

**SIMPLIFIED INTENSIVE TACT INSTRUCTION  
AND BIDIRECTIONAL AND INCIDENTAL  
NAMING IN AUTISTIC CHILDREN**

*ENSEÑANZA INTENSIVA DE TACTO SIMPLIFICADA  
Y NAMING BIDIRECCIONAL E INCIDENTAL  
EN NIÑOS AUTISTAS*

Isabelly Costa Bastos<sup>1,2</sup>  
Andréa Fonseca Farias Lobato<sup>1,2</sup>  
& Carlos Barbosa Alves de Souza<sup>1,3</sup>

<sup>1</sup>*Federal University of Pará*

<sup>2</sup>*Link – Behavioral Solutions*

<sup>3</sup>*National Institute of Science and Technology on  
Behavior, Cognition, and Teaching*

**Resumen**

La consolidación del Naming Bidireccional (BiN) como la relación conductual generalizada de Naming Bidireccional Incidental (Inc-BiN) se considera fundamental para el desarrollo efectivo del lenguaje. Investigaciones previas indicaron que la Enseñanza Intensiva de Tactos (EIT), con 100 ensayos por día, implementado tres veces por semana, indujo BiN e Inc-BiN en dos niños autistas. Este estudio evaluó los efectos de una EIT con 50 ensayos diarios, administrada tres veces por semana, en la inducción de BiN e Inc-BiN en tres niños autistas. Los participantes fueron expuestos a pre pruebas de BiN e Inc-BiN, EIT, post pruebas de BiN e Inc-BiN, y pruebas de generalización y mantenimiento de BiN e Inc-BiN. Los resultados mostraron que, tras el EIT con hasta tres conjuntos de estímulos, solo un participante demostró la emergencia de BiN, y ninguno la emergencia de Inc-BiN. Se discute la necesidad de investigar variaciones paramétricas en la implementación del EIT (ej., número de ensayos diarios o semanales y de conjuntos de estímulos), considerando también aspectos como el repertorio verbal inicial de los participantes, las funciones reforzadoras de los estímulos antecedentes y consecuentes y de las respuestas de observación de los estímulos, y el impacto de requerir o restringir

---

1.- This work was part of the first author's master thesis, developed at Federal University of Pará (Brazil), under supervision of the last author and co-supervision of the second author. ICB was supported by a Master scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES- Finance code 001) and CBAS is recipient of research productivity scholarship from National Council for Scientific and Technological Development (CNPq#316766/2021). Correspondence concerning this work should be addressed to: Isabelly Bastos. Universidade Federal do Pará. Núcleo de Teoria e Pesquisa do Comportamento. Rua Augusto Corrêa, 01, Campus Universitário do Guamá, Belém, Pará, Brasil. CP: 66.075-110. E-mail: [bastosisabellyto@gmail.com](mailto:bastosisabellyto@gmail.com)

respuestas ecoicas.

*Keywords:* *naming* bidireccional, *naming* bidireccional incidental, enseñanza intensiva de tactos, niños autistas

### Abstract

The consolidation of Bidirectional Naming (BiN) as the generalized behavioral relation of Incidental Bidirectional Naming (Inc-BiN) is considered fundamental for effective language development. Previous research has shown that Intensive Tact Instruction (ITI), consisting of 100 trials per day implemented three times a week, induced BiN and Inc-BiN in two autistic children. This study evaluated the effects of ITI with 50 daily trials, administered three times per week, on the induction of BiN and Inc-BiN in three autistic children. Participants underwent pretests for BiN and Inc-BiN, ITI sessions, posttests for BiN and Inc-BiN, as well as generalization and maintenance tests for BiN and Inc-BiN. Results showed that, following ITI with up to three stimulus sets, only one participant demonstrated the emergence of BiN, and none demonstrated the emergence of Inc-BiN. The need for further investigation into parametric variations in the implementation of ITI is discussed (e.g., the number of daily or weekly trials and stimulus sets), also considering factors such as the participants' initial verbal repertoire, the reinforcing functions of antecedent and social consequence stimuli, the reinforcing function of observation responses to stimuli, and the impact of requiring or restricting echoic responses.

*Keywords:* bidireccional naming, incidental bidireccional naming, intensive tact instruction, autistic children

\*\*\*

During the initial period of language acquisition, listener and speaker repertoires are functionally independent (Skinner, 1957/2020). For example, a child may be able to point to an object or event upon hearing its name but may not be able to say the name of the object or event when asked. However, in children with neurotypical development, the integration of listener and speaker repertoires typically occurs between the ages of two and three years (Horne & Lowe, 1996)

According to the Naming Theory (Horne & Lowe, 1996), the integration of listener and speaker repertoires is the result of the repeated and integrated occurrence of listener, echoic, and tact<sup>1</sup> respon-

---

1- Echoic and tact are verbal operants (Skinner, 1957/2020). The echoic is a verbal operant controlled by verbal antecedent stimuli and maintained by generalized reinforcement. It exhibits point-to-point correspondence (PPC) and formal auditory similarity between the antecedent and the response. For example, the child hears their mother say "hand" and repeats "hand," receiving praise as reinforcement. The tact is a verbal operant controlled by nonverbal antecedent stimuli and maintained by generalized reinforcement. For example, the child sees a toy airplane and says "airplane," receiving praise as reinforcement.

ses. Through interactions with the verbal community, children initially acquire listener behavior as they engage in observation, approach, and interaction responses with stimuli named by others (e.g., drinking from the cup, picking up the cup, etc.). When naming these items, members of the verbal community also reinforce vocal approximations emitted by the child (e.g., the child says "up" and receives attention from the caregiver). As a result, echoic behavior begins to be established, and since the vocalization occurs in the presence of a non-verbal stimulus (e.g., the cup), the acquisition of listener and echoic behaviors sets the stage for the development of the tact repertoire. This, in turn, facilitates responses directed toward the named object (e.g., looking at or handling it), leading to the integration of listener and speaker repertoires (see Horne & Lowe, 1996, p. 191-205). Thus, when listener responses to objects/events are taught, speaker responses to those objects/events emerge, and vice versa. This integration of listener and speaker repertoires, where teaching one results in the emergence of the other, was later characterized as bidirectional naming (BiN; Miguel, 2016).

According to Naming Theory, the integration of speaker and listener repertoires as a generalized behavioral relation results in a full name relation (Horne & Lowe, 1996, p. 207). In this way, the child becomes capable of learning both speaker and listener responses to objects/events incidentally (i.e., without direct teaching), simply by observing members of their verbal community talk about the objects/events in their presence.

This ability to incidentally learn listener and speaker responses was later defined as full naming (FN – Greer & Ross, 2008; Greer & Speckman, 2009). FN has been characterized as a foundational behavioral repertoire for the proper development of verbal skills (Greer & Speckman, 2009; Greer et al., 2017).

