parents with socioeconomic classes A and B may also be considered a limitation for the study, making the generalization of the results unfeasible, since it is not a representative sample of the Brazilian population and consists mainly, especially in the EG, of individuals with greater access to information, therapies, and support networks. Furthermore, the children in both groups were in intervention, and the objectives were individualized and established based on a prior evaluation that considered their behavioral reserves, excesses, and deficits. Consequently, it is also possible that this aspect interfered with the results obtained from the intervention with the parents.

Other limitations found in the study refer to one of the researchers having conducted the interventions and the intervention fidelity not being monitored by external judges. Future studies could include distinct and independent implementers unrelated to the research objectives, instruments for monitoring fidelity, as well as strategies to increase parental adherence. Additionally, there are no widely recognized studies published in high-impact scientific journals presenting psychometric properties of the Portuguese version of the VB-MAPP (translated by Martone, 2017). The original instrument by Sundberg (2008) was also not developed based on traditional psychometric criteria but rather as a functional tool from Behavior Analysis for the assessment of verbal repertoires. Despite its widespread clinical use, the VB-MAPP lacks formal evidence of validity or reliability in the classical psychometric sense, which may constitute a limitation of the present study.

Although the results were promising, there is a clear need for more robust investigations with larger populations, follow-up assessments, and programs exclusively focused on child care, with evidence-based practices that also include experiences related to the recovery of other roles these individuals have in the world beyond parenting a child with ASD. Despite the limitations, this study contributes evidence regarding interventions performed with parents and advances in the verbal repertoire of their children with ASD, reinforcing the importance of including parents in their children's therapeutic process.

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