Analyzing the sources of reinforcement in the induction of BiN and FN, Hawkins et al. (2018) suggested that these repertoires could be characterized into six distinct subtypes: (1) Listener Unidirectional Naming: the speaker behavior for an object/event is taught, and listener behavior for that object/event emerges; (2) Speaker Unidirectional Naming: the listener behavior for an object/event is taught, and speaker behavior for that object/event emerges; (3) Joint Bidirectional Naming (equivalent to BiN): the individual demonstrates both of the previous subtypes; (4) Listener Incidental Unidirectional Naming: the individual emits listener behaviors for objects/events based on the pairing of these objects/events with their respective names (without reinforcement contingencies); (5) Speaker Incidental Unidirectional Naming: the individual emits tacts for objects/events based on the pairing of these objects/events with their respective names (without reinforcement

contingencies); (6) Joint Incidental Bidirectional Naming (equivalent to FN): the individual demonstrates both of the previous subtypes, meaning the emergence of untrained listener and speaker behaviors for the same stimulus following an incidental experience.

The development and consolidation of Bidirectional Naming (BiN) and Incidental Bidirectional Naming (Inc-BiN) repertoires (and their subtypes) occur in daily life through observational experiences and teaching histories (Greer et al., 2017; Horne & Lowe, 1996). However, for certain individuals, such as some autistic individuals, the acquisition of these verbal repertoires is either absent or weakly established. Therefore, it may be necessary to organize systematic teaching using procedures designed to address these deficits and modify interactions with verbal communities to promote both vocabulary acquisition and its generative potential for new verbal functions (Greer & Ross, 2008).

Intensive Tact Instruction (ITI) is one of the procedures identified as capable of facilitating the induction of Inc-BiN (Greer et al., 2017<sup>2</sup>). ITI involves the addition of 100 daily tact training trials (e.g., a set of 20 stimuli organized into five categories [e.g., foods, drinks, fruits, etc.], with four stimuli in each category, conducting five trials per stimulus) interspersed with the individual's other teaching activities. It has been suggested that increasing daily opportunities for tact learning may promote the emission of echoic and listener responses related to those tacts, enabling the repeated and integrated occurrence of these three repertoires- a fundamental aspect of speaker-listener integration that results in BiN and Inc-BiN (Greer et al., 2017; Greer & Ross, 2008).

A recent literature review (Keuffer & Souza, 2024a) demonstrated that nearly all studies evaluating the role of ITI in the induction/expansion of verbal repertoires analyzed the effect of ITI on the emergence of tacts, mands<sup>3</sup>, and other verbal operants in non-instructional environments, such as recreation areas and transitions between settings (Costa & Pelaez, 2014; Greenberg et al., 2014; Greer & Du, 2010; Lydon et al., 2009; Pereira-Delgado & Oblak, 2007; Pistoljevic & Greer, 2006; Schauffler & Greer, 2006; Schmelzkopf et al., 2017). In these studies, ITI was implemented five times per week

---

2- Greer et al. (2017) define the integration of listener and speaker repertoires as BiN. However, in their article, they describe this integration as an incidental language learning capability, which effectively corresponds to Inc-BiN.

3.- Mand is a verbal operant controlled by motivating operations (i.e., variables that alter the reinforcing value of a stimulus and the probability of responses that previously produced that stimulus - Laraway et al., 2003), in which a response results in a specific reinforcing consequence (Skinner, 1957/2020). For example, a thirsty child says, "Water," and receives a glass of water from their caregiver.

(500 tact training trials per week) using five stimulus sets (one set at a time until learning criteria were met) (e.g., Greer & Du, 2010; Lydon et al., 2009; Schmelzkopf et al., 2017) or with a varying number of sets, ranging from one to five (Pereira-Delgado & Oblak, 2007; Pistoljevic & Greer, 2006). Only one study (Iacomini et al., 2021), in a parametric variation of ITI, evaluated the effect of implementing 100 tact training trials one to two times per week (using two stimulus sets).

Overall, the results of these studies showed both an increase in the quantity of directly trained and untrained (spontaneous) tact responses, as well as in other verbal operants. Additionally, they reported an expansion in the number of verbal interactions that facilitated access to generalized social reinforcers (e.g., social attention from adults and peers in the environment). However, none of these studies assessed the presence of Inc-BiN (or BiN) in the participants' behavioral repertoires before or after the implementation of ITI (Keuffer & Souza, 2024a; Santos & Souza, 2020).

Only one study (Hotchkiss & Fienup, 2020) sought to investigate the effectiveness of ITI in inducing Inc-BiN<sup>4</sup> and conducted a parametric analysis comparing an ITI with 100 daily trials to an ITI with 50 daily trials. Eight children (ages 5 to 8) with neuroatypical development (five of whom were autistic) were grouped into four dyads. In each dyad, one child was exposed to one of the ITI protocols. To assess Inc-BiN (before and after ITI), pre and posttests were conducted. First, identity match-to-sample (IDMTS) responses were taught (using stimuli different from those used in ITI), with the experimenter naming the model stimulus (e.g., "Match duck"). Then, listener (selecting stimuli in an auditory-visual matching-to-sample [AVMTS] task) and speaker (tact and intraverbal<sup>5</sup> tact) repertoires were tested for the stimuli used in the IDMTS training. It was found that both ITI protocols resulted in the acquisition of listener and speaker responses, a result that, according to the authors, demonstrated the emergence of Inc-BiN in the children's repertoires.

However, this testing structure does not allow for an adequate evaluation of Inc-BiN. This is because, during the IDMTS training in

---

4- Hotchkiss and Fienup (2020) characterize the integration of listener and speaker repertoires as BiN but define it as the acquisition of name-object relations incidentally or in the absence of direct reinforcement (pp. 481-482), which corresponds to Inc-BiN.

5- Intraverbal is a verbal operant (Skinner, 1957/2020) controlled thematically by verbal antecedent stimuli, without PPC between responses and antecedent stimuli, and maintained by generalized reinforcement. For example, when asked, "What is your name?" the child responds, "Luka," and receives praise. An intraverbal tact is a verbal response simultaneously controlled by a nonverbal stimulus and a verbal stimulus (which does not have PPC with the response). For instance, the child says "cat" when someone points to a cat and asks, "What is this?".

which the experimenter states the name of the sample stimulus, the task effectively constitutes a conditional discrimination training with an auditory-visual compound sample stimulus (the item to be matched and its spoken name by the experimenter). It can thus be better characterized as IDMTS+AVMTS training. Consequently, during IDMTS+AVMTS, participants were exposed to reinforced AVMTS training (with some achieving the learning criterion for this repertoire during the pretests). This prevents the subsequent AVMTS and tact tests, following the IDMTS+AVMTS training, from being considered evaluations of Inc-BiN. Instead, following the framework proposed by Hawkins et al. (2018), these should be interpreted as tests of speaker unidirectional naming (Lima & Souza, 2022; Santos & Souza, 2020).

Considering these limitations, Keuffer and Souza (2024b) conducted an appropriate evaluation of the effect of ITI on the induction of Inc-BiN and BiN in autistic children. The evaluation of the effect on BiN was included in the study to expand the limited research on the effects of teaching procedures on BiN induction and the relationship between BiN and Inc-BiN in the integration process of listener and speaker repertoires (Queiroz & Souza, 2024; Santos & Souza, 2024).

Based on the findings of Hotchkiss and Fienup (2020) and Iacomini et al. (2021), which suggest that lower ITI intensities may also result in the acquisition/expansion of verbal repertoires, Keuffer and Souza (2024b) implemented an ITI with 100 daily trials, delivered three times a week until the learning criterion was met, using three sets of stimuli (one at a time) with three autistic children aged 4 to 6 years. To test BiN and Inc-BiN before and after ITI implementation, a repeated probes design was employed, using the tact-selection procedure (Pérez-González et al., 2014) and the stimuli pairing observation procedure (SPOP; Lobato & Souza, 2020), respectively. The tact-selection procedure involves teaching tacts for one set of stimuli and testing the emergence of AVMTS (auditory-visual matching-to-sample) for those stimuli, and doing the reverse for another set of stimuli. The SPOP involves first pairing stimuli (e.g., simultaneous or successive presentation of two images/objects or an image/object and a sound) while requiring only that the individual observes the presentation. Subsequently, emergent responses for relations among stimuli (e.g., tacts and AVMTS) are tested. Following the ITI implementation with the three stimulus sets, two children demonstrated the emergence of both BiN and Inc-BiN. Additionally, both met the learning criterion in generalization tests for BiN and Inc-BiN, and one of them achieved the criterion in maintenance tests for these repertoires.

Although the results of Keuffer and Souza (2024b) indicated that ITI facilitates the induction of BiN and Inc-BiN in autistic children, the

use of a repeated probes design in their study did not allow for the exclusion of the effects of other variables (e.g., participants' maturational aspects, learning occurring in the extra-experimental environment) on these outcomes. Additionally, regarding the investigation of the efficiency of different ITI intensities, Keuffer and Souza (2024b) implemented 300 tact training trials per week, whereas other studies (Hotchkiss & Fienup, 2020; Iacomini et al., 2021) demonstrated that lower intensities (ranging from 100 to 250 trials per week) resulted in the acquisition/expansion of verbal repertoires. Therefore, the present study aimed to evaluate the effect of an ITI protocol with 150 trials per week (50 daily trials, implemented three times per week), on the induction of BiN and Inc-BiN in autistic children, using a multiple-probe experimental design across participants (Horner & Baer, 1978).

## **Method**

### **Participants**

Three children diagnosed with Autism Spectrum Disorder participated in the study (see participant descriptions in Table 1). All participants were receiving treatment at a private clinic, with interventions based on Applied Behavior Analysis (ABA) conducted three times per week in sessions lasting two to three hours.

Verbal repertoires were assessed using the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2014). Participants included in the study demonstrated verbal repertoires corresponding to a complete Level 1 and an incomplete Level 2 of the VB-MAPP in the domains of tact and listener responding. Additionally, participants did not exhibit BiN or Inc-BiN in the pretests of these repertoires (or exhibited only one of them) (see Stage 1 of the Procedure).

Parents/caregivers of the participants signed an Informed Consent Form and an Assent Form (which was read to the participants), authorizing their participation in the study. The study was approved by the Research Ethics Committee of the Tropical Medicine Center at UFPA (approval number 6.302.104).

### **Setting, Materials, and Equipment**

Data collection took place at a private clinic specializing in ABA, in a climate-controlled room measuring 5m x 2.5m, equipped with artificial lighting and appropriate furniture for activities with children. Sessions were recorded using a pencil and data sheets specifically designed for the study, as well as an iPhone 13 for video recording.

Tasks were presented using dolls, color photos of food, toys, professions, objects, and animals, and stimuli identified as potentially reinforcing for the children, as described below.

**Table 1**

*Age, Gender, and Initial Repertoire of Participants According to the VB-MAPP Assessment*

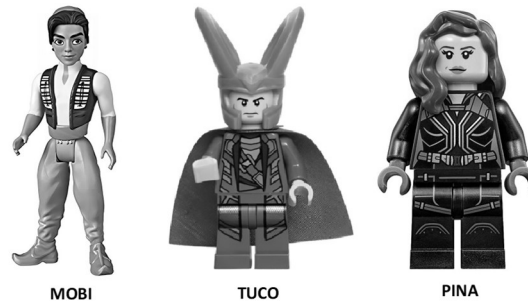
Participant/ age/gender	Verbal repertoire
P1 5 years old Female	<p><b>Mand:</b> Emitted mands for access to present items when provided with a verbal prompt such as 'What do you want?' as well as for actions, both in two- to three-word phrases following another person's model. Did not emit mands for item removal but emitted spontaneous one-word mands.</p> <p><b>Tact:</b> Tacted three exemplars of a stimulus for 50 different items. Did not emit spontaneous tacts and did not use two- or more-word phrases when tacting.</p> <p><b>Listener response:</b> Selected up to three exemplars of 50 different items, including images and objects; followed instructions involving verbs and verb-noun combinations.</p> <p><b>Echoic:</b> Repeated words with up to three syllables and phrases with up to three words spoken by another person, with PPC or approximations of the correct response.</p>
P2 5 years old Female	<p><b>Mand:</b> Emitted mands for access to both present and absent items, for actions, and for the removal of less preferred items or activities. Emitted spontaneous mands in phrases of up to four words.</p> <p><b>Tact:</b> Tacted three exemplars of 50 different items, as well as verbs and verb-noun combinations. Did not emit spontaneous tacts and did not use phrases with more than two words when tacting.</p> <p><b>Listener response:</b> Selected up to three exemplars of 50 different items, including images and objects; selected images of verbs; followed instructions involving verbs and verb-noun combinations.</p> <p><b>Echoic:</b> Repeated words with up to four syllables and phrases with up to four words spoken by another person, with PPC or approximations of the correct response.</p>
P3 4 years old Male	<p><b>Mand:</b> Emitted mands for access to both present and absent items, for actions, and for the removal of less preferred items or activities. Emitted mands in phrases of up to four words following another person's model and spontaneous mands containing two words.</p> <p><b>Tact:</b> Tacted three exemplars of 50 different stimuli, as well as verbs and verb-noun combinations. Did not emit spontaneous tacts and did not use phrases with more than two words when tacting.</p> <p><b>Listener response:</b> Selected up to three exemplars of 50 different items, including images and objects; selected images of verbs; followed instructions involving verbs and verb-noun combinations.</p> <p><b>Echoic:</b> Repeated words with up to four syllables and phrases with up to four words spoken by another person, with PPC or approximations of the correct response.</p>

### *Antecedent Stimuli*

To evaluate the induction of BiN and Inc-BiN, up to 27 dolls (10 to 14 cm in height), unfamiliar to the participants, were used. These were organized into nine sets, each containing three dolls. Each doll was assigned a pseudo-name consisting of two syllables, avoiding phoneme repetitions that could lead to pronunciation difficulties (e.g., consonant clusters, vowel clusters, or digraphs - e.g., Mobi, Tuco, Pina) or syllable repetition across names (see Figure 1 for an example of the stimulus sets). The pseudo-names were selected through a pre-experimental evaluation, which was conducted without consequences for correct or incorrect responses, to identify syllables that participants could accurately repeat.

**Figure 1**

*An Example of the Stimulus Sets Used to Evaluate the Induction of BiN and Inc-BiN*



For the ITI training, three sets of color photos (presented on printed cards measuring 15 cm x 10 cm) were utilized. Each set comprised 10 stimuli, with two stimuli representing each of the following five categories: food, toys, professions, objects, and animals. Each stimulus included five distinct exemplars varying in attributes such as color, size, and spatial orientation to simulate real-world scenarios where the same tact response is taught across multiple exemplars of the same stimulus (e.g., saying "cat" in response to a black cat, a white cat, a cartoon cat, or a toy cat). Stimuli for each participant were selected during a pre-experimental evaluation conducted without consequences for correct or incorrect responses. The selected stimuli were those for which participants did not demonstrate correct intraverbal tact responses to any of the five exemplars associated with each stimulus (see Table 2 for an example of the stimulus sets).

**Table 2**

*Description of the Three Stimulus Sets Used in ITI Training for Participant P1*

Sets	Categories				
	Foods	Toys	Professions	Objects	Animals
Set 1	Kibbeh (Quibe)	Spring (Mola)	Dancer (Bailarino)	Whisk (Fuê)	Skink (Gambá)
	Churros (Churros)	Track (Trilho)	Pilot (Piloto)	Mouse (Mouse)	Tapir (Anta)
	Pudding (Pudim)	Wireframe (Aramado)	Player (Jogador)	Cable (Cabo)	Hyena (Hiena)
Set 2	Sushi (Sushi)	Chalkboard (Lousa)	Sweeper (Gari)	Goblet (Taça)	Stingray (Arraia)
	Plum (Ameixa)	Puppet (Fantoche)	Musician (Músico)	Paperclip (Clipe)	Lemur (Lêmure)
Set 3	Jackfruit (Jaca)	Video game (Videogame)	Fighter (Lutador)	Bakin pan (Fôrma)	Squid (Lula)

*Note.* The names of the stimuli in Portuguese are presented in parentheses

### ***Consequence Stimuli***

To select potential reinforcing stimuli, a preliminary survey was conducted with the caregivers and the teams responsible for the participants' care. Based on this survey, a multiple-stimulus without replacement (MSWO) preference assessment (Carr et al., 2000) was conducted prior to each experimental session to identify items most likely to function as reinforcers. These items were then used during the session as consequences for correct responses. In addition to tangible items, correct responses were also reinforced with verbal praise (e.g., “Well done!” or “Great job!”).

### ***Experimental Design***

A multiple-probe design across participants (Horner & Baer, 1978) was used to evaluate the effect of ITI training with 50 daily trials (implemented three times per week) on the induction of BiN and Inc-BiN. Initially, all participants were exposed to pretests for BiN and Inc-BiN. Among those who did not demonstrate either repertoire or demonstrated only one of them (see Stage 1 of the Procedure), one participant was exposed to the first set of ITI stimuli until the learning criterion was met (Stage 2 of the Procedure). Subsequently, posttests for BiN and/or Inc-BiN were conducted with this participant (Stage 3

of the Procedure), while the pretests for BiN and/or Inc-BiN were repeated with the other two participants.

Next, the second participant was exposed to ITI training until the learning criterion was met, followed by posttests for BiN and/or Inc-BiN. Meanwhile, pretests for BiN and/or Inc-BiN were repeated for the third participant. This process continued until all participants had been exposed to ITI training, followed by posttests for BiN and/or Inc-BiN. Participants who reached the learning criterion for BiN and/or Inc-BiN were then exposed to generalization tests for these repertoires (Stage 4 of the Procedure).

Those who met the criterion on the generalization tests proceeded to maintenance tests (Stage 5 of the Procedure). If the learning criterion was not met after completing a set of ITI training, the participant underwent additional ITI training using a second set of stimuli until the criterion was achieved, followed by posttests for BiN and/or Inc-BiN. Upon meeting the criterion, the participant proceeded to the subsequent tests as outlined. If the criterion remained unmet, the participant was exposed to ITI training with a third set of stimuli, followed by the corresponding posttests and subsequent assessments.

### ***Independent and Dependent Variables***

The independent variable was the implementation of ITI, consisting of 50 daily trials, three times per week. The dependent variable was the percentage of independent correct responses in intraverbal tact and AVMTS tests during pre-test, post-test, generalization, and maintenance phases for BiN and Inc-BiN. Additionally, the following were analyzed: (1) the number of intraverbal tact and AVMTS training trials during pre-test, post-test, generalization, and maintenance for BiN; and (2) the number of trials required to reach mastery criterion for each set of ITI implemented.

### ***Procedure***

The experimental procedure was conducted in up to five stages, depending on participant performance: 1- Pretests for BiN and Inc-BiN, 2- Implementation of ITI, 3- Posttests for BiN and/or Inc-BiN, 4- Generalization tests for BiN and/or Inc-BiN; and 5- Maintenance tests for BiN and/or Inc-BiN.

Three experimental sessions were conducted weekly during all implemented stages, with a variable number of training/testing trial blocks depending on the stage in progress. To maintain participant engagement in tasks and avoid potential negative effects of test trials without reinforcement, occasional responses already present in the

child's behavioral repertoire—referred to as maintenance responses (identified by the clinical team)—were prompted, allowing participants to execute them easily and access identified reinforcers. Additionally, collaboration responses (e.g., storing and handing over items) were differentially reinforced by the experimenter.

### *Stage 1: Pretests for BiN and Inc-BiN*

**BiN pretests.** The tact-selection procedure (Pérez-González et al., 2014) was used for the BiN pretest. For one set of stimuli, intraverbal tact training was provided until the mastery criterion was met, followed by AVMTS testing for the same set. For another set of stimuli, AVMTS teaching was provided, followed by intraverbal tact testing. Training and testing were conducted in blocks of nine randomized trials, with three trials for each of the three stimuli in the set.

*Intraverbal Tact or AVMTS Training.* The first six trials in the initial training block (two for each of the three stimuli in the set) were conducted with prompts: 1- For intraverbal tact instruction, the experimenter presented the doll to the child, asked, "What is this?" or "What is its name?" and then provided a vocal prompt (stating the stimulus name); 2- For AVMTS instruction, the experimenter placed the three dolls in front of the child (comparison stimuli, with randomized positions across trials), said, "Point to/Which one is/Give me [name of the doll]," and then provided a gestural prompt (pointing to the doll). The last three trials in the block were conducted without any prompts. Correct responses within five seconds (pointing to/picking up the comparison stimulus named by the experimenter for AVMTS, or stating the pseudo-name of the stimulus for intraverbal tact) were reinforced with praise and trial termination (for prompted trials) or with praise, tangible items, and trial termination (for unprompted trials). For all trials, incorrect responses (pointing to/picking up a stimulus other than the one named by the experimenter for AVMTS, or stating a name that did not match the assigned stimulus for intraverbal tact) or no response resulted in the trial being re-presented with prompts until the child responded correctly or until three repetitions with prompts were completed (both resulting in trial termination).

This training structure was maintained until the participant produced independent correct responses in the last three trials of a training block. Once this criterion was met, subsequent blocks were conducted without prompts. Correct and incorrect responses were reinforced or addressed as previously described.

The mastery criterion to conclude training was eight independent correct responses (88.88%) across two consecutive blocks or 100%

independent correct responses in a single block. Once this criterion was met, a 10-minute break was provided, during which participants were allowed to play and engage in preferred activities with objects available in the environment (all different from the dolls used in the study). After the break, the untrained repertoire test was implemented for the stimulus set.

*Intraverbal Tact or AVMTS Testing.* For each repertoire (intraverbal tact and AVMTS), three testing blocks were conducted, comprising three consecutive measures for a total of 27 trials. The trials were similar to those in the training phase but were conducted without prompts, and no differential reinforcement was provided for correct or incorrect responses (every two or three trials, the experimenter provided generic statements such as "Let's continue").

Performance consisting of eight independent correct responses in two blocks (88.88%) or 100% independent correct responses in one block, for both repertoires, was considered an indicator that BiN was part of the participant's behavioral repertoire. Performance meeting these criteria for only one repertoire (either intraverbal tact or AVMTS) or below these criteria for both repertoires was taken as an indicator that BiN was not part of the participant's behavioral repertoire.

**Inc-BiN pretests.** To assess Inc-BiN, the stimulus-pairing observation procedure (SPOP; see Lobato & Souza, 2020) was used with a new set of stimuli. Three pairing-test cycles were conducted. In each cycle, during play sessions, each doll and its pseudo-name were paired five times (randomized), requiring only that the child look at the doll while the experimenter said its pseudo-name (the child was allowed to handle the doll if they showed interest). After completing the five pairings for each doll/pseudo-name, participants were given 15 minutes to play and engage in preferred activities with other objects available in the environment, all distinct from the dolls used in the study.

Following this break, intraverbal tact and AVMTS tests (in that order) were conducted for the stimuli used in the SPOP, followed by a five-minute break before the next cycle. Each test was identical to a testing block for each repertoire in the BiN pre-tests.

Performance of eight independent correct responses (88.88%) across two consecutive blocks, or 100% independent correct responses in one block, for both repertoires, was considered an indicator that Inc-BiN was part of the participant's behavioral repertoire. Performance meeting these criteria for only one repertoire (either intraverbal tact or AVMTS), or below these criteria for both repertoires, was considered an indicator that Inc-BiN was not part of the participant's behavioral repertoire. Participants who did not demonstrate BiN or Inc-BiN, or

demonstrated only one of them (or some of their subtypes), proceeded to Stage 2 of the Procedure.

### ***Stage 2: ITI implementation***

The ITI was implemented during the participant's daily activities at the behavioral intervention clinic. The experimenter utilized moments of playful and less-structured interactions to teach intraverbal tact. During the implementation of ITI, stimuli were presented on cards in a randomized order. For each stimulus set, 50 training trials were conducted per day (five trials for each of the two stimuli in each of the five categories within the set). One training block was conducted for each stimulus category (10 randomized trials), completing five blocks per day (one block for each category in the set), with five-minute intervals between blocks.

In the initial phase of ITI, the experimenter began each training block by saying, for example, "Let's learn about toys/animals/etc." During each trial, the experimenter gained the participant's attention toward the stimulus (i.e., one of its five exemplars) and said, "This is a [stimulus name]" or simply "[stimulus name]." If the participant echoed the stimulus name within five seconds, this response was considered correct with prompts and was followed by praise. If the participant did not echo or emitted an incorrect response, the experimenter implemented a correction procedure: gaining the participant's attention to the stimulus again and repeating the stimulus name in a segmented manner until the child responded correctly or until the name was repeated up to five times (both scenarios resulted in the end of the trial). This procedure was repeated until the participant independently echoed the names of stimuli in 45 out of the 50 ITI daily trials.

Subsequently, training blocks were conducted without the initial echoic prompt. In these trials, the experimenter gained the participant's attention to the stimulus and asked, "What is this?" or "What's the name of this?" Correct responses were followed by generalized reinforcers associated with the participant's preferred items and the conclusion of the trial. Incorrect responses or no response within five seconds resulted in the experimenter re-implementing the correction procedure described earlier. If the participant correctly responded to four trials for a stimulus across two consecutive blocks or five trials in a single block, the training trials for that stimulus were redistributed to the remaining stimuli, prioritizing increased exposure to stimuli where performance did not show an upward trend. Additionally, if a participant's performance for a specific exemplar of a stimulus did not show improvement across three consecutive sessions, that exemplar was replaced.

The mastery criterion for a set of stimuli was 90% independent correct responses across two consecutive 50 ITI trials or 100% independent correct responses in one 50 ITI trials. Once one of these criteria was met, the participant advanced to Stage 3 of the Procedure.

### ***Stage 3: Posttests for BiN and/or Inc-BiN***

**BiN Posttests.** It was identical to the BiN pretest in Stage 1 (using the same sets of stimuli); however, intraverbal tact and AVMTS instruction began without prompts. BiN posttests were conducted after the participant met the performance criterion for each ITI set.

**Inc-BiN Posttests.** It was similar to the Inc-BiN pretest in Stage 1 but was conducted with a new set of stimuli to ensure that performance improvements were due to the implementation of ITI and not solely the SPOP. Inc-BiN posttests were also conducted after the participant achieved the performance criterion for each ITI set.

### ***Stage 4: Generalization Tests for BiN and/or Inc-BiN***

It was identical to Stage 3, but new sets of stimuli were used for BiN and Inc-BiN tests. Participants who met the learning criterion for BiN and/or Inc-BiN proceeded to maintenance tests for these repertoires (Stage 5 of the Procedure). If the participant did not meet the learning criterion for the new stimuli, Stage 5 was conducted using the set of stimuli from the most recent posttest.

### ***Stage 5: Maintenance Tests for BiN and/or Inc-BiN***

Identical to Stage 4, conducted two weeks later to assess the maintenance of BiN and/or Inc-BiN in the participant's repertoire.

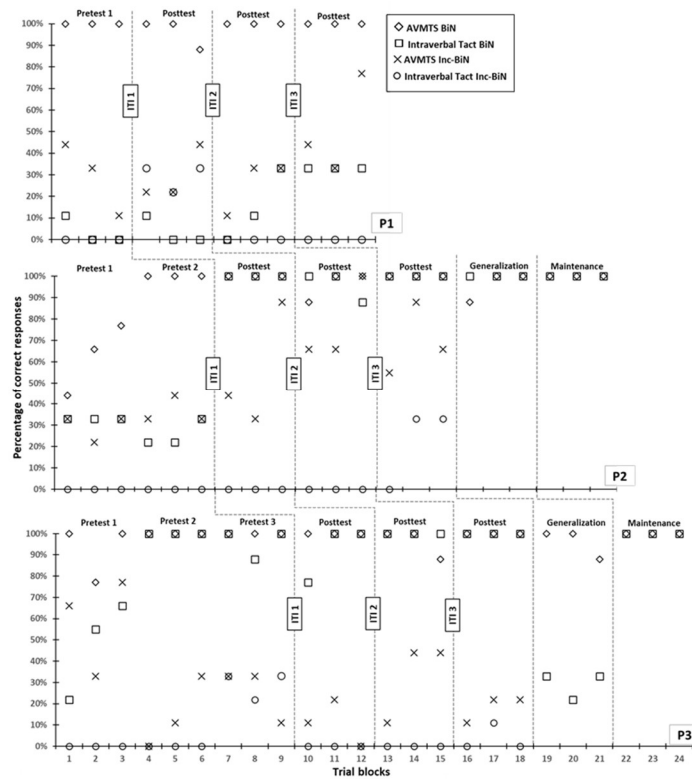
### **Interobserver Agreement and Procedural Integrity**

To assess recording reliability and procedural integrity, another experimenter reviewed 30% of the video-recorded sessions from all implemented stages of the study for each participant. Recording reliability was determined by calculating the interobserver agreement ( $[\text{Agreement}/(\text{Agreement}+\text{Disagreement})]\times 100$ ) based on the response records for each participant during each experimental stage. In Stage 1, interobserver agreement was 97% for P1 and P3, and 99% for P2. In Stage 2, it was 100% for P1 and 97% for P2 and P3. In Stage 3, interobserver agreement was 100% for all participants. Only P2 and P3 completed Stage 4, with 100% agreement on recording. In Stage 5, interobserver agreement was 98% for both P2 and P3.

Procedural integrity was evaluated using a checklist to verify the correct implementation of each stage of the procedure (see Appendix) for each participant. The integrity score was calculated by dividing the number of correctly implemented trial by the total number of trials and multiplying the result by 100. In Stage 1, procedural integrity scores were 98% for P1, 91% for P2, and 99% for P3. In Stage 2, scores were 95% for P1, 85% for P2, and 88% for P3. In Stage 3, procedural integrity was 98% for P1, 98% for P2, and 97% for P3. In Stage 4, integrity scores were 92% for P2 and 100% for P3. Finally, in Stage 5, scores were 93% for P2 and 98% for P3.

**Figure 2**

*Percentage of Correct Responses in Pretests, Posttests, Generalization and Maintenance Tests for BiN and Inc-BiN*



### Results

Figure 2 presents the percentage of correct responses for all three participants during pretests, posttests, generalization and maintenance tests for BiN and Inc-BiN. In the pretests, participants P1 and P2 exhibited listener unidirectional naming, where intraverbal tact learning led to the emergence of AVMTS. Participant P3, on the other hand, demonstrated the emergence of BiN, achieving 100% accuracy in both AVMTS and intraverbal tact across six of nine testing blocks.

After the implementation of ITI with the three stimulus sets, P1 maintained listener unidirectional naming, P2 demonstrated the emergence of BiN after the first ITI (a performance maintained during generalization and maintenance tests), and P3 maintained BiN (a performance that did not replicate in the generalization test but was observed again in the maintenance test using stimuli from posttest 3).

**Table 3**

*Number of Intraverbal Tact and AVMTS Training Trials Required for the Pretests, Posttests, Generalization and Maintenance Tests of BiN for all three participants*

Experimental Stage	Repertoire	Participant		
		P1	P2	P3
Pretest 1	Tact	54	180	36
	AVMTS	90	117	27
Pretest 2	Tact	-	27	27
	AVMTS	-	18	18
Pretest 3	Tact	-	-	27
	AVMTS	-	-	18
Posttest 1	Tact	18	9	36
	AVMTS	18	27	9
Posttest 2	Tact	27	18	9
	AVMTS	36	9	18
Posttest 3	Tact	36	9	18
	AVMTS	18	18	9
Generalization	Tact	-	216	63
	AVMTS	-	126	36
Maintenance	Tact	-	27	27
	AVMTS	-	162	9
Total	Tact	135	486	243
	AVMTS	162	477	144

None of the participants demonstrated Inc-BiN after the implementation of ITI, with P2 showing only listener incidental unidirectional naming (100% accuracy in one AVMTS testing block).

Table 3 shows the number of intraverbal tact and AVMTS training trials required for the pretests, posttests, generalization and maintenance tests of BiN for all three participants. Participant P1 underwent 135 intraverbal tact training trials, ranging from 18 to 54, and 162 AVMTS training trials, ranging from 18 to 90. Participant P2 completed 486 intraverbal tact training trials, ranging from 9 to 216, and 477 AVMTS training trials, ranging from 9 to 126. Participant P3 participated in 243 intraverbal tact training trials, ranging from 9 to 63, and 144 AVMTS training trials, ranging from 9 to 36.

**Table 4**

*Number of Training Trials to Criterion in Each ITI Set for Each Participant*

Participant	ITI 1	ITI 2	ITI 3	Total
P1	250	400	400	1050
P2	500	550	350	1400
P3	200	300	250	750

Table 4 presents the number of training trials to criterion for each ITI set across the three participants. Participant P1 required between 250 and 400 trials to achieve the learning criterion during ITI training, completing a total of 1,050 trials. P2 needed 350 to 550 trials, with a total of 1,400 trials, while P3 required 200 to 300 trials, amounting to a total of 750 trials.

### Discussion

This study evaluated, using a multiple-probe experimental design across participants, the effect of an ITI procedure with 50 daily trials, implemented three times per week, on the induction of BiN and Inc-BiN repertoires in three autistic children. It was found that, following the implementation of this ITI procedure with up to three sets of stimuli, only one participant (P2) demonstrated the emergence of BiN and listener incidental unidirectional naming (exposure to the stimuli names resulted in the emergence of AVMTS). None of the participants demonstrated the emergence of Inc-BiN.

These results partially differ from those reported by Keuffer and Souza (2024b), who reported the emergence of BiN and Inc-BiN in two autistic children following exposure to ITI with 100 daily trials, implemented three times per week, using three sets of stimuli. In

addition to the difference in the number of daily ITI trials, the number of pairings in SPOP during pre and posttest in Keuffer and Souza (2024b) was twice as high (30 pairings per cycle—10 for each stimulus) as that implemented in the present study, which might explain the results obtained in the Inc-BiN emergence tests. However, in both studies, stimuli were replaced after each pairing-test cycle, and Inc-BiN only emerged for the two participants in Keuffer and Souza (2024b) after the implementation of ITI with two and three sets of stimuli.

The results of the present study also differ from those of Hotchkiss and Fienup (2020), which demonstrated that an ITI with 50 daily trials, implemented five days per week, was as effective as an ITI with 100 daily trials (also implemented five days per week) in inducing speaker unidirectional naming in neurodivergent children. However, as previously noted, that study did not allow for the evaluation of the effect of ITI on the induction of Inc-BiN due to pretests that involved teaching listener responses, nor did it evaluate listener unidirectional naming, as it lacked a specific test to assess the emergence of listener responses for a set of stimuli following tact learning for those stimuli.

Taken together, these results suggest that an ITI with 50 daily trials, implemented three days per week, can induce BiN in autistic children. However, establishing this repertoire as a generalized operant, resulting in Inc-BiN, appears to require an ITI with higher number of trials per day. Nonetheless, additional parametric aspects of ITI implementation (e.g., frequency, number of trained sets) need to be evaluated to gain a broader understanding of the effects of ITI on the induction of BiN and Inc-BiN.

As mentioned before, the literature has indicated that children/adolescents with neuroatypical development exposed to ITIs with 100 daily trials, implemented five times a week, using up to five sets of stimuli (e.g., Greenberg et al., 2014; Greer & Du, 2010; Lydon et al., 2009; Schmelzkopf et al., 2017), or implemented one to two times a week with two sets of stimuli (Iacomini et al., 2021), demonstrated acquisition/increase in tacts, mands, and other verbal operants. Thus, new studies should evaluate the effects of parametric manipulations related to frequency (e.g., number of implementations per week) and the number of sets used in ITI implementation on the induction of BiN and Inc-BiN. This will enable the assessment, for example, of whether an ITI with 50 daily trials, implemented five times a week, can be as effective in inducing BiN and Inc-BiN as the one implemented by Keuffer and Souza (2024b)—i.e., an ITI with 100 daily trials, three times a week—or the effect of the same ITI with 50 daily trials but implemented with at least five sets of stimuli.

It is certain that parametric variations in aspects of ITI, such as the number of trials per day or per week and the sets of stimuli with which it is implemented, directly impact the total amount of exposure to ITI, which could be the fundamental element for the procedure's effectiveness in inducing BiN and Inc-BiN. This possibility seems to be supported by the data from the present study, in which the participant (P2) exposed to the highest number of ITI trials (1,400) demonstrated the emergence of BiN and listener incidental unidirectional naming. In contrast, the results from Keuffer and Souza (2024b) do not support this assumption, as the participant (P1) who was exposed to the lowest number of ITI trials (1,400) was one of the two participants who showed the emergence of both BiN and Inc-BiN, whereas the participant (P3), exposed to the highest number of ITI trials (2,700), only demonstrated the emergence of BiN and listener incidental unidirectional naming. Thus, the need to continue investigating parametric variations in ITI implementation becomes evident, both to confirm its effectiveness in inducing BiN and Inc-BiN and to determine more efficient implementation structures.

In this regard, future studies aiming to confirm the effectiveness of ITI in inducing BiN and Inc-BiN should compare different total exposure levels to ITI while maintaining consistent parameters such as the number of trials per day or week and the number of stimulus sets. They should also ensure equal exposure until the learning of each set is achieved (conducting additional ITI training sessions if necessary). Conversely, studies investigating more efficient ITI structures for inducing BiN and Inc-BiN should ideally manipulate one parameter at a time (e.g., the number of trials per day), keeping all other variables constant and equalizing exposure until the learning of each ITI set is achieved.

In further investigations into the effectiveness and efficiency of ITI in inducing BiN and Inc-BiN, it is important to consider the participants' initial verbal repertoire. In both the present study and Keuffer and Souza (2024b), participants who demonstrated less robust listener and speaker repertoires in the VB-MAPP assessments were those who performed worse in the BiN and Inc-BiN induction tests. Therefore, studies should aim to evaluate how different ITI training parameters impact the performance of participants with varying verbal repertoires. The insights generated from these studies will be valuable for professionals working with autistic individuals, particularly those interested in using ITI as a procedure to promote linguistic development within this population.

Additionally, the present study had limitations that could be addressed in future investigations. One limitation was that the

reinforcing functions of the antecedent stimuli, social consequences used, and observation responses to the stimuli were neither evaluated nor established. The literature suggests that these reinforcing functions are important for acquiring joint attention and generalized imitation repertoires, which may play a significant role in the initial learning of listener and speaker repertoires (Greer et al., 2017; Longano & Greer, 2015). Therefore, future research on the effectiveness and efficiency of ITI in inducing BiN and Inc-BiN should explore the impact of establishing the reinforcing function of social consequences and observational responses to stimuli, both in BiN and Inc-BiN tests and during ITI.

Another limitation is that no records were made of the spontaneous echoic responses produced by participants during the experimental phases. As previously noted, echoic responses are considered fundamental to the listener-speaker integration process, which leads to BiN and culminates in Inc-BiN (Greer et al., 2017; Greer & Ross, 2008; Horne & Lowe, 1996). Therefore, future studies could both record spontaneous echoic responses during the experimental phases and investigate the effects of requiring or blocking the emission of echoic responses during ITI implementation.

Despite these limitations, the present study contributes to advancing research on the effects of ITI in inducing BiN and Inc-BiN in autistic children. As far as the existing literature indicates, it is only the second study to investigate this effect using appropriate pre and posttests for BiN and Inc-BiN, while also evaluating the generalization and maintenance of these repertoires. Furthermore, the use of a multiple-probe experimental design across participants provided greater experimental control over the influence of other variables on the observed outcomes. Thus, even in an initial capacity, it provides data that may be of interest to professionals seeking evidence-based information on the use of ITI to induce BiN and Inc-BiN in autistic individuals.

### References

- Carr, J. E., Nicholson, A. C., & Higbee, T. S. (2000). Evaluation of a brief multiple-stimulus preference assessment in a naturalistic context. *Journal of Applied Behavior Analysis, 33*(3), 353-357.  
<https://doi.org/10.1901/jaba.2000.33-353>
- Costa, A., & Pelaez, M. (2014). Implementing intensive tact instruction to increase frequency of spontaneous mands and tacts in typically developing children. *Behavioral Development Bulletin, 19*(1), 19-24.  
<https://doi.org/10.1037/h0100569>
- Greenberg, J. H., Tsang, W., & Yip, T. (2014). The effects of intensive tact instruction with young children having speech delays on pure tacts and

- mands in non-instructional settings: A partial replication. *Behavioral Development Bulletin*, 19(1), 35-39. <https://dx.doi.org/10.1037/h0100572>
- Greer, R. D., & Du, L. (2010). Generic instruction versus intensive tact instruction and the emission of spontaneous speech. *The Journal of Speech and Language Pathology – Applied Behavior Analysis*, 5(1), 1-19. <https://dx.doi.org/10.1037/h0100261>
- Greer, R. D., & Ross, D. (2008). *Verbal Behavior Analysis: Inducing and expanding new verbal capabilities in children with language delays*. Boston: Pearson Education.
- Greer, R. D., & Speckman, J. (2009). The integration of speaker and listener responses: A theory of verbal development. *The Psychological Record*, 59(3), 449-488. <https://10.1007/BF03395674>
- Greer, R. D., Pohl, P., Du, L., & Moschella, J. L. (2017). The separate development of children's listener and speaker behavior and the intercept as behavioral metamorphosis. *Journal of Behavioral and Brain Science*, 7(13), 674-704. <https://doi.org/10.4236/jbbs.2017.713045>
- Hawkins, E., Gautreaux, G., & Chiesa, M. (2018). Deconstructing common bidirectional naming: A proposed classification framework. *The Analysis of Verbal Behavior*, 34(1-2), 44-61. <https://doi.org/10.1007/s40616-018-0100-7>
- Horne, P., & Lowe, F. (1996). On the origins of naming and other symbolic behavior. *Journal of the Experimental Analysis of Behavior*, 65(1), 185-241. <https://doi.org/10.1901/jeab.1996.65-185>
- Horner, R. D., & Baer, D. M. (1978). Multiple-probe technique: a variation of the multiple baseline. *Journal of Applied Behavior Analysis*, 11(1), 189-196. <https://doi.org/10.1901/jaba.1978.11-189>
- Hotchkiss, R. M., & Fienup, D. M. (2020). A parametric analysis of a protocol to induce bidirectional naming: Effects of protocol intensity. *The Psychological Record*, 70(3), 481-497. <https://doi.org/10.1007/s40732-020-00383-5>
- Iacomini, S., Antonella, D., Vascelli, L., & Artoni, V. (2021). Effects of a non-intensive tact training on the emission of spontaneous verbal operants in different non-instructional settings. *Life Span and Disability*, 24(1), 7-28. <https://doi.org/2023-08837-001>
- Keuffer, S. I. C. K., & Souza, C. B. A. (2024a). *Efeitos do ensino intensivo de tato no comportamento verbal: Uma revisão sistemática* [Manuscript submitted for publication].
- Keuffer, S. I. C. K., & Souza, C. B. A. (2024b). *Nomeação bidirecional e incidental em crianças autistas: Efeitos do Ensino Intensivo de Tato* [Manuscript submitted for publication].
- Laraway, S., Snyckerski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis*, 36, 407-414. <https://doi.org/10.1901/jaba.2003.36-407>
- Lima, L. C. A., & Souza, C. B. A. (2022). Ensino por múltiplos exemplares: revisão sistemática de estudos experimentais. *Revista Brasileira de Terapia Comportamental e Cognitiva*, 24, 1-22. <https://doi.org/10.31505/rbtcc.v24i1.1507>

- Lobato, J. L., & Souza, C. B. A. (2020). Bidirectional naming in children with autism: Effects of stimulus pairing observation procedure and multiple exemplar instruction. *Revista Brasileira de Educação Especial*, 26(4), 639-656. <https://doi.org/10.1590/1980-54702020v26e0189>
- Longano, J. M., & Greer, R. D. (2015). Is the source of reinforcement for naming multiple conditioned reinforcers for observing responses? *The Analysis of Verbal Behavior*, 31, 96-117. <https://doi:10.1007/s40616-014-0022-y>
- Lydon, H., Healy, O., Leader, G., & Keohane, D. (2009). The effects of intensive tact instruction on three verbal operants in non-instructional settings for two children with autism. *The Journal of Speech and Language Pathology – Applied Behavior Analysis*, 3(2), 173-184. <https://doi.org/10.1037/h0100242>
- Miguel, C. F. (2016). Common and intraverbal bidirectional naming. *The Analysis of Verbal Behavior*, 32(2), 125-138. <https://doi.org/10.1007/s40616-016-0066-2>.
- Pereira-Delgado, J. A., & Oblak, M. (2007). The effects of daily intensive tact instruction on the emission of pure mands and tacts in non-instructional settings by three preschool children with developmental delays. *Journal of Early and Intensive Behavior Intervention*, 4(2), 392-411. <http://dx.doi.org/10.1037/h0100381>
- Pérez-González, L. A., Cereijo-Blanco, N., & Carnerero, J. J. (2014). Emerging tacts and selections from previous learned skills: A comparison between two types of naming. *The Analysis of Verbal Behavior*, 30(2), 184-192. <https://doi.org/10.1007/s40616-014-0011-1>
- Pistoljevic, N., & Greer, R. D. (2006). The effects of daily intensive tact instruction on preschool students' emission of pure tacts and mands in non-instructional setting. *Journal of Early and Intensive Behavior Intervention*, 3(1), 103-120. <http://dx.doi.org/10.1037/h0100325>
- Queiroz, A. G., & Souza, C. B. A. (2024). *Exigência de ecoicos no ensino por múltiplos exemplares e a aquisição de nomeação bidirecional em crianças autistas* [Manuscript submitted for publication].
- Santos, E. L. N., & Souza, C. B. A. (2020). Uma revisão sistemática de estudos experimentais sobre nomeação bidirecional. *Revista Brasileira de Análise do Comportamento*, 16(2), 113-133. <http://dx.doi.org/10.18542/rebac.v16i2.9605>
- Santos, E. L. N., & Souza, C. B. A. (2024). *Nomeação bidirecional em crianças autistas: Efeitos do ensino por múltiplos exemplares e sua relação com a nomeação incidental* [Manuscript submitted for publication].
- Schauffler, G., & Greer, R. D. (2006). The effects of intensive tact instruction on audience-accurate tacts and conversational units. *Journal of Early and Intensive Behavior Intervention*, 3(1), 121-134. <http://dx.doi.org/10.1037/h0100326>
- Schmelzkopf, J., Greer, R. D., Singer-Dudek, J., & Du, L. (2017). Experiences that establish preschoolers' interest in speaking and listening to others. *Behavioral Development Bulletin*, 22(1), 44-66. <http://dx.doi.org/10.1037/bdb0000026>

- Skinner, B. F. (2020). *Verbal Behavior (extended edition)*. Cambridge, MA: B. F. Skinner Foundation. (Originally published in 1957).
- Sundberg, M. L. (2014). *Verbal Behavior Milestones Assessment and Placement Program*. 2<sup>a</sup> ed. Concord, CA: AVB Press.

*Received: November 27, 2024*  
*Final acceptance: June 30, 2025*

## Appendix

<b>Procedural integrity Checklist</b>	
<b>Bidirectional Naming: Intraverbal Tact Training</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Ensured the participant's attention to the stimulus (doll)	
Presented the discriminative stimulus (DS): "What is this?"	
Provided the prompt (stimulus name)	
If the participant's response was correct (independent), did the experimenter provide an appropriate consequence? (social and tangible reinforcement)	
If the participant did not respond within 3 seconds or provided an incorrect response, does the experimenter implement the correction procedure?	
a) Withdrew attention for 3 seconds after the error	
b) Gained the participant's attention to the stimulus	
c) Provided the prompt (stimulus name) until the participant responded or up to three prompted repetitions	
d) Provided social reinforcement	

<b>Procedural integrity Checklist</b>	
<b>Bidirectional Naming: AVMTS Tact Training</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Ensured the participant's attention to the stimuli (3 dolls)	
Presented the DS: "Point to/Which is/Give me (name of one doll)"	
Randomized the stimulus arrangement	
Provided the prompt (pointing to the doll)	
If the participant's response was correct (independent), did the experimenter provide an appropriate consequence? (social and tangible reinforcement)	
If the participant did not respond within 3 seconds or provided an incorrect response, does the experimenter implement the correction procedure?	
a) Withdrew attention for 3 seconds after the error	
b) Gained the participant's attention to the stimulus	
c) Provided the prompt (pointing to the doll) until the participant responded or up to three prompted repetitions	
d) Provided social reinforcement	

<b>Procedural integrity Checklist</b>	
<b>Incidental Bidirectional Naming: SPOP</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Ensured the participant's attention to the stimulus (doll) within a play context.	
Said the name of the stimulus (doll)	

<b>Procedural integrity Checklist AVMTS Test</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Ensured the participant's attention to the stimuli (3 dolls)	
Presented the DS: "Point to/Which is/Give me (name of one doll)"	
Randomized the stimulus arrangement	
If the participant's response was correct (independent), the experimenter did not provide reinforcement	
If the participant did not respond after 3 seconds or provided an incorrect response, the experimenter did not provide reinforcement and did not carry out a correction procedure	

<b>Procedural integrity Checklist Intraverbal Tact Test</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Ensured the participant's attention to the stimulus (doll)	
Presented the DS: "What is this?"	
If the participant's response was correct (independent), the experimenter did not provide reinforcement	
If the participant did not respond after 3 seconds or provided an incorrect response, the experimenter did not provide reinforcement and did not carry out a correction procedure.	

<b>Procedural integrity Checklist Intensive Tact Instruction (ITI)</b>	
<b>Session date:</b>	<b>Experimenter:</b>
<b>Session number:</b>	<b>Observer:</b>
Started the training block by saying "Let's learn (category name)"	
Ensured the participant's attention to the stimulus (color photo of an item used in ITI)	
Presented the DS: "What is this?"	
If the participant's response was correct (independent), the experimenter provided the appropriate consequence? (social and tangible reinforcement)	
If the participant did not respond after 3 seconds or provided an incorrect response, did the experimenter carry out the correction procedure?	
a) Removed attention for 3 seconds after the error	
b) Gained the participant's attention to the stimulus	
c) Provided prompt (stimulus name with or without a faded prompt) until the participant responded or up to five repetitions of the name	
d) Provided social reinforcement	
e) Gained the participant's attention again	
f) Re-presented the stimulus with a prompt	
g) Waited for the response	
h) Provided social reinforcement or a smaller magnitude of tangible reinforcement	